Ordinance No. 3606

["Beginning July 1, 1998"]

(Amending or Repealing Ordinances)

Amending 2829 & 2960
ORDINANCE NO. 3606

AN ORDINANCE of the City Council of the City of Kent, Washington, approving establishment of the 2002 Water System Plan

WHEREAS, the Washington State Department of Health requires the City to prepare a Water System Plan and update the Plan every 6 years, and

WHEREAS, the 2002 Water System Plan is a compilation of planning and engineering analyses conducted to determine the adequacy of the city of Kent Water System to meet existing and projected requirements for provision of domestic and fire protection service within the City's established water service area; and

WHEREAS, the 2002 Water System Plan will supersede the City's previous Water System Plan and will serve as a guideline for future development of the City's water system, and

WHEREAS, on June 3, 2002, the Public Works Committee recommended that the City Council approve the 2002 Water System Plan, NOW THEREFORE,
THE CITY COUNCIL OF THE CITY OF KENT, WASHINGTON
DOES HEREBY ORDAIN AS FOLLOWS

SECTION 1. Adoption. The 2002 Water System Plan is hereby adopted. A copy of the 2002 Water System Plan is attached and incorporated as Exhibit "A".

SECTION 2. Severability. If any section, subsection, paragraph, sentence, clause, or phrase of this ordinance is declared unconstitutional or invalid for any reason, such decision shall not affect the validity of the remaining portions of this ordinance.

SECTION 3. Effective Date. This ordinance shall take effect and be in force thirty (30) days from and after its passage as provided by law.

JIN WHITE, MAYOR

ATTEST

BRENDA JACOBER, CITY CLERK

APPROVED AS TO FORM

TOM BRUBAKER, CITY ATTORNEY
PASSED: 18 day of June, 2002
APPROVED: 18 day of June, 2002
PUBLISHED: 22 day of June, 2002

I hereby certify that this is a true copy of Ordinance No. 3606 passed by the City Council of the City of Kent, Washington, and approved by the Mayor of the City of Kent as hereon indicated.

Brenda Jacob (SEAL)
BRENDA JACOBER, CITY CLERK

P: C:\Civil\Ordinance\2002\WaterSystemPlan.doc
City of Kent
2002 Water System Plan
Prepared by
The Department of Public Works

Council Members

Leona Orr
Judy Woods
Tim Clark
Connie Epperly
Ricco Yingling
Julie Peterson
Bruce White

Mayor

Jim White

Director of Public Works

Don E. Wickstrom, P.E.

City of Kent Public Works Office

220 4th Avenue South
Kent, Washington 98032
Telephone: (253) 856-5500
Fax: (253) 856-6600
# Table of Contents

**Executive Summary**

**Chapter 1: Description of Water System**

<table>
<thead>
<tr>
<th>Sub-Chapter</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1-1</td>
</tr>
<tr>
<td>Ownership and Management</td>
<td>1-1</td>
</tr>
<tr>
<td>System Background</td>
<td>1-2</td>
</tr>
<tr>
<td>Characteristics of the Service Area</td>
<td>1-11</td>
</tr>
<tr>
<td>Inventory of Existing Facilities</td>
<td>1-15</td>
</tr>
<tr>
<td>Connections</td>
<td>1-20</td>
</tr>
<tr>
<td>Interties</td>
<td>1-21</td>
</tr>
<tr>
<td>Relationship with Other Plans</td>
<td>1-22</td>
</tr>
<tr>
<td>Land Use</td>
<td>1-23</td>
</tr>
<tr>
<td>Service Area Agreements</td>
<td>1-24</td>
</tr>
<tr>
<td>Reliability Standard</td>
<td>1-26</td>
</tr>
<tr>
<td>Conditions of Service</td>
<td>1-26</td>
</tr>
<tr>
<td>Complaints / Inquiries</td>
<td>1-27</td>
</tr>
</tbody>
</table>

**Chapter 2: Basic Planning Data and Water Demand Forecasting**

<table>
<thead>
<tr>
<th>Sub-Chapter</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>2-1</td>
</tr>
<tr>
<td>Service Area Boundaries</td>
<td>2-1</td>
</tr>
<tr>
<td>Land Use</td>
<td>2-1</td>
</tr>
<tr>
<td>Population / Service Connections</td>
<td>2-4</td>
</tr>
<tr>
<td>Water Use Data Collection Requirements</td>
<td>2-6</td>
</tr>
<tr>
<td>Rate of Growth</td>
<td>2-6</td>
</tr>
<tr>
<td>Demands</td>
<td>2-8</td>
</tr>
<tr>
<td>Conservation Program</td>
<td>2-18</td>
</tr>
</tbody>
</table>

**Chapter 3: System Analysis**

<table>
<thead>
<tr>
<th>Sub-Chapter</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3-1</td>
</tr>
<tr>
<td>State Agency Regulations</td>
<td>3-1</td>
</tr>
<tr>
<td>System Design Standards</td>
<td>3-1</td>
</tr>
<tr>
<td>Water Quality Analysis</td>
<td>3-7</td>
</tr>
<tr>
<td>System Description and Analysis</td>
<td>3-13</td>
</tr>
<tr>
<td>Source Description</td>
<td>3-16</td>
</tr>
<tr>
<td>Water Treatment</td>
<td>3-19</td>
</tr>
<tr>
<td>Water Treatment Capacity Analysis</td>
<td>3-21</td>
</tr>
<tr>
<td>Storage Capacity Analysis</td>
<td>3-25</td>
</tr>
<tr>
<td>Distribution System</td>
<td>3-32</td>
</tr>
<tr>
<td>Hydraulic Capacity Analysis</td>
<td>3-49</td>
</tr>
</tbody>
</table>
Chapter 4: Conservation Program

Conservation Program
Conservation Objectives
Evaluation of Conservation Measures
Conservation Activities
Monitoring Conservation Measures
Target Water Savings

Chapter 5: Water Resources

Introduction
Kent Source Aquifers – Background
Rock Creek Resource Protection Program
Existing Water Rights and Water Supply Facilities
Application for New Primary Rights, Supplemental Rights, and Water Right Changes

Chapter 6: Source of Supply Alternatives

Surface Water
Acquisition of Existing Rights
Enhanced Conservation Measures
Water Right Changes
Regional Supply Purchases
Artificial Recharge
Use of Reclaimed Water and Other Non-Potable Sources
Storage Reservoir

Chapter 7: Wellhead Protection

Introduction
Monitoring Plan
Spill Response

Chapter 8: Operation and Maintenance Program

Water Department General Information
Water System Organization, Management, and Personnel
Operator Certification
System Operations and Control
Emergency Response
Safety Procedures
# Table of Contents

**Chapter 9: Distribution Facilities Design and Construction Standards**

- General
- Permits and Approvals
- General
- Construction Permits
- General Conditions and Requirements
- General
- Definitions
- Abbreviations
- Scope of Work
- Control of Work
- Control of Materials
- Design Plans and Specifications
- Public Utility Access
- Standards for Water System Improvements
- General
- Easements and Rights-of-Way
- Standard Specifications
- Water Main Extension Design Requirements
- Private Service Connections to City Mains
- Domestic Water Service
- Cross Connections
- Water Main Materials
- Water Main Installation

**Chapter 10: The Capital Improvement Program**

- Tacoma Green River Second Supply Project
- The Storage Impoundment Reservoir
- East Hill Reservoir

**Chapter 11: Financing Plan**

- Purpose of Financial Analysis
- Funding Options
- State Funding Programs
- Short-term Program
Appendix

Water Facilities Inventory Form  Appendix A
Service Area Agreements  Appendix B
City Code (Water)  Appendix C
Material Safety Data Sheets  Appendix D
Warehouse Tools & Equipment  Appendix E
PW Operations Disaster Response Procedure  Appendix F
State Environmental Policy Act (SEPA)  Appendix G
List of Tables

**Chapter 1: Description of Water System**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1 Number of Connections</td>
<td>1-21</td>
</tr>
<tr>
<td>1-2 City of Kent System Interets</td>
<td>1-22</td>
</tr>
<tr>
<td>1-3 History of Complaints / Inquiries</td>
<td>1-28</td>
</tr>
</tbody>
</table>

**Chapter 2: Basic Planning Data and Water Demand Forecasting**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1 Number of Connections</td>
<td>2-4</td>
</tr>
<tr>
<td>2-2 Population Projections</td>
<td>2-5</td>
</tr>
<tr>
<td>2-3 Water Production Records</td>
<td>2-7</td>
</tr>
<tr>
<td>2-4 Metered Consumption Records</td>
<td>2-7</td>
</tr>
<tr>
<td>2-5 Population Growth</td>
<td>2-8</td>
</tr>
<tr>
<td>2-6 ERU Statistical Information</td>
<td>2-8</td>
</tr>
<tr>
<td>2-7 Gal/ERU Historical Information</td>
<td>2-9</td>
</tr>
<tr>
<td>2-8 Peak &amp; Average Day Demand Comparison</td>
<td>2-10</td>
</tr>
<tr>
<td>2-9 Peak Day Demand Projections</td>
<td>2-12</td>
</tr>
<tr>
<td>2-10 Average Day Demand Projections</td>
<td>2-15</td>
</tr>
<tr>
<td>2-11 Yearly Demand Projections</td>
<td>2-17</td>
</tr>
</tbody>
</table>

**Chapter 3: System Analysis**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1 Maximum Contaminant Levels</td>
<td>3-2</td>
</tr>
<tr>
<td>3-2 King County Minimum Fire Flow Rates and Duration</td>
<td>3-7</td>
</tr>
<tr>
<td>3-3 City of Kent Minimum Fire Flow Rates and Duration</td>
<td>3-7</td>
</tr>
<tr>
<td>3-4 Water Treatment</td>
<td>3-8</td>
</tr>
<tr>
<td>3-5 Water Quality Monitoring Schedule</td>
<td>3-9</td>
</tr>
<tr>
<td>3-6 Sample Locations</td>
<td>3-10</td>
</tr>
<tr>
<td>3-7 Analytical Laboratories</td>
<td>3-11</td>
</tr>
<tr>
<td>3-8 City of Kent Water Quality Data</td>
<td>3-12</td>
</tr>
<tr>
<td>3-9 Water Rights Held by the City of Kent</td>
<td>3-13</td>
</tr>
<tr>
<td>3-10 Total Water Rights Held by the City of Kent</td>
<td>3-13</td>
</tr>
<tr>
<td>3-11 Peak Dependable Supply</td>
<td>3-15</td>
</tr>
<tr>
<td>3-12 Yearly Average Flows</td>
<td>3-16</td>
</tr>
<tr>
<td>3-13 Saturated Development PDD Projections</td>
<td>3-27</td>
</tr>
<tr>
<td>3-14 Source with Dependable Supply and Respective Service Area</td>
<td>3-27</td>
</tr>
<tr>
<td>3-15 590/485 Provided Storage</td>
<td>3-29</td>
</tr>
<tr>
<td>3-16 590/485 Required / Provided Storage</td>
<td>3-29</td>
</tr>
</tbody>
</table>

City of Kent Water System Plan
Table of Contents
Chapter 4: Conservation Program

Table

4-1 Average Use Per Connection History
4-2 Recommended Water Conservation Program
4-3 Conservation Measures - Schedule and Budget

Chapter 5: Water Resources

Table

5-1 Water Rights Held by the City of Kent
5-2 Total Water Rights Held by the City of Kent

Chapter 8: Operation and Maintenance Program

Table

8-1 Employee Certification
8-2 City of Kent System Interties
8-3 Source Preventative Maintenance Schedule
8-4 Pump Station Preventative Maintenance Schedule
8-5 Reservoir Preventative Maintenance Schedule
8-6 Intertie Preventative Maintenance Schedule
8-7 PRV Preventative Maintenance Schedule
8-8 Distribution System Preventative Maintenance Schedule
8-9 SCADA Preventative Maintenance Schedule
8-10 Water Department Vehicles / Equipment
8-11 Fleet Services Vehicles
8-12 Chemical Inventory
8-13 Water Treatment
8-14 Water Quality Monitoring Schedule
8-15 Water Quality Sample Locations
8-16 Analytical Laboratories
8-17 City of Kent Water Quality Data
8-18 Coliform Monitoring Sources
8-19  Major System Components 8-82
8-20  Coliform Sample Site Locations 8-84
8-21  Routine Coliform Monitoring Routes 8-86
8-22  City of Kent Public Notification Contacts 8-90
8-23  Washington State Department of Health NW Drinking Water Public Notification Contacts 8-90
8-24  Media Contacts 8-95
8-25  Water System Personnel Emergency Call-up List 8-96
8-26  Personnel Emergency Management Capabilities 8-97
8-27  City of Kent Public Notification Contacts 8-98
8-28  Washington State Department of Health NW Drinking Water Public Notification Contacts 8-98
8-29  Seismic Upgrades 8-102
8-30  Water System Component Vulnerability 8-106
8-31  Emergency Water Delivery Locations 8-125
8-32  Customer Complaint / Inquiry History 8-162

Chapter 9: Distribution Facilities Design and Construction Standards

Table  Page Number
9-1  Meter Box Specifications 9-45
9-2  Irrigation Meter Box Specifications 9-46
9-3  DCVA & RPBA Box Specifications 9-46
9-4  Meter Setter Specifications 9-47
9-5  5/8 inch rock gradation 9-55
9-6  Class I & Class II gradation 9-55
9-7  Required Flow & Openings to Flush Mains 9-58

Chapter 10: System Improvements

Table  Page Number
10-1  20 Year Capital Improvement Program 10-4

Chapter 11: Financing Plan

Table  Page Number
11-1  Water Capital Projects 11-5
11-2  Water Fund 11-6
11-3  Existing User Charges 11-7
This Water System Plan is a compilation of planning and engineering analyses recently conducted to determine the adequacy of the City of Kent water system to meet the existing and projected requirements for provisions of domestic and fire protection service within the City's established water service area. This Plan supersedes the City's previous Water System Plan and serves as a guideline for future development of the water system. It has been prepared in accordance with applicable requirements of the State Department of Health and the City of Kent.

The Kent Water System service area covers approximately 27 square miles, of which, approximately 23.5 square miles are within the City of Kent. Residential, commercial, and industrial uses of land are interspersed in the service area. The area's easy access to the employment centers throughout the Seattle and Tacoma area makes it well suited to commuter-oriented, residential development. Kent is close to Seattle, Tacoma, Sea-Tac International Airport, two major transcontinental rail lines, and two major interstate freeways. There are substantial amounts of flat, industrially-zoned land which attract new industry to the Kent area. Industrial growth is transforming the use from agriculture to industry along the Kent valley floor. Continued economic and population growth is expected for the next several years.

The present sources of water supply are two springs and wellfields east of Kent plus two wells at Covington, three wells on the East Hill and four wells on the valley floor, which are used in the summer to supplement lower flow from the primary sources during the high demand season.

In 1997, the City served an estimated 49,259 people through approximately 11,234 connections (35,485 Equivalent Residential Units). Future growth projections indicate that the City will ultimately serve more than 96,000 people with an estimated peak day demand of 31.0 million gallons. Analysis of the City's existing system indicates that the current source capacity is insufficient to meet projected demands. Source improvements recommended include continued participation in the Tacoma Pipeline Number 5 project and construction of a storage impoundment. Coordination with neighboring purveyors, including Seattle Public Utilities, is of particular importance as other purveyors in the area are experiencing similar source of supply limitations.

Kent's existing water system is in good condition, with the exception of available future supply. Recommended system improvements include:

1. Development of Tacoma Second Supply Project
2. Development of Storage Impoundment
3. Construction of new Reservoir in the High East Hill zone
4. Distribution System Improvements

The total cost of the Capital Improvement Program, through 2006, is estimated at $39,319,000 with the bulk of some ($28,000,000) associated with the Tacoma Second Supply Project. Because the City has anticipated such capital needs over a long period the financial status of its Water Utility is strong. As such, 55% of this Capital...
Improvement Program is anticipated to be financed out of cash with the balance, approximately $18,000,000, coming from new debt. In November of 1999 the City Council increased the Water Utility System Development Charges and Water Rates accordingly to confirm this financial approach.
INTRODUCTION

This Water System Plan for the City of Kent has been developed pursuant to the guidelines and standards promulgated by the Washington State Department of Health (DOH). It offers an overview of the facilities of the Kent Water System and of the physical, economic, and political demands for water in the service area, selects the most cost-effective approach, and summarizes a plan to finance the necessary capital improvements. Previous planning efforts include a Comprehensive Water Report developed for the City in 1972, a Water System Plan developed in 1979, a Water System Plan Amendment prepared in 1982, a 1984 update which incorporated information from the 1979 plan, and a 1988 update which was done in conjunction with the Critical Water Supply Plan for the South King County area; plus more recent data and analysis on system needs and possible strategies to meet those needs.

OWNERSHIP AND MANAGEMENT

The City of Kent owns and operates a franchised public water system, under the direction of the Public Works Director/Public Works Department, which supplies water for municipal purposes primarily to citizens of Kent. The title of the system is the City of Kent Water Department and the public water system identification number is 381501. The most current copy of the Water Facilities Inventory (WFI) report is included in Appendix A.

The City of Kent is municipality organized with an elected mayor/council type of government. The Water Department operates as a self-funded utility. The operating license(s) have been included in Appendix A. The Water Department is operated and maintained under the direct supervision of a Water Superintendent holding the Water Distribution Manager certification required by the Washington State Department of Health (DOH). A Public Works Operations Manager oversees the operation of the Public Works Maintenance Division, which includes the Water Department. The Public Works Director manages the entire Public Works Department, including an Engineering Division which provides support to all of the Public Works Divisions. Overall City management, including Public Works, is provided by an Operations Manager who acts under the direction of the Mayor/City Council. The Water Superintendent and Public Works Operations Manager handle the routine management decisions for the Water Department. The Public Works Director is involved with all decisions of a significant nature, including the planning for future needs. All major policy decisions and capital requests are reviewed and approved by the Mayor/City Council/Operations Manager. An organizational chart has been included in Chapter 8.
SYSTEM BACKGROUND

History

In 1955 the City of Kent adopted its first Comprehensive Water Plan. Since then the system has undergone numerous improvements and additions which are summarized in the following synopsis.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>The City developed a rebate program for low flow toilets and low water use washing machines.</td>
</tr>
<tr>
<td>1998</td>
<td>The City landscape code was revised to include use of native, low water use vegetation and landscaping water requirements, irrigation system design, and performance requirements.</td>
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<tr>
<td>1998</td>
<td>Installed new Master SCADA system (Central) with Wonderware InTouch and Teledac autodial system.</td>
</tr>
<tr>
<td>1998</td>
<td>A 65KW propane fueled generator and automatic transfer switch was installed at the Kent Springs source.</td>
</tr>
<tr>
<td>1999</td>
<td>The Seven Oaks (Soos Creek) Well Transmission Main was constructed. With the addition of the new main, the Seven Oaks Well can pump into the Clark or Kent Springs Transmission Mains.</td>
</tr>
<tr>
<td>1999</td>
<td>Seismic improvements were completed at the Garrison Creek (6 MG #2) Reservoir.</td>
</tr>
<tr>
<td>1999</td>
<td>Drilled Replacement Well at the O'Brien Well site.</td>
</tr>
<tr>
<td>1999</td>
<td>Approximately 1,800 feet of the Kent Springs Transmission Main on South 288th Street was replaced with 30-inch Ductile iron Main.</td>
</tr>
<tr>
<td>1998</td>
<td>The City developed a rebate program for low flow toilets and low water use washing machines.</td>
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</tr>
<tr>
<td>1998</td>
<td>A 65KW propane fueled generator and automatic transfer switch was installed at the Kent Springs source.</td>
</tr>
</tbody>
</table>

2000 | The O'Brien Well House and transmission main improvements were completed. |
2000 | A test well was drilled at the Kent Springs Source. |
1999 | The City Council adopted new conservation rate structure that consisted of a two-tiered escalating block rate structure. The rate ordinance also included increased water system development charges. For example, the new 1-inch service connection fee is $1,100 and a 10-inch service connection fee is $195,558. These new rates were effective January 1, 2000. |
1999 | The interior and exterior of the 35 MG Reservoir was recoated. An artists mural was also added to the exterior. Fall protection improvements were also installed. |
1999 | Leak detection tests were performed on the Kent Springs Transmission Main. The tests identified a leak of approximately 55 gpm. Repair methods are currently being evaluated. |
1999 | Seismic and fall protection improvements were completed on the 125,000 elevated tank. The tank interior and exterior was also recoated. |
1999 | The Seven Oaks (Soos Creek) Well Transmission Main was constructed. With the addition of the new main, the Seven Oaks Well can pump into the Clark or Kent Springs Transmission Mains. |
1999 | Seismic improvements were completed at the Garrison Creek (6 MG #2) Reservoir. |
1999 | Drilled Replacement Well at the O'Brien Well site. |
1999 | Approximately 1,800 feet of the Kent Springs Transmission Main on South 288th Street was replaced with 30-inch Ductile iron Main. |
1998 | The City developed a rebate program for low flow toilets and low water use washing machines. |
1998 | The City landscape code was revised to include use of native, low water use vegetation and landscaping water requirements, irrigation system design, and performance requirements. |
1998 | Installed new Master SCADA system (Central) with Wonderware InTouch and Teledac autodial system. |
1998 | A 65KW propane fueled generator and automatic transfer switch was installed at the Kent Springs source. |
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<thead>
<tr>
<th>YEAR</th>
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<tbody>
<tr>
<td>1998</td>
<td>A 45KW propane fueled generator and automatic transfer switch was installed at the Clark Springs source.</td>
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<tr>
<td>1997-1998</td>
<td>A 10-inch ductile iron main was installed to connect the Soos Creek Well source with the Kent Springs Transmission Main.</td>
</tr>
<tr>
<td>1997</td>
<td>A new main was installed on 152nd Avenue SE, which removed the remaining customers from the Kent Springs Transmission Main and transferred them to WD #111</td>
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<tr>
<td>1997</td>
<td>Fall protection was installed on Cambridge, Blue Boy, and Reith Road Reservoirs</td>
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<tr>
<td>1997</td>
<td>Seams in the Guiberson Reservoir were resealed. The leakage was reduced from 150+ gpm to 10 gpm or less</td>
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<td>1997</td>
<td>Seismic upgrades were performed at the Guiberson Reservoir. The interior columns were upgraded and end pilings were added to the roof beams</td>
</tr>
<tr>
<td>1997</td>
<td>The Water Department repaired a leak on the Kent Springs Transmission Main estimated to be ±200 gpm</td>
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<tr>
<td>1997</td>
<td>A seismic evaluation of the entire water system was performed by Dames &amp; Moore Engineering. Seismic restraints were installed on the chlorine systems</td>
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<tr>
<td>1997</td>
<td>The chlorinators and booster pump controls were replaced at Kent Springs as well as the addition of new chemical feed piping</td>
</tr>
<tr>
<td>1997</td>
<td>The 4-inch steel water main on South 262nd Street west of 78th Avenue South was replaced with 10-inch ductile iron.</td>
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<tr>
<td>1997</td>
<td>Several of the distribution mains on the West Hill were cleaned using poly foam “pigs”. This reduced complaints of discolored water significantly</td>
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<tr>
<td>1997</td>
<td>Began implementation of an Infrastructure Maintenance Management and Inventory System “Hansen IMS”</td>
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<tr>
<td>1996-1997</td>
<td>Lead and Copper Rule Treatment and Siting Studies were performed by Economic and Engineering Services.</td>
</tr>
<tr>
<td>1996-1997</td>
<td>Pump Station #4 – pumps #1 and #2 were replaced and their respective motors rebuilt. The contactors and controls were upgraded for motor #1.</td>
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<tr>
<td>1996</td>
<td>Completed the Kent Springs Transmission Main upgrade from Armstrong Springs to the Kent Springs source with 24-inch ductile iron. This was the final replacement of the original aged and leaking concrete cylinder pipe installed in the 1920’s / 1930’s. An intertie was added at Armstrong Springs which provides the capability of pumping Armstrong water into either the Kent Springs or Clark Springs Transmission Mains.</td>
</tr>
<tr>
<td>1996</td>
<td>Clark Springs – a 15 hp pump with VFD control was installed in the clear well with a capacity of 3 cfs for discharge to Rock Creek, in order to augment stream flow when necessary.</td>
</tr>
<tr>
<td>1996</td>
<td>The water main crossing on South 212th Street at the Green River bridge was replaced with 8-inch ductile iron.</td>
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<tr>
<td>YEAR</td>
<td>ITEM</td>
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</tr>
<tr>
<td>1996</td>
<td>Renegotiated Highline Water District intertie contract – primarily for emergency use only</td>
</tr>
<tr>
<td>1996</td>
<td>Fall protection was installed on the Kent Springs Surge Tank.</td>
</tr>
<tr>
<td>1995</td>
<td>The 3rd Avenue bridge water main crossing was replaced with restrained joint 8-inch ductile iron and 8-inch steel.</td>
</tr>
<tr>
<td>1995</td>
<td>Kent Springs – installed replacement pumps, motors, and VFD's for both wells (40 hp Byron Jackson submersibles @ 1,800 gpm each)</td>
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<tr>
<td>1995</td>
<td>Replaced the water main on South 212th Street West of the Green River with 8-inch ductile iron.</td>
</tr>
<tr>
<td>1995</td>
<td>Applied for the following water rights new 10 MGD at Ranney Wells, new 17 MGD at the future impoundment site, and change in place of withdrawal-0 8 MGD at the Blue Boy Tank site</td>
</tr>
<tr>
<td>1995</td>
<td>Derbyshire Water Main Replacements</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 8-inch AC water main with 8-inch ductile iron main on SE 272nd Street from 124th Avenue SE to 120th Avenue SE</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 6-inch AC water main with 6-inch ductile iron main on 123rd Avenue SE from SE 272nd Street to SE 274th Street</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 6-inch AC water main with 6-inch ductile iron main on 122nd Avenue SE from SE 272nd Street to SE 274th Street.</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 6-inch AC water main with 6-inch ductile iron main on 121st Avenue SE from SE 272nd Street to SE 274th Street.</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 6-inch AC water main with 8-inch ductile iron main on 120th Avenue SE from SE 272nd Street to SE 274th Street.</td>
</tr>
<tr>
<td></td>
<td>Replaced existing 8-inch AC water main with 8-inch ductile iron main on SE 274th Street from 120th Avenue SE to 122nd Avenue SE.</td>
</tr>
<tr>
<td>1994</td>
<td>Water System Improvements</td>
</tr>
<tr>
<td></td>
<td>Kent Springs – both wells and the master meters were upgraded with flow pacing as well as an upgrade to the electrical system.</td>
</tr>
<tr>
<td></td>
<td>Pump Station #5 – generator seismic restraints and transfer switch were added.</td>
</tr>
<tr>
<td></td>
<td>Pump Station #4 – improvements to the control systems, addition of UPS power, and diesel engine controls for pump #3 emergency use were added.</td>
</tr>
<tr>
<td></td>
<td>Pump Station #7 – Improved the pump sequencing.</td>
</tr>
<tr>
<td></td>
<td>Clark Springs – Complete surge system modifications, relocated VFD’s and PLC with upgrades to the control system, and added fluoride saturators and a day tank.</td>
</tr>
<tr>
<td>YEAR</td>
<td>ITEM</td>
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</tbody>
</table>
| 1994 | Downtown Infrastructure Water Main Replacements | Replaced existing 6-inch CI water main with 12-inch ductile iron water main on James Street from 5th Avenue North to Clark Avenue (connected to existing 16-inch main at Clark)  
Replaced existing 2-inch plastic water main with 8-inch ductile iron main on South 212th Street from the West end of the Green River Bridge to approximately 1,100 feet to the East  
Replaced existing 6-inch CI water main with 10-inch ductile iron main on Lincoln Avenue North at West James Street (approximately 150 feet)  
Replaced existing 6-inch CI main with 12-inch ductile iron main on West Saar Street from 1st Avenue South to 5th Avenue South  
Replaced existing 6-inch CI water main with 8-inch main on 3rd Avenue South from West Titus Street to West Saar Street  
Replaced existing 6-inch CI water main with 12-inch ductile iron main on 5th Avenue South from West Saar Street to West Gowe Street  
Replaced existing 6-inch CI water main with 8-inch ductile iron main on West Titus Street from 5th Avenue South to West (approximately 350 feet) |
| 1994 | Downtown Infrastructure Water Main Replacements continued | Replaced existing 6-inch CI water main with 12-inch ductile iron main on 4th Avenue South from Willis Street to West Saar Street.  
Replaced existing 8-inch CI water main with 12-inch ductile iron main on Willis Street from 4th Avenue South to 7th Avenue South (SR 167 off ramp)  
Replaced existing 4-inch CI water main with 8-inch ductile iron main on 6th Avenue South from Willis Street to South (approximately 350 feet)  
Replaced existing 6-inch CI water main with 12-inch ductile iron main at SR 516 between Naden Avenue and 74th Avenue South  
Replaced existing 6-inch AC water main with a 10-inch ductile |
| 1994 | Recoated Kent Springs surge tank interior and installed new interior stainless steel ladders. | |
| 1994 | Installed SCADA system repeater at 35 MG Reservoir site for the 3 remote Springs sites | |
| 1994 | The interior and exterior of the Blue By Reservoir was recoated  
An artists mural was also added to the exterior | |
<p>| 1993 | The Clark Springs, Kent Springs, Armstrong Springs, Soos Creek Well, and East Hill Well sites were fenced. | |
| 1993 | The City Conservation Plan was adopted | |
| 1993 | The Wetland PRV was replaced | |
| 1993 | A 12-inch main was installed at South 262nd Street between West Valley Highway and SR 167 to replace a 4-inch steel main. |</p>
<table>
<thead>
<tr>
<th>YEAR</th>
<th>ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Cleaning of large diameter mains in the 240 zone industrial areas reduced the manganese/iron deposits from 212&lt;sup&gt;th&lt;/sup&gt; well #2</td>
</tr>
<tr>
<td>1993</td>
<td>Construction of the 212&lt;sup&gt;th&lt;/sup&gt; Treatment Plant was completed and start-up performed. With the completion of the Treatment Plant, an additional 5 4 MGD was available to the Kent supply for summer peaking</td>
</tr>
<tr>
<td>1992</td>
<td>Started construction of the 212&lt;sup&gt;th&lt;/sup&gt; Treatment Plant</td>
</tr>
<tr>
<td>1992</td>
<td>The City adopted ordinance #3043, which restructured its water rate to reflect a summer surcharge.</td>
</tr>
<tr>
<td>1992</td>
<td>The Kent Springs gallery transmission piping was slipped lined with HDPE pipe (approximately 600 feet). A bridge and casing were also added for the creek crossing.</td>
</tr>
<tr>
<td>1991</td>
<td>Utility Services Association performed a leak study in the downtown area. After a complete and thorough survey of the downtown area, the consultant found the City system to be in good condition.</td>
</tr>
<tr>
<td>1991</td>
<td>Reith Road and Cambridge water tanks were repainted after fall protection improvements were completed</td>
</tr>
<tr>
<td>1991</td>
<td>The Auburn/Kent intertie was replaced</td>
</tr>
<tr>
<td>1990</td>
<td>Replaced 3,578 feet of the Kent Springs Transmission Main with 24-inch ductile iron main from 168&lt;sup&gt;th&lt;/sup&gt; Pl SE to ±200 feet west of Armstrong Springs.</td>
</tr>
<tr>
<td>1988-1990</td>
<td>Replaced 20,000 feet of the Kent Springs Transmission Main with 30-inch and 36-inch ductile iron main from SE 274&lt;sup&gt;th&lt;/sup&gt; Street, through the future impoundment site, to 132&lt;sup&gt;nd&lt;/sup&gt; Avenue SE</td>
</tr>
<tr>
<td>1988</td>
<td>1988 Water System Plan was completed, adopted by the City Council, and the State DOH.</td>
</tr>
<tr>
<td>1988</td>
<td>Hilltop PRV installed in the 485 system – East Hill to serve the Ridge Apartment Complex.</td>
</tr>
<tr>
<td>1987-1988</td>
<td>Repainted the 98&lt;sup&gt;th&lt;/sup&gt; Avenue 6 MG reservoir.</td>
</tr>
<tr>
<td>1987-1988</td>
<td>Designed the balance of the upgrade of the East Hill Community Well Distribution mains and the mains reflected in the 1984 Water System Plan to eliminate the fire flow deficiencies of the East Hill System Replacements completed.</td>
</tr>
<tr>
<td>1987-1988</td>
<td>Designed the Kent Springs Replacement (20,000 feet) from SE 274&lt;sup&gt;th&lt;/sup&gt; Street to Impoundment site and then to SR 516 and 132&lt;sup&gt;nd&lt;/sup&gt; Avenue SE</td>
</tr>
<tr>
<td>1987</td>
<td>Constructed a fluoride building and storage area as well as a chemical feed area with containment for dual fluoride saturators and a day tank at Clark Springs</td>
</tr>
<tr>
<td>1986</td>
<td>East Hill Well facility supply capability was upgraded from 2 3 MGD to 3 MGD</td>
</tr>
<tr>
<td>1986</td>
<td>Kent Springs Transmission Main was replaced with 2,384 feet of 36-inch pipe and 1,070 feet of 30-inch pipe from 104&lt;sup&gt;th&lt;/sup&gt; Avenue to South 274&lt;sup&gt;th&lt;/sup&gt; Street</td>
</tr>
<tr>
<td>YEAR</td>
<td>ITEM</td>
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<tr>
<td>1986</td>
<td>One well at the 212th Street and SR 167 well field was developed at 3 MGD and put into service.</td>
</tr>
<tr>
<td>1986</td>
<td>Pump Station #8 at the Water District No 75 intertie was constructed securing the flow therefrom at 1 42 MGD</td>
</tr>
<tr>
<td>1986</td>
<td>Construct new intake and metering facilities at the Guiberson Street Reservoir</td>
</tr>
<tr>
<td>1986</td>
<td>Installed new distribution mains for the East Hill system (590 service area) to upgrade a portion of those mains acquired per the East Hill Community Well take over and to eliminate some of the fire flow deficiencies identified in the 1984 Water System Plan</td>
</tr>
<tr>
<td>1986</td>
<td>Replaced the existing 4-inch diameter main on West Valley Highway south of the Green River with a new 12-inch diameter main</td>
</tr>
<tr>
<td>1985</td>
<td>Chlornation facilities were added to the Seven Oaks Plat Well (Soos Creek Well)</td>
</tr>
<tr>
<td>1985</td>
<td>Kent Springs Transmission Main was replaced with 6,665 feet of 24-inch and 220 feet of 30-inch water main between 152nd Avenue and 132nd Avenue</td>
</tr>
<tr>
<td>1985</td>
<td>Central Avenue water main was replaced from Novak Lane to James Street with a 10-inch water main in order to meet fire flow requirements</td>
</tr>
<tr>
<td>1985</td>
<td>On May 6, 1985 the City executed a take over agreement of East Hill Community Well Company</td>
</tr>
<tr>
<td>1985</td>
<td>On June 17, 1985 the City executed an agreement with the City of Tacoma for purchase of 4 62 MGD supply capacity form Tacoma’s Green River Pipe Line No 5 project.</td>
</tr>
<tr>
<td>1985</td>
<td>Completed acquisition of all properties (approximately 151 acres) for construction of the water impoundment storage facility</td>
</tr>
<tr>
<td>1985</td>
<td>Local Improvement District (LID) 316 was created to reconstruct a distribution system on 94th Avenue from 238th Street to 220th Street</td>
</tr>
<tr>
<td>1985</td>
<td>Local Improvement District (LID) 314 was created to construct a new distribution system on 104th Avenue and on 272nd Street</td>
</tr>
<tr>
<td>1984</td>
<td>Repainted the 125,000 gallon elevated tank</td>
</tr>
<tr>
<td>1984</td>
<td>Water System telemetering and control system was totally upgraded to state-of-the-art automated computerized control and telemetry system</td>
</tr>
<tr>
<td>1984</td>
<td>A Booster pump station was constructed in the 529 service area boosting the service pressure of the northerly sub-area therein to elevation 587</td>
</tr>
<tr>
<td>1983-1984</td>
<td>Pumps installed in the Armstrong Springs wells, providing 1 7 MGD to the Clark Springs Transmission Main</td>
</tr>
<tr>
<td>1983</td>
<td>Three observation wells and two test wells (one shallow and one deep) were drilled at the Auburn well field to determine the potential for a deep well field and/or Ranney Well</td>
</tr>
<tr>
<td>YEAR</td>
<td>ITEM</td>
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<tr>
<td>1983</td>
<td>A second well at South 212&lt;sup&gt;th&lt;/sup&gt; Street and SR 167 was drilled and developed. A test well was drilled at South 208&lt;sup&gt;th&lt;/sup&gt; Street and SR 167. Results indicate a combined anticipated flow of 5 to 7 MGD, but also indicate unacceptably high manganese levels.</td>
</tr>
<tr>
<td>1983</td>
<td>New policy providing for a connection fee for water service outside the City limits was adopted.</td>
</tr>
<tr>
<td>1983</td>
<td>A booster pump station was constructed on West Hill with alternative power supplies to provide up to 2,000 gpm (2.88 MGD). Remote monitor and control capability was included.</td>
</tr>
<tr>
<td>1983</td>
<td>The Kent Springs Transmission Main was replaced with 4,100 feet of 24-inch ductile iron main from 164&lt;sup&gt;th&lt;/sup&gt; Avenue SE to 152&lt;sup&gt;nd&lt;/sup&gt; Avenue SE.</td>
</tr>
<tr>
<td>1983</td>
<td>Kent Springs Transmission Main was replaced with 8,000 feet of 24-inch and 2,000 feet of 36-inch water main between the Gumerson Street Reservoir and 104&lt;sup&gt;th&lt;/sup&gt; Avenue SE.</td>
</tr>
<tr>
<td>1983</td>
<td>Local Improvement District (LID) 309 was created to construct new distribution mains along East Hill to remove existing customers from the Kent Springs Transmission Main.</td>
</tr>
<tr>
<td>1983</td>
<td>Reconstruction of the parts of the Kent Springs Transmission Main with the worst leaks was designed.</td>
</tr>
<tr>
<td>1982-1983</td>
<td>Seven Oaks Plat Well (Soos Creek Well) was constructed with remote telemetry and control capability to supply about 1.25 MGD.</td>
</tr>
<tr>
<td>1982</td>
<td>The water system for Water District 87 was transferred to the Cities of Kent and Auburn.</td>
</tr>
<tr>
<td>1982</td>
<td>West Hill Distribution Main, which consists of 8,000 feet of 12-inch and 16-inch mains, was installed from Cambridge Reservoir to Military Road to improve fire flows and water pressure.</td>
</tr>
<tr>
<td>1982</td>
<td>A well was drilled and developed at South 212&lt;sup&gt;th&lt;/sup&gt; Street and SR 167.</td>
</tr>
<tr>
<td>1982</td>
<td>Two production wells with a combined capacity of 1.7 MGD were drilled and developed at Armstrong Springs.</td>
</tr>
<tr>
<td>1982</td>
<td>The City adopted the Water System Plan Amendment and the Water System Financial Plan, including new water rates. The new water rate was $1.64 per 100 cubic feet. It should be noted that the said new rate was one of the highest in the State of Washington at that time.</td>
</tr>
<tr>
<td>1981-1982</td>
<td>Garrison Creek Well was constructed and placed into operation, supplying up to 0.5 MGD to the Valley System.</td>
</tr>
<tr>
<td>YEAR</td>
<td>ITEM</td>
</tr>
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</tbody>
</table>
| 1981 | A consortium of Water Districts 105, 111, and the City of Kent explored for additional water resources at the following sites:  
A. Mill Creek Canyon - City of Kent (Owner)  
B. City of Kent 1 MG Reservoir - City of Kent (Owner) - 300 GPM  
C. Joint Use Reservoir - Consortium (Owner) - 160 GPM  
D. Lake Sawyer - Consortium (Owner) - 75 GPM  
E. Lake Morton Site - Consortium (Owner) - 50 GPM  
F. Covington Park - Consortium (Owner) - 50 GPM  
G. Clark Springs Site - City of Kent (Owner) - Dry  
H. Water District No 111 - WD No. 111 (Owner) - 150 GPM |
| 1981 | The City adopted Ordinance #2298, which increased the water rate along with establishing a new rate structure (switching from a declining block structure to a flat rate of $0.82 per 100 cubic feet), established a system development charge on new water service connections, set new permit fees. |
| 1981 | The City amended policy on water service outside the City limits to allow developers to provide an offsetting supply of water. |
| 1980 | The City adopted the Brown and Caldwell financial plan. |
| 1980 | The City drilled, developed, and tested wells at the following sites:  
A. Cambridge Well (S 265th & Military Rd S) - Dry hole  
B. Linda Heights Park (S. 248th St & 35th Ave S) - Dry hole  
C. Garrison Creek Well (S 218th St & 98th Ave S) - 500 GPM  
D. Soos Creek Well (Kent-Kangley & 118th Ave SE) - 900 GPM |
<p>| 1980 | East Hill Well was placed in operation with remote telemetry and control capacity. |
| 1979 | The transmission main from Pump Station No. 5 at 98th Avenue South and South 240th Street to the 590 system at 104th Avenue SE and SE 244th Street was constructed. |
| 1979 | The water main on SE 256th Street from 116th Avenue SE to 104th Avenue SE was reconstructed. |
| 1979 | Chlorination facilities with a capacity of 10 MGD at Kent Springs were constructed. |
| 1979 | The water system's telemetry and control system was upgraded. |
| 1979 | The capacities of the West Hill Pumping Stations No 3 and 4 were increased. |
| 1979 | The Water System Plan was completed, adopted by the City Council, and the State DOH. |
| 1979 | Interties with the Tukwila and Renton water systems were constructed to allow the City of Kent to supplement its supply during peak demand periods. |
| 1979 | East Hill Well, capable of producing 23 MGD, was drilled and developed. |</p>
<table>
<thead>
<tr>
<th>YEAR</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>Policy was adopted to deny water service to properties outside the City limits.</td>
</tr>
<tr>
<td>1979</td>
<td>The City resolved to remove all customers from the Kent Springs Transmission Main.</td>
</tr>
<tr>
<td>1978</td>
<td>The distribution main was constructed along 116th Avenue SE from Kent-Kangley Road to SE 280th Street and along SE 280th Street from 116th Avenue SE to 120th Avenue SE to service the 3.5 MG Joint Use reservoir.</td>
</tr>
<tr>
<td>1978</td>
<td>The Kent Springs Transmission Main was replaced with 152 feet of 18-inch and 781 feet of 24-inch ductile iron main from 164th Avenue SE to 170 feet west of 167th Pl SE.</td>
</tr>
<tr>
<td>1978</td>
<td>Two wells, each with a capacity of 25 MGD, were developed at Kent Springs and brought on line.</td>
</tr>
<tr>
<td>1978</td>
<td>A 3.5 MG reservoir for joint use with Water District No. 111 was completed. It serves the 590 system and is located near 120th Avenue SE and SE 288th Street.</td>
</tr>
<tr>
<td>1976</td>
<td>The East Hill Pump Station No. 5 near South 240th and 98th Avenue South was completed. It pumps water from the James Street Tank to the 485 and 590 systems.</td>
</tr>
<tr>
<td>1976</td>
<td>The distribution main was completed along 104th Avenue SE from SE 240th Street to SE 267th Street and along SE 267th from 104th Avenue SE to 102nd Avenue SE.</td>
</tr>
<tr>
<td>1972</td>
<td>The 1972 Comprehensive Water Report was completed, adopted by the City Council, and the State DOH.</td>
</tr>
<tr>
<td>1970-1971</td>
<td>The 6 MG concrete reservoir on South 218th Street and adjacent supply lines were constructed.</td>
</tr>
<tr>
<td>1969</td>
<td>The South 218th Street Supply Main was completed from the 6 MG reservoir at South 240th Street and 98th Avenue South to the North Industrial Area.</td>
</tr>
<tr>
<td>1969</td>
<td>The construction of Phase 2 of the North Industrial Water Mains and the South 180th Street mains was completed.</td>
</tr>
<tr>
<td>1969</td>
<td>The roof over the 3 MG reservoir on Guiberson Street was completed.</td>
</tr>
<tr>
<td>1967-1968</td>
<td>The 6 MG reservoir at South 240th Street and 98th Avenue South was constructed.</td>
</tr>
<tr>
<td>1966</td>
<td>Federal funds from the Department of Economic Development Administration were obtained to pay a portion of the costs of additional water mains to serve the North Kent area, two 6 MG reservoirs together with required transmission facilities, construction of wells and pumping stations to increase the capacity of Clark Springs, and a roof over the existing 3 MG ground reservoir on Guiberson Street.</td>
</tr>
</tbody>
</table>
1965 The construction of North Industrial Water Mains serving areas adjacent to the West Valley Highway, South 212th Street, and South 228th Street were completed.

1964 The Clark Springs Transmission Main for Kent Springs to Kent was completed. This provided the City of Kent with a second independent transmission main for supply of water.

1959 Two pumping stations, two storage reservoirs, and transmission mains were completed.

1958 East Hill Water System Improvements were made, consisting of a booster pump station, transmission line, and 125,000 gallon elevated storage tank near the intersection of South 240th Street and 98th Avenue South.

1957 The Clark Springs water source was developed together with a transmission main from Clark Springs to Kent Springs and a booster pump station was installed on the existing transmission main.

1955 A comprehensive plan for water supply and distribution was adopted by the City of Kent.

**CHARACTERISTICS OF THE SERVICE AREA**

Residential, commercial, and industrial uses of land are interspersed in the service area. The area's easy access to the employment centers throughout the Seattle and Tacoma area makes it well suited to commuter-oriented, residential development. Kent is close to Seattle, Tacoma, Sea-Tac International Airport, two major transcontinental rail lines, and two major interstate freeways. There are substantial amounts of flat, industrially-zoned land which attract new industry to the Kent area. Industrial growth is transforming the use from agriculture to industry along the Kent valley floor. Continued economic and population growth is expected for the next several years.

At present, about 23.5 square miles in the service area are within the City of Kent. The principle topographic features are the Green River Valley and the upland plateaus rising from both sides of the valley. The valley itself extends from the adjoining City of Auburn on the South through Kent to the cities of Tukwila and Renton on the North. It is about 2.5 miles wide with an elevation ranging from 30 to 40 feet above sea level on the valley floor. The West hill rises abruptly to about 400 feet, while the East Hill rises to a similar elevation with a more gentle slope. Because of the East Hill's more gentle slope, more development has occurred there. The topography of the service area is shown in Figure 1-1.

**Geologic Setting**

The Kent area is located in the Green River valley near the eastern boundary of the Puget Lowlands physiographic province. The province is bounded on the east by the Cascades North and Cascades South provinces and on the west by the Olympic Mountains and the
Willapa Hills provinces. The San Juan Islands form the division between the Puget Lowlands and the Strait of Georgia in British Columbia.

The surficial geology of the Puget Lowlands is primarily the result of a continental glacier which advanced from British Columbia approximately 18,000 years ago and covered the entire Puget Sound area as far south as Olympia until approximately 13,000 years ago.

Geologic Structure

The Green River valley is a north-trending topographic feature between 1 and 4 miles wide. The valley is characterized by a relatively flat floor and moderate slopes. Downtown Kent is located on the eastern perimeter of the valley floor, near where the Green River crosses from the east to the west side of the valley floor.

The hills east and west of the Kent valley are composed almost entirely of glacial till and other glacial deposits overlying bedrock principally consisting of Tertiary sedimentary rocks. The youngest of the glacial materials were deposited approximately 13,000 to 15,000 years ago with the recession of the last glacier. The floor of the Green River valley is underlain by post-glacial alluvial deposits generally derived from erosion of the glacial deposits in the surrounding hillsides.

There are few faults with surface expression in the Green River valley. Mapped faults generally consist of northeast trending features of limited length. The Seattle fault is located approximately 15 miles north of Kent, and is considered the most significant fault which could affect the City. Kent is located above the subsurface projection of the Cascadia Subduction Zone, where the Juan de Fuca tectonic plate is being forced under the North American continental plate.

Near-Surface Geology

The Green River valley is an erosional trough of glacial origin which is partially filled by more than 400 feet of post-glacial alluvial deposits in the Kent area. Three main depositional units have been identified in the subsurface younger alluvium, the Osceola mudflow, and older alluvium. Silty sand and gravel deposited along the margin of the Vashon stade glacier are present along the western valley margin.

Subsurface Geology and Groundwater Flow – Clark Springs Area

The Clark Springs are situated in a narrow, sediment-filled channel bounded by till-capped bedrock knobs to the north and south. The infilled materials are very coarse-grained recessional outwash sand and gravel deposited as the last glacier retreated from this area. These coarse-grained glacial deposits extend due east of the Clark Springs property, then fan out to the north and south just beyond the Georgetown area. The coarse-grained glacial deposits comprise the aquifer which provides groundwater flow to Clark Springs.
Bedrock confinement of the permeable outwash deposits to a narrow channel at the Clark Springs property may be the cause of the springs which naturally emanate in this area. Bedrock surfaces again east, southeast, and southwest of Lake Retreat over 2 miles east of Clark Springs. In the area by Lake Retreat and southwestward, shallowing bedrock causes the coarse-grained glacial deposits to rise in elevation. This rise distinguishes a northwest-southeast trending trough of recessional outwash that occurs along the east side of the bedrock knobs north and south of Georgetown and west to Lake Retreat. This trough may represent former meltwater discharge pathways to the Cedar and Green Rivers and a preferred pathway for groundwater flow through this area today.

Groundwater flow through the glacial deposits east of Clark Springs appears to be predominantly east to west. However, within the trough of recessional deposits along the east side of the bedrock knobs north and south of Georgetown, a northward flow pattern is indicated.

Subsurface Geology and Groundwater Flow – Kent Springs Area

The Kent Springs property lies just north of Lake Sawyer within the glacial drift plain in the western portion of the study area. In this area the bedrock dives steeply beneath a thick sequence of glacial and interglacial sediments. This surficial deposits are predominately Vashon recessional outwash, the permeable recessional outwash deposits seen further east. Till-capped knobs are interspersed within the flatter outwash channels. In this area the subsurface stratigraphy becomes more complex with a thicker sequence of variable material types.

The Kent Springs aquifer appears to be made up of two coarse-grained glacial sequences, the Vashon recessional outwash and the older coarse-grained deposits. At the Kent Springs property these glacial sequences appear to be in direct contact with each other, while to the north, east, and south, till typically separates these units. Till appears to occur beneath the Covington wells, parts of Lake Sawyer, and stretches beneath the ground surface between till-capped knobs to the northeast. However, as you near the Kent Springs property, the till deposits thin or are absent. Limited data also suggest that the till may also be absent for some distance west-southwest of the Kent Springs site.

Geologic materials and seasonal behavior suggest the Kent Springs are derived from the shallower recessional outwash and the wells are completed in the older coarse-grained deposits. Use of the Springs occurs primarily in the wetter months of the year and this would correlate with renewed recharge of the shallower Vashon recessional outwash deposits. In the drier summer and early fall months the deeper and more continuous older coarse-grained deposits provide a more reliable source.

Groundwater flow through the Kent Springs vicinity is a continuation of the east to west flow pattern discussed for the Clark Springs property. Moving westward from the Georgetown area toward the Kent Springs property, groundwater passes through the
bedrock-bounded recessional outwash channel around Ravensdale Lake into the drift plain in the western portion of the study area. Water level and well log data suggest that much of the groundwater supplying the Kent Springs property flows through the Ravensdale channel toward Lake Sawyer.

**Subsurface Geology and Groundwater Flow – Armstrong Springs Area**

The geology around the Armstrong Springs property is similar to the Kent Springs property. The property lies within the recessional outwash plain and the wells appear to tap into the deeper older coarse-grained deposits, lying below the vashon recessional outwash, in an area where the till seems to be thin or absent. Till occurs on hills to the southeast and northwest and till-like material appears to extend beneath the vashon recessional outwash in these same directions away from the Armstrong Springs property. The till also appears eroded away in the area 1-1/2 miles to northeast of the property within the recessional outwash channel.

Groundwater flow patterns around the Armstrong Springs property are more complex than at Kent and Clark Springs because of multiple hydrogeologic boundary conditions. That is, several regional recharge and discharge factors appear to affect groundwater flow in this area. Regional recharge from the Lake Youngs area creates a north to south flow pattern toward the Armstrong Springs property. This flow pattern converges with the regional east to west flow (dominating the Kent Springs property) in this same area. The Soos Creek valley, located less than a mile west of the springs property, is a central discharge area for both of these regional groundwater flow systems. Further complicating the groundwater flow interpretation is the likely location of a groundwater divide two miles to the northeast of Armstrong Springs where groundwater flow may be directed toward the Cedar River.

**Climate/Weather**

The service area is influenced by the West Coast marine climate, which is characterized by mild, wet winters and cool, relatively dry summers. Most of the precipitation occurs as rainfall, although snow does occur almost every year. Approximately 75 percent of the rainfall occurs between October 1 and April 1, with an average annual precipitation of 35 to 40 inches in Kent.

Temperatures are moderate by the proximity of Puget Sound and the Pacific Ocean. The mean annual temperatures in Kent is 51.7 degrees Fahrenheit, although extremes of 100 degrees Fahrenheit and minus 5 degrees Fahrenheit have been recorded. Winds from the South prevail in the fall and winter, gradually shifting to a northerly direction in late spring and summer.
Neighboring Purveyors

The service area is located within the incorporated City of Kent, plus some additional unincorporated areas within the jurisdiction of King County. Figure 1-2 shows the City limits, Figure 1-3 shows the service area boundaries. The boundaries were established under the adopted Critical Water Supply Plan for South King County and cover approximately 27 square miles. By Ordinance No 1315 on October 23, 1973, King County granted the City of Kent franchise rights for water main installation, maintenance, and operation in the area. Since October, 1973, there have been no changes regarding the boundaries of the service area, and no changes are planned in the foreseeable future.

On the East, the service area boundary coincides with that of Water District No 111 (with the recent Meridian Annexation (1997), the majority of Water District #111's service area is within the Kent City limits) and Soos Creek Water and Sewer District, on the North it coincides with the mutual Kent/Renton and Kent/Tukwila City limit lines, on the West it coincides with that of Highline Water District, and on the South it coincides with the service area boundary of the City of Auburn.

INVENTORY OF EXISTING FACILITIES

The City of Kent's distribution system consists of over 250 miles of mains, 8 reservoirs with a total capacity of approximately 20.9 MG, and six pump stations. There are five main pressure zones/elevations, which have in some zones been divided into one or more smaller sub-areas. The sources of supply for the City are, primarily, Clark Springs and Kent Springs and, secondarily, several wells on East Hill. A major addition to Kent's sources of supply to meet summer's peak demands is the Iron/Manganese Filtration Plant which filters the production of three artesian wells on the east side of the Valley Floor. A schematic of the system is given in Figure 1-3.

Sources

Most of the water for the City of Kent system is received from two sources: Clark and Kent Springs. The Clark Springs source is located near the Kent-Kangley Road, just east of the Maple Valley-Black Diamond Road in the 245th block East. The City owns 300 ± acres at this source, all of which have been annexed into the City for municipal purposes. The site is segregate by Kent Kangley Road and by Rock Creek. Rock Creek flows through the property in a westerly-northwesterly direction. The water intake facilities which are located in the mid westerly part of the property consist of 3 wells and an infiltration gallery. The combined production capacity, thereof is about 7.71 MGD which corresponds to the rights granted under Certificate No 7660-A. In the past, continuous pumping at 7.71 MGD resulted in total loss of the well field in six to seven days. In 1985, however, the Clark Springs facility was totally rehabilitated including high pressure cleaning of the well holes and the installation of variable speed control on the pump motors. The results, based on '86 summer peak demand use, increased the maximum
dependable flow available from 4 MGD to 6 MGD. Conservatively the equivalent yearly average is 6.75 MGD based on 6 months at 7.5 MGD and 6 months at 6 MGD.

The Kent Springs source is located near SE 288th Street and 216th Avenue SE. The City owns 75± acres at this source all of which have been annexed into the City for municipal purposes. The site is segregated by Jenkins Creek which flows through the property in a westerly direction. The water intake facilities which are located in the middle of the property consists of a wellfield and a spring fed infiltration gallery. The yield during the winter is estimated at 6.3 MGD. The actual summer and winter production capacity is limited by the aquifer levels. Reliability of the wells has been significantly increased by the addition of variable speed drives on the well pumps, allowing them to pump at a rate commensurate with the available water supply. Kent is exploring the feasibility of developing additional wells in this area in order to distribute the aquifer demands over a wider zone and improve the productivity and reliability of this important source.

When the water demand exceeds the capacity of the Clark Springs and Kent Springs sources, additional wells are activated. The East Hill Well, located at SE 264th Street and 104th Avenue SE can provide 3.0 MGD during a peak period of limited duration and a yearly average supply of 1.48 MGD, based on 120 days per year of pumping. The Garrison Creek Well which is located at S. 218th Street and 98th Avenue S., can supply 0.57 MGD during peak demand and 0.16 MGD as a yearly average, based on 120 days of pumping per year. It pumps directly into the 218th Street, 6 MG #2 reservoir, which supplies the Valley system. The Seven Oaks Plat (Soos Creek) Well, located at 118th Avenue SE and Kent-Kangley Highway, can yield 1.28 MGD at peak demand and 0.28 MGD on a yearly average, based on 120 days of operation per year. It pumps directly into either the Clark Springs or Kent Springs Transmission Mains. The Armstrong Springs wells, located at 179th and Kent-Kangley Road (just east of Wax Road), can yield 1.7 MGD at peak demand and 0.49 MGD on a yearly average, based on 120 days of operation per year. It also pumps directly into either the Clark Springs Transmission Main or Kent Springs Transmission Main. The O'Brien Well, located at 22132 88th Avenue South, can yield 0.35 MGD during peak demand. The 212th/208th Street Wells, which pump to the Iron/Manganese Filtration Plant located at S. 212th and SR 167, can yield up to 5 MGD at peak demand and 1.64 MGD on a yearly average based on 120 days of operation per year. It pumps directly into the Valley system (240 pressure zone).

Water Treatment

The primary treatment of the water supplied to the Kent consumers is chlorination and fluoridation. Chlorination and fluoridation take place at the Kent Springs and Clark Springs sources, East Hill Well, Seven Oaks Well (Soos Creek), the Armstrong Springs Wells, O'Brien Well, and at the Iron/Manganese Filtration Plant. pH adjustment with the addition of caustic soda takes place at the Iron/Manganese Filtration Plant to enhance the filtration process and reduce the corrosivity of the finished water in the distribution system to maintain compliance with the Lead and Copper Rule.
pH adjustment, with the addition of caustic soda, is planned for the East Hill Well site and the Clark Springs supply at the James Street reservoir (6 MG #1) on 98th Avenue. Piloting is also being done at the Guiberson reservoir site to test the effectiveness of aeration/spraying to increase the pH of the Kent Springs supply. All of these sites were selected/recommended by a consultant (Economic and Engineering Services) as the end results of a system wide desktop and pre-design study completed in 1997, to comply with the Lead and Copper Rule for reducing the corrosivity of the water in Kent’s distribution system. These projects are discussed in more detail in chapter 8.

**Transmission Mains**

The Clark Springs Transmission Main, which originates at the Clark Springs source and terminates at the 6 MG reservoir on 98th Avenue S and S 240th Street, consists of about 1,203 miles of 24-inch main, 689 miles of 21-inch main, and 367 miles of 18-inch main. It has the gravity capacity of 5 MGD with the reservoir full and 5.8 MGD with the reservoir empty, but under forced flow condition, the main has a capacity of 7.5 MGD with a head of 110 feet.

The Kent Springs Transmission Main, which originates at the Kent Springs source and terminates at the Guiberson Street reservoir, has been re-constructed in the 1990's. The new main has been constructed in phases and replaced the existing (old) Kent Springs Transmission Main which was not capable of conveying maximum flows from Kent Springs due to deteriorating conditions. The new main has been constructed and sized to accommodate additional flows from the Kent Springs and Clark Springs sources and the future flows from the water impoundment project. From the Kent Springs source to the future impoundment site, the Kent Springs Transmission Main has a gravity capacity of 3.25 MGD and a forced pumping flow capacity of 6.3 MGD. It consists of 0.803 miles of 36-inch main, 3.19 miles of 30-inch main, 7.066 miles of 24-inch main, and 0.114 miles of 18-inch main.

The Clark Springs Transmission Main has an eighteen inch (18-inch) intertie with the Kent Springs Transmission Main at Kent Springs, a twelve inch (12-inch) intertie with the Kent Springs Transition Main at Armstrong Springs and also at the intersection of Kent Kangley Road and 132nd Ave SE. From 132nd Ave SE to the future impoundment reservoir, the Kent Springs Transmission Main is capable of accommodating the pumping flows from both Kent and Clark Springs (13.8 MGD). This requires the addition of a future surge control station at the Kent and Clark Springs Transmission Main intertie prior to conveying flows from the Clark Springs Transmission Main to the Kent Springs Transmission Main.

From the future impoundment Reservoir to the Guiberson Street reservoir, the Kent Springs Transmission Main has a gravity flow capacity of 15.5 MGD. It consists of 14,030 feet of 36-inch main and 7,483 feet of 24-inch main.
Thus the combined capacity of the two Transmission Mains at gravity flow ranges from 8.25 MGD to 9.05 MGD. The combined capacity with both Kent Springs and Clark Springs under forced flow conditions is 13.8 MGD.

Pressure Zones

The total service area is divided into five sub-areas, each of which has a distinct hydraulic level. These pressure zones are the high East Hill level, at elevation 590 feet above sea level (the 590 system), the low East Hill level at 485 feet (the 485 system), the valley level at 240 feet (the 240 system), the low West Hill level at 354.5 feet (the 354 system), and the high West Hill level at 529 feet (the 529 system).

The High East Hill System

The Clark Springs main discharges into a 6 MG tank (the James Street tank), which is located west of 98th Avenue S and north of S 240th Street and which serves as a holding reservoir. Its high water surface elevation is at 418 feet. Water is pumped from it into a 1 MG tank and a 3.5 MG tank, each with a high water surface elevation of 590 feet. Water is also pumped from the East Hill Well into these tanks. These two tanks which serve the high East Hill pressure zone are located respectively near 112th Avenue SE and SE 236th Street and near 124th Avenue SE and SE 286th Street. The boundaries of this zone within the Kent system extend as far as 124th Avenue SE on the east, SE 277th Place on the north, 98th Avenue S on the west, and SE 224th Street on the north.

Three of the four interties with Water District #111 which lie just east of the Kent system are serviced from the high East Hill system. These three interties are located near 124th Ave SE at SE 256th Street, at SE 277th Street and at SE 282nd Street. Because the high East Hill System and District’s system are at the same hydraulic elevation, they can operate as a single system. In fact, when Kent was the District’s sole water source they were operated as one. Today, however, with the District supplying its own water, these interties are off. The fourth intertie with the District was located at 150th Place SE and Kent Kangley Road. This intertie took water directly out of the Clark Springs Transmission Main and pumped into the District’s reservoir. This intertie was capped during the reconstruction of Kent Kangley Road and may be relocated at some future date.

The Low East Hill System

The low East Hill system at elevation 485 feet serves the westerly slopes of East Hill. Its boundaries are approximately 98th Avenue S to the east, S 257th Street to the south, Clearview Avenue S to the west, and the north extremity of 222nd to the north. This system draws its supply from a 125,000 gallon elevated steel tank adjacent to the 6 MG, 418 feet elevation holding reservoir.
Pump Station No 5, which is located at the site of the James Street tank, serves both pressure zones of the East Hill system with three pumps. One of the pumps (#1) serves the 125,000 gallon tank at elevation 485 feet. At 1,150 RPM, the pump can deliver 1,075 gpm. Another pump (#3) serves the two tanks at elevation 590. At 1,750 RPM, it can deliver 1,950 gpm. The shared pump (#2) serves both pressure zones. At 1,150 RPM, it can deliver 1,075 gpm to the 485 system, and at 1,750 RPM, it can deliver 1,950 gpm to the 590 system. At present capacity if the shared pump is serving the lower East Hill system, a total of 2,150 gpm (3.1 MGD) can be supplied to the 485 system, while 1,950 gpm (2.8 MGD) can be supplied to the 590 system. On the other hand, if the shared pump is serving the higher East Hill system, 1,075 gpm (1.5 MGD) can be supplied to the lower system, while the higher one receives 3,900 gpm (5.6 MGD). There is space in the pump station for the installation of two more pumps, yielding an ultimate pumping capacity of 11.2 MGD to the 590 system and 1.5 MGD to the 485 system. Alternatively, 3.1 MGD could be delivered to the 485 system while 8.4 MGD could be supplied to the 590 system. The 485 system is also intertied to the 590 system in the vicinity of Pump Station #5 through a pressure reducer station. The pressure reducer station is only activated when the 125,000 gallon reservoir is either taken out of service or some other problem prohibits supplying water to the system via Pump Station #5. Another intertie to the 590 system exists on Woodland Way near Scenic Hill Elementary School through a check valve. It opens when pressure in the 590 system drops extremely low, a situation that might occur during a main break or fire in the immediate area.

The Valley System

This system has a hydraulic elevation of 240 feet and is served by two tanks. The 6 MG tank at S 218th Street and 98th Avenue S (Garrison Creek Reservoir) serves the northerly portions of the valley system. Its primary water source is gravity flow from the James Street tank. However, the Garrison Creek Well, both 212th Street Wells, the 208th Street Well, the O'Brien Well, the Tukwila intertie and the Renton intertie can also feed it. The 3 MG tank near Kensington Avenue and Seattle Street, also known as the Scenic Hill Reservoir, or Guiberson Street Reservoir serves the southerly portions of the Valley system. It receives water directly from the Kent Springs source via the Kent Springs main.

The boundaries of the Valley system extend from S 180th Street on the north to S 277th Street on the south, and from the base of the West Hill slope on the west to approximately 94th Avenue S on the east.

The West Hill Systems

Similar to the East Hill systems, the West Hill systems consist of two major pressure zones. The lower one operates at a hydraulic elevation of 354.5 feet and the higher one operates at elevation 529 feet. Two sub areas of the higher elevation are further pressurized by individual continuous running pumping stations to elevation 575 and 587. The low level is served by a 1 MG tank, located in the vicinity of Reith Road and S. 256th
Street  The higher elevation is served by a 300,000 gallon tank (Cambidge Reservoir), located near 34th Avenue S. and S. 264th Street.

The West Hill system is primarily supplied through the Valley system via a 12-inch main which crosses the Green River along Meeker Street and terminates at Pump Station No 3, at the intersection of Lake Fenwick Road and Reith Road. From here the water is pumped into the 354.5 elevation, 1 MG tank.

The pump station has two pumps each with a capacity 900 gpm (1.3 MGD). Under normal operating conditions, only one pump is operating. Pump Station No. 4, which is located at the 1 MG tank site (Reith Road Tank), pumps the water into the 529-foot elevation, 300,000 gallon tank (Cambidge Tank) and contains three pumps, two electric-driven at 900/1000 gpm each and one electric or diesel-driven at 1800 gpm. The combined capacity, under normal conditions, due to distribution line restrictions, is 2500 to 2600 gpm. Under normal operating conditions only one of the electrical pumps is operating. Water can also be supplied to the 529 system of the West Hill system through an intertie (Pump Station No. 8) with Highline Water District located on the east side of I-5 and S. 240th Street.

CONNECTIONS

Table 1-1 shows the actual total number of connections per customer classification, as provided by the City of Kent Utility Billing Department, and the estimated population for each pressure zone. Although the 529 pressure zone contains two sub-zones, all connection and population information has been performed for the 529 zone (the underlying zone). Connection and population information for each specific pressure zone has been estimated.

Population estimates were performed by multiplying the number of residential connections (and Multi-family) ERU’s for each pressure zone by 2.6. The 2.6 multiplier is the average number of people per household as stated in the City of Kent Comprehensive Plan written by the City Planning Department.
<table>
<thead>
<tr>
<th>Service Type</th>
<th>590 Zone</th>
<th>485 Zone</th>
<th>240 Zone</th>
<th>354.5 Zone</th>
<th>529 Zone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Connections</td>
<td>3,772</td>
<td>1,229</td>
<td>1,312</td>
<td>164</td>
<td>1,722</td>
<td>8,199</td>
</tr>
<tr>
<td>Residential ERU's</td>
<td>3,772</td>
<td>1,229</td>
<td>1,312</td>
<td>164</td>
<td>1,722</td>
<td>8,199</td>
</tr>
<tr>
<td>Multi-Family Connections</td>
<td>445</td>
<td>121</td>
<td>741</td>
<td>20</td>
<td>20</td>
<td>1,347</td>
</tr>
<tr>
<td>Multi-Family ERU's</td>
<td>3,403</td>
<td>928</td>
<td>5,672</td>
<td>155</td>
<td>154</td>
<td>10,312</td>
</tr>
<tr>
<td>Commercial/Industrial/Governmental Connections</td>
<td>304</td>
<td>135</td>
<td>1,198</td>
<td>4</td>
<td>47</td>
<td>1,688</td>
</tr>
<tr>
<td>Commercial/Industrial/Governmental ERU's</td>
<td>2,935</td>
<td>1,304</td>
<td>11,576</td>
<td>33</td>
<td>456</td>
<td>16,304</td>
</tr>
<tr>
<td>Total Connections</td>
<td>4,521</td>
<td>1,485</td>
<td>3,251</td>
<td>188</td>
<td>1,789</td>
<td>11,234</td>
</tr>
<tr>
<td>Total ERU's</td>
<td>10,110</td>
<td>3,461</td>
<td>18,560</td>
<td>352</td>
<td>2,332</td>
<td>34,815</td>
</tr>
<tr>
<td>Population</td>
<td>18,655</td>
<td>5,609</td>
<td>18,158</td>
<td>829</td>
<td>4,878</td>
<td>48,129</td>
</tr>
</tbody>
</table>

*Estimated Number

**INTERTIES**

The City currently has several intertie agreements with neighboring purveyors. The primary function of the interties is to provide emergency service between purveyors, although in some cases they provide firm supply. Table 1-2 lists an inventory of all of the system interties.
### Table 1-2
City of Kent
System Interties

<table>
<thead>
<tr>
<th>Entity</th>
<th>Intertie Location</th>
<th>Meter Size</th>
<th>Direction of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn</td>
<td>78&lt;sup&gt;th&lt;/sup&gt; Ave S &amp; 277&lt;sup&gt;th&lt;/sup&gt; St</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Covington Water District</td>
<td>Wax Road &amp; Kent Kangley</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water District #111</td>
<td>SE 256&lt;sup&gt;th&lt;/sup&gt; St &amp; 121&lt;sup&gt;st&lt;/sup&gt; Pl SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>SE 277&lt;sup&gt;th&lt;/sup&gt; Pl &amp; 124&lt;sup&gt;th&lt;/sup&gt; Ave SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>SE 282&lt;sup&gt;nd&lt;/sup&gt; St &amp; 124&lt;sup&gt;th&lt;/sup&gt; Ave SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>152&lt;sup&gt;nd&lt;/sup&gt; Ave SE &amp; Kent Kangley</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highline Water District</td>
<td>S. 240&lt;sup&gt;th&lt;/sup&gt; St &amp; 35&lt;sup&gt;th&lt;/sup&gt; Ave S</td>
<td>8 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Renton</td>
<td>S 180&lt;sup&gt;th&lt;/sup&gt; St &amp; Lind Ave</td>
<td>10-12 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Soos Creek Water</td>
<td>SE 228&lt;sup&gt;th&lt;/sup&gt; St &amp; 113&lt;sup&gt;th&lt;/sup&gt; Ave SE</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Benson Road &amp; SW 226&lt;sup&gt;th&lt;/sup&gt; St</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>116&lt;sup&gt;th&lt;/sup&gt; Ave SE &amp; SE 232&lt;sup&gt;nd&lt;/sup&gt; Pl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tukwila</td>
<td>Todd Blvd &amp; 68&lt;sup&gt;th&lt;/sup&gt; Ave S</td>
<td>10 inch</td>
<td>Two way</td>
</tr>
</tbody>
</table>

### RELATIONSHIPS WITH OTHER PLANS

#### Comprehensive Plan

The goals and policies of the City of Kent as stated in the 1995 City-wide Comprehensive Plan are in accord with those in the Water System Plan.

#### Sewerage Plan

The Water System Plan is consistent with the City's Sewerage Plan. There are no areas scheduled for water service without accompanying sewerage service.

#### Previous Planning Studies

Development on this Plan has been coordinated with a variety of plans and studies which have previously been prepared by/for the City. The below listed documents were utilized as source material or are referenced herein as a source of additional information:

- Water System Plan for the City of Kent, City of Kent Department of Public Works, 1988
- Earthquake Vulnerability Assessment Water, Waste Water and Storm Systems, Dames & Moore, December 1996
Corrosion Control Project Consolidated Treatment and Siting Report, Economic & Engineering Services, January 1997

City of Kent Comprehensive Plan, City of Kent Planning Department, April 1995

City of Kent Wellhead Protection Program Clark, Kent, and Armstrong Springs, Hart Crowser, April 1996

LAND USE

Existing Land Use

The hillsides and plateaus flanking the Green River Valley support distinctively different uses from those in the valley.

On the East Hill, scattered developments of single family homes are surrounded by rural residential area and by pasturelands. A few wooded areas are found, especially on steep slopes. Multi-family residential areas are concentrated along Kent-Kangley Road, although some are also found North along 104th Avenue SE, SE 240th Street, and SE 256th Street. Parks are found along Mill Creek and along Soos Creek. Commercial areas are concentrated along 104th Avenue SE, particularly at the intersections of 104th Avenue SE and SE 240th Street, and 104th Avenue SE and Kent-Kangley Road. There are minor amounts of land used for office space along Kent-Kangley, 104th Avenue SE, and SE 240th Street.

Historically, the Green River Valley has been used for agricultural purposes because of its excellent soil. However, because of its location near urban centers, transportation corridors and facilities and because of the construction of new utilities and flood control levees along the Green River, the valley is being transformed into an industrial area with residential areas lining the hillsides. Increasing property taxes have forced many farmers to sell their lands, when farming was no longer profitable, to speculators who lease land to farmers until the land is ready to be developed to a more profitable land use.

On the valley floor, commercial areas dominate the central business district (CBD) between James Street and Willis Street, between Kennebeck Avenue and SR 167, and are scattered heavily throughout the central and eastern portions of the valley. Commercial development extends from the CBD west along Meeker Street and south along Central Avenue. Multi-family residential units are located mostly between Meeker and 228th west of West Valley Highway (SR 181) with some blocks scattered around the CBD. Single family residential areas are found around the CBD and scattered in small amounts throughout the Valley floor. Residential agriculture is very scattered mostly along West Valley Highway. Open space, or undeveloped areas, are scattered with some large tracts in the west central valley. Industrial areas occupy more space than any other classification in the valley; larger properties are found primarily north of S 228th Street.
between West Valley Highway and the Green River; smaller industrial properties are south of 228th, mostly along Central Avenue and SR 167.

Single family residential use dominates the West Hill area with commercial areas at scattered locations. There are some areas of multi-family residential use on the eastern slope, but the slope is primarily open space due to its seventy.

Future Service Area

In May 1990, the King County Council adopted the South King County Coordinated Water Supply Plan (CWSP). The CWSP was developed in accordance with the “Coordination Act” for water utilities in the State to coordinate their planning and construction programs with other water utilities and local governments in the same geographic area. The CWSP was prepared to assist the area’s water utilities in establishing an effective process for planning and development of public water systems. Service area boundaries were identified by each utility for capital improvement planning and service responsibilities. It is anticipated, at this time, that the future water service area will not deviate as stated in the CWSP.

INTERTIE AGREEMENTS

The City of Kent has entered into several intertie agreements with surrounding purveyors. The agreements are described below and a copy of the agreements are available in Appendix B.

Highline Water District

In April 1995, the City of Kent executed an open-ended intertie agreement with the Highline Water District. Flows from the two-way intertie are limited to fire-fighting purposes, emergency use, and special maintenance purposes, although in the past, the intertie has provided 1.5 MGD of firm supply. The intertie is referred to as the City of Kent Pump Station #8 throughout this document.

City of Tukwila

On June 28, 1979, an open-ended agreement was signed with the City of Tukwila to provide water on 10 days notice or on an emergency basis for $0.33 per hundred cubic feet. This intertie has provided Kent with up to 3.4 MGD in additional supply to help meet peak demands, however, it has also been used in the reverse direction to provide water to the Southcenter South Industrial Park when Tukwila’s under-river crossing failed in the Spring of 1983.
City of Auburn

An intertie with the Auburn Water system exists via the dissolution of Water District #87. The intertie was reconstructed in 1991.

City of Renton

In June 1980, the City of Kent entered into an intertie agreement with the City of Renton. This agreement was superseded in May 1995, when the City of Kent and City of Renton signed an open-ended intertie agreement. Although Renton has provided Kent up to 4.89 MGD, the 1995 agreement provides Kent up to 3.5 MGD from Renton, depending upon demand conditions, while Kent would provide up to 2.0 MGD to Renton, depending upon demand conditions.

Water District #111

The City of Kent has three interties with Water District #111. The interties were mainly used when the City of Kent provided water to Water District #111. When this was the case, the City's S90 system and the District's system were operated as one. The City no longer supplies water to Water District #111; however, the interties still remain and are used for two-way supply.

Soos Creek Water and Sewer District

In August 2001, the City of Kent entered into an intertie agreement with Soos Creek Water and Sewer District. This agreement provides up to 1 MGD of emergency water supply.

City of Tacoma

In June 1985, an agreement was executed with the City of Tacoma for Kent to share in both the capital costs and the operational and maintenance costs of Tacoma's Green River Pipe Line #5 project.

On December 16, 1997, a conceptual agreement was signed between City of Tacoma Public Utilities Water Division and the Participating South King County Regional Water Association Member Utilities (SKCU), which Kent is a member thereof. The agreement was necessary to reflect changes to the Project and specific elements of the Project not envisioned at the time of the 1985 contract. It is the intent of Tacoma and SKCU that this Conceptual Agreement, in conjunction with the provisions of the 1985 Contract, would serve as the basis for a Project Agreement which would set forth in detail the specific terms and conditions under which the parties would participate in the Project. To date, a new agreement has been developed for which all parties are in concurrence therewith (Tacoma presently seeking their Council concurrence) and for which a formal execution thereof is anticipated to occur in November of this year (2001).
Under this new agreement Kent will receive 7.48 MGD of summer time peaking water up to 2,200 Acre Feet plus during the balance of the year run of the river water when it's available. Supply from this project is expected to be available by 2006.

Covington Water District

Although the City of Kent and Covington Water District do not have a current intertie agreement, historically Kent provided water to Covington through an intertie in the vicinity of Covington Way SE and SE 272nd

Lakehaven Utility District

The Lakehaven Utility District and the City of Kent have discussed a possible emergency intertie. The location of the said intertie would be in the vicinity of Military Road and South 277th Street. At this time, the City is still considering this intertie and has not ruled out its implementation.

RELIABILITY STANDARD

Kent has developed and adopted a reliability standard, as recommended by the Department of Health. The standard requires the Kent water system to be able to meet both current and projected peak day demands with its single largest supply source off-line for at least 72 hours. Due to declining aquifer conditions and constant growth within its service area, Kent has been unable to meet this standard since prior to 1990

Knowing since the mid 1980's that Kent will not be able to stay consistent with this reliability standard, the City has vigorously pursued additional water rights and explored other alternatives to obtain sufficient sources to meet this reliability standard. A description of the alternatives explored is located within chapter six (6) of this document.

CONDITIONS OF SERVICE

The City of Kent currently provides water service to customers within its established service area boundary. Additionally, the City maintains metered interties with the City of Renton, the City of Tukwila, Highline Water District, the City of Auburn, Water District #111, and plans one in the future with Soos Creek Water and Sewer District. All interties are for two-way flows

Service area policies such as developer extension requirements, fee payment responsibilities, design standards and related issues are governed by the Kent City Code and the City of Kent Construction Standards. A copy of the Kent City Code for the water system is located in Appendix C.
COMPLAINTS/INQUIRIES

The City has adopted the following policy and procedures for taking and responding to complaints/inquiries.

To contact the Water Department, citizens contact the Public Works Operations Department through the public number which is (253) 856-5600. The phone is operated by City employees Monday through Friday (except Holidays) between the hours of 7:30 a.m. and 4:00 p.m. During non-working hours, the phones are answered by a voice message system. In the case of emergencies during non-working hours, the calls are forwarded to the City Police Department who contact the Water Department employee on call or the Water Superintendent.

During standard working hours, the individual receiving the call shall record all of the pertinent information (i.e., name, address, location of the problem, date, phone number, and the nature of the call) on a complaint/inquiry form. Each form has a unique identifying number to assist in tracking. Once all of the pertinent information is recorded, a copy of the form is given to the corresponding supervisor or superintendent.

Field Supervisors/Superintendents are responsible for contacting the citizen as soon as possible. After the citizen has been contacted and the situation assessed, the response given to the citizen is recorded on the complaint/inquiry form. When the form is fully completed, it is returned to the superintendent who in-turn gives it to office staff for filing/archiving.

Table 1-3 below shows the number of complaints/inquiries for the year 1995-1997. The records show that the number of complaints/inquiries have increased over the past few years for distribution related complaints/inquiries and decreased for water treatment complaints/inquiries. The increase in distribution related complaints/inquiries was anticipated with growth within the system.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water turn on requests</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Flow test requests</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Low pressure/no water</td>
<td>69</td>
<td>38</td>
<td>51</td>
<td>158</td>
</tr>
<tr>
<td>High pressure</td>
<td>42</td>
<td>30</td>
<td>32</td>
<td>104</td>
</tr>
<tr>
<td>Water system leaks</td>
<td>46</td>
<td>59</td>
<td>62</td>
<td>167</td>
</tr>
<tr>
<td>Meter leaks/repairs/problems</td>
<td>18</td>
<td>46</td>
<td>49</td>
<td>113</td>
</tr>
<tr>
<td>Hydrant leaking</td>
<td>30</td>
<td>31</td>
<td>12</td>
<td>73</td>
</tr>
<tr>
<td>Hydrant out of service/hit/down</td>
<td>20</td>
<td>15</td>
<td>24</td>
<td>59</td>
</tr>
<tr>
<td>Hydrants need painting/clearing</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Valve box cover/casing damaged</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Air in lines</td>
<td>11</td>
<td>2</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Water system questions/general</td>
<td>38</td>
<td>18</td>
<td>34</td>
<td>90</td>
</tr>
<tr>
<td>Questions re: chlorine in water</td>
<td>26</td>
<td>22</td>
<td>13</td>
<td>61</td>
</tr>
<tr>
<td>Discolored water</td>
<td>26</td>
<td>48</td>
<td>43</td>
<td>117</td>
</tr>
<tr>
<td>Questions re: health effects of water</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>General water quality requests for info/analysis</td>
<td>8</td>
<td>31</td>
<td>22</td>
<td>61</td>
</tr>
<tr>
<td>Copper stains</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>349</td>
<td>346</td>
<td>345</td>
<td>1040</td>
</tr>
</tbody>
</table>
Chapter 2
Basic Planning Data and Water Demand Forecasting

GENERAL

This section provides the basic planning data pertinent to the Water System Plan. It provides a description of the water system’s service area, population, service connections, water use, equivalent residential units, projected land use, future population, and water demand.

SERVICE AREA BOUNDARIES

The service area is located within the incorporated City of Kent, plus some additional unincorporated areas within the jurisdiction of King County. Figure 1-2 shows the City limits; Figure 1-3 shows the service area boundaries. The boundaries were established under the adopted Critical Water Supply Plan for South King County and cover approximately 27 square miles. By Ordinance No. 1315 on October 23, 1973, King County granted the City of Kent franchise rights for water main installation, maintenance, and operation in the area. Since October, 1973, there have been no changes regarding the boundaries of the service area, and no changes are planned during the present planning period.

On the East, the service area boundary coincides with that of Water District No. 111 and Soos Creek Water and Sewer District, on the North it coincides with the mutual Kent/Renton and Kent/Tukwila City limit lines, on the West it coincides with that of Highline Water District, and on the South it coincides with the service area boundary of the City of Auburn.

LAND USE

Existing Land Use

The hillsides and plateaus flanking the Green River Valley support distinctively different uses from those in the valley.

On the East Hill, scattered developments of single family homes are surrounded by rural residential area and by pasturelands. A few wooded areas are found, especially on steep slopes. Multi-family residential areas are concentrated along Kent-Kangley Road, although some are also found North along 104th Avenue SE, SE 240th Street and SE 256th Street near Lake Meridian. Parks are found along Mill Creek and along Soos Creek. Commercial areas are concentrated along 104th Avenue SE, particularly at the intersections of 104th Avenue SE and SE 240th Street, and 104th Avenue SE and Kent-Kangley Road. There are minor amounts of land used for office space along Kent-Kangley, 104th Avenue SE, and SE 240th Street.
Historically, the Green River Valley has been used for agricultural purposes because of its excellent soil. However, because of its location near urban centers, transportation corridors and facilities and because of the construction of new utilities and flood control levees along the Green River, the valley is being transformed into an industrial area with residential areas lining the hillside.

On the valley floor, commercial areas dominate the central business district (CBD) between James Street and Willis Street, between Kennebec Avenue and SR 167, and are scattered heavily throughout the central and eastern portions of the valley. Commercial development extends from the CBD west along Meeker Street and south along Central Avenue. Multi-family residential units are located mostly between Meeker and 228th Street west of West Valley Highway (SR 181) with some blocks scattered around the CBD. Single family residential areas are found around the CBD and scattered in small amounts throughout the Valley floor. Residential agriculture is very scattered mostly along West Valley Highway. Open space, or undeveloped areas, are scattered with some large tracts in the west central valley. Industrial areas occupy more space than any other classification in the valley, larger properties are found primarily north of S. 228th Street, between West Valley Highway and the Green River; smaller industrial properties are south of 228th, mostly along Central Avenue and SR 167.

Single family residential use dominates the West Hill area with commercial areas at scattered locations. There are some areas of multi-family residential use on the eastern slope, but the slope is primarily open space due to its severity.

**Proposed Land Use**

The zoning within the service area follows the trend outlined above. Much of the valley is zoned Industrial and Commercial interspersed with other uses, while the hillside and the higher elevations are zoned primarily Single Family Residential, Multi-family Residential, and Neighborhood Commercial. A copy of the future land use plan is included as figure 2-1.

Land use plans for the East hill area indicate that single family residential use will supplant nearly all of the pastureland, wooded areas, and rural residential area, although some rural residential areas will be retained near Soos Creek and further east. Green belts, or open space, will remain primarily along the creeks and hillside. Multi-family residential use will expand, particularly around Kent-Kangley Road as far east as 116th Avenue SE. In addition, it will be concentrated along 104th Avenue SE near SE 240th Street, along 108th Avenue SE near SE 208th Street, and between 100th Avenue SE and 112th Avenue SE between SE 240th Street and SE 256th Street. The commercial areas at 104th Avenue SE and SE 240th Street and at 104th Avenue SE and Kent-Kangley Road will expand, but other neighborhood commercial areas will remain essentially unchanged. Office space and limited commercial use will expand dramatically to include all the area on 104th Avenue SE between the commercial areas at SE 240th Street and SE 256th Street (Kent-Kangley intersection). This use will also dominate in the area bordering Mill Creek southwest of the Kent-Kangley intersection with 104th Avenue SE.
A portion of the service area falls within the Soos Creek Plateau Land Use Plan. This Plan covers the East Hill of Kent and substantial areas lying to the east. The zoning of those areas of the service area which fall within the Soos Creek Plan is Single and Multi-Family Residential and Neighborhood Commercial, which is similar to that called for by the City's Comprehensive Plan.

In the Valley area, industrial use is expected to occupy all the space north of S. 228th Street and SR 167 and east of the Green River except the 259 acres which have been designated open space for the Green River Enhancement Area as described in the following paragraph. There will also be substantial tracts of industrial land south of the Green River along SR 167 and a smaller area, just southwest of the CBD and north and east of the Green River. The commercial areas along Central Avenue will expand, as well as those in the CBD and along West Meeker and West Valley Highway near their intersection with each other. Single residential use will be completely supplanted by commercial and multi-family residential uses. The multi-family residential areas will expand dramatically, occupying rather large tracts scattered around the commercial areas. Open space will be found along the Green River and on steep slopes. Agricultural land will remain only south and west of the Green River.

The addition of the Green River Natural Resources Enhancement Area (GRNREA) has reduced the industrial capacity of the valley floor by 259 acres. The GRNREA is bordered to the North by S. 212th Street, to the South by S. 226th Street, to the West by the Green River, and to the East by 64th Avenue South. The area includes existing, enhanced, and created wetlands. It provides regional stormwater detention and serve as a wildlife habitat enhancement area. The City owns the property and it will not be available for future development therefor, it will be redesignated as open space.

On West Hill, the single family residential area will remain largely the same as it is now, although a small amount will be lost to an expanded commercial area around Military Road and 38th Avenue S. Multi-family residential use will be somewhat expanded on the eastern slope. Open space will remain in reduced amounts, due largely to the expansion of multi-family residential areas.

Overall, the character of Kent will change and intensify present trends in land use. The Valley floor will be dominated by industrial uses with commercial and multi-family residential also using significant amounts of land. The East Hill will lose almost all of its open space to single family residential area, while multi-family residential and commercial areas will expand substantially. The West Hill will have fewer changes with an increase in multi-family residential being the biggest change.

The effect of these changes will be to increase water demand greatly on the Valley floor and in the high East Hill system. Peak demands in the Valley should be during daytime business hours and will be relatively unaffected by variations in weather. On the other hand, demand on East Hill and West Hill will have peaks in early morning and early evening, especially as temperatures climb and lawn irrigation increases significantly.

City of Kent Water System Plan
Page 2-3
There will be a large amount of growth in water needs on East Hill and moderate growth on West Hill

POPULATION/SERVICE CONNECTIONS

Current Population

The existing population (1996) was determined by multiplying the total number of residential connections (single family and multi-family ERU’s) by the average persons per household (2.6, City of Kent Comprehensive Plan). The multi-family population was calculated as described in the demands section. Table 2-1 reflects the estimated number of connections per pressure zone, the estimated population within each pressure zone, and the actual number of connections within the service area.

<table>
<thead>
<tr>
<th>Service Type</th>
<th>591 Zone</th>
<th>486 Zone</th>
<th>240 Zone</th>
<th>3545 Zone</th>
<th>529 Zone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Connections</td>
<td>*3,772</td>
<td>*1,229</td>
<td>*1,312</td>
<td>*164</td>
<td>*1,722</td>
<td>8,199</td>
</tr>
<tr>
<td>Residential ERU’s</td>
<td>*3,772</td>
<td>*1,229</td>
<td>*1,312</td>
<td>*164</td>
<td>*1,722</td>
<td>8,199</td>
</tr>
<tr>
<td>Multi-Family Connections</td>
<td>*445</td>
<td>*121</td>
<td>*741</td>
<td>*20</td>
<td>*20</td>
<td>1,347</td>
</tr>
<tr>
<td>Multi-Family ERU’s</td>
<td>*3,403</td>
<td>*928</td>
<td>*5,672</td>
<td>*155</td>
<td>*154</td>
<td>10,312</td>
</tr>
<tr>
<td>Commercial Industrial Governmental Connections</td>
<td>*304</td>
<td>*135</td>
<td>*1,198</td>
<td>*4</td>
<td>*47</td>
<td>1,688</td>
</tr>
<tr>
<td>Commercial Industrial Governmental</td>
<td>*2,935</td>
<td>*1,304</td>
<td>*11,576</td>
<td>*33</td>
<td>*456</td>
<td>16,304</td>
</tr>
<tr>
<td>Total Connections</td>
<td>*4,521</td>
<td>*1,485</td>
<td>*3,251</td>
<td>*188</td>
<td>*1,789</td>
<td>11,234</td>
</tr>
<tr>
<td>Total ERU’s</td>
<td>*10,110</td>
<td>*3,461</td>
<td>*18,560</td>
<td>*352</td>
<td>*2,332</td>
<td>34,815</td>
</tr>
<tr>
<td>Population</td>
<td>*18,655</td>
<td>*5,609</td>
<td>*18,158</td>
<td>*829</td>
<td>*4,878</td>
<td>48,129</td>
</tr>
</tbody>
</table>

*Estimated Number
Projected Population

Projections for future populations between current and saturated population, shown in table 2-2, were performed by using the same method that was used to calculate the current population in the previous paragraph and applying growth rates which are discussed in the following rate of growth section.

Saturated Population

Population projections were derived from vacant single family zoned acres and redevelopable land zoned Duplex Multi-family Residential District (MR-D), Garden Density Multi-family Residential District (MR-G), Medium Density Multi-family Residential District (MR-M), and High Density Multi-family Residential District (MR-H). In this analysis, the following assumptions were made:

1. All existing single family homes on land zoned for single family (SR-1, SR-2, SR-3, SR-4, SR-5, SR-6, and SR-8) would remain and not further subdivide.

2. Of the existing structures/residences on land zoned for potential multi-family development (MR-D, MR-G, MR-M, and MR-H) sixty-five (65) percent would redevelop to the maximum allowable number of multi-family units for that zoning classification. The sixty-five percent was established by the City Planning Department and provides discounts for critical areas, right-of-way, public purpose lands, and a market factor discount.

3. Of the existing vacant single family zoned land, only sixty-six (66) percent would be developed to the maximum allowable number of units for that respective zoning classification. The sixty-six percent was established by the City Planning Department and provides discounts for critical areas, right-of-way, public purpose lands, and a market factor discount.

The final population figure was determined by multiplying the saturated number of housing units, both single family and multi-family, by the average persons per household as stated above. This revealed a projected saturated population of 96,323.

<table>
<thead>
<tr>
<th>Table 2-2</th>
<th>Population Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>1996</td>
</tr>
<tr>
<td>Population</td>
<td>48,129</td>
</tr>
</tbody>
</table>
WATER USE DATA COLLECTION REQUIREMENTS

As identified in the Conservation Planning Requirements prepared by the Department of Health and Department of Ecology, data collection is required to project public water systems water demand and to provide a basis for the evaluation of the effectiveness of conservation programs. The data collection schedule for the City’s water system is shown below by data type and frequency and will be collected on an ongoing basis:

- Source of supply meter - daily readings, report monthly and annual totals
- Emergency interties/wholesale - monthly (if applicable)
- Peak day/peak month/annual totals
- Unaccounted for water - monthly
- Accounted for water - monthly
  - Service meter readings – monthly/annually
  - Single-family
  - Multi-family
  - Commercial/government/industrial
  - Agriculture
- Population served – annual totals
- Economic data – existing water rights
- Conservation data - yearly

RATE OF GROWTH

There are several factors which have a direct influence on the rate of growth. In determining the rate, City staff evaluated the rates of growth in the following areas: water production records, metered data, and population growth within the service area.

Although all of the previous factors were evaluated, the final rate of growth was determined from the actual water production records and metered data shown in tables 2-3 and 2-4 respectively. Records revealed a residential and multi-family rate of growth of 2.35 percent per year, a commercial rate of 1.44 percent per year, and a production growth rate of 2.31 percent per year.

Historical water production records are shown in table 2-3. As can be seen, the water production rate of growth has an average increase of 2.31 percent per year. Also shown are the actual Peak Day Demand (PDD) and Average Day Demand (ADD) for each year.
### Water Production Records

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Production (MGD)</th>
<th>Time to Month</th>
<th>Add. Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>2,183 106</td>
<td></td>
<td>547</td>
</tr>
<tr>
<td>1997</td>
<td>2,351 200</td>
<td>10.40</td>
<td>645</td>
</tr>
<tr>
<td>1997</td>
<td>2,620 685</td>
<td>13.00</td>
<td>718</td>
</tr>
<tr>
<td>1997</td>
<td>2,731.550</td>
<td>14.17</td>
<td>748</td>
</tr>
<tr>
<td>1997</td>
<td>2,713 571</td>
<td>15.28</td>
<td>743</td>
</tr>
<tr>
<td>1997</td>
<td>2,849 917</td>
<td>13.28</td>
<td>781</td>
</tr>
<tr>
<td>1997</td>
<td>3,120 207</td>
<td>14.97</td>
<td>855</td>
</tr>
<tr>
<td>1997</td>
<td>3,143 092</td>
<td>13.28</td>
<td>861</td>
</tr>
<tr>
<td>1997</td>
<td>3,048 149</td>
<td>12.71</td>
<td>835</td>
</tr>
<tr>
<td>1997</td>
<td>2,907 217</td>
<td>13.04</td>
<td>796</td>
</tr>
<tr>
<td>1997</td>
<td>3,228 763</td>
<td>15.13</td>
<td>884</td>
</tr>
<tr>
<td>1997</td>
<td>3,139 754</td>
<td>14.84</td>
<td>860</td>
</tr>
<tr>
<td>1997</td>
<td>3,212 020</td>
<td>15.01</td>
<td>856</td>
</tr>
</tbody>
</table>

2.51% per year

Table 2-4 below contains metered consumption records provided by the Utility Billing Department. The percentage of unaccounted for water was determined by comparing the production meter readings in Table 2-3 above (readings taken at the water sources) to those in Table 2-4.

In 1997 the Water Department started to meter all water used in the flushing program. In addition, two major known system leaks were corrected, one of which was on the Kent Springs Transmission Main (±200 gpm) and the other was at the Guiberson Street Reservoir (±400 gpm). With these corrections and additions to the flushing program, it is the Department's goal to keep the percentage of unaccounted for water below ten (10) percent each year.

### Metered Consumption Records

<table>
<thead>
<tr>
<th>Year</th>
<th>Residential/Commercial Family</th>
<th>Consumer 1</th>
<th>Consumer 2</th>
<th>Unaccounted Flushing Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1,319 897</td>
<td>1,212 629</td>
<td>12.89 %</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>1,468 389</td>
<td>1,432 126</td>
<td>10.17 %</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>1,413 001</td>
<td>1,330 050</td>
<td>12.63 %</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>1,456 894</td>
<td>1,286 385</td>
<td>12.18 %</td>
<td></td>
</tr>
</tbody>
</table>

Not used in future growth projections 8.6%

Not used in future growth projections 8.0%

Not used in future growth projections 6.8%
Table 2-5 below, contains the current and historical population records. The 1988 population was obtained from the 1988 Water System Plan. The 1996 population was calculated by multiplying the total number of residential and multi-family ERU's by 2.6 people per ERU (City of Kent Comprehensive Plan).

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (People)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>39,014</td>
</tr>
<tr>
<td>1996</td>
<td>48,129</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>2.36% per year</td>
</tr>
</tbody>
</table>

Table 2-6 provides recent ERU statistical information. As can be seen the number of residential ERU's grow each year and correspond directly with the number of residential connections. The number of multi-family and commercial ERU's change each year depending on the average residential consumption volume and the total volumes used by the multi-family and commercial classes in an equivalent duration of time. Depending on the volume of consumption in the multi-family and commercial classifications, the number of ERU's within each class have the potential of increasing or decreasing from year to year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Residential (ERU's)</th>
<th>Multi-Family (ERU's)</th>
<th>Commercial (ERU's)</th>
<th>Total (ERU's)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>7,703</td>
<td>9,736</td>
<td>16,028</td>
<td>33,467</td>
</tr>
<tr>
<td>1994</td>
<td>7,938</td>
<td>9,174</td>
<td>16,688</td>
<td>33,800</td>
</tr>
<tr>
<td>1995</td>
<td>7,925</td>
<td>9,616</td>
<td>16,428</td>
<td>33,969</td>
</tr>
<tr>
<td>1996</td>
<td>8,199</td>
<td>10,312</td>
<td>16,304</td>
<td>34,815</td>
</tr>
</tbody>
</table>

DEMANDS

In order to calculate future water system demands, it is necessary to evaluate water use characteristics of the various types of customers served by the City by an equal unit. This is accomplished by expressing multi-family and non-residential customers in Equivalent Residential Units (ERU's). To determine ERU's, historical water records were researched to obtain the average daily demand of a residential customer. By dividing this average daily demand per single ERU into the total use within other customer classes, the estimated ERU's per customer class can be determined.
Current Demands

The City's Utility Billing Department groups water customers under five categories, which are: residential, multi-family, commercial, governmental, and schools. In projecting future demands, these five categories were grouped into two, which are residential & multi-family, and commercial. The residential & multi-family consists of those two categories. The commercial category consists of commercial, governmental, and schools.

Peak Day Demand

The equivalent residential unit (ERU) provides a common unit for all classification so they can be grouped and evaluated with each other individually. This principal was utilized in determining future peak day demands. Both the residential/multi-family and commercial projections were expressed in ERU's based on the previous growth factors stated in this chapter. Once the future projected number of ERU's was known, to determine the respective peak day demand, they needed to be multiplied by a factor. The factor applied is a consumption volume per ERU. This factor is unique to each system and may fluctuate from year to year. The factor is determined through review of historical data. Table 2-7 contains the historical data which was evaluated.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of ERU</th>
<th>(PDD in MG)</th>
<th>Gal/ERU</th>
</tr>
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<tbody>
<tr>
<td>1993</td>
<td>33,467</td>
<td>13.04</td>
<td>389.60</td>
</tr>
<tr>
<td>1994</td>
<td>33,800</td>
<td>15.13</td>
<td>447.63</td>
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<tr>
<td>1995</td>
<td>33,969</td>
<td>14.84</td>
<td>436.87</td>
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<tr>
<td>1996</td>
<td>34,815</td>
<td>15.61</td>
<td>448.37</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>430.60</td>
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Although the average of the above gal/ERU is 430.60, this is below three of the four actual numbers used to obtain the average and therefore does not represent this information effectively.

Peak day demand projections provide the City the ability to plan future improvements around a worse case scenario. Values used to determine the peak day demand should also reflect a worse case scenario. To stay consistent with this, a value of 450 gal/ERU is used for the peak day demand projections. In comparing this value with that of surrounding purveyors, from their latest comprehensive plans, shown in table 2-8, it can be seen that Kent is the lowest by far for Peak Day Demand projections and the second lowest for Average Day Demand. This is a direct reflection of an effective conservation program and a system with a low percentage of unaccounted for water.

City of Kent Water System Plan
Page 2-9
Because the value of 450 gal/ERU was derived from meter readings at the City’s water sources, unaccounted for water has been accounted for in this factor and thusly future projections.

Since the one-day peak demand is one of the critical parameters to be considered in planning management strategy and capital improvements, it is important to determine the one-day peak and project it into the future. Review of water records for the peak day demand revealed that the actual peaks were not accurately projected by a single number. To account for this, a standard deviation of the actuals vs. the projections was performed. The results showed that the actuals were within thirteen point five (13.5) percent of the projected amount. Using the results from the standard deviation, a “range” of demand was created. Table 2-9 shows a low, medium, and high demands respectively for each year. Conservation was taken into account for all future projections.

Saturated Demand

In an effort to determine the ultimate demand to be made on the system, saturated development of the area was assumed and water needs computed in three different ways. In the first, the current water consumption on the peak day of 1561 (1996 PDD) was divided by the current population of 48,129 to obtain a value of 324.34 gallons per capita per day (gpcd). This figure was then multiplied by the projected saturation population of 96,323 in the service area to yield an ultimate demand of 30.86 MGD. The resulting 30.68 MGD is close to the value obtained by the following approaches.

In the second method, the population served by the Kent system under such development was assumed at 96,323 and the number of people per connection assumed at 2.6 (City of Kent Comprehensive Plan). Dividing the former by the latter yielded 37,047 connections. When this was multiplied by the State recommended value of 800 gallons per day per connection, the resulting ultimate demand for water was 29.64 MGD.

In the third method of figuring ultimate demand at saturated development, the number of acres proposed for each type of land use was multiplied by the appropriate rate of water consumption at peak hour per acre to give a total flow. The composite flow produced was actually high, since it is unlikely that peaks for commercial/industrial consumers would not coincide temporally with residential peaks. The calculations indicated a...
saturated peak day flow of 32.96 MGD. This projected amount was high for the same reason mentioned above, because all of the industrial use takes place in the Valley System and this use dominated consumption in that zone. The peak hours of consumption there will be during daytime hours. On the other hand, residential consumption dominates usage on the East Hill and West Hill, so that peaks were likely to be experienced in the early morning and early evening, not at all simultaneously with the daytime peaks in the valley.

Since three different methods of calculation yielded a total ultimate demand in a narrow range between 29.64 MGD and 32.96 MGD, long range plans will need to include provisions to supply approximately 31.0 MGD. Given the seasonal impacts to the aquifer systems that support Kent's supply, the City will require new sources of supply, including Tacoma's Pipeline 5 project, to meet projected peak day demand and long term Qa and Qi. Reference Chapter six (6) for Kent's efforts to develop new supply to meet demand, which includes aggressive conservation efforts.
### Table 2-9
Peak Day Demand Projections

<table>
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<tr>
<th>Year</th>
<th>Population</th>
<th>Residential</th>
<th>Commercial</th>
<th>Low PDD (MGD)</th>
<th>Medium PDD (MGD)</th>
<th>High PDD (MGD)</th>
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<td>17.57</td>
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</table>
Average Day Demand (ADD)

It has been an accepted practice to project the average daily demand (ADD) as fifty percent of the peak day demand. When verifying this with historical records, it was discovered that this was not the case for Kent’s system. Therefore, records were analyzed to determine what percent the average day demand was of the peak day demand. The analysis revealed the average day demand was fifty-six point five (56.5) percent of the peak day demand, with a standard deviation of plus or minus six (6) percent. To account for the fluctuation, a low, medium, and high average day demand is reflected in Table 2-10.
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<th>Year</th>
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<th>MEDIUM ADD (MGD)</th>
<th>HIGH ADD (MGD)</th>
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Figure 2-4

Average Day Demand Projections

YEAR

DEMAND (MGD)


Low ADD — Med ADD — High ADD — Actual ADD
### Yearly Demands

Table 2-11 reflects projected yearly production demands. These demands were derived by multiplying the medium average day demand projections in Table 2-10 by 365 days.

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<th>Year</th>
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<th>Year</th>
<th>Yearly Production (Mg/yr)</th>
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<td>4,566.150 / 14,012.601</td>
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<td>2015</td>
<td>4,657.400 / 14,292.629</td>
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<td>2,620.685 / 8,042.358</td>
<td>2016</td>
<td>4,748.650 / 14,572.657</td>
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<td>1987</td>
<td>2,731.550 / 8,382.581</td>
<td>2017</td>
<td>4,839.900 / 14,852.685</td>
</tr>
<tr>
<td>1988</td>
<td>2,713.571 / 8,327.407</td>
<td>2018</td>
<td>4,934.800 / 15,143.914</td>
</tr>
<tr>
<td>1989</td>
<td>2,849.917 / 8,745.825</td>
<td>2019</td>
<td>5,033.350 / 15,446.344</td>
</tr>
<tr>
<td>1990</td>
<td>3,120.207 / 9,575.291</td>
<td>2020</td>
<td>5,131.900 / 15,748.775</td>
</tr>
<tr>
<td>1991</td>
<td>3,143.092 / 9,645.521</td>
<td>2021</td>
<td>5,234.100 / 16,062.406</td>
</tr>
<tr>
<td>1992</td>
<td>3,048.149 / 9,354.160</td>
<td>2022</td>
<td>5,336.300 / 16,376.037</td>
</tr>
<tr>
<td>1993</td>
<td>2,907.217 / 8,921.668</td>
<td>2023</td>
<td>5,442.150 / 16,700.870</td>
</tr>
<tr>
<td>1994</td>
<td>3,228.763 / 9,908.428</td>
<td>2024</td>
<td>5,548.000 / 17,025.702</td>
</tr>
<tr>
<td>1995</td>
<td>3,139.754 / 9,635.277</td>
<td>2025</td>
<td>5,657.500 / 17,361.736</td>
</tr>
<tr>
<td>1996</td>
<td>3,124.020 / 9,587.993</td>
<td>2026</td>
<td>5,763.350 / 17,697.770</td>
</tr>
<tr>
<td>1997</td>
<td>3,292.300 / 10,103.410</td>
<td>2027</td>
<td>5,796.200 / 17,787.379</td>
</tr>
<tr>
<td>1998</td>
<td>3,358.000 / 10,305.030</td>
<td>2028</td>
<td>5,829.050 / 17,888.189</td>
</tr>
<tr>
<td>1999</td>
<td>3,416.400 / 10,484.248</td>
<td>2029</td>
<td>5,861.900 / 17,989.000</td>
</tr>
<tr>
<td>2000</td>
<td>3,485.750 / 10,697.070</td>
<td>2030</td>
<td>5,898.400 / 18,101.010</td>
</tr>
<tr>
<td>2001</td>
<td>3,555.100 / 10,909.891</td>
<td>2031</td>
<td>5,934.900 / 18,213.021</td>
</tr>
<tr>
<td>2002</td>
<td>3,624.450 / 11,122.712</td>
<td>2032</td>
<td>5,971.400 / 18,325.032</td>
</tr>
<tr>
<td>2003</td>
<td>3,693.800 / 11,335.533</td>
<td>2033</td>
<td>6,004.250 / 18,425.842</td>
</tr>
<tr>
<td>2004</td>
<td>3,766.800 / 11,559.556</td>
<td>2034</td>
<td>6,040.750 / 18,537.854</td>
</tr>
<tr>
<td>2005</td>
<td>3,817.900 / 11,716.372</td>
<td>2035</td>
<td>6,080.900 / 18,661.066</td>
</tr>
<tr>
<td>2006</td>
<td>3,912.800 / 12,007.601</td>
<td>2036</td>
<td>6,117.400 / 18,773.077</td>
</tr>
<tr>
<td>2007</td>
<td>3,989.450 / 12,242.824</td>
<td>2037</td>
<td>6,157.550 / 18,896.289</td>
</tr>
<tr>
<td>2008</td>
<td>4,066.100 / 12,478.048</td>
<td>2038</td>
<td>6,197.700 / 19,019.502</td>
</tr>
<tr>
<td>2009</td>
<td>4,146.400 / 12,724.472</td>
<td>2039</td>
<td>6,237.850 / 19,142.714</td>
</tr>
<tr>
<td>2010</td>
<td>4,226.700 / 12,970.897</td>
<td>2040</td>
<td>6,274.350 / 19,254.725</td>
</tr>
<tr>
<td>2011</td>
<td>4,307.000 / 13,217.322</td>
<td>2041</td>
<td>6,318.150 / 19,389.139</td>
</tr>
<tr>
<td>2012</td>
<td>4,390.950 / 13,474.947</td>
<td>2042</td>
<td>6,358.300 / 19,512.351</td>
</tr>
<tr>
<td>2013</td>
<td>4,478.550 / 13,743.774</td>
<td>2043</td>
<td>6,394.800 / 19,624.362</td>
</tr>
</tbody>
</table>

1) Actual production volumes
Conservation Program

In 1993 when the water conservation plan was developed and implemented, the goals of the conservation program were to attain a 6.5 percent water reduction by 1995 and 8 percent reduction by the year 2000. Data collection for a ten year period between 1988 and 1997, was used to determine and evaluate consumption trends and the effectiveness of conservation programs. During that time period, data collected showed a per connection water reduction of 19.97 percent, while the number of service connections increased by 20.27 percent. Through conservation efforts at the local as well as regional level, the City has already surpassed the 8 percent water reduction goal for the year 2000. However, conservation efforts will become even more critical in the future as shown by projected growth rates in our area versus the available water supply.

The City of Kent shall continue an aggressive conservation program. New goals for the future include annual reductions of 2 percent per connection and implementation of retrofit programs for residents; low flow plumbing fixtures, low flush toilets, landscape management; potential sub-metering of apartments and commercial businesses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Connections</th>
<th>Total Production (MG)</th>
<th>Average per Connection (MG)</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>9,005</td>
<td>2,713.571</td>
<td>0.3013</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>9,416</td>
<td>2,849.917</td>
<td>0.3027</td>
<td>+0.46</td>
</tr>
<tr>
<td>1990</td>
<td>9,585</td>
<td>3,120.207</td>
<td>0.3255</td>
<td>+7.0</td>
</tr>
<tr>
<td>1991</td>
<td>10,417</td>
<td>3,143.092</td>
<td>0.3017</td>
<td>-7.9</td>
</tr>
<tr>
<td>1992</td>
<td>10,798</td>
<td>3,048.149</td>
<td>0.2823</td>
<td>-6.9</td>
</tr>
<tr>
<td>1993</td>
<td>10,290</td>
<td>2,907.216</td>
<td>0.2825</td>
<td>+0.07</td>
</tr>
<tr>
<td>1994</td>
<td>10,407</td>
<td>3,228.763</td>
<td>0.3102</td>
<td>+8.9</td>
</tr>
<tr>
<td>1995</td>
<td>10,701</td>
<td>3,139.754</td>
<td>0.2934</td>
<td>-5.7</td>
</tr>
<tr>
<td>1996</td>
<td>10,898</td>
<td>3,124.020</td>
<td>0.2867</td>
<td>-2.4</td>
</tr>
<tr>
<td>1997</td>
<td>10,977</td>
<td>2,769.426</td>
<td>0.2523</td>
<td>-13.6</td>
</tr>
</tbody>
</table>
Introduction

It is vital to establish realistic design criteria in order to evaluate the existing water system’s adequacy and to plan for future water system improvements. The minimum design criteria for the City of Kent Water system must be in accordance with the standards and requirements set forth by the U.S. Environmental Protection Agency and the State Department of Health. The minimum design criteria of the City must also be in accordance with the regionally accepted criteria established by the South King County Coordinated Water System Plan.

Minimum design criteria in this section include water supply requirements, storage volume, distribution system and transmission main capacity and water quality standards. This criteria will be utilized to determine existing deficiencies in the water system and projected water system requirements for the planning area described previously in this document. The City’s Construction Standards are discussed in further detail in Chapter 9 of this document.

State Agency Regulations

The State of Washington Department of Health’s (DOH) “Sizing Guidelines for Public Water Supplies” is the primary document governing the sizing and design of public water systems in the State of Washington. This publication sets forth the minimum system plan and reliability considerations. Criteria for distribution system design, water storage and daily supply requirements are summarized in this Section.

SYSTEM DESIGN STANDARDS

Water Quality Standards

Table 3-1 identifies the maximum contaminant levels allowed in drinking water supplies as put forth by the Washington State Department of Health (DOH) at the time of publication of this Plan. Additional requirements of the federal Safe Drinking Water Act (SDWA) which may be in effect but not yet required for monitoring by the DOH are not included in this table. The City recognizes that additional monitoring requirements are forthcoming and will comply with such requirements as they are implemented in the State of Washington.
Table 3-1

<table>
<thead>
<tr>
<th>Inorganic Chemicals</th>
<th>Primary MCL (mg/L)</th>
<th>Physical Characteristics</th>
<th>Secondary MCL (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic (As)</td>
<td>0.05</td>
<td>Color</td>
<td>15 Color Units</td>
</tr>
<tr>
<td>Antimony (Sb)</td>
<td>0.006</td>
<td>Turbidity</td>
<td>1 NTU</td>
</tr>
<tr>
<td>Barium (Ba)</td>
<td>2.0</td>
<td>Specific Conductivity</td>
<td>700 umhos/cm</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>0.004</td>
<td>Total Dissolved Solids</td>
<td>500 mg/L</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>0.01</td>
<td>Radionuclides</td>
<td>MCL (pCi/L)</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>*</td>
<td>Hardness</td>
<td>None Established</td>
</tr>
<tr>
<td>Fluoride (F)</td>
<td>4.0</td>
<td>Combined Radium 226 &amp; 228</td>
<td>5</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>*</td>
<td>Gross alpha particle activity (excluding uranium)</td>
<td>15</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>0.002</td>
<td>TTHM</td>
<td>1 10**</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>0.1</td>
<td>Volatile Organic Chemicals</td>
<td>In accordance with 40 CFR 141.61(a)</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>10.0</td>
<td>Synthetic Organic Chemicals</td>
<td>In accordance with 40 CFR 141.61(c)</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selenium (Se)</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thallium (Tl)</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride (Cl)</td>
<td>250.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride (F)</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver (Ag)</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfate (SO₄)</td>
<td>250.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source. WAC 246-290-310**

Although the State Board of Health has not established a MCL for copper, lead and sodium, there is enough public health significance connected with sodium levels to require inclusion in inorganic and physical monitoring.

**The MCL for TTHM is calculated on the basis of running average of quarterly samples.**

Water Main Extension Design Requirements

- All water main extensions shall conform to the design requirements of the City of Kent and the Washington State Department of Health.

- The Comprehensive Water Plan indicates the location and configuration of the major elements of the existing and proposed City supply mains, distribution system, interties and loops. The exact location or configuration of this system may be modified, provided the proposed system remains consistent with the overall intent of the plan. Minor modifications to the Comprehensive Plan require specific approval by the Director.

- Mainline extensions will be required when the property does not front on a water main or when the existing main is deemed inadequate for the proposed use. It is a

*City of Kent Water System Plan*

Page 3-2
City policy that the water main be extended to the far edge of the property to be serviced, regardless of where the service connection is to be made.

**System Design Parameters**

- The desirable system working pressure shall be approximately 60-70 psi, but not less than 35 psi under Peak Hourly Demand (PHD). The minimum pressure in the water system under fire flow conditions shall be 20 psi.

- A Pressure Reducing Valve (PRV) shall be installed and maintained on water service lines, by the property owner, when system pressures are in excess of 80 psi.

- The minimum diameter of water main for commercial, industrial, multi-family and residential developments shall be eight (8) inches. Six (6) inch diameter mains may be acceptable for looped systems within single family residential areas containing fire hydrants on the eight (8) inch or larger system, and for “dead end” mains servicing less than twenty (20) single family residences where a fire hydrant is not required. The size of main in all cases must meet fire flow requirements as determined by the Fire Marshal.

- Two cubes for “Pigging” shall be installed in the new water main at the initial connection and at each lateral from the new water main. The Water Division shall provide the cubes picked up by the contractor at the Water Division Shop located at 5821 South 240th Street.

- Dead End mains shall be avoided whenever possible. Where dead end mains are unavoidable, a minimum two (2) inch blowoff assembly is required. Blowoff sizes shall be per the City of Kent Construction Standards.

- The maximum day demand shall be determined by the design Engineer on a case by case basis. 450 gal/ERU shall be the minimum allowable factor in determining the maximum day demand.

- The average day demand shall be determined by the design Engineer on a case by case basis. The minimum allowable average day demand shall be fifty-six point five (56.5) percent of the peak day demand.

- The peak hour demand factor shall be determined by the design Engineer. The minimum allowable factor shall be 1.92 times the average hour of the peak day demand.
Storage Requirements

Storage requirements are based on three components: Equalizing Storage, required to supplement production from water sources during periods of high demand; Standby Storage, required as a backup supply in case the largest source is out of service; and, Fire Storage, required in order to deliver fire flow for the required duration.

The minimum requirements for each of these components of the total storage requirements are summarized below. According to the Group A Public Water Systems Waterworks Standards, released by DOH, the minimum amount of storage required shall be the total combined amount of the equalized storage, standby storage, and fire storage. Later in this chapter is a complete analysis of the City’s water storage requirements and existing capacities.

- **Equalizing Storage**

  The volume of equalizing storage must be sufficient to meet hourly water system demands in excess of the rate of supply and must be at an elevation sufficient to meet these demands at a minimum delivery pressure of 30 psi. The amount of required equalizing storage is to be calculated in accordance with the DOH Minimum Sizing Guidelines for Public Water Supplies”.

- **Standby Storage**

  Standby storage is required in order to augment the available supply of water during a period of restricted flow from the supply source. Restriction of flow may be caused by a pumping equipment failure, supply line failure, maintenance or repair, or other condition which causes interruption in the supply.

- **Fire Flow Reserve Storage**

  Fire reserve storage must be equal to the amount of water required to accommodate fire demand. Fire flow requirements shall be determined by the City Fire Marshall.

**Telemetry Systems**

- **Telemetry systems** must be compatible with Kent’s existing SCADA system, which is radio-based. The system must provide discrete status, continuous analog reporting, and control capability which is both sending and receiving. It must also have an integral backup power supply able to sustain communication for a 24-hour period.

**Backup Power Requirements**
• Backup power shall be provided at all sources or pumping stations which are required to be operational during power failures in order to meet system reliability requirements, or to continuously maintain a positive distribution system pressure.

**Water Valves**

• Water valves shall be located at four hundred (400) foot maximum intervals in commercial/industrial and multi-family residential areas. Locations involving hospitals, medical clinics, and others determined by the City of Kent to be critical applications, may be required to have intervals reduced.

• Water valves shall be located at eight hundred (800) foot maximum intervals in residential districts.

• All sides of mainline tees.

• All sides of mainline crosses.

• At all service, fireline, and hydrant connections to the City main.

• At both sides of all bridge crossings, railroad crossings and casing/bores.

• Combination air/vacuum release valves shall be located at high points along the main. As a guide, valves are necessary where the difference between high and low points is two (2) feet on a gradual rise, or any abrupt rise. Actual locations should be in accordance with good engineering judgement and approved by the Director. The air inlet/discharge opening shall be thirty six (36) inches above finished grade and provided with a screened downward facing vent opening. It shall be located outside of traffic areas and installed to prevent damage to landscaping and pedestrians.

• Blow-off valves shall be located at the end of all mains for flushing purposes. Blow-off Assemblies must be sized and designed to achieve a minimum flow of 2.5 ft/sec in the water main. Fire hydrants are preferred in lieu of blow off devices where flows and pressures warrant a hydrant.

**Water Main Location**

• Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer. The distance shall be measured edge-to-edge. Any deviation from this requirement shall meet DOE and Washington State Department of Health (WSDOT) requirements and be allowed only upon approval of the Director.

• Perpendicular water main crossings of sanitary sewers shall be laid to provide a minimum vertical distance of eighteen (18) inches above the sewer line, measured...
from the bottom of the water line to the top of the sewer line. Where separation between the water line and sewer line is less than eighteen (18) inches, the sewer line shall be ductile iron. All sanitary sewer lines which cross above a water main, regardless of the separation, shall be ductile iron as well, with no joints within a nominal ten (10) feet of the water main.

- Installation of water mains near other potential sources of contamination shall be subject to written approval by the Director on a case by case basis. They would include but not limited to; storage ponds, land disposal sites for wastewater or industrial process water containing toxic materials or pathogenic organisms, solid waste disposal sites, or any other facility where failure of the facility would subject the water in the main to toxic chemical or pathogenic contamination.

- Water mains shall be located at least five (5) feet away from any other utility, including but not limited to storm drains, power, natural gas, CATV, private firelines, etc.

**Fire Hydrants**

- Fire hydrant locations shall be reviewed and approved by the Fire Marshall prior to plan approval.
- At all street intersections
- Six hundred (600) foot maximum intervals in single family residential area.
- Three hundred (300) foot intervals in multi-family and commercial areas.
- Upstream of a fireline vault, if an existing hydrant is not available within fifty (50) feet of the Fire Department connection.
- At locations noted on the approved project site plans.
- At other locations as directed by the Fire Marshal.

**Cross Connection**

- There shall be no cross connection whatsoever between the City water distribution system and any unapproved pipes, wells, pumps, private hydrants, tanks, non-potable fluid or any other contaminating materials that may Backflow into the water system.
Fire Flow

All fire flow rates and duration shall be determined by the City of Kent Fire Prevention Division on a case by case basis. Table 3-2 and 3-3 below, identify the minimum fire flow rates and respective durations. Figure 3-1 shows the minimum fire flows required throughout the service area by a generalized zoning classification. It should be noted that the City requirements exceed or equal those of King County.

<table>
<thead>
<tr>
<th>Classification</th>
<th>King County Fire Flow Rates and Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>500 gpm for 30 minutes</td>
</tr>
<tr>
<td>Commercial</td>
<td>750 gpm for 60 minutes</td>
</tr>
<tr>
<td>Industrial</td>
<td>1,000 gpm for 60 minutes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classification</th>
<th>City of Kent Fire Flow Rates and Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1,000 gpm for 60 minutes</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,000 to 2,000 gpm for 120 minutes</td>
</tr>
<tr>
<td>Industrial</td>
<td>2,000 gpm for 120 minutes</td>
</tr>
</tbody>
</table>

It should also be noted the Kent City code defines “Fire Flow” as the measure of the sustained flow of available water for fighting fire at a specific building or within a specific area at 20 psi residual pressure.

WATER QUALITY ANALYSIS

Existing Water Quality

The City of Kent’s water supply is currently classified as groundwater at each source. In keeping with current Department of Health guidelines, the City is conducting additional monitoring for the determination of potential groundwater under the influence of surface water at the Clark Springs and Kent Springs sources. The City is also conducting an extensive Wellhead Protection Monitoring Program to serve as an early detection system to warn of possible aquifer contamination. The program involves monitoring from selected wells within 1 year, 5 year, and 10 year zones of influence for the sources most susceptible to contamination; Clark Springs, Kent Springs, and Armstrong Springs.

The current quality of Kent’s water supply is excellent with only minor secondary contaminant concerns in some of its seasonal wells. Secondary contaminants are classified by the Environmental Protection Agency (EPA) as aesthetic concerns and not a threat to human health. These contaminants are primarily iron and manganese. They are...
treated by dilution at the Soos Creek and Garrison Creek well sites, and oxidation followed by filtration for the 208th and 212th wells #1 and #2 sites. The City chlorinates its water supply to provide public health protection from bacteriological pathogens. The City also fluoridates the water supply to provide dental health benefits for consumers. The City’s water supply is also moderately hard, with a relatively low pH, consequently, it is corrosive to plumbing fixtures. The City is currently in the design phase of facilities to adjust the pH of the water to make it less corrosive. This project is described in detail in chapter 8. As noted earlier, the 212th Treatment Plant adjusts the pH of its product water to a pH of 8.2 whenever it is operating.


### Water Treatment

<table>
<thead>
<tr>
<th>Source:</th>
<th>Typical Treatment:</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Chlorination, fluoridation</td>
<td>Blended with Clark or Kent Springs</td>
</tr>
<tr>
<td>Armstrong Springs Wells #1 &amp; #2</td>
<td>Chlorination, fluoridation</td>
<td>None</td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>No Treatment</td>
<td>Blended with treated water at 6 MG #2 Tank</td>
</tr>
<tr>
<td>O’Brien Well</td>
<td>Chlorination, fluoridation</td>
<td>None</td>
</tr>
<tr>
<td>208th Well and 212th Wells #1 &amp; #2</td>
<td>Chlorination, fluoridation, Filtration, and pH adjustment</td>
<td>208th and 212th Wells treated together at the 212th Street Treatment Plant</td>
</tr>
</tbody>
</table>
Legend

- City Of Kent Water Service Boundary
- Generalized Zoning
  - Rural/Open Space - No Required Flow
  - Residential - 1000 GPM
  - Commercial - 1000-2000 GPM
  - Industrial - 2000 GPM

Fire Flow Map
Figure 3.1
### Table 3-5
Water Quality Monitoring Schedule

| Analytical Parameter | Monitoring System | Daily | Weekly | Monthly | Every 3 years | Every 4 years | Every 8 years | From Distribution System | From selected customer taps throughout Distribution System | Every 3 years | Every 4 years | Every 8 years | Every 3 years | Every 4 years | Every 8 years | From Distribution System | From selected customer taps throughout Distribution System | Every 3 years | Every 4 years | Every 8 years | From Distribution System | From selected customer taps throughout Distribution System | Every 3 years | Every 4 years | Every 8 years | From Distribution System | From selected customer taps throughout Distribution System |
|----------------------|-------------------|-------|--------|---------|---------------|---------------|---------------|-----------------------------|-------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------------------------|-------------------------------------------------|---------------|---------------|---------------|---------------|-------------------------------------------------|---------------|---------------|---------------|---------------|-------------------------------------------------|---------------|---------------|---------------|---------------|-------------------------------------------------|---------------|---------------|---------------|---------------|-------------------------------------------------|
| pH                   | Each on-line source | Daily |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Nitrite              | Each on-line source | Daily |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Nitrate              | Selected Distribution System Locations | Daily |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Fluoride             | Selected Distribution System Locations | Daily |        | Monthly |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Bromide              | Source/Selected Distribution System Locations | Daily | Weekly |        |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Inorganics and Gravels | Each source | Every 3 years |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Nitric Acid          | Each source | Every year |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Nitrous Acid         | Each source | Every year |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Nitrates             | Each source | Every 4 years |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Arsenic              | From Distribution System | Every 8 years |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| lead                 | From selected customer taps throughout Distribution System |        |         |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Copper               | Each source | Every 3 years |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Copper               | Each source | Every 3 years |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Copper               | Clark Springs, Kent Springs, from source and the nearest surface waters | Daily |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |
| Copper               | Clark Springs, Kent Springs, from source and the nearest surface waters | Daily |        |         |               |               |               |                             |                                                 |               |               |               |               |                 |               |                             |                                                 |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |               |               |               |               |                                                   |

*Note: The table represents the monitoring schedule for various water quality parameters, including the frequency and analysis dates for each location.*
<table>
<thead>
<tr>
<th>Source</th>
<th>Sample Location</th>
<th>Parameters Monitored for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>Gravity flow from infiltration gallery - sample from sample tap on gravity supply line</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, Radionuclides, GWUI, Chlorine, Fluoride</td>
</tr>
<tr>
<td></td>
<td>Pumping from well field - sample from taps at well head</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mainline sample tap inside surge tank building 125K Gallon Tank - sample at tank base</td>
<td></td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Gravity flow from infiltration gallery - sample from sample tap on gravity supply line</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, Radionuclides, GWUI</td>
</tr>
<tr>
<td></td>
<td>Pumping from well field - sample from taps at well head</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gurberson Reservoir - incoming line sample tap</td>
<td></td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Sample tap on well building</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td></td>
<td>Sample on mainline</td>
<td></td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>Sample tap on mainline piping prior to discharge into 6 MG #2 Tank</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Sample tap on mainline piping</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Armstrong Springs</td>
<td>Sample taps on mainline piping</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Wells #1 &amp; #2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O'Brien Well</td>
<td>Sample tap on mainline piping</td>
<td>PH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>208th Well and 212th Wells #1 &amp; #2</td>
<td>Sample lines at sample sink inside 212th Street Water Treatment Plant</td>
<td>Pre-filtration: pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides, iron, manganese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-filtration: pH, turbidity, chlorine, fluoride, iron, manganese</td>
</tr>
</tbody>
</table>
The following is a partial list of Analytical Laboratories used by the City for routine and specific analysis of drinking water samples. These laboratories are EPA and DOH certified for compliance with Department of Health Regulations.

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Phone Number</th>
<th>Address</th>
<th>Analysis performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Management Labs Inc</td>
<td>(253) 531-3121</td>
<td>1515 80th Street E, Tacoma, WA 98404</td>
<td>Bacteriological, IOC, VOC, SOC, THM, general chemistry and other water quality analysis</td>
</tr>
<tr>
<td>Laucks Testing Laboratories, Inc</td>
<td>(206) 767-5060</td>
<td>940 S Harney St, Seattle, WA</td>
<td>Bacteriological, IOC, VOC, SOC, THM, general chemistry and other water quality analysis</td>
</tr>
<tr>
<td>AM Test, Inc</td>
<td>(425) 885-1664</td>
<td>14603 NE 87th St, Redmond, WA</td>
<td>Organic and general chemistry</td>
</tr>
<tr>
<td>Weyerhauser Analytical</td>
<td>(253) 924-6872</td>
<td>32901 Weyerhauser Way S, Federal Way, WA 98477</td>
<td>Organic and general chemistry (also Clark Springs 129 priority pollutants analysis)</td>
</tr>
<tr>
<td>State of Washington Department of Health Public Health Laboratories</td>
<td>(206) 361-2898</td>
<td>1610 NE 150th Street, Seattle, WA 98155</td>
<td>Maximum total Trhalomethane potential (MTTP's); radionuclides, general organic chemistry</td>
</tr>
<tr>
<td>Sample Date</td>
<td>08/27/97</td>
<td>08/27/97</td>
<td>03/09/00</td>
</tr>
<tr>
<td>-------------</td>
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<tr>
<td>Sample Type</td>
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<td></td>
<td></td>
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<tr>
<td>Alkalinity</td>
<td>0.006</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.05</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
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<td>Barium</td>
<td>0.2</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
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<tr>
<td>Beryllium</td>
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<td>&lt;0.002</td>
<td>&lt;0.002</td>
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<tr>
<td>Cadmium</td>
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<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Chromium</td>
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<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Copper</td>
<td>0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Lead</td>
<td>0.3</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.05</td>
<td>0.3</td>
<td>0.335</td>
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<tr>
<td>Mercury</td>
<td>0.002</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
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<tr>
<td>Nickel</td>
<td>0.01</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
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<tr>
<td>Nickel (W)</td>
<td>NR</td>
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<td>78</td>
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<tr>
<td>Selenium</td>
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<td>&lt;0.005</td>
</tr>
<tr>
<td>Silver</td>
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<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<tr>
<td>Sodium</td>
<td>NR</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Silver (W)</td>
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<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<td>Zinc</td>
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<td>&lt;0.05</td>
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<tr>
<td>Nickel</td>
<td>NR</td>
<td>64</td>
<td>88</td>
</tr>
<tr>
<td>Conductivity</td>
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<td>129</td>
<td>162</td>
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<tr>
<td>Turbidity</td>
<td>1</td>
<td>0.4</td>
<td>0.6</td>
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<tr>
<td>Salinity</td>
<td>15</td>
<td>&lt;5.0</td>
<td>&lt;5.0</td>
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<tr>
<td>Chlorides</td>
<td>250</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cyanides</td>
<td>0.2</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Fluoride</td>
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<td>&lt;0.2</td>
<td>&lt;0.2</td>
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<tr>
<td>Nitrate</td>
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<td>&lt;0.2</td>
<td>&lt;0.2</td>
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<tr>
<td>Nitrite</td>
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<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Silica</td>
<td>NR</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TDS (mg/L)</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Percentile</td>
<td>100</td>
<td>8-13%</td>
<td>8-13%</td>
</tr>
</tbody>
</table>

Table 3-8
City of Kent Water Quality Data
SYSTEM DESCRIPTION AND ANALYSIS

As mentioned previously, Clark and Kent Springs provide the bulk of the water needed by Kent. The total water rights held, pending, or claimed by the City are shown in table 3-9 and 3-10. Demand exceeds the capacity of these two sources at times during the winter, but primarily in the warmer and drier season, when aquifer recharge is lower and water demand rises. The wells at East Hill, Garrison Creek, O'Brien, Armstrong Springs, 208th Street, 212th Street, and Seven Oaks Plat (Soos Creek) are activated then, and more heavily used to provide the water needed.

**Table 3-9**

<table>
<thead>
<tr>
<th>Water Right</th>
<th>Priority Date</th>
<th>Source Name</th>
<th>Max.</th>
<th>Max. Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>3107-A</td>
<td>02/57</td>
<td>Clark Springs &quot;trench&quot;</td>
<td>2250*</td>
<td>*1350</td>
</tr>
<tr>
<td>7232-A</td>
<td>10/31</td>
<td>Clark Springs Rock Creek</td>
<td>2244*</td>
<td>*3600</td>
</tr>
<tr>
<td>7660-A</td>
<td>02/69</td>
<td>Clark Springs Wells</td>
<td>5400</td>
<td>8710</td>
</tr>
<tr>
<td>G1-22956C</td>
<td>09/77</td>
<td>Kent Springs Wells</td>
<td>3690</td>
<td>5904</td>
</tr>
<tr>
<td>123225 (Claim)</td>
<td>05/09</td>
<td>Kent Springs (Springs)</td>
<td>4488</td>
<td>965</td>
</tr>
<tr>
<td>G1-23285C</td>
<td>01/79</td>
<td>East Hill Well</td>
<td>1900</td>
<td>3040</td>
</tr>
<tr>
<td>G1-23614C</td>
<td>06/80</td>
<td>Garrison Creek Well</td>
<td>500</td>
<td>*800</td>
</tr>
<tr>
<td>G1-23713C</td>
<td>10/80</td>
<td>High Meadows</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>G1-24073C</td>
<td>04/82</td>
<td>Seven Oaks (Soos Creek)</td>
<td>900</td>
<td>*864</td>
</tr>
<tr>
<td>G1-24189C</td>
<td>10/82</td>
<td>Armstrong Springs Wells</td>
<td>1300</td>
<td>*500</td>
</tr>
<tr>
<td>G1-24190C</td>
<td>10/82</td>
<td>212th Street Wells</td>
<td>2700</td>
<td>*1400</td>
</tr>
<tr>
<td>G1-24404C</td>
<td>08/83</td>
<td>208th Street Well</td>
<td>1200</td>
<td>*600</td>
</tr>
<tr>
<td>2890-A</td>
<td>09/56</td>
<td>East Hill Well</td>
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<td>146</td>
</tr>
<tr>
<td>42-D</td>
<td>09/23</td>
<td>East Hill Well</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>44-A</td>
<td>09/45</td>
<td>East Hill Well</td>
<td>90</td>
<td>135</td>
</tr>
<tr>
<td>651-A</td>
<td>03/48</td>
<td>East Hill Well</td>
<td>60</td>
<td>42</td>
</tr>
<tr>
<td>2428-A</td>
<td>02/53</td>
<td>East Hill Well</td>
<td>120</td>
<td>78 4</td>
</tr>
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<td>1116-A</td>
<td>06/50</td>
<td>Summit</td>
<td>200</td>
<td>320</td>
</tr>
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<td>494-A</td>
<td>07/47</td>
<td>Hamilton Road</td>
<td>38</td>
<td>30</td>
</tr>
<tr>
<td>4534-A</td>
<td>05/62</td>
<td>Hamilton Road</td>
<td>12</td>
<td>19 2</td>
</tr>
<tr>
<td>767-A</td>
<td>01/51</td>
<td>O'Brien</td>
<td>243</td>
<td>45</td>
</tr>
<tr>
<td>G1-25204C</td>
<td>03/88</td>
<td>Parks &amp; Recreation</td>
<td>290</td>
<td>290</td>
</tr>
<tr>
<td>1957-A</td>
<td>1952</td>
<td>Impoundment</td>
<td>140</td>
<td>60</td>
</tr>
</tbody>
</table>

*Supplemental Rights

**Table 3-10**

<table>
<thead>
<tr>
<th>Water Rights Held (Qa)</th>
<th>19,885 AF/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Primary Rights (Qa)</td>
<td>19,885 AF/Year</td>
</tr>
<tr>
<td>Total Primary Rights (Qc)</td>
<td>33.8 mgd</td>
</tr>
<tr>
<td>Supplemental Rights Held (Qa)</td>
<td>9,114 AF/Year</td>
</tr>
</tbody>
</table>
Peak Dependable Supply

The month of August is the month of the year in which the system demand has the greatest potential of exceeding the dependable supply. The volumes shown in table 3-11, are the estimated dependable flows for Clark Springs, Kent Springs, and Kent's additional wells, based on historical data from the last 13 years. The production shown in column 1 is the lowest average daily production for the month of August for the 5 years which had the highest peak day demands during the last 13 years. Column 2 is based on the lowest one day production recorded on one of those 5 highest Peak Days during the past 13 years. Column 3 is the average of the source production for all of those 5 highest Peak Days. Column 4 is the extrapolation of Columns 1, 2, and 3, combined with Kent's operational history, to obtain an estimate of the maximum reliable yield available from each source during the period when demands are greatest and aquifer levels are often the lowest. This effort was made in order to identify worst case conditions for supply which have occurred historically at each of Kent's sources, short of total failure. Although Kent Springs wells were thought to have a history of going dry during the summer, it actually turned out to be a faulty sensing device versus actually going dry. Once the sensors were replaced we have not encountered this problem again. Static levels do decline in warmer months however, reduced pumping rates and the use of VFD's (variable speed pumps) has allowed Kent to estimate a safe, reliable yield of 1.5 MGD throughout the summer for this source. It should be recognized however, that under very extreme conditions, any of the sources, especially the shallower wells, could face a significant loss of even the estimated yields, with the resulting shortfall of peaking capacity. This estimate of the yields is based on the 1997 condition of the facilities/wells which Kent has at each of the sites.

It is estimated that Clark Springs and the 212th wellfield are Kent's only sources which have a small amount of reserve summer capacity remaining that have not been fully utilized, as shown in the table below. However there is very little margin of safety for the unexpected mechanical or source failure and increased system demands, other than emergency interties, none of which are "firm water". Thus one of Kent's highest priorities for the water system is the development of additional supply to fulfill the Kent system reliability standard of meeting peak day demands for at least 72 hours with the largest single source of supply out of service.
**Yearly Average Flows**

Since all of the wells, other than those at Clark Springs and Kent Springs, are presently used most heavily for production during high demand summer periods, the equivalent yearly average available supplies will be lower than the peak available daily supplies for these sources during the summer. Conversely, the primary sources of Clark Springs and Kent Springs sustain higher flows in the winter time when the aquifer recharge is greater, which elevates the yearly average available supply above the available summer peaking supply. The equivalent yearly available supplies are listed in table 3-12.

The Clark Springs average is based on 6 months at 7.0 MGD and 6 months at 5.5 MGD. Recently it has been found that 5.5 MGD flow can be sustained under most summer conditions, while a 7.0 MGD flow can be sustained during the wetter half of the year with the existing infrastructure and operating conditions.

At Kent Springs, the equivalent yearly average supply is based on 6 months at 2 MGD and 6 months at 5 MGD. The summer peaking dependable flows are 1.5 MGD, however higher volumes are often available before and after the peak demand/low aquifer levels of August, so the 6 month average is estimated at 2 MGD. While the pumps are capable of pumping 5.3 MGD, the aquifer is not capable of sustaining these flows during a peak demand period (summer) without a temporary loss of the aquifer.

The flows at Garrison Creek Well averaged 0.72 MGD in the first year of pumping. The peak dependable flow has been estimated to be 0.5 MGD and the yearly average estimated at 0.16 MGD.
At Seven Oaks Plat Well (Soos Creek Well), the average yield was 1.3 MGD in the first year of pumping. Currently the well is only capable of producing a yearly average of 0.28 MGD. The City is pursuing artificial recharge at this site to attempt to regain all/part of the lost production capacity of the well.

### Table 3-12

#### Yearly Average Flows

<table>
<thead>
<tr>
<th>Source</th>
<th>Yearly Average Supply (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>6.16</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>3.45</td>
</tr>
<tr>
<td>East Hill Well (180 day)</td>
<td>1.48</td>
</tr>
<tr>
<td>Garrison Creek Well (120 day)</td>
<td>0.16</td>
</tr>
<tr>
<td>Seven Oaks Plat Well (120 day)</td>
<td>0.28</td>
</tr>
<tr>
<td>O’Brien Well</td>
<td>0.35</td>
</tr>
<tr>
<td>Armstrong Springs (120 day)</td>
<td>0.49</td>
</tr>
<tr>
<td>217th Treatment Plant (120 day)</td>
<td>1.64</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.64</strong></td>
</tr>
</tbody>
</table>

One of Kent’s primary sources of future supply is expected to come from Tacoma’s Pipeline 5, Howard Hansen storage project. This project will provide Kent with 1/9th of 20,000 acre-feet or 2,222 acre-feet, which will be available throughout the year (with the offsetting storage of the Impoundment Project which Kent is developing) or during the summer months at 7.22 MGD for 100 days. The equivalent yearly average supply will be approximately 1.98 MGD in addition to what has been identified above, a total of 15.64 MGD to meet Kent’s future average daily demands.

From October through February 15th there is also “run of the river” water available that is not counted into the 2,222 acre/feet.

**Source Description**

**Clark Springs**

Clark Springs is Kent’s largest source and consists of several alternate methods of supply, which can be used simultaneously, described as follows:

Infiltration gallery and collector - Kent’s most effective source of supply, it consists of several hundred feet of 16-inch perforated steel pipe, lying horizontally 15 to 20 feet below the ground surface, which collects the springs supply over a wide area and diverts it to the chamber at the beginning of the Clark Springs Transmission Main. The gallery is also connected to a valved section of 12-inch pipe which extends beneath the Rock Creek channel to the southern side. The system collector piping is believed to be in good condition, as there has not been any significant loss of capacity in the recent past. However, Kent plans to inspect the piping interior with a video camera following...
completion of the GUI source analysis in 2001. This source was constructed in 1957 and is anticipated to have a life expectancy of approximately 100 years, thus about 50 years of useful life remains. However, this will be more accurately defined after the planned video camera inspection. This source capacity is affected by the seasonal decline of the aquifer levels, and may decline as much as 1,000 gpm during the summer period, although it recovers rapidly each fall.

Wellfield - the wellfield at this source presently consists of 3 wells, which are 50 to 80 feet deep. The wells were rehabilitated in 1985 because of corrosion clogging the screens and aquifer, with a resultant loss of capacity. As the wells are located under a BPA power transmission line, with the resulting electrolysis problems, two of the well pumps have again been pulled as of this writing for needed rehabilitation to restore lost capacity and replace the motor mercury seals. The wells were installed in 1969 and have a useful life expectancy of 50 years, due to the electrolysis problems in the area. Thus the existing wells have approximately 20 years of useful life remaining.

Clark Springs Transmission Main (CSTM) - the conveyance facility for this source consists of 13+ miles of coated steel pipe and steel cylinder concrete pipe with an approximate capacity of 5,400 gpm. The piping was constructed from 1957 through 1969 and remains in good condition, with a history of 1 repair approximately every two years, generally due to the loss of the protective coating over the pipe and the resulting corrosion causing leakage to develop. The useful life expectancy of this main is 75 years, with 25 to 30 years remaining.

Kent Springs

Kent Springs - consists of 2 sources of supply which are described below:

Infiltration gallery - constructed of several hundred feet of perforated concrete pipe buried 10 to 15 feet deep at the base of a hillside where the springs exit and are collected below the ground surface and diverted to the beginning of the Kent Springs Transmission Main. The gallery was constructed in 1908 and is expected to have a useful life expectancy of approximately 100 years, which is fast approaching. The gallery system is believed to be badly in need of improvements or reconstruction, which is affecting the capacity of this source. Kent plans to inspect the gallery with a video camera following completion of the GUI source analysis in 2001, and proceed with possible reconstruction if found to be necessary. This source loses capacity entirely early in the summer, and Kent uses the wellfield until the springs recover in the early winter months.

Wellfield - the wellfield presently consists of several wells which are drilled to a depth of 70 to 90 feet. The wells are in good condition, as they were inspected several years ago, and the well pumps were replaced at the same time. The wells were installed in 1977 and also have a useful life expectancy of 75 years (or less) as there are BPA powerlines nearby which create a significant corrosion problem in the area. The aquifer experiences a significant level drop during the summer which restricts the peaking capacity of this source during the summer. The winter capacity may also be declining, believed to be due
to the increasing development in the area and the resultant withdrawal of water from the aquifer by exempt wells, other water systems, and other sources of supply.

Kent Springs Transmission Main (KSTM) - this main was formerly constructed of concrete pipe, and was a limiting factor in the withdrawal capacity from the source. However, the full replacement of the transmission main was completed in 1997, with 24-inch to 36-inch ductile iron pipe, allowing a significant capacity and reliability increase. An intertie also exists at Kent Springs between the CSTM and the KSTM, so this main serves as an alternate conveyance facility for the Clark Springs supplies also. Current capacity of the transmission main is estimated to be approximately 4,400 to 5,000 gpm from the sources to the Impoundment. The capacity from the Impoundment to the Guiberson Reservoir is approximately 15 MGD (10,500 gpm). Two other sources, Armstrong Springs and Soos Creek Well will now pump into the Kent Springs Transmission Main, to allow for increased capacity in the CSTM. The useful life expectancy of this transmission main is 75 years, and the oldest sections of the main are approximately 20 years old.

Armstrong Springs

Armstrong Springs - a wellfield presently consisting of 2 wells drilled to a depth of 80 to 90 feet. The wells were installed in 1982 and have a useful life expectancy of 100 years. The wells are in good condition, although they are experiencing a slight reduction in capacity over time. The aquifer levels drop during the summer, with a resultant decrease in supply capacity, although the wells remain capable of producing the full annual withdrawal amount which is certificated.

Soos Creek Well

Soos Creek Well - this well was installed in 1982 with a yield of 900 gpm and has a useful life expectancy of 100 years. This well is believed to be in good condition and was inspected with a video camera several years ago. However, a recent capacity test showed that the aquifer had lost significant capacity over the last several years, therefore Kent is in the midst of a feasibility analysis on artificial recharge to regain lost capacity.

East Hill Well

East Hill Well - this well was installed in 1979 and has a useful life expectancy of 100 years. It is believed to be in good condition, as the well capacity has remained consistent in the recent past. The well pump and motor were replaced in 2000, at which time the well condition was be assessed and some maintenance performed.

Garrison Creek Well

Garrison Creek Well - this well was installed in 1981 and has a useful life expectancy of 100 years. This well is in adequate condition, and has not been inspected since it was constructed. It has lost capacity since it was first constructed and may be a candidate for
artificial recharge. It is scheduled for rehabilitation and replacement of the motor mercury seals in 2000

212th Treatment Plant

212th/208th Wellfield - this source was initially constructed in 1982 and subsequently fully developed with treatment facilities in 1993. The wells have a useful life expectancy of 100 years and have shown no significant deterioration in the recent past. Aquifer water levels affected by peak demand pumping sometimes affect the capacity of the two 212th wells due to interference. A possible solution may be the development of a 4th well some distance away, at some time in the future, to help meet peak demands more fully.

O'Brien Well

O'Brien Well - this well was installed in 1999 and has a useful life expectancy of 100 years.

Other Sources

Other Sources - Kent has a number of other small well sources (certificated water rights) which it is in the process of rehabilitating to meet its near future demand requirements

Water Treatment

The treatment for Kent’s sources is primarily gas chlorination and fluoridation with sodium fluoride, with a standard treatment goal of 0.5 to 0.6 mg/l free chlorine residual and an average concentration of 1.0 mg/l fluoride throughout the water system. The exception to this is the Garrison Creek Well, which has no direct treatment, but is disinfected by mixing with chlorinated water in the Garrison Creek Reservoir (6 MGR #2). The other exception to this is the new Manganese Filtration Plant for the 212th and 208th wells. Although it has the same treatment goals as Kent’s other sources, this facility uses sodium hypochlorite for pre-treatment and for a disinfection residual, and also uses sodium fluoride for its fluoride treatment. The facility also uses potassium permanganate for oxidation and removal of the manganese and iron through greensand filters, as well as sodium hydroxide for pH adjustment to a level of 8.2 to 8.5 pH. Shown below are the treatment capacities of each source, current condition and age/life expectancy of each facility, as well as the performance of each facility based on its reliability in meeting the treatment goals described above.

Clark Springs

- Treatment capacity - approximately 6,000 gpm
- Condition - reliable, good condition
- Facility age and life expectancy - constructed in 1969, fluoridation system upgraded in 1987 and 1992. This site has a future life expectancy of 5 additional years
(chlorination) and 15 additional years (fluoridation) for the treatment systems and equipment.
- Reliability - consistently and reliably meets treatment goals. Kent has recently installed emergency generator power for the chemical feed systems to enhance reliability.

Kent Springs

- Treatment capacity - approximately 5,000 gpm
- Condition - reliable, excellent condition
- Facility age and life expectancy - constructed in 1979, chlorination system upgraded in 1997. This site has a future life expectancy of 20 additional years (chlorination) and 5 additional years (fluoridation) for the treatment systems and equipment.
- Reliability - consistently and reliably meets treatment goals. Kent has recently installed emergency generator power for the chemical feed systems to enhance reliability.

Armstrong Springs

- Treatment capacity - approximately 1,300 gpm
- Condition - reliable, good condition
- Facility age and life expectancy - temporary treatment facilities were installed at this source in 1995, as a backup to the Kent Springs treatment. Permanent facilities are in the design stage, with funds budgeted for construction.
- Reliability - consistently and reliably meets treatment goals.

O'Brien Well

- Treatment capacity - approximately 250 gpm
- Condition - reliable, good condition
- Reliability - consistently and reliably meets treatment goals.

Soos Creek Well

- Treatment capacity - approximately 900 gpm
- Condition - reliable, good condition
- Facility age and life expectancy - constructed in 1985. Has a future life expectancy of 5 additional years for the equipment.
- Reliability - consistently and reliably meets treatment goals.
East Hill Well

- Treatment capacity - approximately 2,100 gpm
- Condition - reliable, good condition
- Reliability - consistently and reliably meets treatment goals.

212th Manganese Treatment Facility

- Treatment capacity - approximately 4,000 gpm
- Condition - reliable, excellent condition
- Facility age and life expectancy - constructed in 1993. Has a future life expectancy of 25 additional years for the treatment equipment and 100 additional years for the filters and building
- Reliability - consistently and reliably meets treatment goals

Water Treatment Capacity Analysis

The Kent water system uses flow pacing as the method for gauging treatment volumes. Each site which has treatment (stated previously in this chapter) have chemical feed pumps capable of meeting or exceeding the treatment flows of the largest designed discharge flow for the respective source. The volume of treatment chemicals stored at each site (identified in chapter 8) meet or exceed the required amount to treat the designed discharge for each source for an extended period of time. All existing sources either meet or exceed the required treatment, as required by DOH, or are scheduled to have treatment facilities constructed per DOH approval. If an additional source or storage facility is developed by the City, it shall be designed to meet all treatment requirements of DOH and shall be capable of treating the maximum designed discharge flow of the source.

Storage

6 MG #1

The primary function of the 6 Million #1 Reservoir is to provide storage for the Clark Springs Supply and thus serve as the peaking supply for the pumps serving the 590 System (Pump Station #5; Pump #3 and Pump #2 on high speed), the 485 system (Pump Station #5; Pump #1 and Pump #2 on low speed), as well as the 6 Million #2 Reservoir. The 6 Million #1 Reservoir fresh water storage tank, is located near 239th and 98th Avenue South and was erected in 1967 by Chicago Bridge and Iron with Horton Tank Company performing the welding. The tank is 1460 feet in diameter, 50 feet high, and has a usable storage capacity of 6 million gallons. Ground level elevation is 370.0 feet with the overflow water surface elevation at 418.0 feet so the reservoir contains 48 feet of water when full.
The steel is in excellent condition, and the reservoir future life expectancy has been estimated to be 80 years. It was noted in the recent seismic analysis that the reservoir was in need of concrete ringwall and anchorage strap repairs. This project has been budgeted for the year 2000.

The reservoir was last recoated in 1987 and is next scheduled for cleaning and inspection in 2000.

Water is turned over approximately every three days during the low demand season.

6 MG #2 (Garrison Creek Reservoir)

The primary function of the 6 Million #2 Reservoir is to provide peaking storage for high demands and to serve the 240 system. The 6 Million #2 Reservoir fresh water underground storage tank, with tennis courts, basketball court, and play facilities on the roof slab, is located at 9615 S. 218th Street and was built in 1969. The storage facility is 242.6 feet by 158.6 feet and has a useable storage capacity of 6 million gallons. Ground level elevation is 211.5 feet (floor drain) with the overflow water surface elevation at 240 feet. The reservoir is constructed entirely of reinforced concrete and normally contains 28 feet of water when full.

The reservoir is in excellent condition, and has an estimated future life expectancy of 80 years. It was noted in a recent seismic analysis that roof-to-wall anchors should be added. This project was completed in 1999, along with several other routine maintenance repair items to improve the reservoir.

The reservoir was last cleaned and inspected in 1997 and 1998, at which time repairs were made to wall seams and interior ladders were replaced.

Water is turned over approximately every three days during the low demand season.

Guiberson Street Reservoir

The primary function of the Guiberson Reservoir is to provide peaking storage for high demands and to serve the 240 (Valley) system and also serve as the primary supply for the West Hill system via the 240 system. The discharge piping to the 240 system is 24 inch cast iron pipe, which branches into two 16 inch pipelines just outside the reservoir site. The Guiberson Reservoir, constructed in approximately 1934, is a three million gallon (usable capacity) concrete reservoir constructed below grade and covered with a metal roof and walls. Guiberson Reservoir receives its water primarily from Kent Springs, Armstrong Springs, Soos Creek Well, and also from Clark Springs via an intertie if needed.

The reservoir was constructed in approximately 1934 and is in good condition, and has an estimated future life expectancy of 43 years. The reservoir was last cleaned and
inspected in 1997 and 1998, at which time seismic upgrades were made to the columns and roof beams and all of the floor and wall seams were resealed to eliminate leakage. Kent is piloting aeration/spraying at this reservoir to elevate the pH in the water system for corrosion control. Water enters the reservoir through a metered, flow controlled manifold system to promote circulation in the reservoir. This manifold system has been modified to enhance aeration of the water supply as it enters the reservoir.

Water is turned over approximately every two days during the low demand season.

3.5 MG Tank

The primary function of the 3.5 MG tank is to provide peaking storage and to serve the East Hill /590 system. The 3.5 MG fresh water storage tank, a standpipe, located at 125th Avenue S.E. and S.E. 285th Street was erected in 1978 by Chicago Budget Iron. Water enters and exits through a 12 inch ductile iron pipe. The steel standpipe is 74 feet in diameter and 110 feet high. Ground level elevation is 483.0 feet with the overflow water surface elevation at 590.0 feet. The Tank has a usable capacity (subtracting the bottom forty feet of volume from the total volume) of 2.21 million gallons.

The reservoir is in excellent condition, and has an estimated future life expectancy of 90 years. It was cleaned, painted, and fall protection modifications were performed in 1999.

Water is turned over approximately every 7.5 days (fifteen feet of water exchanged every twenty-four hours) during the low demand season. As this length of time has been a concern for the City, additional water quality monitoring has been performed. The monitoring confirmed that the reservoir water maintained a consistent chlorine residual that meets the desired level in Kent's distribution system. Significant population growth is occurring in the 590 system and it will continue to have expansion for many years, so the problem of turnover will become less and less in the next few years.

Blue Boy Tank

The primary function of the Blue Boy Tank is to provide peaking storage and to serve the East Hill/590 system. The Blue Boy Reservoir fresh water storage tank, a steel standpipe, located at 23616 112th Ave S.E. was erected in 1965 by Pittsburgh-Des Moines Steel Co. The tank is 42 feet in diameter and 94 feet high. Ground level elevation is 496.0 feet with the overflow water surface elevation at 590.0 feet. The tank has a usable capacity (subtracting the bottom forty feet of volume from the total volume) of 0.59 million gallons.

The tank is in excellent condition and has an estimated future life expectancy of 70 years. A recent seismic analysis recommended repairs to the concrete ringwall and anchorage.

The last painting was performed in 1996. Fall protection upgrades were added in 1997.

Water is turned over approximately every three days during the low demand season.
Cambridge Tank

The primary function of the Cambridge Reservoir is to provide peaking storage and serve the West Hill 529' system. The Cambridge Reservoir, a 300,000 gallon freshwater storage tank, a steel elevated tank, located at South 264th and 34th South, was erected in 1959 by American Pipe and Construction Company. Water enters and exits through a 12 inch pipe. The elevated tank is 53 feet 4 inches in diameter and 85 feet from the ground level to overflow. Ground level elevation is 441.0 feet with the overflow water surface elevation at 529.0 feet.

The tank is in good condition, and has an estimated future life expectancy of 55 years. A recent seismic evaluation recommended repairs to the anchorage and crossbracing. The tank was last recoated in 1991 with fall protection improvements. Additional fall protection improvements were made in 1997.

Water is turned over approximately three times a day during the low demand season.

125,000 Gallon Tank

The primary function of the 125,000 Gallon Reservoir is to provide peaking storage for and serve the East Hill 485 system. The 125,000 Gallon Reservoir freshwater elevated storage tank located on 98th Avenue South and 239th, was erected in 1958 by Pittsburgh-Des Moines Steel Company. The tower is approximately 75 feet high with the steel tank (water bowl) 23.5 feet high for a total height of 98.2 feet. The tank is approximately 32 feet in diameter. The ground elevation is 386.8 feet and the overflow surface elevation is 485 feet.

The tank is in fair condition and has an estimated future life expectancy of 35 to 45 years. A recent seismic analysis recommended repairs to the anchorage and crossbracing. These improvements, along with the tank recoating and fall protection improvements, were completed in 1999.

Water is turned over approximately ten times a day during the low demand season.

Reith Road Tank

The primary function of the Reith Road Tank is to provide peaking storage for the West Hill 354.5 system and as a source of supply for Pump Station #4. The Reith Road fresh water storage tank, a steel, ground level tank, located at 42nd Avenue South and Reith Road was erected in 1959 by American Pipe and Construction Company. The tank is 66 feet in diameter and 40 feet high. Ground level elevation is 315.33 feet with the overflow water surface elevation at 354.5 feet.

The tank is in good condition and has an estimated future life expectancy of 55 years. A recent seismic evaluation recommended repairs to the concrete ringwall and anchorage.
The tank was last recoated in 1991, at which time fall protection improvements were made. Additional fall protection equipment was added in 1997.

Water is turned over approximately every two days during the low demand season.

Storage Capacity Analysis

The storage requirements for the East Hill systems, the Valley system, and the West Hill system were analyzed in terms of the three components which constitute the total storage required. These components were fire flow, standby, and flow equalization. The magnitude of each component depends on the specific conditions of the respective water systems. The design standards of the Department of Health (DOH) provide a framework for calculating the total storage requirement.

Where storage was provided by standpipes, the bottom 40 feet thereof was considered as limited usefulness, and as such was assumed to be unavailable unless otherwise stated. As a result of this assumption, slightly conservative and therefore, safer results were derived.

Standby Storage (SB)

The purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. The minimum standby storage requirement for systems served by one source (i.e., the West Hill zones) are different than for systems served by multiple sources (i.e., the East Hill and Valley zones).

The minimum standby storage for the West Hill system was calculated using the following method:

\[ V_{SB} = 2[ADD] \]

\[ V_{SB} = \text{Required standby storage component, in gallons; and} \]

\[ ADD = \text{Average day demand for the design year, in gallons.} \]

The minimum standby storage for the East Hill and Valley systems were calculated using the following method:

\[ V_{SB} = 2[ADD] - 1440[Q's] \]

\[ V_{SB} = \text{Required standby storage component, in gallons;} \]

\[ ADD = \text{Average day demand for the design year, in gallons; and} \]
Q's = Sum of all source of supply capacities, minus the actual installed capacity of the largest source continuously available to the system, in gpm.

**Fire Suppression Storage (FSS)**

The magnitude of fire suppression storage is the product of the fire flow rate and duration established by the City of Kent Fire Department. The minimum fire suppression storage volume for systems served by a single source of supply or multiple source of supply is the product of the needed fire flow (expressed in gpm) multiplied by the needed fire flow duration (expressed in minutes).

\[ V_{FSS} = NFF \times T \]

NFF = Needed fire flow, expressed in gpm as specified by the City Fire Department; and

T = Duration of NFF, expressed in minutes as specified by the City Fire Department.

**Equalizing Storage (ES)**

The volume of equalizing storage depends upon several factors, including peak system demand, diurnal variations in the system demand, source production capacity, and mode of operation (either continuous pumping for a select period of time or by call-on-demand through use of reservoir level control switches).

The equalization storage equation below was used for estimating equalizing storage requirements:

\[ V_{ES} = (Q_{PH} - Q_S)150, \text{ but no case less than zero} \]

\[ V_{ES} = \text{Equalizing storage component, in gallons.} \]

\[ Q_{PH} = \text{Peak hourly demand, in gpm} \]

\[ Q_S = \text{Sum of all source of supply capacities, except emergency sources of supply, in gpm.} \]

The saturated development peak day demand has been projected to be 31.0 MG, which is 21,528 gpm. This demand is further defined in the following table 3-13.
### Table 3-13
Saturated Development PDD Projections

<table>
<thead>
<tr>
<th></th>
<th>East Hill</th>
<th>Middle Valley</th>
<th>West Hill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated PDD (MG)</td>
<td>12.5</td>
<td>16.5</td>
<td>20</td>
</tr>
<tr>
<td>Saturated PDD (gpm)</td>
<td>8,681</td>
<td>11,458</td>
<td>1,389</td>
</tr>
</tbody>
</table>

### Table 3-14
Source with Dependable Supply and Respective Service Area

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependable Supply (MG)</th>
<th>Service Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>5.0</td>
<td>590, 485, 240, 354.5, 529</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>1.5</td>
<td>240, 354.5, 529</td>
</tr>
<tr>
<td>East Hill Well</td>
<td>2.7</td>
<td>590</td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>0.5</td>
<td>240</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>0.8</td>
<td>590, 485, 240</td>
</tr>
<tr>
<td>Armstrong Springs</td>
<td>1.5</td>
<td>590, 485, 240</td>
</tr>
<tr>
<td>O'Brien</td>
<td>0.35</td>
<td>240</td>
</tr>
<tr>
<td>212th Treatment Plant</td>
<td>5.0</td>
<td>240</td>
</tr>
<tr>
<td>Pipeline 5 Intertie</td>
<td>7.2</td>
<td>590, 240, 354.5, 529</td>
</tr>
<tr>
<td>Future Impoundment</td>
<td>11.0</td>
<td>240, 354.5, 529</td>
</tr>
</tbody>
</table>

All future storage requirements have the assumption that Pipeline 5 and the impoundment will be constructed and on-line prior to saturated Development. For this analysis it is assumed that of the 7.2 MGD available from Pipeline 5, half of this amount will be available to the 590 system. It has also assumed that under normal operating conditions, water from Soos Creek Well and Armstrong Springs will be conveyed via the Kent Springs Transmission Main to the Guiberson Reservoir.

590/485 Zone

The 590 and 485 systems were grouped together because the 590 system is capable of supplying water to the lower 485 system.

Equalization Storage

Without Pipeline 5

\[
E_S = (1.92(8,681 \text{ gpm}) - 5,347 \text{ gpm})(150)/1,000,000
\]

\[
E_S = 1.70 \text{ MG}
\]

1.92 = Peak hourly factor
With Pipeline 5

\[ E.S = (1.92(8,681 \text{ gpm}) - 7,847 \text{ gpm})(150)/1,000,000 \]

\[ E.S = 1.32 \text{ MG} \]

Standby Storage

The purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. Emergency power exists at Pump Station 5 and is capable of supplying sufficient power to operate all pumps within the station. Pump #2 also acts as a "back-up" pump to pumps #1 and #3 should any problem occur. Therefore, it is the City's position that the station is reliable, thusly the pumping volume for Pump #1 (pump to the 485 zone) and Pump #3 (pumps to the 590 zone) can be subtracted from the standby storage requirement.

Pump Station 5 reliable volume

Pump #3 = (1,950 gpm)(0.00144) = 2.81 MGD

Pump #1 = (1,100 gpm)(0.00144) = 1.58 MGD

Total reliable volume from Pump Station 5 = 4.39 MGD

Without Pipeline 5

\[ V_{SB} = 2((12.5 \text{ MGD})(0.565)) - ((1440 \text{ min/day}(1,875 \text{ gpm}))/1,000,000) - 4.39 \text{ MG} \]

\[ V_{SB} = 7.04 \text{ MG} \]

With Pipeline 5

\[ V_{SB} = 2((12.5 \text{ MGD})(0.565)) - ((1440 \text{ min/day}(4,375 \text{ gpm}))/1,000,000) \]

\[ V_{SB} = 3.43 \text{ MG} \]

Fire Suppression Storage

\[ V_{FSS} = 5,000 \text{ gpm}(240 \text{ min}) \]

\[ V_{FSS} = 1.20 \text{ MG} \]

590/485 total storage required

Without Pipeline 5

\[ = 1.70 \text{ MG} + 7.04 \text{ MG} + 1.20 \text{ MG} \]

\[ = 9.94 \text{ MG} \]
With Pipeline 5  

\[ = 1.32 \text{ MG} + 3.43 \text{ MG} + 1.2 \text{ MG} \]

\[ = 5.95 \text{ MG} \]

<table>
<thead>
<tr>
<th>Table 3-15 590/485 Provided Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distribution Storage</strong></td>
</tr>
<tr>
<td>Blue Boy (standpipe)</td>
</tr>
<tr>
<td>3.5 MG Tank (standpipe)</td>
</tr>
<tr>
<td>125,000 Tank (elevated tank)</td>
</tr>
</tbody>
</table>

| 6 MG #1 (located at P.S #5) | 6 MG | 6 MG |

Total storage provided = 8,925 MG

\(^1\) Storage volume less the volume in the bottom 40 feet.

<table>
<thead>
<tr>
<th>Table 3-16 590/485 Required / Provided Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Provided</td>
</tr>
<tr>
<td>Required Storage Without Pipeline 5</td>
</tr>
<tr>
<td>Required Storage With Pipeline 5</td>
</tr>
</tbody>
</table>

**Conclusion**

With the addition of Pipeline 5, the City will exceed the minimum storage requirements.

240 Zone Equalization Storage

Without Pipeline 5 and the Storage Impoundment

\[ E_S = \left( (1.92 (11,458 \text{ gpm}) - 9,930 \text{ gpm}) \times 150 \right) / 1,000,000 \]

\[ E_S = 1.81 \text{ MG} \]

With Pipeline 5 and the Storage Impoundment

\[ E_S = \left( (1.92 (11,458 \text{ gpm}) - 17,569 \text{ gpm}) \times 150 \right) / 1,000,000 \]

\[ E_S = 0.66 \text{ MG} \]
Standby Storage

Without Pipeline 5 and the Storage Impoundment

\[ V_{SB} = 2(16.5 \text{ MGD})(0.565) - \frac{(1440 \text{ min/day}(6,458 \text{ gpm})}{1,000,000} \]

\[ V_{SB} = 9.35 \text{ MG} \]

With Pipeline 5 and the Storage Impoundment

\[ V_{SB} = 2(16.5 \text{ MGD})(0.565) - \frac{(1440 \text{ min/day}(9,930 \text{ gpm})}{1,000,000} \]

\[ V_{SB} = 4.35 \text{ MG} \]

Fire Suppression Storage

\[ V_{FSS} = 7,000 \text{ gpm (240 min)} \]

\[ V_{FSS} = 1.68 \text{ MG} \]

240 total storage required

Without Pipeline 5 and the Storage Impoundment

\[ = 1.81 \text{ MG} + 9.35 \text{ MG} + 1.68 \text{ MG} \]

\[ = 12.84 \text{ MG} \]

With Pipeline 5 and the Storage Impoundment

\[ = 0.66 \text{ MG} + 4.35 \text{ MG} + 1.68 \text{ MG} \]

\[ = 6.69 \text{ MG} \]

<table>
<thead>
<tr>
<th>Table 3-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 Provided Storage</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Guiberson Street Reservoir</td>
</tr>
<tr>
<td>Garrison Reservoir (6 MG #2)</td>
</tr>
<tr>
<td>Impoundment Reservoir</td>
</tr>
<tr>
<td>Total Storage Provided Without the Storage Impoundment</td>
</tr>
<tr>
<td>Total Storage Provided With the Storage Impoundment</td>
</tr>
<tr>
<td>Table 3-18</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>240 Required / Provided Storage</strong></td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>Storage Provided With the Storage Impoundment</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>Storage Required Without Pipeline 5 and the Storage Impoundment</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>Storage Required With Pipeline 5 and the Storage Impoundment</td>
</tr>
</tbody>
</table>

**354.5/529 Zone**

Equalization Storage

\[
ES = (1.92(1389 \text{ gpm}) - 1300 \text{ gpm})(150)/1,000,000
\]

Note: 1300 gpm is the current pumping capacity of P.S. #3

\[
ES = 0.205 \text{ MG}
\]

Standby Storage

As was stated previously, the purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. Emergency power and an additional pump is planned to be added to Pump Station #3 (the primary supply to the West Hill) in 2001. With these additions the station will be considered reliable continuously. Furthermore, at Pump Station #4 (pumps from the 354.5 zone to the 529 zone) there is a diesel powered pump and enough pumping capacity to meet the demands of the 529 zone (as well as the availability of the Highline Intertie if needed).

Because of the planned project at Pump Station #3, it is again the City's position that the pumping volume may be subtracted from the standby storage requirement.

\[
V_{SB} = 2(2.0 \text{ MGD})(0.565)
\]

\[
V_{SB} = 2.26 \text{ MG} \text{ less the reliable volume from Pump Station #3}
\]

Pump Station #3 reliable volume

\[
(1300 \text{ gpm})(0.00144) = 1.87 \text{ MG}
\]

\[
V_{SB} = 0.39 \text{ MG}
\]
Fire Suppression Storage

\( V_{FSS} = 3,500 \text{ gpm (180 min)} \)

\( V_{FSS} = 0.63 \text{ MG} \)

354.5/529 total storage required = 0.205 MG + 0.39 MG + 0.63 MG

= 1.225 MG

<table>
<thead>
<tr>
<th>Table 3-19</th>
<th>354.5 / 529 Provided Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distribution Storage</td>
</tr>
<tr>
<td>Reith Road Tank</td>
<td>1 MG</td>
</tr>
<tr>
<td>Cambridge Tank</td>
<td>0.3 MG</td>
</tr>
<tr>
<td>Total Storage Provided</td>
<td>1.3 MG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3-20</th>
<th>354.5 / 529 Required / Provided Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Provided</td>
<td>1.3 MG</td>
</tr>
<tr>
<td>Storage Required</td>
<td>1.225 MG</td>
</tr>
</tbody>
</table>

Distribution System

The City water transmission and distribution system includes more than 235 miles of pipeline. The pipe size varies from 2-inch to 36-inch, with 8-inch being the predominant size. The majority of the distribution system is ductile-iron pipe. Table 3-21 provides a summary of the pipe sizes within the Kent system.
Table 3-21
Transmission and Distribution System
Pipe Size

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Total Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-inch</td>
<td>1.41</td>
</tr>
<tr>
<td>4-inch</td>
<td>5.18</td>
</tr>
<tr>
<td>6-inch</td>
<td>53.05</td>
</tr>
<tr>
<td>8-inch</td>
<td>72.89</td>
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<tr>
<td>10-inch</td>
<td>32.22</td>
</tr>
<tr>
<td>12-inch</td>
<td>32.92</td>
</tr>
<tr>
<td>14-inch</td>
<td>3.0</td>
</tr>
<tr>
<td>16-inch</td>
<td>12.08</td>
</tr>
<tr>
<td>18-inch</td>
<td>0.5</td>
</tr>
<tr>
<td>24-inch</td>
<td>0.03</td>
</tr>
<tr>
<td>16-inch Transm Main</td>
<td>1.7</td>
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<tr>
<td>18-inch Transm Main</td>
<td>2.15</td>
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<tr>
<td>21-inch Transm Main</td>
<td>6.0</td>
</tr>
<tr>
<td>24-inch Transm Main</td>
<td>8.49</td>
</tr>
<tr>
<td>30-inch Transm Main</td>
<td>2.85</td>
</tr>
<tr>
<td>36-inch Transm Main</td>
<td>3.46</td>
</tr>
<tr>
<td>Total</td>
<td>237.95</td>
</tr>
</tbody>
</table>

Pressure Zones

The total service area is divided into five sub-areas, each of which has a distinct hydraulic level. These pressure zones are: the high East Hill level, at elevation 590 feet above sea level (the 590 system); the low East Hill level at 485 feet (the 485 system); the valley level at 240 feet (the 240 system); the low West Hill level at 354.5 feet (the 354 system); and the high West Hill level at 529 feet (the 529 system).

The High East Hill System

The Clark Springs main discharges into a 6 MG tank (the James Street tank 6 MG #1), which is located west of 98th Avenue S. and north of S. 240th Street and which serves as a holding reservoir. Its high water surface elevation is at 416 feet. Water is pumped from it into a 1 MG tank and a 3.5 MG tank, each with a high water surface elevation of 590 feet. Water is also pumped from the East Hill Well into these tanks. These two tanks which serve the high East Hill pressure zone are located respectively near 112th Avenue SE and SE 236th Street and near 124th Avenue SE and SE 286th Street. The boundaries of this zone within the Kent system extend as far as 124th Avenue SE on the east, SE 277th Place on the south, 98th Avenue S. on the west, and SE 224th Street on the north.

Three of the four interties with Water District #111 which lie just east of the Kent system are serviced from the high East Hill system. These three interties are located near 124th Ave SE at SE 256th Street, at SE 277th Street and at SE 282nd Street because the high East...
Hill System and District's system are at the same hydraulic elevation, they can operate as a single system. In fact, when Kent was the District's sole water source they were operated as one. Today, however, with the District supplying its own water, these interties are used only occasionally. The fourth intertie with the District is located at 150th Place SE and Kent Kangley Road. This intertie took water directly out of the Clark Springs Transmission Main and was pumped into the District's reservoir. This intertie was removed from the transmission main during the reconstruction of Kent Kangley Road, and may be relocated to a different site at some time in the future.

The Low East Hill System

The low East Hill system at elevation 485 feet serves the westerly slopes of East Hill. Its boundaries are approximately 98th Avenue S. to the east, S 257th Street to the south, Clearview Avenue S. to the west, and the north extremity of 222nd to the north. This system draws its supply from a 125,000 gallon elevated steel tank adjacent to the 6 MG, 416 feet elevation holding reservoir.

Pump Station No. 5, which is located at the site of the James Street tank, serves both pressure zones of the East Hill system with three pumps. One of the pumps serves the 125,000 gallon tank at elevation 485 feet. At 1,150 RPM, the pump can deliver 1,075 gpm. Another pump serves the two tanks at elevation 590. At 1,750 RPM, it can deliver 1,950 gpm. The third pump serves both pressure zones. At 1,150 RPM, it can deliver 1,075 gpm to the 485 system, and at 1,750 RPM, it can deliver 1,950 gpm to the 590 system. At present capacity if the third pump is serving the lower East Hill, a total of 2,150 gpm (3.1 MGD) can be supplied to the 485 system, while 1,950 gpm (2.8 MGD) can be supplied to the 590 system. On the other hand, if the backup pump is serving the higher East Hill system, 1,075 gpm (1.5 MGD) can be supplied to the lower system, while the higher one receives 3,900 gpm (5.6 MGD). There is space in the pump station for the installation of two more pumps, yielding an ultimate pumping capacity of 11.2 MGD to the 590 system and 1.5 MGD to the 485 system. Alternatively, 3.1 MGD could be delivered to the 485 system while 8.4 MGD could be supplied to the 590 system. The 485 system is also intertied to the 590 system in the vicinity of Pump Station #5 through a pressure reducer station. The pressure reducer station is only activated when the 125,000 gallon reservoir is either taken out of service or some other problem prohibits supplying water to the system via Pump Station #5. Another intertie to the 590 system exists on Woodland Way near Scenic Hill Elementary School through a check valve. It opens when pressure in the 590 system drops extremely low, a situation that might occur during a main break or fire in the immediate area.

The Valley System

This system has a hydraulic elevation of 240 feet and is served by two tanks. The 6 MG tank at S 218th Street and 98th Avenue S (Garrison Creek Reservoir) serves the northerly portions of the valley system. Its primary water source is gravity flow from the James Street tank. However, the Garrison Creek Well, both 212th Street Wells, the 208th Street Well, the O'Brien Well, the Tukwila intertie and the Renton intertie can also feed it. The
3 MG tank near Kensington Avenue and Seattle Street, also known as the Scenic Hill Reservoir, or Guiberson Street Reservoir serves the southerly portions of the Valley system. It receives water directly from the Kent Springs source via the Kent Springs main.

The boundaries of the Valley system extend from S. 180th Street on the north to S. 277th Street on the south, and from the base of the West Hill slope on the west to approximately 94th Avenue S. on the east.

The West Hill Systems

Similar to the East Hill systems, the West Hill systems consist of two major pressure zones. The lower one operates at a hydraulic elevation of 354.5 feet and the higher one operates at elevation 529 feet. Two sub areas of the higher elevation are further pressurized by individual continuous running pumping stations to elevation 575 and 587. The low level is served by a 1 MG tank, located in the vicinity of Reith Road and S 256th Street. The higher elevation is served by a 300,000 gallon tank (Cambridge Reservoir), located near 34th Avenue S and S 264th Street.

The West Hill system is primarily supplied through the Valley system via a 12-inch main which crosses the Green River along Meeker Street and terminates at Pump Station No. 3, at the intersection of Lake Fenwick Road and Reith Road. From here the water is pumped into the 354.5 elevation, 1 MG tank.

The pump station has two pumps each with a capacity 900 gpm (1.3 MGD). Under normal operating conditions, only one pump is operating. Pump Station No. 4, which is located at the 1 MG tank site, pumps the water into the 529-foot elevation, 300,000 gallon tank and contains three pumps, two electric-driven at 900/1,000 gpm each and one electrical/diesel-driven at 1,800 gpm. The combined capacity, however, due to distribution line restrictions is 2,500 to 2,600 gpm. Under normal operating conditions only one of the electrical pumps is operating. Water can also be supplied to the 529 system of the West Hill system through an intertie with Highline Water District located on the east side of I-5 and S. 240th Street.

General Description of all distribution facilities

Pump Stations

Distribution System/Pump Stations assessment

Pump Station #3 was constructed in 1959 with an upgrade completed in 1979 to increase capacity and is in fair condition with some deterioration of the walls and roof, although the equipment is reliable and fully functional. However the pumps no longer have the capacity to meet present and future peak demands, and a replacement pump station is currently being designed with construction scheduled for 2001. The replacement pump station will have emergency generator power.
Pump Station #4 was constructed in 1959 with an upgrade completed in 1979, 1983 and in 1997 to improve capacity and reliability. The pump station and equipment is in good condition and adequately meets reliability criteria, with a future life expectancy of 25 years.

Pump Station #5 was constructed in 1975 with an additional (4th) pump installation scheduled for 2000, to supply the 590 system. The pump station and equipment is in good condition and adequately meets reliability criteria, with a future life expectancy of 50 years. The capacity of the existing emergency generator will need evaluation to determine if it is adequately sized to meet the demands the 4th pump will place on it.

Pump Station #6 was constructed in 1984, and has required few improvements. The pump station and equipment is in good condition and adequately meets reliability criteria, with a future life expectancy of 40 years, although equipment maintenance will certainly increase during that period as the pump station operates continuously.

Pump Station #7 was constructed in 1985, and has required few improvements. The pump station and equipment is in good condition and adequately meets reliability criteria, with a future life expectancy of 40 years, although equipment maintenance will certainly increase during that period as the pump station operates continuously.

Pump Station #8 was constructed in 1986, and has required few improvements. The pump station and equipment is in good condition and adequately meets reliability criteria, with a future life expectancy of 50 to 75 years. This pump station is designed to operate continuously but only when the Highline Intertie is in use, which is infrequently, thus the equipment experiences little wear.

Pressure Reducing Stations (PRV's) of various sizes are scattered throughout the system in both the East Hill and West Hill areas. All of the PRV's are maintained on a regular basis, and are fully rebuilt/tested every 4 years. All of them are in good to excellent condition with the exception of the Stetson Avenue PRV, and a new design has been completed and it has been scheduled for replacement in 1998.

**Water/Sewer Line Separation Requirements**

Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer. The distance shall be measured edge-to-edge. Any deviation from this requirement shall meet DOE and Washington State Department of Health requirements and be allowed only upon approval of the director.

Perpendicular water main crossings of sanitary sewers shall be laid to provide a minimum vertical distance of eighteen (18) inches above the sewer line, measured from the bottom of the water line to the top of the sewer line. Where separation between the water line and sewer line is less than eighteen (18) inches, the sewer line shall be ductile iron pipe. All sanitary sewer lines which cross above a water main, regardless of the separation,
shall be ductile iron as well, with no joints within a nominal ten (10) feet of the water main

**Location of dead end lines**

Within the distribution system, there are approximately 375 dead end mains. The location of these mains are listed below. As stated in the City Construction Standards (chapter 9), it is the City’s position that dead end mains should be avoided whenever possible.
<table>
<thead>
<tr>
<th>Location</th>
<th>Kroll Number</th>
<th>Location</th>
<th>Kroll Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6020 S 190th St.</td>
<td>350SE</td>
<td>27517 121st Ave SE</td>
<td>660NW</td>
</tr>
<tr>
<td>7011 S 182nd St.</td>
<td>351NW</td>
<td>730 N. Clark Ave</td>
<td>618SW</td>
</tr>
<tr>
<td>7633 S 180th St.</td>
<td>351NW</td>
<td>731 N. Jason Ave</td>
<td>618SW</td>
</tr>
<tr>
<td>7211 S. 180th St.</td>
<td>351NW</td>
<td>811 N Lenora Ave</td>
<td>618SW</td>
</tr>
<tr>
<td>18250 E.V H.</td>
<td>351NW</td>
<td>443 N 1st Ave</td>
<td>621NE</td>
</tr>
<tr>
<td>7109 S. 180th St.</td>
<td>351NW</td>
<td>841 N Alvord Ave</td>
<td>618SW</td>
</tr>
<tr>
<td>S. 239th Pl &amp; Military Rd</td>
<td>373SW</td>
<td>22647 W V H</td>
<td>617NW</td>
</tr>
<tr>
<td>23951 35th Pl S</td>
<td>373SW</td>
<td>815 5th Ave N.</td>
<td>617SE</td>
</tr>
<tr>
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<td>374NE</td>
<td>26604 Dover Ct.</td>
<td>375SE</td>
</tr>
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<td>26921 Arden Ct.</td>
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<td>375SE</td>
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<td>374SE</td>
<td>3333 S 268th St</td>
<td>375SW</td>
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<td>374SW</td>
<td>6632 190th St</td>
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<tr>
<td>3918 S. 250th St</td>
<td>374SW</td>
<td>5820 S 228th St</td>
<td>616NW</td>
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<td>25286 Lake Fenwick Rd</td>
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</tr>
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</tr>
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<td>374SW</td>
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<td>18200 E.V H.</td>
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<td>Location</td>
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<td>S. 200&lt;sup&gt;th&lt;/sup&gt; &amp; Russell Rd</td>
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<td>23340 115&lt;sup&gt;th&lt;/sup&gt; Pl SE</td>
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<tr>
<td>20215 84&lt;sup&gt;th&lt;/sup&gt; Ave S</td>
<td>607SE</td>
<td>23533 110&lt;sup&gt;th&lt;/sup&gt; Pl SE</td>
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<td>23224 109&lt;sup&gt;th&lt;/sup&gt; Pl. SE</td>
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<td>10821 SE 233&lt;sup&gt;rd&lt;/sup&gt; Pl</td>
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<td>619SE</td>
</tr>
<tr>
<td>8100 S. 224&lt;sup&gt;th&lt;/sup&gt; St</td>
<td>612SE</td>
<td>28101 122&lt;sup&gt;nd&lt;/sup&gt; Pl SE</td>
<td>660SW</td>
</tr>
<tr>
<td>8661 S. 208&lt;sup&gt;th&lt;/sup&gt; St</td>
<td>613NW</td>
<td>926 Valley Pl</td>
<td>618SW</td>
</tr>
<tr>
<td>8811 S. 208&lt;sup&gt;th&lt;/sup&gt; St</td>
<td>613NW</td>
<td>1015 Crest Pl</td>
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<tr>
<td>22023 92&lt;sup&gt;nd&lt;/sup&gt; Ave S.</td>
<td>613SW</td>
<td>11208 SE 228&lt;sup&gt;th&lt;/sup&gt; Pl</td>
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<tr>
<td>21829 88&lt;sup&gt;th&lt;/sup&gt; Pl S</td>
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<td>11313 SE 228&lt;sup&gt;th&lt;/sup&gt; Pl</td>
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<tr>
<td>22513 54&lt;sup&gt;th&lt;/sup&gt; Ave S</td>
<td>616NW</td>
<td>23203 115&lt;sup&gt;th&lt;/sup&gt; Ave SE</td>
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Frequency, Cause and Type of System Leaks

Overall, the City of Kent Water system has very few leaks as is evident in the table 3-22 below, which reflects the percentage of unaccounted for water within the system.

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<td>27604 123rd Ave</td>
<td>660NW</td>
<td>11419 SE 258th St.</td>
<td>627NE</td>
</tr>
<tr>
<td>12137 SE 276th Ct</td>
<td>660NW</td>
<td>11328 Kent Kangley Rd.</td>
<td>627NE</td>
</tr>
<tr>
<td>27646 121st Pl SE</td>
<td>660NW</td>
<td>11020 Kent Kangley Rd</td>
<td>627NE</td>
</tr>
<tr>
<td>27254 123rd Ave SE</td>
<td>660NW</td>
<td>10839 Kent Kangley Rd.</td>
<td>627NE</td>
</tr>
<tr>
<td>27902 122nd Pl SE</td>
<td>660NW</td>
<td>11305 Kent Kangley Rd</td>
<td>627NE</td>
</tr>
<tr>
<td>27900 123rd Pl. SE</td>
<td>660NW</td>
<td>26800 S Central Ave.</td>
<td>625SE</td>
</tr>
</tbody>
</table>

Table 3-22

<table>
<thead>
<tr>
<th>Year</th>
<th>Unaccounted for Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>12.89%</td>
</tr>
<tr>
<td>1997</td>
<td>10.17%</td>
</tr>
<tr>
<td>1998</td>
<td>12.63%</td>
</tr>
<tr>
<td>1999</td>
<td>12.18%</td>
</tr>
<tr>
<td>Average</td>
<td>11.97% per year</td>
</tr>
</tbody>
</table>

Of the leaks that do occur the majority are service piping or fitting leaks. On average these occur about four to five (4-5) times a month. Of these leaks, approximately 50 percent are found to occur on copper service lines and 50 percent occur on galvanized service lines. Most of the copper leaks are the result of incorrect installation of the copper flare fittings. When the fittings are replaced by the Water Department as a result of a leak, they are done so with pack-joints, which have been a standard construction fitting in Kent for the past 10 years. The galvanized service lines leak due to corrosion of the pipe material and are replaced with copper or polyethylene when leaks occur, or when other improvements are performed on the utilities in the area.
Main breaks occur about six to eight (6-8) times per year. Main breaks typically occur on cast iron pipe (circumference cracks) or occasionally leaks on steel or asbestos mains. These pipe materials are no longer accepted within the Water System for new construction. Existing mains of this type are identified to be replaced as described in the distribution system replacement program.

The other type of leak which occurs approximately one to two times a month are fire hydrants that are not shut off completely. Typically this is the result of a contractor that does not fully shut off the hydrant.

**Distribution System Improvement Program**

A distribution system improvement program was established in 1994. With the establishment of the program, funds are budgeted each year (see below) within the Water Department budget to replace/add identified mains.

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget</td>
<td>$286,000</td>
<td>$297,000</td>
<td>$309,000</td>
<td>$321,000</td>
<td>$334,000</td>
<td>$347,000</td>
<td>$360,000</td>
</tr>
</tbody>
</table>

The mains which are identified to be replaced are prioritized by the following categories.

1. **Maintenance History** – Maintenance history is evaluated. Mains which have a high maintenance history are identified to be replaced and receive a higher priority.

2. **Fire flow** – Fire flow capacities are evaluated. Mains which are under-sized and cannot provide the required fire flows are given a higher priority.

3. **Customers** – The number of customers on the identified section of main is determined. Typically, the mains that have a higher number of customers are given a higher priority.

4. **Pipe Material** – Mains are evaluated and ranked by material. Typically steel mains are given a higher priority than asbestos cement or cast iron mains.

5. **Relationship with other projects** – If a known project will be performed in the future, the main replacement schedule is typically adjusted to meet the schedule of the other project.

6. **Cost / Benefit ratio** – A cost / benefit ratio is established. Cost is the cost of the main replacement, while the benefit is the number of customers who will benefit from the replacement.

The following table identifies mains that have been identified as needing to be replaced within the system improvement program.
<table>
<thead>
<tr>
<th>Priority Number</th>
<th>Area/Address</th>
<th>Number of Customers</th>
<th>Length to be Replaced (feet)</th>
<th>Size &amp; Type of Existing Main</th>
<th>Future Development Potential</th>
<th>Reason for Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E. Temperance St. between Kennebec Ave &amp; Alvord Ave</td>
<td>± 25</td>
<td>± 1,900</td>
<td>8-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clark Ave between E Temperance St. &amp; S. 240th St</td>
<td>± 19</td>
<td>± 850</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jason Ave between E Temperance St. &amp; S. 240th St</td>
<td>± 21</td>
<td>± 850</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prospect Ave between E Temperance St. &amp; S. 240th St</td>
<td>± 22</td>
<td>± 850</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hazel Ave between E Temperance St. &amp; S. 240th St</td>
<td>± 17</td>
<td>± 850</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cedar St. between Clark Ave &amp; Jason Ave</td>
<td>± 0</td>
<td>± 300</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>HM, RM, A</td>
</tr>
<tr>
<td>2</td>
<td>SE 272nd Pl between 116th Ave SE &amp; 120th Ave SE</td>
<td>± 17</td>
<td>± 1,200</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SE 276th St between 116th Ave SE &amp; 120th Ave SE</td>
<td>± 17</td>
<td>± 1,200</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>117th Ave SE between SE 272nd Pl &amp; SE 276th St</td>
<td>± 24</td>
<td>± 1,050</td>
<td>4-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>118th Ave SE between SE 272nd Pl &amp; SE 276th St</td>
<td>± 18</td>
<td>± 1,050</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120th Ave SE between SE 276th St &amp; SE 274th St</td>
<td>± 8</td>
<td>± 525</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SE 274th St between 118th Ave SE &amp; 120th Ave SE</td>
<td>± 8</td>
<td>± 525</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SE 275th St between 118th Ave SE &amp; 120th Ave SE</td>
<td>± 8</td>
<td>± 525</td>
<td>4-inch AC</td>
<td>Little if any</td>
<td>RM, A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>109th Ave SE between SE 256th St &amp; SR 516</td>
<td>± 15</td>
<td>± 750</td>
<td>4-inch AC</td>
<td>Little if any</td>
<td>OM, A</td>
</tr>
<tr>
<td>4</td>
<td>SE 270th St between 124th &amp; 126th Ave</td>
<td>± 38</td>
<td>± 2,200</td>
<td>2-inch to 4-inch galvanized and poly pipe</td>
<td>Big K addition / with sewer project</td>
<td>OM, F</td>
</tr>
<tr>
<td>Priority Number</td>
<td>Area/Address Description</td>
<td>Number of Customers</td>
<td>Length to be Replaced (feet)</td>
<td>Size &amp; Type of Existing Main</td>
<td>Future Development Potential</td>
<td>Reason for Replacement</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------</td>
<td>---------------------</td>
<td>-------------------------------</td>
<td>------------------------------</td>
<td>----------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>5</td>
<td>100th PI SE from SE 256th to end of cul-de-sac</td>
<td>± 11</td>
<td>±600</td>
<td>2-inch to 1-inch poly</td>
<td>Residential area could be developed commercial</td>
<td>RM, F</td>
</tr>
<tr>
<td>6</td>
<td>Jason/Titus between Smith St &amp; Kennebeck Ave</td>
<td>± 11</td>
<td>±1,100</td>
<td>6-inch cast iron</td>
<td>Little if any</td>
<td>OM, L</td>
</tr>
<tr>
<td>7</td>
<td>Canyon Drive from 92nd Ave S to S 252nd St</td>
<td>± 6</td>
<td>±2,000 of new water main no replacement</td>
<td>None existing</td>
<td>Little if any</td>
<td>G, F, W</td>
</tr>
<tr>
<td>8</td>
<td>121st PI SE North of SE 272nd St</td>
<td>± 6</td>
<td>±425</td>
<td>2-inch rigid plastic</td>
<td>Possible 6 to 8 residences</td>
<td>OM, F, W</td>
</tr>
<tr>
<td>9</td>
<td>500 block of N Alvord</td>
<td>± 25</td>
<td>±400</td>
<td>4-inch steel &amp; 6-inch cast iron</td>
<td>Little if any</td>
<td>OM, F</td>
</tr>
<tr>
<td>10</td>
<td>S 243 St from 75 ft. East of Military Rd to 41st Ave S Includes 200 ft on 39th Ave S &amp; 200 ft on S 241st</td>
<td>± 25</td>
<td>±1,250</td>
<td>2, 4, &amp; 6-inch AC</td>
<td>Little if any</td>
<td>OM, F, A, W</td>
</tr>
<tr>
<td>11</td>
<td>Canyon Drive to East Smith St</td>
<td>± 4</td>
<td>±800</td>
<td>6-inch cast iron</td>
<td>Little if any</td>
<td>OM, L</td>
</tr>
<tr>
<td>13</td>
<td>Crow St between 1st &amp; 5th Ave South</td>
<td>± 23</td>
<td>±1,325</td>
<td>4-inch AC &amp; Steel</td>
<td>Little if any</td>
<td>OM, F, W</td>
</tr>
<tr>
<td>14</td>
<td>Jeffery Rd between S. 240th St &amp; Military Rd - includes approximately 175 ft on 35th PI S. / S 233rd St. between S 240th St &amp; Military Rd / S 240th St between S 233rd St and Military Rd / Military Rd between S 233rd St &amp; S 240th St</td>
<td>± 30</td>
<td>±3,600</td>
<td>6 &amp; 8-inch AC</td>
<td>Little if any</td>
<td>OM, A, W</td>
</tr>
<tr>
<td>Priority Numbers</td>
<td>Area/Address Details</td>
<td>Number of Customer</td>
<td>Length to be Replaced (feet)</td>
<td>Size &amp; Type of existing main</td>
<td>Future development potential</td>
<td>Reason for replacement</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------</td>
<td>--------------------</td>
<td>------------------------------</td>
<td>----------------------------</td>
<td>-----------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>15</td>
<td>120th Pl SE South of SE 256th St.</td>
<td>± 6</td>
<td>± 250</td>
<td>1.5 &amp; 2-inch galvanized</td>
<td>Little if any</td>
<td>OM, F, W</td>
</tr>
<tr>
<td>16</td>
<td>100th Ave SE, North of James St to 23600 block</td>
<td>± 15</td>
<td>± 1,660</td>
<td>6-inch cast &amp; ductile iron</td>
<td>Little if any</td>
<td>F, G</td>
</tr>
<tr>
<td>17</td>
<td>Woodford Ave North from James St to South 238th St &amp; loop to State St.</td>
<td>± 22</td>
<td>± 1,500</td>
<td>4-inch AC</td>
<td>Little if any, possible commercial</td>
<td>F, A, W</td>
</tr>
<tr>
<td>18</td>
<td>Hawley Rd from Valley News to Green River</td>
<td>± 3</td>
<td>± 1,100</td>
<td>2-inch AC</td>
<td>Possible commercial</td>
<td>OM, W, F</td>
</tr>
<tr>
<td>19</td>
<td>78th Ave S between S 262nd to S 277th St</td>
<td>± 10</td>
<td>± 5,280</td>
<td>8-inch AC</td>
<td>Large potential to the West side of road</td>
<td>OM, A</td>
</tr>
<tr>
<td>20</td>
<td>111th Ave SE North of SE 256th St</td>
<td>± 16</td>
<td>± 800</td>
<td>6-inch AC</td>
<td>Little if any</td>
<td>A, W</td>
</tr>
<tr>
<td>21</td>
<td>East Smith St &amp; Alvord Ave (both East &amp; South)</td>
<td>± 8</td>
<td>± 750</td>
<td>1 &amp; 2-inch poly</td>
<td>Residential / possible commercial</td>
<td>OM, F, W</td>
</tr>
<tr>
<td>22</td>
<td>West Harrison St from 4th to 6th Ave South</td>
<td>± 4</td>
<td>± 600</td>
<td>4-inch</td>
<td>Possible commercial</td>
<td>F, W</td>
</tr>
<tr>
<td>23</td>
<td>113th Ave SE from 25200 block North to end of St.</td>
<td>± 2</td>
<td>± 150</td>
<td>1-inch poly</td>
<td>Possible residential</td>
<td>RM, F, W</td>
</tr>
<tr>
<td>24</td>
<td>Frager Rd North of South 212th St</td>
<td>± 2</td>
<td>± 1,000</td>
<td>0.75 &amp; 1-inch poly &amp; galvanized</td>
<td>Possible commercial</td>
<td>OM, F, W, L</td>
</tr>
<tr>
<td>25</td>
<td>South 182nd St. from 72nd Ave South, West to end of Rd</td>
<td>± 2</td>
<td>± 400</td>
<td>2-inch galvanized</td>
<td>Possible commercial</td>
<td>OM, F, W</td>
</tr>
</tbody>
</table>

**OM** - Occasional repair or Maintenance Enforced (every 2 - 5 years)

**RM** - Regular repair or Maintenance required (every year)

**HM** - High Maintenance: When failures occur they have a high repair cost & a significant possibility of property damage

**F** - Fire flow improvements. Fire protection is restricted or non-existent

**A** - Asbestos water main replacement

**W** - Water Quality improvements. dead ends mains, unlined CI mains, etc.

**O** - General system improvements with little potential for other sources of financing

**I** - Improper installation or location of water main - under buildings or otherwise inaccessible for maintenance or repairs.
In addition to the above, the following list identifies general system improvements that should be completed in concert with future improvements and/or development. Note this list is not in a priority order:

- Lake Fenwick Road loop.
- Russel Road Loop between South 212th Street & South 196th Street.
- West Valley / South 277th Street / Frontage Road loop.
- East Valley / South 277th Street / River Road loop.
- SE 236th Street - 1 MG Reservoir (Blue Boy) 12-inch connection to the East.
- 11600 block loop between SE 277th Place and SE 284th Street.
- SE 240th Street / 120th Ave SE / SE 248th Street loop.
- SE 274th St loop between 114th Ave SE & 116th Ave SE.
- SE 264th Street loop between the 11000 & 11200 blocks.
- 124th Ave SE - SE 270th St to Kent Kangley.
- Canyon Drive - 94th Ave S to 725 ft NW.
- S 256th Pl to Reith Rd (Near Reith Rd. Tank).

System Pressures

Distribution system pressures remain fairly constant under normal operating conditions. Facility maintenance workers record distribution system pressure for on-line facilities daily, weekly, and monthly on the respective facility reports.

The new Wonderware SCADA system the City has purchased monitors and records pressures at any given location throughout the distribution system. The software monitors the level within reservoirs and intake/outlet pressures at pump stations. For example, for the 240 zone if the level of either the 6 MG #2 or Guberson Street reservoir drops below a preset value or the intake pressure at Pump Station #3 is below a preset value, a low level alarm/low system pressure signal is transmitted to the SCADA system and an operator takes corrective action. Other zones are monitored in a similar fashion. All of the values monitored by the SCADA system are stored in an electronic file for 10 years.

Changes in the Distribution System (GIS)

The City's Geographic Information System (GIS) is maintained by the Public Works Engineering Department. The Engineering Department updates the data base and respective graphical representation of information as project as-buils are submitted. The City is currently in the process of converting from the existing Genesis GIS system to Arc-Info GIS. From these systems, there are two forms of output which are used by the Water Department.

The first form of output is a distribution system plan. The distribution system plan provides an overall view of the water system including existing mains, facilities, and
future mains which are required as development occurs. A copy of this map has been included in chapter 1 as Figure 1-2. This map is also used by the Engineering Department to ensure that future developments are in accordance with the current Comprehensive Plan.

The second form of output that the Water Department uses are Kroll quarter section maps. A copy of these maps are located in each water department vehicle and in appropriate offices throughout the City. The maps provide much more detailed information such as the location of all water mains and appurtenances, valves (both open and closed), fire hydrants (both public and private), and distribution facilities. New maps are generated and distributed approximately twice a year.

**Required Valve Locations and Hydrant Spacing**

**Water Valves**

Water valves are required at the following locations:

- Water valves shall be located at four hundred (400) foot maximum intervals in commercial/industrial and multi-family residential areas. Locations involving hospitals, medical clinics, and others determined by the City of Kent to be critical applications, may be required to have intervals reduced.

- Water valves shall be located at eight hundred (800) foot maximum intervals in residential districts.

- All sides of mainline tees.

- All sides of mainline crosses.

- At all service, fireline, and hydrant connections to the City main. Where water services or hydrants are installed on a fireline run a valve is required prior to the fireline vault, but after the water service or hydrant connections.

- At both sides of all bridge crossings, railroad crossings and casing/bores.

- Combination air/vacuum release valves shall be located at high points along the main. As a guide, valves are necessary where the difference between high and low points is two (2) feet on a gradual rise, or any abrupt rise. Actual locations should be in accordance with good engineering judgement and approval of the Director. The air inlet/discharge opening shall be thirty-six (36) inches above finished grade and provided with a screened downward facing vent opening. It shall be located outside of traffic areas and installed to prevent damage to landscaping and pedestrians.
• Blow-off valves shall be located at the end of all mains for flushing and "Pigging" purposes. Blowoff Assemblies must be sized and designed to achieve a minimum flow of 2.5 ft/sec in the Water main. These flows are to be used as a guideline but does not relieve the Contractor from assuring a clean line. Sizing of Blowoff Assemblies shall be per the City of Kent Construction Standards.

Fire Hydrants

Location – Actual fire hydrant locations shall be reviewed and approved by the Fire Marshall prior to plan approval. In general fire hydrants shall be installed at the following locations:

A. At all street intersections
B. Six hundred (600) foot maximum intervals in single family residential area
C. Three hundred (300) foot intervals in multi-family and commercial areas
D. At locations noted on approved project site plans
E. Upstream of a fireline vault, if an existing hydrant is not available within fifty (50) feet of the Fire Department connection
F. At other locations as directed by the Fire Marshall

Hydraulic Capacity Analysis

In conjunction with the development of the 2002 Water System Plan, a comprehensive analysis of the water supply, transmission, distribution, and storage facilities in the City's water system was performed. Using Haestad Methods Cybernet 3.0 software package the operating characteristics and deficiencies under present and future demands were determined.

The criteria used in the analysis of the output data produced from the computer runs for each scenario is representative of standards as established by the City of Kent and requirements of the State Department of Health. Flow velocities in distribution lines above 8 feet per second (fps) are noted since fire flow velocities on these lines could become excessive. Fire flow velocities in pipes should not exceed 10 fps, if this results in excessive head losses. Line pressures during normal operating conditions should not drop below 35 pounds per square inch (psi). The minimum line pressure acceptable during fire flow is 20 psi. Water storage tanks with services near the same ground elevations should not drop below 46 feet in water storage height.
Demand Loading

Water Department records of the peak day demand versus the average day demand provided the ratio (1.77) used consistently throughout the analysis. The factor of 1.77 was used to convert average-day to peak-day and vice-versa. Water use was divided among the pressure zones and then evenly distributed among the nodes within the zones in terms of gallons-per-minute (gpm).

The annual flows of the 13 largest industrial users, in the following table, were converted to average daily flows by dividing by the number of business days in a year (260). The peak day and average day flows were then subtracted from the daily flows of the corresponding pressure zone and specifically allocated to nodes corresponding with the approximate location of these industries.

<table>
<thead>
<tr>
<th>USER</th>
<th>LOCATION</th>
<th>12 MONTH DEMAND (MG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing Space Center</td>
<td>68th Ave S &amp; S. 212th St</td>
<td>129.75</td>
</tr>
<tr>
<td>American National Can</td>
<td>1220 2nd Ave N</td>
<td>39.16</td>
</tr>
<tr>
<td>Reynolds Metals Company</td>
<td>27402 72nd Ave S</td>
<td>33.38</td>
</tr>
<tr>
<td>Air Liquide</td>
<td>8008 S 222nd St</td>
<td>31.67</td>
</tr>
<tr>
<td>Mikron Industries</td>
<td>1136 6th Ave N</td>
<td>30.56</td>
</tr>
<tr>
<td>Northstar Beverage</td>
<td>8462 S 190th St</td>
<td>23.03</td>
</tr>
<tr>
<td>King Command Foods Inc</td>
<td>7622 S 188th St</td>
<td>23.03</td>
</tr>
<tr>
<td>Green Garden Foods</td>
<td>5851 S 194th St</td>
<td>19.48</td>
</tr>
<tr>
<td>Merlino’s Macaroni</td>
<td>8247 S 194th St</td>
<td>14.09</td>
</tr>
<tr>
<td>Flow International</td>
<td>23316 64th Ave S</td>
<td>12.82</td>
</tr>
<tr>
<td>Hytek Finishes Company</td>
<td>8127 S 216th St</td>
<td>12.21</td>
</tr>
<tr>
<td>Oberto Sausage Company</td>
<td>7060 S 238th St</td>
<td>11.78</td>
</tr>
<tr>
<td>Davis Wire</td>
<td>19411 80th Ave S</td>
<td>10.15</td>
</tr>
</tbody>
</table>

Water use, of course, varies throughout the day. A standard Diurnal Demand Curve for an urban area was used to assign usage factors for each hour over a 24-hour day. It should be noted that the peak hour is 9:00 p.m. The flow factor for the peak hour is 1.92. The minimum flow factor is 0.28 and occurs at 2:00 a.m. It was assumed that the great majority of industrial water use occurred during the 12-hour period between 6:00 a.m. and 6:00 p.m. Minimum industrial flows were assigned to the night period.

Six time scenarios were set up for the analysis. They were the Average Day and the Maximum Day demands for 1998, 2004, and at saturated development. After initial model runs, the load demands were further altered to set up fire flows at requested locations.
The Average Day scenarios were modeled with the fire flows. The model analyzed the effects that these fire flows had upon the water system when applied during the mid-day period (11:00 a.m. to 2:00 or 3:00 p.m.) of the day. Where deficiencies such as low pressure (less than 20 psi) were identified, system upgrades are recommended.

**Water Supply Scenarios**

**Scenario #1  1998 Average-Day**

All of the tanks except one of the smallest ones, 125,000 GAL, start and end the simulation with tank levels greater than 80 percent of capacity, an indication of plentiful storage condition. Soos Creek Well operates for only two hours while water is not needed from either the East Hill or the Garrison wells. All nodes maintain pressure at greater than 35 psi and water velocities in the pipes remain below 8 fps. In summary, the current water system is quite capable of handling the 1998 Average Day demands throughout the water system.

**Scenario #2  1998 Peak-Day**

The water level in one of the large tanks declines substantially by the end of the 24-hour simulation period. Guiberson finishes at about 49 percent full. This tank would be expected to recover following several days of non-peak water demands. The 6 MG #2 Tank, which feeds the same 240 Zone as Guiberson, ends the simulation period at 94 percent of capacity. The nearby 208th and 212th wells appear to be doing a good job at supplying water to the northern portion of the 240 Zone, where the 6 MG #2 Tank is located. Nearby Garrison Well is not activated. However, the Soos Creek well pumps for the latter 12 hours of the simulation period while the East Hill Well pumps during the final 3 hours.

Both pumps serving the 590 Zone at PS #5 pump nearly continuously during the simulation. Pressure remains above 35 psi in the 590 zone except for a couple of isolated nodes in the highest portion of the western side. Pressure remains above 20 psi throughout the entire zone. Several nodes in the northern and the southern portion of the 485 Zone fall below 35 psi for several hours during the highest demand period. However, all nodes in the 485 Zone also remain above 20 psi. Pressures remain above 35 psi throughout the 240 and 354.5 zones.

PS #4 delivers water to the 529 Zone via an 8-inch line. When all pumps are pumping, this line experiences relatively high flow velocities of 10 to 11 fps which, in turn, causes a relatively high loss in head, greater than 40 feet. Despite this, adequate pressures are maintained in the 529 and 565 zones.

**Scenario #3  2004 Average-Day**

The current supply appears adequate to meet the Average-Day water demands in 2004. Most of the large tanks finish the simulation period at 80 percent of capacity or higher.
However, the Guiberson Tank began and ended the period at 53 percent of capacity. It should be mentioned that initial runs using the existing pump activation points for the tanks resulted in several of the tanks ending the period at considerably lower capacity. The pump activation points were subsequently elevated by 5 to 20 feet of head, causing them to turn on earlier in the day, when tank levels were higher. This, in turn, allowed the tanks to finish the simulation period with higher water levels. There is a trade-off between running the pumps at frequent intervals to keep the tanks "topped off" and running the pumps less frequently, only after a large portion of the tank capacity has been exhausted. In this scenario existing set points were readjusted to yield generally adequate tank storage conditions for the 2004 scenario.

The Garrison Well did not pump during this period. The East Hill Well pumped for only one hour while the Soos Creek Well pumped a total of 11 hours. Adequate pressures were maintained throughout the water system.

The simulation demonstrates that the current water supply is adequate to meet the system demands in 2004. The Guiberson Tank is drawn down considerably, reflecting the large increase in water demand in the 240 Zone. The system would benefit from adjustments to utilize more of the storage volume of the 6 MG #2 Tank, which also serves the 240 Zone and which maintained more than 90 percent of its capacity at the end of the simulation period.

Scenario #4 2004 Peak-Day

A number of the larger tanks maintain greater than 50 percent or more of their capacity at the end of the simulation period. The 6 MG #1 is reduced to 14 percent of capacity and Guiberson is reduced to just 2 percent of its capacity. Despite this, system pressures remain well above 35 psi throughout the 240 Zone. The 6 MG #2 Tank remains above 60 percent of capacity. As stated above, it has capacity to provide more water to the 240 Zone and reduce the draw on Guiberson Tank.

The 590 Zone shows some scattered areas where pressures fall below 35 psi for several hours. Several nodes located in the highest areas of the zone fall to between 15 and 20 psi. In the 485 Zone extensive areas experience pressures less than 35 psi, with some falling to below 20 psi. The 125,000 GAL Tank drains to empty on several occasions during the day and it is clear that the pumps at PS #5 are not adequate to meet the 2004 Peak-Day demand. Several lines in the 485 and 590 zones exhibit peak velocities of 8-9 fps. This includes the 10-inch line exiting PS #5 and feeding the 485 Zone and an 8-inch line feeding the 590 Zone north of PS #5. In addition, a 6-inch and 8-inch line feeding the southern portion of the 485 Zone slightly exceed 8 fps for a limited period. None of these result in high head losses.

In the West Hill Area, several nodes fall below 35 psi but remain above 20 psi. The Reith Road Tank falls to just 1 percent of capacity. Adequate pressures are maintained in the 529 and 565 zones. However, the 8-inch line leaving PS #4 exhibits high velocities (up to 12 fps), resulting in head losses up to 50 feet.
Scenario #5  Saturated Development Average-Day

In the 590 Zone, a number of the larger tanks finish the simulation period with less than 50 percent of capacity, while the 125,000 GAL Tank serving the 485 Zone completely empties. Extensive areas in both the 485 and the 590 zones experience pressures less than 35 psi. Several nodes on the eastern edge of the 590 Zone drop to as low as 17 psi, while nodes in the northern portion of the 485 Zone drop down to 11 psi.

In the 240 Zone, Guiberson Tank is nearly empty at the end of the simulation period. Adequate pressures greater than 35 psi are maintained throughout the 240 zone. However, it is clear that water demand has outstripped the supply and that the tank will empty completely on the subsequent day. (Note the Cybernet Model only simulates a single 24-hour period, reporting results only within that period). There is a need for additional sources of water to meet the Average-Day demand under Saturated Development.

The pressure zones in the West Hill Area behaved similarly to that discussed in Scenario #3, where the water demands for this area are the same. However, with the water shortages that would develop in the 240 Zone (which supplies the West Hill Area) over the subsequent days, the West Hill Area would also be inadequately supplied.

Scenario #6  Saturated Development Peak-Day

Under this scenario, the current water supply is overwhelmed. Four of the major tanks, Guiberson, 3.5 MG, 6 MG #1, and Blue Boy all are completely drained. As a result, pressures throughout the 590 and 485 zones are shown in the model output as negative pressures. In reality, this means that instantaneous water demand is greater than the supply in the pipes, actual pressures would be near zero.

Pressures in the 240 Zone remain above 35 psi because the 6 MG #2 Tank still has 23 percent of its capacity at the end of the simulation period. However, this tank would be expected to fully drain the following day, resulting in loss of pressure in the remaining portion of the City water system.

Several of the larger water lines reach peak flow velocities of 8-10 fps. These include the 12 inch line feeding into the 6 MG #2 Tank, the 16 inch line on 212th Street immediately west of the 212th Street wells, and the 16 inch line immediately west of the Guiberson Tank. In all these cases the head losses are minor.

The West Hill Area showed results similar to Scenario #4 since, once again, water demands are the same. However, imminent loss of pressure in the 240 Zone would result in inadequate supply to this area, as well.
Recommended Improvements

A number of system deficiencies have been identified previously. The following improvements are recommended in the order of their need.

Increase Pipe Capacity South of PS #4 (2001). An 8-inch pipe extends south from PS #4 and serves as the sole pipe supplying the 529, 565, and 587 zones. It has been consistently identified as having peak flow velocities greater than 8 fps and head losses exceeding 30 feet (50 feet under fire flow conditions). It is recommended that this 8-inch line be replaced with a 12-inch line in order to provide additional, needed pipe capacity above PS #4.

Add Additional Pumping Capacity to PS #5 (2000). The analysis demonstrate that both the 590 and the 485 zones will need two pumps, each, to adequately meet the 2004 Peak-Day demands. Two additional pumps with ratings equivalent to Pump #2 (which can currently serve either zone) should be added. In concert with this improvement, there is a 6-inch pipe serving as the sole conduit for the entire southern portion of the 485 Zone. This 6-inch pipe should be replaced with a 10-inch pipe to eliminate excessive head losses during peak flow periods and improve pressure in the southern portion of the 485 Zone.

These improvements will allow the system to easily meet the Year 2004 Average-Day demands and adequately meet Year 2004 Peak-Day demands with a few possible exceptions. The highest area on the eastern side of the 590 Zone (in the vicinity of the Blue Boy Tank) may drop slightly below 20 psi during the peak 2-3 hours. This relatively low pressure would be quite temporary and infrequent. A second area of concern is the northern-most portion of the 485 Zone. This area encompasses the highest elevations of the pressure zone. Several nodes drop down to around 10 psi for a period of several hours during peak flow periods. Both of these potential problem areas would be eliminated with the addition of the Storage Impoundment proposed by the City just south of its service area. This additional supply, plus associated improvements discussed below, would adequately serve the City's water demands resulting from Saturated Development. It is recommended that the new supply be installed as soon after 2004 as practical.

New Reservoir and Transmission Main (2005). The City has an agreement to obtain water from the City of Tacoma's Pipeline 5 Project after it is constructed early in the next decade. The City proposes to construct a large impoundment reservoir which will be capable of supplying up to 15 MGD to the water system. Simulations were run introducing this water into the Kent Springs Transmission Main to augment the 240 Zone supply. Water from this new source was also introduced into the 12-inch line serving the southern portion of the 590 Zone at its junction with the 3.5 MG Tank. The model showed that 2 MGD of additional supply for the Kent Springs Main and 3 MGD of additional supply for the 590 Zone were adequate to meet the water demands of Saturated-Development Average-Day (with the addition of another large tank, proposed below). The existing pipe network in the southern portion of the 590 Zone is adequate to
handle this 3 MGD of new water with the stipulation that several 8-inch pipes north of the 3.5 MG Tank be replaced with 12-inch pipes in order to provide the required capacity while keeping peak flow velocities below 8 fps.

With this additional water source, most of the larger tanks maintained greater than 90 percent of their capacity at the end of their Average-Day simulation period (Saturated Development). The Blue Boy and Reith Road Tanks and the new 5 MG tank proposed for the 590 Zone (see below) maintained around 80 percent capacity. The entire water system maintained pressures greater than 35 psi, indicating good system performance.

For the Saturated Development Peak-Day Scenario, nearly all of the tanks ended the simulation period with greater than 35 percent capacity remaining. The Gurberson Tank had 29 percent capacity remaining while the 125,000 GAL Tank serving the 485 Zone was drained empty. This was achieved using only 5 MGD from the New Reservoir. If high demand persisted for a number of days, supply from this source could be temporarily increased to assure adequate tank levels. During the peak period, some portions of the 485 Zone fell to less than 10 psi for several hours. This was corrected by replacing the 10-inch pipe leading south from PS #5 with a 16-inch pipe, reducing both the high pipe velocities (10-11 fps) and associated head losses.

**New 5 MG Tank in the 590 Zone (2005)** Additional storage is needed in the 590 Zone to meet Saturated Development water demands. Simulations demonstrated that a new 5 MG tank located near the eastern side of the 590 Zone near the corner of SE 251st Street and 116th Avenue SE would meet the need. It has dimensions of 75 feet in diameter and 118 feet in height with a capacity of approximately 5 MG.

**Fire Flow Analysis**

Fire flow simulations were run at the individual nodes within the model corresponding to the commercial/industrial and school sites identified. As stated previously, these simulations were run for each of the three Average-Day Scenarios, during the mid-day period. The results are summarized below and deficiencies are noted, where they exist. Flow velocities in the adjacent pipes supplying the fire flow are noted where they exceed 8 fps. Excessive head losses (identified as greater than 20 feet of head) are also identified where they exist.

Kent Elementary School (240 Zone) Under all three scenarios pressures were maintained at 70 to 75 psi. All adjacent pipes are adequately sized to provide the required flow.

Neely O'Brien School (240 Zone). Under all three scenarios pressures were maintained at 70 to 75 psi. Flow in an adjacent 6-inch pipe reached velocities of 8-9 fps but did not result in excessive head losses.

Kent Mendian High School (590 Zone) Minimum fire flow pressures ranged from 51 to 32 psi for, respectively, the 1998 and saturated development conditions. However, under
Saturated Development conditions, the fire flow resulted in several areas of low pressure to the east and the south of the high school, where elevations are somewhat higher. This problem was corrected with the system-wide improvements stated previously. Velocity in the adjacent 8-inch lines reaches 9-11 fps but does not result in excessive head losses.

Daniel Elementary School (590 Zone). This site is located near the eastern edge of the 590 Zone. Under the 1998 Scenario, minimum line pressure was 24 psi. However, under the 2004 Scenario, the local pressure falls to a minimum of 19.6 psi slightly below the criteria of 20 psi. At Saturated Development, pressure declines to a minimum of 4 psi, which is unacceptable. Site-specific measures prior to 2004 are probably not justified for two reasons: (1) the pressure criteria is still marginally met and (2) system-wide improvements needed soon after 2004 will improve the pressure to 26 psi. Flow velocity in the adjacent 8-inch pipe reaches 12 fps but does not result in excessive head losses.

King County Regional Justice Center (240 Zone). The minimum pressure of 68 psi was found to occur under Saturated Development. Local pipe velocities remain less than 8 fps.

Boeing (240 Zone). Pressure was maintained in the mid-70 psi under all three scenarios. Flow velocities in an adjacent 10-inch line slightly exceed 8 fps but did not result in excessive head losses.

Kent North Corporate Park (240 Zone). The minimum pressure of 51 psi occurred under Saturated Development conditions. Flow velocities in an adjacent 12-inch line slightly exceed 8 fps but do not result in excessive head losses.

Carpet Exchange (240 Zone). The minimum pressure of 40 psi occurred under Saturated Development conditions. An adjacent short length of 10-inch pipe experienced velocities up to 16 fps. Although head losses were small, pipe replacement may be warranted.

Target (590 Zone). The minimum pressure of 36 psi occurred, locally, under Saturated Development conditions. However areas at higher elevations to the north and south of the site dropped to minimum pressures as low as 12 psi. This problem was corrected with the system-wide improvements recommended previously and minimum pressures were improved to 56 psi. Velocity in the adjacent 8-inch lines reached 8-10 fps but did not result in excessive head losses.

Kent Motel (240 Zone). Under all three scenarios pressures were maintained at 75 to 80 psi. All adjacent pipes were adequately sized to provide the required flow.

Totem Junior High School (529 Zone). The model reported negative pressures for fire flows at the Totem School under all three scenarios. The two pumps normally in operation at PS #4 were not able to provide the required flows. However use of the backup pump, Pump #3, in a simulation did provide adequate fire flow and maintained pressures in the 529 Zone. It is recommended that this pump, normally used as a backup.
in case one of the two primary pumps should fail, be set to operate when a fire flow demand suddenly induces low pressure in the 529 Zone.

Under fire flow conditions, high velocities and head losses occur at the 8-inch line leaving PS #4, as reported previously. This 8-inch line should be replaced with a 12-inch line, also recommended previously. Several other 6-inch and 8-inch pipes in the 529 Zone also have flow velocities peaking in the 8-10 fps range. Their individual losses are not excessive, although some of them are additive and may consider consideration for replacement.

<table>
<thead>
<tr>
<th>Year</th>
<th>Improvement</th>
<th>Units</th>
<th>Number</th>
<th>Unit Cost</th>
<th>Cost</th>
<th>EngCost</th>
<th>Total Cost</th>
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</thead>
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<tr>
<td>2001</td>
<td>529 Zone - 8&quot; to 12&quot; line replacement</td>
<td>Feet</td>
<td>950</td>
<td>$50</td>
<td>$47,500</td>
<td>$19,000</td>
<td>$66,500</td>
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<tr>
<td>2001</td>
<td>PS #4 - Convert standby pump to fire flow pump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>PS #5 - Add 2 new pumps</td>
<td>Each</td>
<td>2</td>
<td>$22,000</td>
<td>$44,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$65,000</td>
<td>Total</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>$109,000</td>
<td>$43,600</td>
</tr>
<tr>
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<td>485 Zone - 6&quot; to 10&quot; line replacement</td>
<td>Feet</td>
<td>650</td>
<td>$45</td>
<td>$29,250</td>
<td>$11,700</td>
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</tr>
<tr>
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<td>Feet</td>
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<td>$70</td>
<td>$70,000</td>
<td>$28,000</td>
<td>$98,000</td>
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<td>2003</td>
<td>590 Zone - New 5 MG Tank</td>
<td>Each</td>
<td>1</td>
<td></td>
<td>$1,400,000</td>
<td></td>
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<td>Foundation</td>
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<td></td>
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<td>$70,000</td>
<td>Valves, pipe, &amp; telemetry</td>
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<td></td>
<td></td>
<td>$1,565,000</td>
<td>$626,000</td>
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<tr>
<td>2004</td>
<td>590 Zone - 8&quot; to 12&quot; replacement</td>
<td>Feet</td>
<td>1,800</td>
<td>$50</td>
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<td>$36,000</td>
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<td></td>
<td></td>
<td></td>
<td>$1,910,750</td>
<td>$2,685,050</td>
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*To be completed with recommended 529 zone water main upgrade*
Chapter 4
Conservation Program

CONSERVATION PROGRAM

On June 1, 1993 the Kent City Council passed Resolution 1361, adopting a Water Conservation Plan as an additional element of the City's Water System Plan. The conservation program, as detailed below, has been updated to reflect the years 2000 - 2006.

Water Use Data Collection Requirements

As identified in the Conservation Planning Requirements prepared by the Department of Health and Department of Ecology, data collection is required to project public water systems' water demand and to provide a basis for the evaluation of the effectiveness of conservation programs. Data collection for the baseline period between 1988 and 1997 has been compiled and is contained in chapter two of this Water System Plan. The data collection schedule for the City's water system is shown below by data type and frequency and will be collected on an ongoing basis:

- source of supply meter - daily readings, report monthly and annual totals
- emergency interties/wholesale - monthly (if applicable)
- peak day/peak month/annual totals
- unaccounted for water - monthly
- accounted for water - monthly
- service meter readings - monthly/annually
  - single-family
  - multi-family
  - commercial/government/industrial
  - agriculture
- population served - annual totals
- economic data - existing water rights
- conservation data - yearly

Water Demand Forecast

The Conservation Planning Requirements identify appropriate demand forecasting methodology for public water systems with 10,001 to 25,000 services to evaluate supply demands. Kent's water demand has been forecast in Chapter two of this document, and includes demand forecasting for three customer classes; single-family, multi-family, and commercial/governmental/industrial. Factors used in developing demand forecast include use, rates, land use zoning, population, and conservation. The water projections are based on actual data that reflects both existing trends and trends adjusted for changes in land use and implementation of conservation programs.
City is budgeting for a new Utility Billing software which will provide a more desirable reporting and database capabilities relating to water use and conservation savings.

Kent's water conservation program elements are detailed below. Program elements previously implemented in the 1993 plan include program promotion, public education, single-family/multifamily conservation kits, water leak detection, meters for all customers, and seasonal pricing. Although it was recommended Kent implement medium system measures, the City chose to take on a more aggressive approach and include recommended large system measures. An update on implementation of these elements and new program efforts is contained herein.

In addition, the City of Kent continues to work cooperatively with surrounding water purveyors to develop, promote, and coordinate programs promoting water conservation on a local and regional level and is an active participant in the South King County Regional Water Association.

Kent recognizes the continued need for long term conservation planning to meet future water demands and continued increases in population. As shown in the Water System Plan, other than obtaining a portion of water supply from Tacoma’s Green River Pipeline #5, future source development includes construction of an impoundment reservoir to store winter flows from existing sources (Clark Springs, Kent Springs, and Pipe Line #5) for utilization during the peak summer demand period.

**CONSERVATION OBJECTIVES**

In 1993 when the water Conservation Program was first developed and implemented, the goals of the program were to attain a 6.5 percent water reduction by 1995 and 8 percent reduction by the year 2000. Table 4-1 below identifies data collected for a twelve year period between 1988 and 1999. This data was used to determine and evaluate consumption trends and the effectiveness of conservation programs. During that time period, data collected showed a 16.7 percent reduction in average use per connection (with the largest reduction of 13.8% in 1997), while the growth rate for service connections increased by 36.21 percent.

Through conservation efforts at the local as well as regional level, the City of Kent has already surpassed the 8 percent water reduction goal for the year 2000. However, conservation efforts will become even more critical in the future as shown by projected growth rates in our area versus the available water supply. New goals for the future include, an annual reduction of 2 percent per connection. However, these percentages could begin to decline and eventually level off once conservation measures that have the greatest impacts on water consumption are implemented (i.e., retrofit programs for residents, low-flow plumbing fixtures, low flush toilets, landscape management, submetering apartments and commercial business).
Table 4-1
Average Use Per Connection History

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Connections</th>
<th>Total Production (MG)</th>
<th>Average per Connection (MG)</th>
<th>Percent Change</th>
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</thead>
<tbody>
<tr>
<td>1988</td>
<td>9,005</td>
<td>2,713.571</td>
<td>0.3013</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>9,416</td>
<td>2,849.917</td>
<td>0.3027</td>
<td>+ 0.46</td>
</tr>
<tr>
<td>1990</td>
<td>9,585</td>
<td>3,120.207</td>
<td>0.3255</td>
<td>+ 7.0</td>
</tr>
<tr>
<td>1991</td>
<td>10,417</td>
<td>3,143.092</td>
<td>0.3017</td>
<td>- 7.9</td>
</tr>
<tr>
<td>1992</td>
<td>10,798</td>
<td>3,048.149</td>
<td>0.2823</td>
<td>- 6.9</td>
</tr>
<tr>
<td>1993</td>
<td>10,290</td>
<td>2,907.216</td>
<td>0.2825</td>
<td>+ 0.07</td>
</tr>
<tr>
<td>1994</td>
<td>10,407</td>
<td>3,228.763</td>
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</tr>
<tr>
<td>1995</td>
<td>10,701</td>
<td>3,139.754</td>
<td>0.2934</td>
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<tr>
<td>1996</td>
<td>10,898</td>
<td>3,124.020</td>
<td>0.2867</td>
<td>- 2.4</td>
</tr>
<tr>
<td>1997</td>
<td>10,977</td>
<td>2,769.426</td>
<td>0.2523</td>
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</tr>
<tr>
<td>1998</td>
<td>12,148</td>
<td>3,134.652</td>
<td>0.2580</td>
<td>+ 2.0</td>
</tr>
<tr>
<td>1999</td>
<td>12,266</td>
<td>3,079.588</td>
<td>0.2510</td>
<td>- 2.8</td>
</tr>
</tbody>
</table>

These goals will be attained by reaching the following objectives:

- improve efficient delivery of water
- reduce the amount of water wasted in the delivery process
- attain maximum utilization of current supplies
- coordinate and support services and programs with adjacent water purveyors
- reduce peak daily consumption
- reduce peak monthly consumption
- reduce total annual consumption
- continue and enhance public awareness and education programs

EVALUATION OF CONSERVATION MEASURES

The following table 4-2 lists the recommended conservation measures as identified in the CONSERVATION PLANNING REQUIREMENTS for medium sized public water systems. The City of Kent's conservation measures are also shown.
The recommended conservation measures outlined in the Conservation Planning Requirements are grouped into four categories: 1) public education, 2) technical assistance, 3) system measures, and 4) incentives/other measures. Kent will continue to implement and expand conservation programs and measures as recommended for large systems, above and beyond our required measures.

A. PUBLIC EDUCATION

The public education programs as recommended in the Conservation Planning Requirements were implemented during the previous conservation plan update. The
City continues to implement and expand upon these programs which include school outreach, speakers bureau, program promotion and theme shows and fairs.

1 School Outreach Programs - From 1991-1996, the City of Kent sponsored the “Small Change Theatre” to perform live theatre communications programs about water to local elementary school children. The plays also included audience participation and written educational materials. During the six year period, presentations were given to nearly 25,000 students, grades K-6. In 1995, the City of Kent, along with local water purveyors, sponsored a “Water and the Environment” workshop for educators in the school district. Over 28 elementary, junior high and high school teachers attended the two day workshop. Hands on activities, interactive lessons, presentations and field experience provided the attendees with valuable information and tools to incorporate into their teaching curriculum. Ongoing programs include, City staff making presentations to students grades K-12, to discuss Kent’s water issues, conservation, water supply and demand, and our wellhead protection area. These presentations give an overview of our water resources and information will be incorporated into classroom curriculum. Beginning in 1998, the City of Kent, Puget Sound Energy, and local purveyors have co-sponsored “In Concert with the Environment” (ICE). This intensive program has been presented to junior high students and includes conservation, energy, water, air pollution, recycling, waste, and students conducting their own home energy audits.

In March, 2000, the City of Kent, Covington Water District, and other local water purveyors, co-sponsored H2O 2000-a Water Festival for over 1,400 fifth and sixth graders from Kent and surrounding South King County communities. The one-day event teaches students about water and protecting and preserving this valuable resource through hands-on activities presented by professionals from throughout western Washington. The water festival will continue to be an annual event.

Additional programs and activities include school presentations, assisting with preparation of curriculum material, tours of facilities including watersheds. The City has developed a conservation material library and will continue acquiring materials such as videos, slides, visual displays and written material for schools to use in their classroom studies.

2. Speakers Bureau - The City of Kent, in cooperation with local purveyors, have available to give presentations to groups, organizations, schools, businesses, and local residents to encourage water conservation practices. Kent has compiled several videos and written materials related to water. Future projects will include narrated video tours of the City’s watershed and facilities. Copies will be made available to local libraries for use by the public and shown on the City’s government cable channel.
3. **Program Promotion** - Ongoing since 1991, Kent has worked with local purveyors to distribute lawn watering calendars to area residents as a guide for lawn watering schedules and as part of the summer watering campaign. Kent also distributes water conservation information through the utility billing system. Since the 1991, over 300,000 conservation items have been distributed to local residents and businesses through utility bills. Direct mailing to residents and business promoting programs such as grasscycling, composting and protecting our drinking water, have been mailed to all residents and businesses. Articles on water conservation are included in every *Environmental News* newsletter which is distributed to 60,000 Kent residents and businesses. To date, over 500,000 newsletters have been distributed. Kent along with local water districts purchase advertising in local newspapers during the summer months to promote water conservation. Classes and workshops will be scheduled to show methods of installing home water conservation devices, to provide information on types of devices available, water conservation ideas and methods for the home and business, how to read a water meter, water supply sources and issues, outdoor watering techniques, and water conserving landscape ideas and alternatives.

During the fall of 2000-2001, the City in cooperation with the school district landscaping and horticulture class, will be designing and installing an arboretum using native plants, low water use irrigation devices and recycled products. Educational brochures will be produced for distribution, and the facility will serve as an educational example of low water use landscaping designs. Volunteers will be utilized to provide stewardship of the site, including providing education and outreach.

The development and ongoing expansion of the conservation library includes a wide range of multi-media materials. Brochures, pamphlets, books, portable displays, slide and video presentations relating to water conservation will be available to use at fairs, town meetings, open houses, community events, public meetings, schools and businesses. The City also uses the Kent government cable television station and the City’s web site to promote conservation programs.

4. **Theme Shows and Fairs** - The City of Kent provides staff, water conservation materials and displays to local and regional theme shows, fairs, festivals and the annual City Open House. In October of 1995, Kent hosted the main site for a county-wide *Festival of the Rivers* which included booths and displays on water conservation, distribution of informational brochures and water saving devices, and interactive programs. Future programs include distribution of water conservation kits and educational materials at annual community fairs and festivals. The City of Kent and Covington Water District jointly designed and created a “Water Drop” costume for use at fairs,
community events, parades, etc to promote conservation and distribute materials

B. TECHNICAL ASSISTANCE

Kent provides ongoing assistance to customers within its service area, in addition to working with local purveyors to provide technical assistance to customers as well as researching and conducting technical studies.

1. Purveyor Assistance - The City of Kent will continue to work with other purveyors to provide assistance in developing and implementing conservation plans. The City's participation in the Water Conservation Coalition of Puget Sound and regional coordination in developing and implementing programs for the Puget Sound area, increases the effectiveness of water conservation. Since 1998, the City of Kent has participated in a program sponsored by the Northwest Energy Efficiency Alliance which includes utilities in Washington, Oregon, Idaho and western Montana. The Energy Star program promotes high efficiency tumble action washers which reduce water use by up to 40 percent, and energy use by up to 60 percent. As an incentive to purchasing the washers, the City offers a $50 rebate to water customer. Since the program's inception, the City has processed 95 rebates to residential water customers and 50 rebates to commercial and multi-family complexes for purchase of the front loading, water efficient washing machines. In addition, the City offers a $50 rebate to water customers who replace an existing 5 gallon flush toilet with a new 1 6 gallon (or less) flush toilet. 100 toilet rebates have been processed to date. The rebate program is ongoing.

2. Customer Assistance - Through the development of educational programs, information, and staff training on water conservation methods and devices, the City provides direct assistance to customers to facilitate water conservation. City utility workers provide ongoing customer services. Meters are rechecked when indications show high and unusual water consumption. Water Conservation kits are provided which include simple water saving devices, instruction on how to check for possible water leaks on the property, and how to read the water meter. Customers are encouraged to contact the City for additional assistance.

3. Technical Studies - In 1991, the City of Kent and local purveyors hired a consultant to conduct a residential indoor water use survey. Survey results included customer perceptions of available water supplies, customer behavior and attitudes, and knowledge and use of conservation practices. Information collected from the survey was used to develop appropriate conservation programs which have since been implemented. The survey will be conducted in the future to audit changes in customers conservation practices, awareness, attitudes and the success of implemented programs and practices.
Beginning in late 1999 and into early 2000, the City hired a consultant to perform water audits of both indoor and outdoor water use systems for all City facilities. Existing systems were analyzed to determine current water use and system inventory, operation and conditions. Utility bills were reviewed and compared to system usage estimates. A detailed report was compiled with proposed modifications for retrofit or replacement of existing systems in order to save water. Modifications included proposed system description and configuration, proposed water use and water savings from baseline, and estimated cost for the implementation of the proposals. In July 2000, the City began replacement option (instead of retrofit option) of all City facilities. Through implementation of this replacement program, it is projected the overall annual water use for all facilities will be 23% less, nearly 600,000 cubic feet of water saved annually.

Beginning in late 2000, early 2001, the City will begin conducting water conservation audits of commercial and industrial properties which have the highest annual water usage and which could potentially have substantial reduction in annual water consumption. Future plans include water audits of residential customers within the water service area.

4. **Bill Showing Consumption History** - The City of Kent has revised the present billing system to include showing consumption history on customer bills, thus encouraging additional water conservation practices. The program was implemented in May 1998.

**C. SYSTEM MEASURES**

System measures include a 100 percent metered system, unaccounted water/leak detection, and high technology meters.

1. **Source Meters** - The City has source meters installed at all sources. Meter testing and repairs are ongoing as part of the preventive maintenance program.

2. **Service Meters** - The City of Kent requires a metered system for all domestic and/or industrial consumption of water. Additionally, all water service connections and plumbing must conform to relevant Washington State plumbing codes and City of Kent standards. Meter testing and repairs are ongoing as part of the preventive maintenance program. The City will be investigating future programs to sub-meter apartments and commercial businesses.

3. **Unaccounted Water/Leak Detection** - In 1991, the City conducted a leak survey of the oldest sections of town. A very minimum number of leaks were found and repaired. In addition, rebuilding the Kent Springs Transmission...
Main, (a 50 year old concrete main which was structurally unreliable and unable to convey the flows it was designed to carry), has been completed. Within the last run alone, the City was losing 200 gpm, but through completion of the repair project, that amount is now near zero. The City’s inspection, repair, and replacement program is ongoing as a part of the preventive maintenance program, such as recent rescaling of the Guberson Street Reservoir which saved 120+ gpm in daily loss. Unaccounted for water is monitored closely and future monitoring programs include metering of dead end main flushing and metering of contractors flushing newly constructed systems. The City’s water system also includes a state-of-the-art automated computerized control and telemetry system, which is an aid in tracking system demands and production, as well as monitoring for significant water system losses. This allows for rapid response in repairing leaks which occur in isolated areas such as Kent’s Transmission Mains.

D. INCENTIVES/OTHER MEASURES

Incentives and measures for the water conservation plan include single-family/multi-family retrofit kits, new conservation practices for nurseries and agriculture, landscape management, conservation pricing, utility financed retrofit, seasonal demand management and recycling and reuse programs.

1. **Single-Family/Multi-Family Kits** - The City distributes kits containing water saving devices and informational brochures at it’s annual open house, fairs, festivals and special events. The kits are publicized through the city-wide newsletter and have been distributed to single-family residential homes, multi-family apartment complexes and condominiums along with educational materials. The City of Kent Home Repair Program is also available to low income and elderly residents to assist in installing devices and making minor repairs. Kent also works with local and regional water purveyors to promote and distribute materials and devices in a regional effort. Future programs include utilizing volunteers to distribute conservation kits/devices to all apartment complexes, and single-family residents, distribution of rain gages, and shower timers, and availability of water barrels for purchase at low cost.

2. **Nurseries/Agriculture** - The City will continue to encourage the application of new technology for irrigation systems that will achieve greater irrigation efficiency. A computerized irrigation system was installed during construction of the City’s golf course to increase efficiency in irrigation. Water for the irrigation system is taken from on-site wells. The City’s composting demonstration site nursery and arboretum serves as a community and regional educational display for water conservation ideas and practices. Native and low water use plants propagated at the nursery will be used for planting at City facilities, parking lots, medians and other areas to promote the use of...
native vegetation and other low water use plants. City facilities and departments will continue working together to promote and demonstrate water conservation practices.

3. **Landscape Management/Playfields/Xeriscaping** - Kent will continue to encourage the use of low water demand landscaping by commercial, industrial, public and private water customers throughout the area. Educational materials, workshops, hands on training, demonstrations, tours of low water use facilities and the use of speakers will be utilized to promote new landscaping ideas and methods to achieve greater irrigation efficiency. Future programs scheduled for 2000-2001 will include landscape assessments if commercial, industrial and residential properties. The landscape assessments will target high-use customers that have the greatest potential for reduction in water use. High water users will be identified through the water data collected. The program will be publicized through the utility billing and community newsletter.

In the Spring of 1998, the City revised the landscaping code to encourage the wise and efficient use of water and prevent waste of water. The revised codes include the use of native vegetation and low water vegetation. Included in the City's Construction Standards are landscaping water requirements, irrigation system design and performance requirements for new construction.

3. **Conservation Pricing** - In July 1992, the City of Kent implemented seasonal water rates effective May 1 through September 30, to encourage water conservation. The old rates for October 1 to April 30 were one dollar and twenty-four cents per one hundred cubic feet plus a monthly demand charge for service and meter, and from May 1 to September 30 the monthly rate was one dollar and sixty-four cents per one hundred cubic feet plus a monthly demand charge for service and meter. In November, 1999, the City Council amended the ordinance to reflect new, conservation water rates for customers. Effective December 31, 1999, the monthly rate form October 1 to April 30 is one dollar and twenty-four cents ($1.24) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus one dollar and sixty-nine cents ($1.69) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. The monthly rate form May 1 to September 30 is one dollar and sixty-four cents ($1.64) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and nine cents ($2.09) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. Implementation of this rate structure promotes water conservation throughout the year and especially during the critical summer months. Implementation of the water bill showing consumption...
history and continuing to provide customers with education and information relating to water conservation will encourage wise and efficient use of water.

5. **Utility Finance Retrofit** - The City has developed program options for utility finance retrofit for existing residential, commercial, and industrial facilities. Programs range from rebates for consumer purchased low water use fixtures, arranging for suppliers to provide fixtures at a reduced price, or to provide fixtures at no cost. These include low-flow showerheads, faucets, water efficient washing machines and low-flush toilets.

6. **Seasonal Demand Management** - In June of 1980 the City adopted “Water Shortage Emergency Regulations” establishing methods and regulations for rationing water during a water shortage emergency. In addition, the City’s new rate structure promotes and rewards water conservation efforts throughout the year. Future plans also include preparing a waste water ordinance focusing on wasteful uses of water such as gutter flooding, watering sidewalks and driveways, etc. Through City utility bills and the city wide newsletter, conservation materials are distributed, such as watering schedules, summer watering tips, etc., to promote conservation and reduce peak day impact on the system.

7. **Recycling/Reuse** - The City of Kent is continuing to examine possibilities for water reuse and recycling as a method to reducing water demands. Future plans include identifying potential sources of reclaimed water, identification of potential users and encouraging reuse of water through water rates which provide an incentive for major industrial water users to develop treatment/reuse/recycle systems.

**MONITORING CONSERVATION MEASURES**

Monitoring and evaluating the individual conservation measures during and after implementation of the conservation plan are essential to judging the effectiveness of the plan. It is important to develop reliable data to use in analyzing the actual water use to identify whether goals and objectives are being met. Factors such as population, growth rate, and revenue will be taken into account when the year ending evaluation of the conservation measures is conducted. Looking at changes in population and growth rates will help determine what effect the changes have on the demand for water. The City is researching and will be acquiring new software for better and more accessible data for water use, consumption, and for review of conservation efforts.

Important monitoring data which will be kept for each conservation measure includes:

- The type of measure implemented, level of implementation, duration and date when implemented.
2. The number of customers affected by the measure in each category, i.e., the number of customers who received utility bill inserts, the number of brochures distributed, newspaper articles, and other conservation literature distributed.

3. The number of conservation kits, rebates and devices distributed.

4. The expected amount of savings from each of the distributed conservation devices.

5. The number of customers who installed conservation devices.

6. The average water used in a specific activity by each category of customer before implementation of a conservation measure targeted for that activity and after implementation of the conservation measure.

TARGET WATER SAVINGS PROJECTIONS

Since 1988, per connection water consumption in the City of Kent has declined an average of 2% per year. It is projected that, these water savings will continue on an annual basis as new and existing conservation programs implemented are ongoing.
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Chapter 5
Water Resources

The City of Kent (Kent) is served by multiple groundwater sources located throughout its water system service area. They include Clark Springs, Kent Springs, East Hill Well(s), Garrison Creek Well, Armstrong Springs, Soos Creek Well, Summit Well, O'Brien Well, 208th Street Well, and 212th Street Wells. These sources of supply are served by aquifers that underlie the Green and Cedar River basins and fall within and without Kent's water service area and City limits. At this time, these sources are responsible for meeting all of Kent's existing and projected water supply demand. The following chapter describes Kent's source conditions, water rights and water facilities.

Kent Source Aquifers - Background

The main aquifer within the Green River valley is the recent alluvial aquifer (Qal) that occurs within the Pacific/Algona/Auburn areas, and in the Renton area. The Qal aquifers generally occur at depth of less than 100 feet, are unconfined, and are in hydraulic continuity with multiple surface water systems (White, Green, and Cedar Rivers). Aquifer recharge is from direct infiltration through the land surface, and lateral groundwater inflow from deeper aquifers in the adjacent uplands. Natural aquifer discharge is to the above-mentioned rivers. The Qal aquifer within the Renton area (6 miles north of Kent) is very productive with well yields that typically exceed 1,000 gpm. The Qal aquifer within the Algona/Pacific/Auburn area (6 miles south of Kent) is moderately productive with well yields on the order of 500 gpm. Water resources in these aquifers are used by several jurisdictions, including the Cities of Pacific, Auburn, Renton, and Algona.

The Qvr aquifer occurs within the Auburn area at depths of a few tens of feet below ground surface to as much as 250 feet below ground surface. The aquifer is very productive given its high permeability and abundant recharge, both from the surface and from the surrounding uplands. The aquifer discharges naturally to the Green River. The characteristics of the Qvr aquifer (extent, thickness, transmissivity, etc.) are well-defined from previous studies by the City of Auburn. No significant aquifers have been identified within the Green River Valley in the Kent area.

The Qvr aquifer also occurs within the southeast portion of the Covington Uplands. The aquifer serves as a source of supply to the major spring sources that serve the City of Kent (Kent, Clark, and Armstrong Springs). The aquifer is shallow, and unconfined, recharge is relatively high due to the coarse-grained nature of the surficial soils and underlying geology, and the abundant precipitation that falls on the area. Natural aquifer discharge is to tributaries such as Jenkins Creek and Rock Creek, which discharge to Soos Creek and the Cedar River, respectively. These basins have been closed to further appropriations by Ecology through administrative rule and/or policy.

The Qva aquifer occurs primarily on the western portion of the Covington Uplands. Low-permeability glacial till overlies the aquifer and limits the amount of direct recharge from precipitation (Bauer and Mastin, 1997). Well yields are moderate to low, but the aquifer...
serves many domestic wells and is the source of supply for most of the wells serving King County Water District 111. Natural discharge from the Qva aquifer occurs to the headwaters of Big Soos Creek.

The Qc2 aquifer occurs throughout much of the Covington Uplands. In many areas it can be difficult to distinguish the Qc2 aquifer stratigraphically from the overlying Qva aquifer. Glacial till overlies large portions of the aquifer, limiting the amount of natural recharge from direct precipitation. The Qc2 aquifer serves as a major source of supply in the east Covington Uplands near Lake Sawyer, and appears to be in hydraulic communication with the north/northeastern end of the lake. Attempts to develop new supplies from this aquifer (e.g., the Witte wellfield) have been stalled due to claims of vertical hydraulic communication with shallower aquifers that are in turn connected to surface water bodies (Massmann, 1995). Natural discharge from the aquifer occurs primarily to the lower reaches of Soos Creek.

The Qc3 and Qc4 aquifers occur within the Kent area near the valley wall and within other localized areas of the Covington Uplands (e.g., at Kent’s Soos Creek Well). The aquifers are relatively productive near Kent, with well yields that can exceed 1,000 gpm. These deep aquifers are confined beneath the Covington Uplands and receive their recharge as regional-scale downward leakage through the confining aquitard layers. Natural discharge from aquifers that outcrop in the major river valley walls is in the form of springs and seeps which feed the surface rivers. The deeper aquifers (at or below sea level) may discharge naturally to deep valley-filling sediments or through upward leakage across confining aquitard layers in the valley margins. Rates of leakage are usually low, giving rise to good degrees of confinement, as evidenced by artesian water levels in some of the wells located at lower elevations.

There is a general absence of deep well information within the Covington Uplands that might be expected to reveal lateral extensions of these aquifers to the east. Deeper exploratory wells (>500 feet deep) that have been drilled at Kent Springs, and within the KCWD 111 and Covington Water District areas, typically penetrate a thick sequence of fine-grained deposits (clays and silts) with a consistent absence of appreciable water-yielding horizons at depth. Bedrock occurs at shallower depths in the north and east parts of the Covington Upland, limiting the potential lateral extent of any unidentified deep Qc3 or Qc4 aquifers.

Kent Source Aquifers - Reliability

As noted above, five aquifer systems exist in the Covington Upland area, all of which are presumed to be part of a larger, hydrostratigraphic unit. Kent’s largest groundwater sources, including Kent, Clark, and Armstrong Springs, are located in the shallower aquifer system (i.e., Qva aquifer) situated within the Covington Uplands which flows or discharges to both the Green and Cedar Rivers. Upstream of Clark Springs, the groundwater flows east to west, but at Clark Springs the flow pattern splits, with groundwater discharge going to both the Green and Cedar Rivers.
The groundwater split which feeds Clark Springs has been determined by King County, Kent and Ecology to discharge to Rock Creek, which is tributary to the Cedar River and closed to further appropriation. The groundwater flowing towards the Green River is intercepted by the City's Kent Spring's and Armstrong Springs wells. This same water flows toward Lake Sawyer, which discharges into Covington Creek, which in turn discharges into Soos Creek, which is tributary to the Green River. Kent Springs has also been determined to flow into Jenkins Creek, which also flows into Covington Creek and the Green River.

With the exception of one water right (irrigation of River Bend Golf Course) all of Kent’s water rights authorize continuous and annual withdrawals of the quantities cited within. However, the production of most of Kent’s groundwater sources has become limited by the inability of the source aquifer systems to produce reliable flows 12 months a year.

**Groundwater Studies/Pumping Tests**

The geology and hydrogeology of southwestern King County, encompassing the Kent area has been summarized in a series of reports including Luzier (1969) and Woodward et al. (1995) the South King County Ground Water Management Plan (1989), and local area Wellhead Protection Plans (Covington Water District, 1995, King County Water District 111, 1996, and the City of Kent, 1996). In addition to these studies, Kent has undertaken two additional groundwater studies.

In November, 1997, Kent authorized Hart Crowser to conduct a well field evaluation of its Clark and Kent groundwater systems. This Study, which was completed in June, 1998, included evaluating the maximum well field yield using the MODFLOW groundwater flow model developed for the Kent Wellhead Protection Study.

**Rock Creek Resource Protection Program**

Because of Rock Creek’s outstanding natural habitat and its role in supporting the Clark Springs Water System, Kent has a substantial and ongoing interest in preserving the health and vitality of the Rock Creek watershed. To this end, the Kent City Council on January 8, 2001, authorized the Public Works Staff and legal counsel to notify National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) of the Kent’s intent to develop a Habitat Conservation Plan (HCP) for purpose of securing an Incidental Take Permit (ITP). Prior to this Council action, the Public Works department had already developed and implemented a number of programmatic actions that are devoted to the following general objectives: (1) promoting responsible resource protection measures by governmental agencies and private parties within the Rock Creek watershed; (2) sustained and effective monitoring of flow and aquatic habitat conditions; (3) improving flow and aquatic habitat conditions in Rock Creek, and (4) substantially minimizing/avoiding adverse operational effects upon listed species and aquatic habitat.
The specific programmatic actions intended to achieve the foregoing objectives, and presumed to be key factors in Kent’s HCP effort, are cited below.

(1) Impact Assessment/Response to Local Government Land Use actions

When reviewing SEPA and land use permit applications falling within the Kent-Covington Wellhead Protection Area (WHPA), Kent staff provide comments to SEPA lead agencies that address the following goals and objectives

- Encourage developers and reviewing agencies to maintain a no net loss standard re. aquifer recharge,
- Encourage lead SEPA and land use permitting agencies (e.g., King County/Maple Valley) to require all known and reasonable technologies to decrease potential impacts to water quality and quantity;
- Encourage lead agencies to require the use of native vegetation to promote water conservation and reduce pesticide and fertilizer application,
- When necessary and appropriate, encourage agencies to require monitoring of groundwater quality and quantity,
- Encourage lead agencies (e.g., King County) to record on the face of plats that land-use applications are located in a critical area as defined by the Growth Management Act, RCW 36 70A,030(5)(b),
- Encourage signage for educational purposes and prevent illegal dumping in open tracts and easements,
- Encourage lead agencies to require developers to create an educational program on general water quality protection for future homeowners The City of Kent would be a willing participant in the creation of this program,
- Encourage lead agencies to require removal of existing, underground storage tanks by certified companies, and
- Encourage agencies to require applicants to develop and apply best management practices where applicable,

(2) Aquatic Habitat Resource Monitoring and Protection

Kent is committed to the working for the preservation of Rock Creek’s environmental values and high quality aquatic habitat. To this end, Kent has made a programmatic commitment to undertake and/or maintain the following activities

- Placement of an additional stream gauge, with telemetry, in Rock Creek at an appropriate location below Kent’s existing flume gauge, and below the existing King County staff gauge
- Recalibrate when appropriate, and increase maintenance of Kent’s Rock Creek flume gage to ensure accurate flow readings. (Please See Attachment H)
• Retain qualified fisheries biologists to conduct annual monitoring of streamflow conditions to assess suitability for salmonid spawners, particularly during the low flow months of late summer and early fall.

• Consult with retained, qualified fishery biologists to determine when it is appropriate and necessary to improve streamflow conditions, beyond the minimum levels required in Kent’s Clark Springs Wells water right, in order to support salmonid spawning and other critical life stages, through direct flow augmentation and/or temporary modification to the withdrawal pattern of the Clark Springs Water System facilities

• Work to identify and advance habitat protection measures and projects in the Rock Creek watershed that offer significant and sustained benefits to fish This includes making financial contributions to credible and scientifically sound habitat protection/restoration projects within the watershed, and acquiring property that provides clear, substantial, and scientifically-supported biological benefits to Rock Creek fish, flows, and aquatic habitat

To illustrate some of the program activities discussed above, through late summer and fall of 2000, Kent closely monitored flows and concurrently undertook a salmonid spawner (including chinook) study on Rock Creek As the study evolved, Kent determined, with the assistance of consulting fishery biologists, that the on-going dry, seasonal conditions could impede salmonid spawner use of Rock Creek Consequently, in early October, Kent modified its Clark Springs Water System operations, in addition to providing direct flow augmentation to Rock Creek, prior to the arrival of the Cedar River fall chinook run, to ensure that approximately 4 cfs was available for sockeye, fall chinook, and other salmonids While this flow was suitable for use by chinook, no chinook spawners were observed using Rock Creek as of mid-November, even under higher flow conditions Instead the system was dominated by large numbers of spawning sockeye. Augmentation actions in future years will vary depending on flow, aquatic habitat conditions, and potential adverse impacts upon public health and safety

The City of Kent is aware of the importance that residents of Kent, King County, Maple Valley, Ravensdale, Covington, and other communities place on maintaining Rock Creek’s outstanding habitat values Kent shares the same goal However, because Kent does not regulate land use within the Rock Creek watershed, its ability to preclude or minimize the land use impacts of other parties and local governments upon watershed habitat has been, and remains fairly limited Nonetheless, Kent has been held responsible, however unfairly, by many parties for most of the ills affecting Rock Creek, particularly with regard to instream flows

Although Kent’s water supply operations hold the potential to affect Rock Creek flows, as noted above, Kent has made a substantial programmatic commitment to significantly minimize, if not fully avoid, such effects. Further, it is Kent’s belief that many of the flow and habitat impacts attributed to Kent by King County staff and some private parties
are without credible scientific foundation, deliberately ignore their own contribution to flow and habitat degradation, disregard natural conditions, and mischaracterize Rock Creek as historical habitat for large numbers of ESA listed species, such as chinook salmon and bull trout.

It is important to note that since the Clark Springs Water System was put in place over 40 years ago, King County has allowed significant logging activity and permitted over 20 significant residential developments in the Rock Creek watershed. It is well-established in the scientific community that deforestation, in combination with increased impervious surfaces commonly associated with commercial/residential development activity, can adversely affect groundwater recharge, decrease groundwater and surface water quality, increase the duration and intensity of stormwater discharges, and negatively affect natural hydrologic systems.

There is credible reason to believe that development activities permitted by King County and other jurisdictions have contributed to and/or caused many of the adverse environmental impacts discussed above that are affecting the Rock Creek watershed. There is also reason to believe that the proliferation of largely shallow, exempt wells developed in the Rock Creek watershed involving homes permitted by King County, have and continue to, adversely affect groundwater recharge and instream flow conditions. Absent positive efforts by King County and other responsible jurisdictions to address these issues, Rock Creek flows and habitat are likely to experience further stress.

Under any circumstance, Kent will continue to monitor and protect flows, aquatic habitat, and fish within the Rock Creek system, while maintaining the viability of its Clark Springs Water Supply System. From an operational context, this means that Kent’s withdrawal pattern approach will be flexible, scientifically-based, and responsive to flow and habitat conditions, as described in the programmatic commitments discussed above. Kent would welcome other responsible local agencies and community groups to make positive, constructive, and science-based contributions to the Rock Creek watershed.

**Existing Water Rights and Water Supply Facilities**

**Existing Water Rights**

At this time, Kent holds twenty-three (23) water rights that authorize a total annual withdrawal (Qa) of 19,885 af/yr (17.75 mgd), and a total instantaneous withdrawal (Qt) of 23,458 gpm or 33.8 mgd. Within that total number of rights, Kent holds fifteen (15) certificated, primary groundwater rights, one (1) claim, six (6) certificated, supplemental groundwater rights, and one (1) supplemental, certificated surface water right. Kent’s supplemental rights (Qa) total 9,114 af/yr.

Kent’s two largest sources, Clark and Kent Springs, are located 10 to 15 miles east of Kent, in the Cascade foothills, near the cities of Covington and Maple Valley. Several of Kent’s other sources are scattered along a corridor roughly paralleling the Kent-Kangley.
Highway running east to west, also the route of Kent's two primary transmission mains. Kent also has sources along the eastern rim of the Kent valley running north to south, as well as several located in the Kent valley itself.

Clark and Kent Springs provide almost 75% of Kent's current water system needs, or 11 mgd. The Clark Springs System provides the bulk of Kent's supply under all conditions. Kent's other water sources are primarily groundwater wells located in various pressure zones in the East Hill, West Hill, and Valley areas of the City.

### Table 5-1

**Water Rights Held by the City of Kent**

<table>
<thead>
<tr>
<th>Water Right / Claim File #</th>
<th>Priority Date Month / Year</th>
<th>Source Name</th>
<th>Max GPM</th>
<th>Max AF / Year</th>
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<tr>
<td>3107-A</td>
<td>02/57</td>
<td>Clark Springs &quot;trench&quot;</td>
<td>2250*</td>
<td>*1350</td>
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<td>Impoundment</td>
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</table>

*Supplemental Rights

### Table 5-2

**Total Water Rights Held by the City of Kent**

<table>
<thead>
<tr>
<th>Total Primary Rights (Qa)</th>
<th>19,885 AF/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Primary Rights (QI)</td>
<td>33 8 mgd</td>
</tr>
<tr>
<td>Supplemental Rights Held (Qa)</td>
<td>9,114 AF/Year</td>
</tr>
</tbody>
</table>
Existing Water Production

As noted above, Kent's primary water rights total 19,885 af/yr (17.71 mgd) of Annual Quantity (Qa), and 23,458 gpm or 33.8 mgd of Instantaneous Quantity (Qi). At this time, the instantaneous quantities (Qi) of all certificated supplemental and primary rights have been perfected through beneficial use. Kent has applied to beneficial use approximately 15,000 af/yr of its authorized total annual quantity (Qa).

Based on population growth projections referenced in Chapter 2, Kent will require a maximum day demand (MMD) production capacity of 32 mgd (Qi) in order to meet service area demands over the next 20-30 years. Consequently, Kent has determined that in order to meet projected demands and the City's reliability standard, current sources, given seasonal/peaking reliability limitations, will need to be augmented with replacement wells, regional supply purchases, and other sources of supply.

Clark Springs Water System

The Clark Springs Water System is located off SR 516 in a protected, fenced, 300 acre section of the Rock Creek watershed (RM 1 8). This property, which is geographically separate from the City of Kent proper, was annexed to the City of Kent in 1958 for municipal water supply purposes. The balance of the area falling outside of Kent's annexed property is bounded and regulated by the City of Maple Valley on the west, and unincorporated King County to the north, south, and east. The Clark Springs Water System is used on a continuous basis throughout the year and is comprised of three (3) separate, but conjunctively managed primary sources and/or water rights: Clark Springs Trench, Rock Creek Surface Water Diversion, and Clark Springs Wells. Each of these rights/sources draw upon the same shallow aquifer source (Qvr) and are in hydraulic continuity with each other.

Given the close hydraulic connections among these sources, Kent has found it most effective from a production and environmental protection standpoint, to operate these sources in a conjunctive manner. Put another way, Kent's Clark Springs System sources are operated as a wellfield, whereby the instantaneous and annual withdrawals of the System are limited to the cumulative totals allowed under the combined Clark Springs System surface water, springs, and groundwater rights (i.e., 5,400 gpm - Qi, and 8,710 af/yr - Qa).

Although substantial development activity, related large increases in impervious surfaces, and the installation of over 300 exempt wells have been allowed to occur within the Rock Creek watershed over the past 30 years, that portion of the watershed falling within Kent's property remains in largely pristine condition.
Clark Springs Trench: Certificate No. 3107-A (Supplemental)

Clark Springs Trench is a certificated, spring-based source with an authorized instantaneous quantity (Q1) of 2,250 gpm and an annual quantity (Qa) of 1,350 af/yr, that is supplemental to Clark Springs Well Right Cert No 7660. The water right has a priority date of 1957. The water right's purpose of use is for "municipal purposes" and the designated place of use is the "City of Kent." The right was initially issued as a primary right and perfected as such. In 1969, the authorized Q1 and Qa became subject to the Q1 and Qa limits established in Clark Springs Wells right (G1-7660-A) described below. This source of supply is not, however, subject to the instream flow limitations set for the Clark Springs Wells.

Kent's Clark Springs Trench is located near Kent-Kangley Road, just east of the Maple Valley-Black Diamond Road in the 245th block east. Rock Creek flows through the property in a westerly-northwesterly direction and is tributary to the Cedar River. The water intake facilities are located in the mid-westerly part of the property at an elevation of 560 feet. Water is collected in the infiltration gallery which is constructed of approximately 500+ feet of perforated steel pipe placed perpendicular to Rock Creek, across a narrow valley of glacial till, and extending under the streambed.

The collection system and the transmission line were constructed in 1957 and allow the collection of water underground at an approximate depth of 10 to 20 feet. Water collected by the gallery system has been determined by Kent's hydrogeologic studies to come from the Qvr aquifer, which is the same aquifer source used by Kent's Clark Springs Wells and the Kent Springs Water System, as well as Armstrong Springs Wells at a lower hydraulic gradient.

The design of the Trench infiltration gallery allows the simultaneous withdrawal of water under the Trench water right as well as the Rock Creek surface water right. This design also allows Kent, when appropriate, to limit diversions allowed under its Rock Creek surface water rights (although use of this right is not subject to a minimum instream flow conditions). In such circumstances, the production of instantaneous and annual quantities authorized under the Rock Creek water right may be voluntarily reduced and shifted to the Trench. This conjunctive management approach assists Kent meet system demands in a reliable and continuous manner, while protecting instream flow conditions in Rock Creek. Any such operational shift, however, would occur pursuant to Kent's Rock Creek Resource Protection Program, even if this results in a withdrawal constraint not required by the water right.

Rock Creek Surface Water Diversion: Certificate No. 7232-A (Supplemental)

Rock Creek Surface Water Diversion is a certificated, surface water source with an authorized primary instantaneous quantity (Q1) of 5 cfs/2,250 gpm. As a pre-1964 surface water right, no annual quantity limitation is assigned to the water right, although Kent has established through beneficial use, an annual quantity (Qa) for this right in the...
amount of 3,600 af/yr which is supplemental to Clark Springs Well Right Cert. No. 7660.

The Rock Creek water right has a priority date of 1931. The right’s purpose of use is for “domestic/municipal supply” and the designated place of use is the “City of Kent.” The right was initially issued as a primary right and perfected as such. In 1969, the authorized Q1 and Qa became subject to the Q1 and Qa limits established in the Clark Springs Wells right (G1-7660-A) described below. This source of supply is not, however, subject to the instream flow limitations set for the Clark Springs Wells.

Rock Creek is Kent’s only direct surface water source. Rock Creek is a tributary to the Cedar River and flows through Kent’s Clark Springs property in a westerly-northwesterly direction. The “intake structure” for this source is constructed as an extension of the infiltration gallery piping, and is a 12 inch diameter steel pipe which extends under the Rock Creek channel to the southern-most side.

As noted earlier (See Clark Springs Resource Protection Program), Kent monitors stream conditions for the purposes of protecting fish and related aquatic habitat and to substantially minimize/avoid potential adverse operational effects. During low flow events or seasonal conditions, Kent may meet its current demand requirements by shifting its withdrawal of authorized (and required) quantities to its Clark Springs Trench/infiltration gallery system. Any such operational shift, however, would occur pursuant to Kent’s Rock Creek resource protection program, even if this resulted in a withdrawal constraint not required by the water right.

As noted above, the Clark Springs Trench and the Rock Creek Surface Water Diversion system is capable of withdrawing over 4,000 gpm. Through the conjunctive management of these two sources, Kent is able to meet current demands within the combined authorized withdrawal limits of its Rock Creek and Clark Springs Trench water rights. Kent is evaluating whether it is possible to better conjunctively manage its Trench source withdrawals with its Rock Creek diversion during high flow winter months for purposes of filling a potential storage reservoir for use during summer peaking months.

Clark Springs Wells: Certificate No. 7660-A

Clark Springs (Wells) is a certificated, primary groundwater source with an authorized instantaneous quantity (Q1) of 5,400 gpm, and an annual quantity (Qa) of 8,710 af/ft from three (3) wells. The Clark Springs Wells water right has a priority date of 1969. The right’s purpose of use is for “municipal purposes” and the designated place of use is the “area served by City of Kent.”

The three Clark Springs Well are located in close proximity to and within the same property as Kent’s Rock Creek and the Clark Springs Trench Source, as described above. Each of the three wells is drilled and screened to an approximate depth of 30 to 60 feet, and tap the same Qvr aquifer that provides source to the Clark Springs Trench source and discharges to Rock Creek. All of the wells have 16 to 18 inch diameter casings and...
screens, and a combined production capacity of 5,400 gpm. The individual wells (numbered #3, #2, and #1) have a capacity of 2,700, 1,800, and 900 gpm respectively.

Because of their hydraulic continuity with Rock Creek, the operation and beneficial use of the Clark Springs Wells is conditioned on ensuring the maintenance of the following instream flows: 15 cfs from January 1 - April 30, 15 cfs on May 1 decreasing arithmetically to 2 cfs by June 30, 2 cfs from July 1 through October 31, 15 cfs from November 1 through December 31. A Parshall Flume is installed in Rock Creek to continuously monitor flow conditions. Kent also has the means to discharge untreated water into Rock Creek from its pumping station to ensure minimum flows are maintained during periods of pumping.

As a result of minimum flow conditions associated with this right, and seasonal (summer) declines in the static water level of the source aquifer level, which Kent believes may involve development impacts upon the local recharge area, exempt wells, and upland degradation of riparian habitat, Kent has encountered difficulty in sustaining the pumping levels required to meet peak demands. The periodic inability of the Clark Springs Wells to sustain their authorized instantaneous withdrawal rates currently affects the City's ability to meet its reliability/emergency standby supply requirement, and, unless resolved, is expected to impair Kent's ability to meet existing and projected peaking demands. Kent is presently studying how it may make more effective use of the Clark Springs Wells, subject to its Rock Creek Resource Protection Program.

Kent Springs Water System

The Kent Springs Water System is located near S E 288th Street and 216th Avenue S E. Kent owns 75 acres surrounding the system source site, all of which was annexed within the City of Kent in 1977 for municipal water supply purposes, but is geographically separate from the City of Kent proper. The site is segregated by Jenkins Creek that flows through the property in a westerly direction. The Kent Spring Water System is comprised of two wells and a spring fed infiltration gallery, all of which are located in the middle of the property in close proximity to each other.

The infiltration gallery is 5 to 10 feet below the surface, while the wells are drilled to a depth ranging from 70-75 feet at the edge of a nearby plateau. Both sources withdraw supply from the same shallow Qvr aquifer, identified by hydrogeologic studies as the aquifer which also serves the Clark Springs System at a higher hydraulic gradient. Due to their close hydraulic connection, the Kent Springs sources are operated in conjunctive manner to maximize instantaneous and annual withdrawal capacity.

Prior to the incorporation of Maple Valley in 1997, and recent annexations by the City of Black Diamond, the Kent Springs Water System property was surrounded by unincorporated King County. Today, Kent Springs is bounded by Maple Valley to the north and east, Black Diamond to the south, and unincorporated King County to the west. Because Kent does not regulate land use outside of its Kent Springs Water System.
property, Kent’s ability to affect land uses potentially affecting the recharge area for these wells, has been and remains limited.

**Kent Springs Wells: Certificate No. G1-22956C**

Kent Springs (Wells) is a certificated, primary groundwater source with an authorized instantaneous quantity (Qi) of 3,690 gpm, and an annual quantity (Qa) of 5,904 af/yr from two (2) wells. The water right has a priority date of 1977. The right's purpose of use is for “municipal supply” and the designated place of use is the “Area Served by the City of Kent Water Supply System.” The two Kent Springs Wells are sited near S E 288th Street and 216th Ave. S.E. and are drilled to an approximate depth of 70 to 75 feet. As noted earlier, prior to 1997, the Kent Springs Water System and related wells were surrounded by unincorporated King County. They are now bounded by Maple Valley, Black Diamond, and unincorporated King County. Consequently, and as noted above, Kent’s ability to affect land use actions that may adversely affect the recharge area for this source is limited.

For some years, Kent has experienced difficulty in maintaining the production capacity of the Kent Springs Wells on a sustained basis. There are a number of factors that may be responsible for this situation including normal seasonal (summer) declines in the static water levels of the Qvr aquifer, the build-up of bio-film on the well screens, development activity resulting in loss of recharge, increased aquifer use by exempt and junior permitted well sources, or a combination thereof. To illustrate, while Kent is able to pump the instantaneous quantity authorized (Qi - 3,690 gpm) during, high flow, winter conditions, seasonal aquifer constraints sometimes reduce the continuous, reliable production rate to approximately 1,390 gpm or less.

Limitations on pumping activity have significantly impaired this source’s ability to meet the Kent’s peaking demands and to act as reliable supply source. Efforts are currently underway to study how winter/high flow production rates could be used to provide source for a proposed storage reservoir. Water stored during winter pumping would be used to meet summer peaking and emergency standby/rehabilitation standard requirements. Kent is exploring the drilling of a replacement well that taps more productive areas of the source aquifer or distributes drawdown over a larger area.

**Kent Springs Infiltration Gallery (Trench): Claim No. 123225**

The second source of supply in the Kent Springs Water System is the Kent Springs Infiltration Gallery. Kent filed a claim establishing its right to withdraw waters from Kent Springs in 1975. Pursuant to its claim, Kent asserts a primary right to withdraw an instantaneous quantity (Qi) of 4,488 gpm and an annual quantity (Qa) of 965 af/yr. The purpose of the right is for municipal supply and the place of use is the area served by Kent. As noted above, Kent’s ability to affect development that may be adversely affecting source recharge areas falling within Maple Valley, Black Diamond, and unincorporated King County is limited.
The Kent Springs source is located in close proximity to the Kent Springs Wells at an approximate elevation of 480 feet. The water intake gallery is located in the middle of the Kent Springs property at an approximate depth of 5-10 feet and withdraws water from the Qvr shallow aquifer, similar to the Kent Springs Wells. Water is collected in the infiltration gallery by 90+ feet of perforated concrete piping. The gallery piping lies parallel to the base of a small hill or plateau from which the springs emerge, and are collected before surfacing, during periods of high aquifer levels. The collection system was first constructed in 1908 as one of Kent’s first sources of municipal supply.

The Kent Springs Wells and Kent Springs infiltration gallery are in close hydraulic connection with each other and withdraw water from the same Qvr source, as does Armstrong Springs. Given this connection, and the seasonal constraints that affect both sources, the Well and Springs sources are operated in a conjunctive alternating manner (wellfield approach), in order to produce amounts sufficient to meet Kent’s peak and annual supply requirements. Kent is presently studying the feasibility of enhancing withdrawals from its Kent Springs system in order to provide supply to a proposed storage reservoir, and thereby meet summer peaking and reliability standard requirements. The gallery is used during periods of high aquifer levels (i.e., winter) in order to reduce the costs of pumping or to improve reliability during extreme winter weather/storm events.

Armstrong Springs: Certificate No. G1-24073C – (Supplemental)

Armstrong Springs Wells is a certificated, supplemental groundwater source with an authorized instantaneous quantity (Qi) of 1,300 gpm and an annual quantity (Qa) of 500 af/yr from two (2) wells. The water right has a priority date of 1982. The right’s purpose of use is for “municipal supply” and its designated place of use is “area served by the City of Kent.” The Armstrong Springs wells are used primarily during the high demand/summer months (90 day production schedule) to meet summer peaking requirements and offset a portion of seasonal supply deficits from Kent’s other sources.

The Armstrong Springs wells are located at SR 516 (Kent-Kangley Road), just east of Wax Road. Well One is located about 500 feet southeast of Jenkins Creek, at an elevation of 15’ above the channel. It is drilled to a depth of 107 feet and is screened between 80-100 feet. Well Two is located about 700 feet southeast of Jenkins Creek at an elevation about 15’ feet higher than the creek channel. Well Two is drilled to a depth of 90’ and screened between 66 and 80 feet. Both wells withdraw water downstream from the same shallow Qvr aquifer system that serves the Clark and Kent Springs Systems. Kent determined during its wellhead protection program study that water not captured by the Clark and Kent Springs Systems flows to the Armstrong Springs sources, thus the three sources are considered hydraulically connected.
Soos Creek Well: Certificate No. G1-24073C (Supplemental)

Soos Creek Well is a certified, supplemental groundwater source with an authorized instantaneous quantity (Qi) of 900 gpm, and an annual quantity (Qa) of 864 af/yr. The water right has a priority date of 1982. The right’s purpose of use is for “municipal supply” and the designated place of use is “Area served by the City of Kent.” The Soos Creek Well is located at 11834 Kent-Kangley Highway.

Studies by Kent indicate the source aquifer may have been affected by the development of other non-City wells over the past several years that have caused an overdraft. Compounding the problem is the fact that recharge to the confined aquifer is limited by the hydraulic characteristics of the confining layers, which may impair the aquifer’s ability to fully recover from each period of groundwater pumping during the summer months. To address this problem, Kent has budgeted $80,000 to study the feasibility of restoring the aquifer’s production capacity by diverting and injecting winter flows from its Clark Springs source. If successful, this action could potentially increase Kent’s supply by approximately 0.5 MGD.

East Hill Well 1: Certificate No. G1-23285C

East Hill Well 1 is a certified, primary groundwater source with an authorized instantaneous quantity (Qi) of 1,900 gpm, and an annual quantity (Qa) of 3,040 af/yr. The water right has a priority date of 1979. The right’s purpose of use is for “municipal supply” and its designated place of use is the “Area served by the City of Kent.” Kent’s East Hill Well 1 is located at 24525 104th Avenue SE. The well was drilled and developed to a depth of 251 feet in 1979.

Similar to other Kent well sources, production from the East Hill Well 1 is limited by seasonal aquifer conditions. Although the well remains capable of producing 1,900 gpm, summer and fall drops in the static aquifer levels have, on occasion, limited the reliable production of this source.

East Hill Wells: Certificate Nos. 2890-A, 42-D, 44-A

Kent holds three (3) certified, primary groundwater rights for three wells located on the same site as East Hill Well 1. These rights and related wells were acquired from the East Hill Community Well Company in 1978 pursuant to Kent’s annexation of the area. Certified Well No 2890-A has an authorized instantaneous quantity (Qi) of 120 gallons, an annual quantity (Qa) of 146 af/yr, and a priority date of 1956. Certified Well 42-D has an authorized instantaneous quantity (Qi) of 60 gpm, an annual quantity (Qa) of 90 af/yr, and a priority date of 1923. Certified Well 44-A has an authorized instantaneous quantity (Qi) of 90 gpm, an annual quantity (Qa) of 135 af/yr, and a priority date of 1945. All of the wells are authorized to provide water for domestic supply purposes within Kent. The depth of the three wells is approximately 236 to 275 feet.
Because the three wells are hydraulically connected to East Hill Well No 1 and their physical condition at time of acquisition, Kent has used East Hill Well No 1 as the point of withdrawal for these sources. For the past two years, however, Kent has been evaluating sites to drill replacement wells and related measures to improve the productive capacity of the source aquifer for these rights. The three East Hill wells cited above are located along the Benson Highway in the area of S E 244th Street, which is located along the eastern rim of the Kent Valley.

East Hill Wells: Certificate Nos. 651-A, 2428A

Kent holds two (2) certificated, primary water rights for two wells acquired from the East Hill Water Company in 1964 pursuant to annexation of the area by Kent. Certificated Well 651-A has an authorized instantaneous quantity (Q1) of 60 gpm, an annual quantity (Qa) of 42 af/yr, and a priority date of 1948. Certificated Well 2428A has an authorized instantaneous quantity (Q1) of 120 gpm, an annual quantity (Qa) of 78 4 af/yr, and a priority date of 1953. The wells are authorized to provide water for domestic supply, municipal, and irrigation purposes. The depth of the two wells is approximately 236 to 275 feet. The wells are located in the area of 108th Ave S E and the Kent-Kangley Highway.

Within the last year, the wells have been subject to test pumping to evaluate aquifer conditions and check well/screen conditions. Both of the wells are presumed to have a hydraulic connection with Kent’s Soos Creek Well, which is a candidate for an aquifer recharge project. Consequently, Kent is hopeful that the reliable, productive capacity of these sources will be improved once the Soos Creek Well recharge project commences.

Garrison Creek Well: Certificate No. G1-23614C- (Supplemental)

Garrison Creek Well is certificated, supplemental groundwater source with an authorized instantaneous quantity (Q1) of 500 gpm, and an annual quantity (Qa) of 800 af/yr. The water right has a priority date of 1980. The right’s purpose of use is for “municipal supply” and its designated place of use is the “Area served by the City of Kent.” The Garrison Creek Well is located at 218th Street and 98th Avenue and is developed to a depth of 435 feet. The majority of the recharge area for this source is outside of Kent, falling within unincorporated King County. Consequently, Kent has no effective means of regulating a substantial proportion of land use actions that may be affecting this source’s recharge area.

Although capable of producing its full instantaneous quantity when first installed, summer and fall drops in static aquifer levels have limited the production of this source to a reliable schedule of approximately 90 days per year. There are a number of factors that may be responsible including: normal seasonal (summer) declines in the static water levels of the Qvr aquifer, the build-up of bio-film on the well screens, and development impacts on recharge areas, or a combination thereof. Analysis of well maintenance...
schedules indicate that the Garrison Creek Well screens have not been cleaned for over
15 years. This fact alone may be the cause of the well's production problems. Screen
cleaning is scheduled to occur within 2001.

This well has been a potential candidate for artificial recharge as a means of restoring it to
original aquifer levels. Recent testing has shown that this well taps the same aquifers as
the 212th, 208th, and O’Brien Wells. Thus, the location and continuity of these sources
support a wellfield management approach. The same testing/information, however,
appears to show that artificial recharge is not feasible, due to the aquifer characteristics.

High Meadow Well: Certificate No. G1-23713C

High Meadow Well is a certificated, primary groundwater source with an authorized
instantaneous quantity (Q1) of 7 gpm and an annual quantity (Qa) of 11 af/yr. The water
right has a priority date of 1980. The right’s purpose of use is for “municipal supply” and
the designated place of use is “Area served by City of Kent.” Kent intends to transfer the
rights from this well to another well in the area, located at the Blue Boy Reservoir site, in
order to help meet Kent’s near future demands for water supply. The High Meadow Well
is located along the Benson Highway at approximately S E 228th Street.

212th Street Wells (2): Certificate No. G1-24190C (Supplemental)

The two (2) 212th Street Wells are certificated, supplemental groundwater sources with a
combined, authorized instantaneous quantity (Q1) of 2,700 gpm and an annual quantity
(Qa) of 1,400 af/yr. The water right has a priority date of 1982. The right’s purpose of
use is for “municipal supply” and the designated place of use is “Area served by the City
of Kent.” The water from these wells, as well as the 208th Street Well, require the
removal of high levels of manganese and iron to meet drinking water standards.
Construction of a Manganese Filtration Plant was completed in 1993.

The two 212th Street wells are located approximately 100 feet apart, on the east side of
SR 167 and south of S E 212th Street, in the center of the “cloverleaf onramp” for the
freeway. Both of these wells are classified as artesian wells, with an artesian pressure of
approximately 15 to 20 psi during the off-season. Well 1 is drilled to a depth of 367 feet
with 12 inch casing, and is screened from 336 to 367 feet. Well 2 is drilled to a depth of
366 feet with 16 and 20 inch casing, and is screened from 231 to 235 feet and also 331 to
356 feet. Kent has not completed the source recharge analysis for this source, so it is
somewhat uncertain where the recharge water supply for this aquifer comes from,
however it is believed to be from the foothills to the east of the well site.

208th Street Well: Certificate No. G1-24404C (Supplemental)

The 208th Street Well is a certificated, supplemental groundwater source with an
authorized instantaneous quantity (Qi) of 1,200 gpm and an annual quantity of 600 af/yr.
The water right has a priority date of 1983. The right’s purpose of use is “municipal
supply” and the designated place of use is “Area served by the City of Kent.” The well is used primarily as a summer peaking source. It is located approximately 2000 feet to the north of the 212th Street wells, at a similar elevation and also on the east side of SR 167, near 208th Street.

The 208th Street well is artesian in nature, and has been drilled to a depth of 231 feet with 16 and 12 inch casing, which has been screened from a depth of 180 to 221 feet. The two sources, 212th and 208th, are hydraulically connected, as pumping of one well will result in a drop in static artesian pressure of the others. Also, the water quality (i.e., manganese and iron) conditions in the 208th Street well are somewhat similar to those found at the 212th Street wells.

Kent operates the three wells associated with its 212th and 208th water rights as a well field. Consequently, authorized annual quantity (Qa) withdrawals are shared among all three (3) wells. The location and continuity of these sources support a wellfield management approach.

Summit Well: Certificate No. 1116A

The Summit Well is a certificated, primary groundwater right with an authorized instantaneous quantity (Qi) of 200 gpm, and an annual quantity (Qa) of 320 af/yr. The water right has a priority date of 1950. The right’s purpose of use is for “municipal supply” and the designated place of use is “City of Kent.” A recent pumping test indicated that the well has lost some production capacity as well as a reduction in aquifer levels over the years, and is “sanding.” The water quality has also deteriorated over time, and has high levels of hydrogen sulfide.

The Summit well is located on the east rim of the Kent valley, just south of James Street, on Summit Avenue. The well is located on an unused reservoir site 1/3rd acre in size. The well is drilled to a depth of 598 feet with 8 and 12 inch casing, and is not presently screened at any level. Because of the well’s current condition, Kent is considering redrilling and screening the well at the same site, or applying for a change in point of withdrawal to make use of an existing well drilled near the Blue Boy reservoir site. The Blue Boy site appears to have sufficient capacity to make use of this water right and would improve Kent’s ability to meet its short term peaking and reliability requirements.

O’Brien Well: Certificate No. 767-A

The O’Brien Well is a certificated, primary groundwater source that was acquired in 1958 from the O’Brien Water Users Association pursuant to Kent’s annexation of “the Community of O’Brien” (Cloverdale addition to Kent). The right has an authorized instantaneous quantity (Qi) of 243 gpm, an annual quantity (Qa) of 45 af/yr, and a priority date of 1951. The water right’s purpose of use is “community domestic” and the designated place of use is “Community of O’Brien,” which now falls within the City of Kent. A replacement well for the original well has been drilled and was placed in.
operation July, 2000, subsequent to receiving DOH source approval. The well’s proximity and continuity with the 212th, 208th, and Garrison Wells support a wellfield management approach, as cited earlier.

Chappelear Well: Certificate No. 1957A

The Chappelear Well is a certificated primary groundwater source with an authorized instantaneous quantity (Q1) of 140 gallons per minute, and an annual quantity (Qa) of 60 af/yr. The water right has a priority date of 1954. The right’s purpose of use is for “domestic supply and irrigation” and the designated place of use falls within the City of Kent. The well was drilled and developed to a depth of 83 feet with 8” casing. The well is located within the footprint of the future reservoir, so it is anticipated that the water right’s point of withdrawal will be transferred to a nearby, more useable well casing. The Chappelear well is located at 124th Avenue S E and approximately S E. 300th Street.

River Bend Golf Course Well: Certificate No. G1-25204C

Kent holds a certificated, primary water right for it’s River Bend Golf Course Well. It is a certificated, primary groundwater source with an authorized instantaneous quantity (Q1) of 290 gpm, and an annual quantity (Qa) of 290 af/yr for the irrigation of 145 acres. The time of use for the water right is during the “irrigation season”, which has traditionally involved the months of May through September. The water right has a priority date of 1988. The right’s purpose of use is for “irrigation” and the designated place of use is the “the River Bend Golf Course”. The well is located at the River Bend Golf course along West Meeker Street in Kent, west of the Green River and is drilled and developed to a depth of 451 feet.

Hamilton Road Wells: Certificate Nos. 494-A/4534-A

Kent holds two primary, certificated water rights for two (2) Hamilton Road Wells that were acquired in 1967 from the Hamilton Road Water Community Water Association pursuant to Kent’s annexation of the Community of Hamilton Road. The depth of both wells is approximately 200 feet, and they are located in residential areas along the eastern rim of the Kent Valley. The place of use of this right falls with the City of Kent and the purpose of use is “domestic supply”. The total instantaneous quantity (Q1) for these water rights is 50 gpm and the total annual withdrawal rate is 49 2 af/yr. It is Kent’s intention to transfer the point of withdrawal of these water rights to a site near the Blue Boy reservoir.
Applications for New Primary Rights, Supplemental Rights, and Water Right Changes

Applications for Supplemental Rights

Groundwater Application G1-27619

On May 22, 1995, Kent applied to Ecology for a supplemental groundwater right (additional point of withdrawal) to drill a well approximately 95-120 feet deep, with a casing of 16 inches, on City of Kent property located near the eastern boundary of 124th Ave S E. This site is in close proximity to Kent's proposed storage reservoir. In its application, Kent requested an instantaneous quantity rate (Qi) of 1,200 gpm and an annual quantity (Qa) of 500 af/yr. The application proposes the place of use to be the "area served by the City of Kent", the purpose of use to be "municipal purposes," and the time of use "continuous.

The well is required as a result of aquifer conditions and source capacity problems that are impairing the ability of Kent's existing sources to meet the City's reliability standard and summer peaking demands. Once permitted, Kent would use this new supplemental well as an additional summer peaking source until Kent's proposed storage reservoir is operational. Once the storage reservoir is on-line, Kent would shift its use of the well to withdraw groundwater seepage escaping the seal of the proposed storage reservoir. At this time, the application is awaiting investigation and processing by Ecology.

Groundwater Application G1 - 27620

On May 22, 1995, Kent applied to Ecology for a seasonal (i.e., winter high flow), supplemental groundwater right (additional points of withdrawal) to install four (4) Ranney Wells on City of Kent property located near 102nd Ave S E. This site is outside of the City of Auburn's municipal boundaries and adjacent to the Green River. Test wells have already been drilled, three of which are 100 feet deep, and one that is 300-350 feet deep. The casing size proposed for the wells is 24 inches. In its application, Kent requested an instantaneous quantity rate (Qi) of 7,000 gpm/10 mgd, and an annual quantity (Qa) of 6,496 af/yr. The application proposes the place of use to be the "area served by the City of Kent", the purpose of use to be "municipal purposes", and the time of use to be seasonal (i.e., winter high flow months). At this time, the application is awaiting investigation and processing by Ecology.

Once permitted, Kent intends to pump groundwater from the Ranney Well system into its proposed storage reservoir during fall, winter, and spring months when Green River flows exceed minimum flows established by WAC 173-509-030. Water produced from the Ranney Well system will supplement other fall and winter flow contributions to the storage reservoir expected to come from Kent's existing groundwater sources (e.g., Clark Springs).

City of Kent Water System Plan
Page 5-19
Applications for Flow Augmentation Groundwater Rights

Mill Creek Flow Augmentation Project

The basic goal of the Kent Mill Creek Flow Augmentation Project is to increase critically low summer baseflows in Mill Creek by pumping and aerating shallow groundwater into the stream. Mill Creek is one of the City's major streams and experiences extremely low baseflows (approx. 0.5-2.0 cfs) during the summer months. Primary benefits desired are to improve salmonid fish habitat by enhancing water quality and increasing habitat volume by roughly doubling summertime streamflows.

Application 1: G1-27068

In April of 1995, the City of Kent applied for a non-consumptive groundwater right permit (G1-27068) for the purpose of augmenting summer baseflows in Mill Creek. Development of wells for flow augmentation purposes is one of the recommended strategies identified in the recently completed Mill Creek Water Quality Improvement Report which was prepared by Kent in coordination with Ecology.

The application, which was not filed as part of and/or a condition of any existing or proposed project, seeks an instantaneous withdrawal rate (Qt) of 200 gpm, and an annual quantity of 100 a£/yr from an existing monitoring well. Kent has proposed the purpose of use to be "streamflow/water quality enhancement".

Kent proposes, subject to a detailed monitoring plan, to withdraw water from this groundwater well and discharge it directly into Mill Creek when seasonal/summer low flows normally impair fish passage and water quality (e.g., dissolved oxygen) conditions. The well, which is located in close proximity to Mill Creek (more detail), and drilled to a depth of 100 feet, was developed pursuant to Kent's creation of the Green River Natural Resources Enhancement Area.

Application 2: G1-27778

In November of 1996, the City of Kent filed for another, non-consumptive groundwater right permit (G1-27778) for the purpose of augmenting baseflows in Mill Creek, consistent with the context, goals, purpose, and monitoring plan stated for the application above. The application seeks a permit to develop four wells, with a total instantaneous withdrawal rate (Qt) of 750 gpm, for seasonal summer use. The wells are existing monitoring wells drilled as part of Kent's Green River Natural Resource Enhancement Area project. Kent proposes to make withdrawals from these wells when low flow conditions in Mill Creek normally impair fish passage and water quality conditions. The wells are located in close proximity to Mill Creek (more detail) and drilled to a depth of 100 feet.
Application 3: Gl-xxxxx

In May, 1998, the City of Kent filed a third, non-consumptive, seasonal groundwater right application for the purpose of augmenting summer baseflows and water quality conditions in Mill Creek. Under this application, Kent seeks an instantaneous withdrawal rate (Q₁) of 100 gpm and an annual quantity (Qₐ) of 80 af/yr (Qₐ) from a new shallow well, approximately 30’ in depth, which will be located in close proximity to and in hydraulic continuity with Mill Creek.

Once permitted, Kent proposes to pump from May through October, clean, shallow groundwater into a system which would oxygenate, filter, and then discharge the water back into the stream channel. Since the groundwater will be in hydraulic continuity with the streambed, the project design is focused on ensuring the inflow from the well roughly equals the ex-flow from the stream to groundwater - resulting in a net change in flow of zero.

Kent has proposed that this application be approved on a temporary basis, over a two year period, subject to a monitoring plan and results that would be shared with Ecology and the Muckleshoot Indian Tribe. Kent has made repeated requests to Ecology to process this application.
Chapter 6
Source of Supply Alternatives

Over the past twenty years, the City of Kent's population and land base have significantly expanded. Further aggressive growth is projected over the next thirty years as population density increases within Kent's existing boundaries and new annexations occur, resulting in an approximate doubling of the city's current water service area population.

As a matter of law, Kent has an on-going responsibility to plan for and develop the water supplies necessary to meet its projected population growth, as well as to maintain and protect the viability of Kent's existing sources. Within recent years, however, meeting these responsibilities has become a significant challenge due to a combination of factors that include the seasonal and development-based impacts on source aquifers, the increasingly stringent and dynamic regulatory environment governing water supply, water quality, and water rights, and the implementation of the Endangered Species Act in an urbanized setting.

In its efforts to meet the challenges posed by both the natural and regulatory environment, Kent has made significant investments in conservation, source rehabilitation, and the development of new sources of supply. The following chapter describes those efforts.

Surface Water

The Green River and Cedar Rivers are subject to minimum instream flow rules and/or agreements that effectively preclude all new surface water withdrawals beyond those occurring during high flow winter months. Since the City of Tacoma secured a flow-restricted, seasonal water right on the Green River for its Second Supply/P-5 project in the 1980's, no further surface water applications have been approved by Ecology due to on-going concerns relating to flow levels, cumulative impacts, and tribal treaty rights. Moreover, because streams tributary to the Green and Cedar Rivers have been closed by administrative rule to further appropriation, Ecology has not seriously entertained the issuance of new primary rights for these surface waters for several years. Due to the foregoing factors, and the advent of the Endangered Species Act, development of new surface water rights is not considered a reasonable or viable supply alternative.

Acquisition of Existing Rights

State water law allows the transfer of existing rights to new places of use and purposes of use if such actions do not impair existing rights and do not create new, adverse effects upon pre-existing aquatic habit, flow, and water quality conditions. Given the extreme difficulty in securing new ground and surface water sources within the Green River basin, Kent has explored the potential of securing existing water rights within the vicinity of its service area that are still valid and could provide water of sufficient quality and quantity to be of value to the system.

With the exception of a defunct trout farm with a highly questionable water right, no water rights could be identified within a reasonable distance of Kent's service area which...
were still active and/or not subject to relinquishment due to lack of use. This alternative is therefore not considered a reasonable or practicable alternative to Kent's supply problems.

**Enhanced Conservation Measures**

Kent's Conservation Program Demand management (DM) practices, including water conservation, including rate structures, public education, distribution of water efficient household plumbing fixtures, and leak detection can play an important role in prolonging use of existing water supplies and delaying the time when new source is required. To that end, in 1993, Kent and other south King County water systems adopted and implemented an aggressive and comprehensive conservation program to prolong supply and mitigate peaking demands that place stress on available sources. The program includes the following components:

- block rate structure
- seasonal rate pricing/summer conservation rates
- water shortage emergency/regulation which authorize the Mayor to restrict non-essential public uses and levy fines during drought condition
- public education/promotional materials
- single/multi-family conservation kits
- metering for all customers
- distribution of water efficient plumbing fixtures
- leak detection
- water efficient irrigation technology
- conservation specialist

To determine the opportunity to secure further conservation gains, Kent examined the costs and feasibility of installing low flow toilets and shower flow restrictors in all residential connections. The number of residential connections for the year 1991 was the figure used as it was prior to the date the water efficient fixture/plumbing code went into effect. Based on 7,422 residential connections in 1991, at a savings of 33.5 gallons/day per residential connection, the daily reduction in water productions from installing the efficiency measures cited above was estimated to be 248,637 gallons/day and/or 90,753 mg/yr. Using an estimate of $1,000 per connection for retrofit, the cost of such a program was calculated to be approximately $7.5 million. While such a program offers further benefits, it is not considered cost-effective at this time.

As alternative enhanced conservation measures, Kent has developed a commercial/industrial customer water audit program and adopted a revised inclining block rate structure. Kent believes that the new rate structure should increase water use efficiency on an annual basis, including summer peaking months.
Water Right Changes

Water right changes include a variety of options, including changes in place of use, purpose of use, and to the point of diversion or withdrawal of water, as well as the addition of points of diversion or withdrawals. Kent has previously considered this option, however, to date, the City has not pursued any water rights transfers.

Two sites within the water system have the potential of benefiting from this option. The first of which is a well located at the Blue Boy reservoir site. Water rights from smaller wells, believed to be in the same aquifer, may be transferred to the Blue Boy Well. It is believed that the well is capable of producing up to 400 gpm, however, this is dependent on a pump test which would need to be performed as well as the total water rights for the site. The second site that may benefit from this option is the Armstrong Springs site. A portion of the water rights for the Kent Springs site, believed to be in the same aquifer, would be transferred to the Armstrong Springs site for an additional well(s).

Currently, it is not known if additional well(s) are a feasible option at the Armstrong Springs site, or the volume that could be produced from these well(s). Therefore, additional testing is required to validate this option.

Regional Supply Purchases

Assessing the viability of acquiring water supply from adjacent and regional supply systems has been a constant feature of Kent's water supply planning and system operations. As noted in Kent's 1992 water system plan, the City has in the past acquired firm, annual supply, via existing interties, from the cities of Tukwila and Renton, and Water District 75. However, because of demand occurring within the respective service areas of these cities/systems, the provision of supply has been suspended or limited to emergency supply. The opportunity may exist, however, for the resumption of firm water supply from one or more of these intertie facilities. Such supply could assist Kent meet its peaking demands and facilitate the development of a new storage reservoir.

Aside from the systems described above, Kent has examined opportunities with other regional purveyors to acquire new, firm, annual supply. That investigation has focused on the City of Auburn, City of Tacoma, City of Seattle and the Cascades Water Alliance.

Seattle Public Utilities (SPU)

SPU has approached Kent to discuss the opportunity and terms under which Kent could secure either a firm supply in perpetuity, or a bridge supply of water that could assist Kent meet its summer peaking needs until its proposed storage impoundment is on-line and/or the P-5 project is providing water to the Kent water system. Kent is pursuing discussions with SPU at this time regarding quantity and terms. At this time, no details are available regarding the feasibility of this water supply option.
Cascade Water Alliance

The Cascades Water Alliance (CWA) is a consortium of eastside King County cities and water districts. The CWA was formed in response to SPU's notice that it would not renew its current agreement to existing customers in 2012. Shortly after its inception, the CWA commenced negotiations with SPU to assume responsibility for the distribution of SPU water to the purveyor community post – 2012. In addition, the CWA engaged in discussions with both Tacoma Public Utilities and SPU regarding the development of new regional supply sources, including Tacoma’s P-5/Howard Hanson project.

In November, 1999, the CWA failed to secure the support of a sufficient number of SPU purveyor customers to form and execute a proposed agreement with SPU. Consequently, SPU has informed the CWA that it no longer intends to delegate its wholesale supply role to the CWA and/or assign existing purveyor contracts to the organization. At this time, the future role and purpose of the CWA is unclear.

City of Auburn

The City of Auburn is located directly south of Kent. Based on its most recently adopted Water System Plan (1995), and discussions with Auburn officials, Auburn has sufficient water supplies to meet projected demand until 2015. In 1996, Auburn executed interruptible supply agreements with two adjacent systems (i.e., Covington Water District and Water District 111) totaling 1-5 mgd. Under the terms of this agreement, should Auburn succeed in securing new primary water rights, the interruptible supplies may be converted to firm supply. If, however, Auburn fails to secure new rights, the water may be called back in 2006 or earlier to meet the City’s projected municipal demand.

Pursuant to its agreement with Covington Water District and Water District 111, Auburn has been working to acquire new, primary water rights in its Valley Production Aquifer since 1995. Auburn’s ability to secure new firm, primary rights is unknown at this time. Further, within recent years, Auburn has proven reluctant to enter into new firm or interruptible water supply agreements.

City of Renton

Negotiations are currently underway with Renton to acquire 1-2 mgd of interruptible “bridge” supplies until additional storage facilities can be developed. The need for such “bridge” supplies has become necessary because the proposed P-5 Tacoma project is not expected to deliver supply on either an annual or seasonal basis until 2005 at the earliest. Even if secured, however, the bridge supply cited above will not provide sufficient supply to meet short-term peaking or water system demands. No agreement has yet been reached.
City of Tukwila

Negotiations are currently underway with Tukwila to resume use of an existing water supply intertie for the provision of firm and/or peaking supply for Kent. Prior to suspending its use, the intertie provided Kent approximately 2-3.5 mgd. No details are currently available regarding a new contract.

City of Tacoma: Second Supply Pipeline Project (P-5)

The P-5 project would provide Tacoma a second supply pipeline and divert water from the Green River for local as well as regional benefit. The P-5 water right is subject to strict upstream flow limitations set through negotiations with the state and the Muckleshoot Indian Tribe. Accordingly, even if the project was built today, it could not provide reliable, firm annual supply. To provide such supply, Tacoma must increase the storage capacity of Howard Hanson dam. Kent expects to execute its final agreement to receive P-5 supply in 2000. Supply from this project is expected to be available by 2005.

Pursuant to its efforts to secure available, regional supplies, in 1985 Kent contracted with Tacoma Public Utilities (TPU) to purchase 7.2 mgd of summer peaking water from the proposed Pipeline 5/Second Supply project. To this end, and in reliance on the Ecology-approved water right and place of use documents issued to Tacoma, Kent has expended substantial financial resources on the P-5 project. The P-5 source of supply is considered critical to Kent’s ability to meet near and long-term demand needs. The viability of this project, however, may now be at risk due to indications that Ecology officials may: (1) recant earlier legal commitments relating to the P-5 project’s place of use; and (2) seek to impose new, retroactive conditions on the TPU’s P-5 water right permit via the permit extension process.

Artificial Recharge

The viability of ASR is subject to many factors, not least of which is the presence and availability of suitable aquifers. In the Puget Sound area, these characteristics are:

- High aquifer transmissivity to permit rapid recharge and recovery;
- Deep aquifer, to provide storage capacity and hydraulic separation from surface waters;
- Good aquifer confinement by aquitards to reduce the loss of stored water;
- Aquifer storativity and depth to water, to provide sufficient aquifer storage capacity; and
- Compatible water quality between aquifer and recharge waters.

A primary limitation in the Puget Sound area in general, and around the City of Kent in particular relative to ASR, is the limited presence of aquifers that are suitable for recharge and recovery. In general, most groundwater resources in the region are drawn from aquifers of shallow or intermediate depth (typically less than 200 feet below the surface).
The contrast in precipitation and recharge between winter and summer means that many shallow or intermediate aquifers are heavily drawn-down during the peak demand periods of the summer months when groundwater levels naturally decline. However, these shallow aquifers are seasonally replenished through natural recharge and are typically discharging to surface water via springs and streambeds by the late spring. Any additional water artificially recharged during the winter months would merely hasten the natural rise in groundwater levels to the point where the aquifers overflow, new seeps and springs emerge, and the bulk of the recharged water is lost as winter runoff through local surface water discharge.

Due to winter precipitation, this increased aquifer discharge would occur around the time of the spring runoff, when streams are already swollen (Ecology et al., 1995). The potential benefit of artificial recharge during the winter months, that is to raise aquifer levels in summer, or to help offset impacts to minimum instream flows, would thus not be realized. The artificial recharge of shallow or intermediate aquifers in the area of Kent will therefore achieve very little in terms of increased water supply. Winter groundwater levels elevated by artificial recharge would also pose an increased threat to the stability of sensitive potentially unstable slopes in the area.

Soos Creek Well Artificial Recharge

Kent has determined that a small opportunity for ASR exists at the site of its Soos Creek Well. This well, which is drilled to a depth of 431 feet (i.e., sea level), taps into one of the deeper Qc(3) aquifers which are confined but of unknown lateral extent. Production rates from the well have been limited within recent years to only half of the original permitted amount. The main factor in the impaired yield is a long-term lowering of the static water level within the aquifer, which has reduced the available drawdown at the Soos Creek Well.

The aquifer may be affected by additional extraction wells, which are causing an overdraft. Recharge to the confined aquifer is also limited by the hydraulic characteristics of the confining layers, which may impair the aquifer's ability to fully recover from each period of groundwater pumping during the summer months.

To address this problem, Kent has budgeted $80,000 to study the feasibility of restoring the aquifer's production capacity by diverting and injecting winter flows from its Clark Springs source. If successful, this action could potentially increase Kent's supply by approximately 0.5 MGD. While this amount is not insignificant, it falls well short of the amount required to enhance overall system reliability, meet short- and long-term firm supply requirements, and solve existing and projected peaking problems.
Use of Reclaimed Water and Other Non-Potable Sources

Wastewater Reuse

The City of Kent currently disposes of over 3 mgd of wastewater (based upon projected population of 50,416 for 1998 and typical water use of 60 gallons per capita per day) to King County Metro’s East Division Wastewater Treatment Plant in the City of Renton (Renton WWTP). In addition to the high cost of this alternative, there is serious question as to its feasibility. Although enough reclaimed water may be available for injection into the City’s Clark and Kent Springs aquifer systems to meet demand, it is uncertain whether the same quantity of water could be withdrawn from the aquifer.

A significant amount of reclaimed water injected into the aquifer systems is likely to leak out of the capture zone of the springs. In short, there is no way to ensure that recharging the aquifers would allow increased withdrawal to meet demands. The viability of this alternative is largely dependent upon the suitability of the aquifer for water storage and extraction. Because of the high cost of this alternative and the uncertainty with the suitability of the aquifer, this alternative is not considered feasible.

Stormwater Reuse

Stormwater runoff and overflow was evaluated as a source of potable water to meet future demands. The City of Kent operates a large stormwater treatment system that collects runoff from approximately 830 acres of developed area within the City and overflow from Mill Creek to control flooding and erosion downstream. The City’s stormwater treatment system consists of constructed wetlands designed to remove urban pollutants, followed by a detention lagoon. Treated runoff and overflow are then discharged back to Mill Creek under controlled release rates.

Effluent from the stormwater treatment system would be viewed as surface water in regards to treatment for potable water. DOH regulations require that surface water be coagulated, filtered, and disinfected to meet the appropriate water quality criteria (Chapter 246-290 WAC). Because these are essentially the same treatment requirements as reclaimed water for non-potable use (with additional disinfection for a greater reduction of pathogens), there would be little savings in cost by treating water separately for potable and non-potable demands. Furthermore, the added cost of a separate distribution system would far exceed any treatment cost savings. Therefore, it was assumed that all water would be treated for potable use and discharged into the existing distribution system.

System Requirements

Kent’s existing stormwater treatment system relies on wetland vegetation to remove pollutants from stormwater runoff. Many waterfowl also rely on the wetlands as a wildlife refuge. Therefore, impact on the wetlands must be minimized to maintain an effective treatment system and a stable wildlife habitat. The vegetation and wildlife
cannot be subjected to large fluctuations in the water level of the wetlands. Consequently, it would not be possible to withdraw water directly from the stormwater treatment system because wide variations in demand, which are common with potable water, could significantly impact the water level. In addition, the City’s stormwater treatment system has insufficient storage to meet the reliability standard under any of the scenarios. Therefore, a separate stormwater detention basin would need to be constructed to provide storage for the collected stormwater in order to protect the wetlands and meet the reliability standard.

To provide adequate storage capacity to meet the reliability standard (72 hours at PDD with the single largest source out of service), a stormwater detention basin must be in excess of 5,000 acre-feet for buildout. The size of a detention basin is based upon applying the reliability standard to summer conditions, when there could be very little runoff and probably no overflow. Consequently, the main source of supply for stormwater reuse during this period would be a stormwater detention basin.

The cost of stormwater reuse includes the stormwater detention basin, treatment system, and distribution. Implementation of this alternative assumes that there would be sufficient stormwater runoff and overflow to meet increasing demand. An average annual flow of 5 mgd is required to meet the ultimate demand at buildout. Based upon average rainfall data for Kent and estimates of overflow from Mill Creek and runoff from the surrounding basins (Green River Natural Resources Enhancement Area 1994), a stormwater treatment system would be able to supply only an average annual flow of about 3.5 mgd at best, not accounting for losses due to evapotranspiration. This is insufficient to meet the long-term demands for buildout. It may also be insufficient to meet the intermediate needs. Furthermore, there is some question as to the reliability of this supply. There could be even less water available for use during periods of drought.

Desalination

Desalination is a water supply alternative that is becoming more widely used as high quality fresh water supplies grow increasingly scarce. Desalination makes available a nearly unlimited source of water by treating seawater for potable use. Use of seawater from the Puget Sound does not require a water right. Therefore, ample seawater is available to meet the long-term demand or reliability standard as long as the treatment process is designed to handle the flow.

As with stormwater reuse, desalination plant capacity is based upon meeting the reliability standard deficit, which would also provide sufficient capacity to meet the PDD deficit and ADD deficit. Desalination is very expensive, particularly from an operational standpoint. A very large amount of energy is required to operate the high-pressure pumps that drive the RO process. Consequently, desalination is not a cost-effective alternative. The cost of desalination also includes treatment and distribution.
Desalination could meet the future demands with a continual supply not limited by contracts or regulations, however, this alternative is simply too expensive to justify further consideration.

Storage Reservoir

It is Kent’s intention to construct a water supply reservoir within City limits, although no application has yet been submitted for this project to Ecology or the Army Corps of Engineers. The reservoir would be used to store and distribute water produced from the City’s existing groundwater sources, as well as water supplies made available from existing or future regional sources, in order to provide a firm, dependable source of supply capable of meeting current and projected municipal water supply demands within the City’s water service area. More specifically, Kent seeks a reservoir with the capacity to store approximately 2,500 a/yr and/or 8.7 mgd diverted from existing groundwater sources, as well as regional supplies that may become available from Tacoma and/or other utilities.

By obtaining this new component of storage, Kent should be able to meet its system reliability standard on both annual (Qa) and (Qi) basis. This standard requires the Kent water system to be able to meet peak daily demand (i.e., 15.6 mgd) with its single largest water supply source off-line for at least 48 hours. Due to declining aquifer conditions and growth, Kent has encountered difficulty in meeting this standard.

System Flexibility/Reliability

By constructing a reservoir project in close proximity to Kent’s existing system and sources, the City has the opportunity to store ample and available winter groundwater for use in summer peaking months. Under this conjunctive use approach, Kent would use its primary groundwater sources, Kent and Clark Springs, to fill the reservoir and meet system demands during winter months when aquifer levels allow higher production volumes.

When summer peaking conditions arise, the reservoir would serve the primary source to meet system demands, thereby supplementing the declining yield of Kent’s groundwater sources. A collateral benefit of the reservoir would be its ability to relieve stress upon Kent’s source aquifers during summer and fall months when groundwater discharge is an important component of maintaining minimum flows required to support fish production and habitat.

In addition to allowing the efficient, conjunctive use of Kent’s groundwater sources, the project would enhance system reliability by creating a redundant source of supply on not only a seasonal, but an annual basis as well. Should any one of Kent’s primary well facilities fail, experience aquifer contamination, or fall victim to natural disaster, the reservoir could compensate for such system emergencies by providing a water supply sufficient to meet all City needs for a period of up to 3 - 6 months. Moreover, the reservoir would create an invaluable storage opportunity for the City to receive...
emergency supplies from neighboring systems pending resolution of system failure or emergency conditions. Reducing exposure to water supply emergencies is a critical benefit of the reservoir's need and purpose.

A closely related benefit of the reservoir, although one not required to ensure its viability, would be its capacity to store water supplies acquired from other systems to meet either emergency or general system needs. Due to its summer peaking and long term projected supply deficit, Kent has actively pursued the acquisition of available supplies from other regional systems to maintain system reliability. To this end, Kent contracted with the City of Tacoma in 1985 to acquire 7.2 mgd from their proposed Pipeline 5 project.

The P-5 project, which is yet unbuilt, is presently limited to providing run of the river water only. Under the P-5 project, said run of the river water is proposed to be placed into storage behind Howard Hanson Dam from February 15th to June 30th in order to be available for use during the summer demand season. However, to be available, any waters remaining in said storage at the end of the summer demand season is then released down the river. Were Kent's reservoir (storage impoundment) available, said waters could be transferred to same for future use versus being list down the river. Further, any available run of the river water between October through February 15th could also be captured and stored in Kent's reservoir (storage impoundment) providing Kent the multiple opportunities it needs to meet its future water demand needs while honoring its reliability standard which requires the City to meet its peaking demand with its largest single source of supply out of commission (i.e., Clark Springs, 4-5 mgd (Q1)).
Chapter 7
Wellhead Protection

Introduction

The Kent City Council passed Resolution 1563 on February 15, 2000 adopting the Kent Wellhead Protection Plan (WHPP) to protect regional groundwater resources.

The City of Kent (City) developed a wellhead protection program (WHPP) for the Clark, Kent, and Armstrong Springs water supply sources. The wellhead protection program is designed to protect groundwater resources supplying public wells used for drinking water. Development of the wellhead protection program is mandated by the 1986 Amendments to the Safe Drinking Water Act and the Washington State Drinking Water Regulations (WAC 246-290-135). The wellhead protection program builds on the South King County Groundwater Management planning process and is an important local tool for protecting groundwater quality. Delineation of wellhead protection areas helps to identify the most important areas of focus for protecting water supplies and the most appropriate areas to focus limited funding resources.

This project began in 1991 when the City applied to the Washington State Department of Ecology (Ecology) for a Centennial Fund Grant to help fund the program development. A Grant was awarded in 1992. The City conducted program development efforts with the Covington Water District (CWD) and King County Water District No. 111 (KCWD #111) who simultaneously developed wellhead protection programs. Coordination efforts have occurred through a Project Review Committee set up for review and input to the process and including representatives from the three purveyors as well as the Seattle-King County Health Department, the State Department of Health, and Ecology's Water Quality Program. Since 1996, the City Council has formally adopted the WHPP and coordinated implementation has begun with CWD and KCWD #111.

Current implementation techniques that have been completed include adoption of the WHPP, established relationships with local jurisdictions to provide comments on proposed developments, WHPA roadside signage, potential contaminant source notification, increased educational awareness including a Water Festival and public presentations on the WHPP.

Management strategies in the WHPP include identification of Pesticide and Fertilizer applications. The City is currently searching for funding sources to develop an Integrated Pest Management (IPM) Plan to include the City of Kent and the entire Wellhead Protection Area. CWD and KCWD #111 are participating in this effort. The IPM Plan will be similar to that of the City of Seattle and King County to encourage regional consistency and protect natural resources.

Phase one of the Kent WHPP has been completed for the Clark, Kent and Armstrong Springs facilities. Phase two includes developing a WHPP for Kent's remaining water sources. Funds are currently being sought to develop this second phase.
Wellhead Protection Areas for these remaining sources include the calculated fixed radius method. The second phase will include modeling to more accurately determine the area of recharge. This new information will provide information that can be used to protect natural resources.

Hydrogeology and Wellhead Protection Area Delineation

The City derives its water from shallow, highly transmissive, glacial outwash aquifers without significant confining layers between ground surface and the depth of groundwater withdrawal. Infiltration of precipitation is the principal source of recharge to the groundwater system in the study area. Infiltration is high in the permeable outwash sediments that comprise much of the area, particularly in the eastern foothills where precipitation averages 58 inches per year. The till-capped uplands provide recharge through runoff to the surrounding, highly permeable outwash channel deposits. Surface water features like Lake Sawyer provide some additional recharge to the groundwater system.

Groundwater flow in the area is predominantly east to west from the high recharge area of the foothills east of Clark Springs through two principal aquifers, the Vashon Recessional Outwash (Qvr) and the deeper, older Qc(2) glacial deposits. In the western area, till lies between the recessional outwash and the deeper Qc(2) aquifer in some locations; however, at the City's Kent Springs and Armstrong Springs properties the till seems to be absent, and these two aquifers are connected. In these areas the aquifer is more highly susceptible to contamination.

The east to west flow pattern creates capture zones that extend eastward from the wellheads. The wellhead capture zones were delineated through development of a regional groundwater flow model. The groundwater flow model, based in MODFLOW, was used in conjunction with a particle tracking model, PATH3D, to define 1-, 5-, and 10-year time of travel zones. An assessment of data uncertainties and coordination of management efforts with the area water districts resulted in development of a composite Soos Creek Basin Wellhead Protection Area (WHPA).

Potential Contaminant Sources

With the WHPA defined, effort was focused on identifying potential groundwater contaminant sources within the WHPA and ranking the risks associated with those contaminant sources. Potential contaminant sources were identified based on review of current and historical land uses within the WHPA, review of regulatory agency database lists and files, and a windshield survey to reconnaissance for other unknown sites. The Wellhead Protection Project Review Committee reviewed inventory considerations and methodology.

Potential sources of contamination were identified and ranked according to their potential risk. The ranking was performed in general accordance with the EPA Guidance Document entitled Managing Groundwater Contamination Sources in Wellhead.
Protection Areas  A Priority Setting Approach  The highest ranked risks to groundwater quality within the WHPA, in order of decreasing priority, were:

- Residential - medium-density land uses;
- Residential - rural land uses;
- Transportation corridors,
- Industrial/Commercial sites,
- Forestry land uses; and
- Mining land uses.

Proximity to the wellhead was given the highest priority level risk for each of the sources considered. This was followed by the type and severity of the contamination, respectively, as the next priority levels. Contaminated sites identified in the regulatory databases ranked as the top priority risk for the Armstrong Springs source. For the Kent Springs source medium-density residential, rural residential, and transportation corridors ranked as top priority risks. The Landsburg mine ranked as the top priority risk for the Clark Springs source followed by medium-density and rural residential land uses.

Management Strategies

Wellhead protection management tasks were developed based on tasks included in the South King County Groundwater Management Plan and technical knowledge of WHPA issues. Forty-eight tasks were developed in consort with the Wellhead Protection Project Review Committee. These tasks were created to help mitigate high priority risks to groundwater quality as identified above. Management strategies were then developed, based on the concept that an implementation steering group would need to "manage" the tasks in certain ways to implement the program. The management strategies were developed as follows:

- Management and Cooperation Strategies
  - Establish a WHP steering group.
  - Manage large land parcels using Best Management Practices

- Land Use Strategies
  - Consider special protection area designations for the WHPA.

- Regulatory Strategies
  - Perform hydrogeologic analysis for parcels triggering SEPA review.
  - Delegate well drilling oversight authority to King County. Encourage frequent inspection of well installation.
  - Require engineering as-builts of septic systems to be recorded with the property deed.
Planning Strategies

- Require industrial and commercial facilities to connect to sanitary sewer.
  Develop emergency plans for sewer breaks.
- Encourage funding of farm plans such that groundwater protection issues are identified and managed.
- Encourage research of storm water discharge on aquifer quantity and quality; evaluate the adequacy of storm water facilities.
- Document the location and use of petroleum pipelines. Ensure emergency response efforts are coordinated.
- Investigate the feasibility of re-routing hazardous materials transport out of zone 1 of the WHPA.
- Establish formal communication with first responders for transportation hazardous materials incidents.

Data Management Strategies

- Participate in regional and local groundwater monitoring strategies. Implement the monitoring plan.
- Conduct herbicide and pesticide use surveys Encourage vegetation management practices which do not use chemicals.
- Inventory underground storage tanks (including exempt tanks) within Zone 1 of the WHPA.
- Encourage King County to monitor dry wells within the WHPA.
- Inventory abandoned wells within the WHPA.

Education Strategies

- Continue public education program with focus toward protection of the WHPA

Other WHPP Elements

The state requires three additional elements in the WHPP, a monitoring plan, spill response plan and a water supply contingency plan.

The monitoring plan identifies a program for water level and water quality monitoring in selected areas throughout the WHPA. These data are used to measure water quality degradation and will provide early warning of groundwater quality changes. The monitoring plan also describes focused hydrogeologic studies that will be needed to more accurately interpret the monitoring data and refine the regional groundwater flow model developed for this project. Refinement of the regional flow model will provide a management tool for managing both groundwater quality and quantity decisions into the future. The City's existing monitoring plan is described in the following pages.

Spill response planning exists throughout national, state, and local programs. Depending on the nature and location of the spill incident, the local Fire Department and the State Patrol are normally the first responders for highway-related incidents, and Ecology is the
lead agency for environmental pollution (i.e., hazardous waste spill) The City's existing spill response plan is described in the following pages.

Kent is responsible for assisting the local fire districts with Hazardous Material Response within the WHPA. The City has a hazardous material response plan which identifies the personnel and procedures that are used in response to a hazardous materials incident within the WHPA. A copy of the response plan is included in Appendix D of the Wellhead Protection Document.

The water supply contingency plan identifies possible steps that could be taken to seek alternate supplies of water if one of the sources within the WHPA becomes contaminated. These steps include activating existing interties, treating contaminated groundwater at the source, or exploring for new sources of groundwater.

MONITORING PLAN

This monitoring plan was developed and implemented based on current understanding of the hydrogeology around the City's sources, land use and potential contaminant concerns identified within the WHPA. A groundwater monitoring program for the source springs and wells (beyond the Department of Health rules) has been implemented to measure groundwater quality and allow early detection of groundwater quality changes. Monitoring provides a means of identifying trends and detecting problems before they reach the wellhead. Monitoring data can support protective regulatory actions and allow mitigative measures to be enacted before the wells are impacted.

Focused hydrogeologic studies have been recommended for some areas where uncertainties exist in understanding the groundwater travel pathways. These studies will help the City more accurately interpret the monitoring data and provide a framework for refinement of the regional groundwater model. The data collection and monitoring are an important part of regional groundwater management as they provide the basis for making appropriate groundwater-related decisions that ensure the long-term water quality and quantity.

Water Level and Water Quality Monitoring

Groundwater monitoring includes water level measurement and groundwater quality sampling and analysis. Water level data are used to define flow directions and gradients and to detect seasonal and other temporal variations in groundwater flow. These data help define the migration pathway of any detected contaminants. Groundwater quality data collected from selected wells and streams can help identify any water quality degradation and serve as an early warning of water quality changes. Together these data can be used to identify a problem and assess the impact to the water supply.

Surface water monitoring is also conducted to characterize bedrock runoff quality, particularly around mining areas, and to better characterize the groundwater-surface water interactions. In the eastern study area bedrock outcrops are believed to generate runoff.
that infiltrates the aquifer within the Clark and Kent Springs Zones 1 and 2. Surface water monitoring includes measurement of flow and water quality sampling.

Sentinel wells located near the protection zone boundaries help detect any degradation in time to allow response. The water quality parameters selected for monitoring include general indicators. Existing wells have been used for monitoring which is not only cost effective but also helps to involve the community in understanding and protecting regional water supplies. The Wellhead Protection Monitoring Program has been implemented, however all monitoring locations recommended by the City's consultants are not presently being monitored. Additional monitoring sites are being sought to fulfill recommendations outlined in the WHPP.

Armstrong Springs

**Develop Four Sentinel Well System.** Within Armstrong Zone 1, four (4) monitoring wells have been recommended to serve as sentinel wells, providing an early warning of water quality changes. Three wells would be located within Zone 1, and one well would be located within Zone 2. Recommended locations for the wells are shown on Figure 7-1 and the rationale is outlined below.

- The north well would be situated in an area northeast of Armstrong Springs on Zone 1 boundary. In this location, limited data indicate the protective till layer may be absent between ground surface and the aquifer. Additionally, this area is located near Highway 18 and within the City of Covington and will be useful for monitoring non-point sources such as runoff and pesticides. The existing database indicates there may be several wells in this area already that could be pursued as potential monitoring wells (See 30A1 and 30B1 on Figure 7-1).

- The east well would lie along Kent Kangley Road on the Zone 1 boundary. This location monitors for transportation corridor issues and lies within commercial land use zoning. The highway right-of-way provides a good location for locating a new well.

- A third well is recommended for Armstrong Zone 1 and would lie along Kent Kangley Road between the Armstrong Springs property and the Zone 1 boundary. A well is recommended in this area because of the high-density commercial and residential development and to assist with better identification of groundwater flow patterns around Armstrong Springs. Again, the well could be located within the highway right-of-way.

- A fourth well would be situated on the Zone 2 boundary just downstream of Kent Springs. This well would be located near the railroad and on the Urban Growth boundary and would monitor for water quality changes.

**Water Quality Parameters.** Water samples collected from the sentinel wells should be analyzed for general water quality parameters twice a year. The general water quality
analyses should include field testing for pH, specific conductivity, and temperature, and laboratory testing for bacteria, nitrates, chloride, lead, turbidity, and total petroleum hydrocarbons. Because of the urban land use of the area and the number of regulatory database sites listed in the vicinity we also recommend an annual monitoring for volatile organic compounds including both the aromatics and halogenated compounds and pesticides.

**Focused Hydrogeologic Study in Armstrong Springs Area.** A focused hydrogeologic study has been recommended in the Armstrong Springs area to better characterize the flow patterns, the relationship of Jenkins Creek with the aquifer, and the potential for impact from the contaminant database sites identified near the springs. The study should include detailed review of Ecology files on the contaminated sites located in this area, noting particularly if monitoring wells already exist for some of these sites, the current monitoring plan for those wells, and any remediation planned. Areas for focused studies are also shown on Figure 7-1.

A focused study of the flow patterns to the northeast of Armstrong Springs has also been recommended. For this study we would develop a water level measurement network using existing wells and survey the elevations of the wells in the network. The wells used for this study should be measured at least quarterly for several years. These data will help determine where the groundwater divide is between the Cedar River and the Soos Creek system and will be needed for future model updates and regional groundwater management decisions.

**Kent Springs**

**Coordination with CWD 222nd Wellfield Monitoring.** The City has coordinated with Covington Water District to avoid duplicative efforts. The City and CWD collectively monitor both groundwater and surface water features for quality and quantity.

The current monitoring plan for Kent Springs and CWD's 222nd Wellfield includes:

- The City and CWD are currently monitoring three sentinel wells in the Kent Springs/222nd Wellfield WHPA. This monitoring provides information on water quality and will provide an early notice should any degradation to the aquifer occur and allow for early response to protect regional groundwater resources. One well is located in the 1-year time of travel zone, a second well near the Ravensdale Fire Department is monitored and a residential well on the south shore of Lake Ravensdale.

- Six Surface Water Monitoring Points are used for evaluating impacts from mining and forestry activities as well as provide information on aquifer recharge rates. The surface water monitoring points include Lake Sawyer, Ravensdale Lake, and Lake Retreat, along with monitoring of surface water flows from three drainages, the Ravensdale Draw (Reserve Silica Mine area), the Retreat Draw west of Retreat Lake, and the Sugarloaf Draw southeast of Retreat Lake as shown on Figure 7-1.
Review of the data from other wells monitored by CWD is also useful, particularly for the proposed focused hydrogeologic study work and future modeling as part of a regional groundwater management. Again, cooperative and coordinated efforts are being completed for all monitoring activities associated with the Kent Springs and the Clark Springs protection areas in conjunction with CWD's groundwater monitoring.

**Monitoring in Addition to Covington's Lake Sawyer Plan.** In addition to CWD's monitoring, the following areas are being monitored for Kent Springs:

- Ravensdale Lake at the outlet where lake discharge to Ravensdale Creek can be measured. These data can indicate any water quality impacts from the lake on the aquifer as well as provide valuable data on surface water-groundwater interactions for future modeling efforts.

- Flow rate measurements at the three surface water quality data collection locations (Retreat Draw, Ravensdale Draw and Sugarloaf Draw). These data will be used to help establish recharge rates for the eastern area.

- Water quality and flow rate monitoring point on Rock Creek near the Zone 2 boundary. These data can provide information on the interaction of Rock Creek and the aquifer as well as early warning of water quality changes from mining and forestry activities (has not been completed).

- Monitor for metals and petroleum hydrocarbons in the surface water samples in addition to the parameters planned by CWD because of the mining activities in these areas.

**Focused Hydrogeologic Study of Retreat Lake and Zone 2/3.** A focused study of the hydrogeology within the outer half of Zone 2 and Zone 3; particularly around and south of Retreat Lake has been recommended. Data collection should include elevation control on wells and measurement of water levels, and information on hydraulic conductivity gained from pumping tests. Covington's Lake Sawyer plan includes water level monitoring in six wells around Retreat Lake.

To better understand the effect of Lake Sawyer on recharge to the aquifer and provide a better water balance for the regional model, monitoring the flow out of Lake Sawyer to Covington Creek has been recommended.

**Clark Springs**

**Coordinate with Kent Springs/222nd Wellfield Monitoring.** The data being collected for the Kent Springs/222nd Wellfield WHPA within Zones 2 and 3 is also useful for understanding the groundwater conditions at the Clark Springs facility. In addition to the monitoring discussed above, the following monitoring is currently being conducted for the Clark Springs facility.
Develop Sentinel Well. Share data with CWD on the two wells proposed in the Georgetown area (CWD Ravensdale and Bremmeyer wells) and the 6 proposed for the Retreat Lake area and develop 1 more; at the Zone 1 boundary as shown on Figure 7-1.

Establish Surface Water Quality Monitoring Plan. Surface water quality data are currently being collected as part of the Landsburg Mine Remedial Investigation/Feasibility Study (RI/FS). The City has been monitoring the progress and data collected for this investigation which includes monitoring of a seep near the south portal of the Rogers No. 3 mine.

Establishment of a monitoring point on Rock Creek upstream of the Clark Springs property has been recommended. This location should be selected in cooperation with King County so that any on-going monitoring of stream flow and water quality is understood and data shared as appropriate.

Focused Hydrogeologic Study in Clark Springs Area. A focused water level monitoring study in the north-half of Section 30 as shown on Figure 7-1 has been recommended to establish the groundwater divide in this area. This study will require establishing 8 to 10 existing wells as monitoring points and making quarterly measurements in these wells for several years. In addition, a pumping test on selected wells will be required to better quantify estimates of groundwater flow to the Cedar River in this area.

The focused study recommended for the Kent Springs area in the vicinity of Retreat Lake will also be useful for the Clark Springs area.

Future Model Refinement

This data collection can provide the basis for refinement of the numerical model developed for this project. Long-term aquifer management will require this type of tool for decision-making purposes and many of these data are essential for better calibration of the model. With a regional groundwater flow model, better decisions can be made. These decisions might relate to a water quality concern that becomes apparent during monitoring of decisions about developing a new water supply well. Section 3.0 and Appendix B of the Wellhead Protection Document provide additional information on the model that currently exists and discussions on future model refinement needs.

SPILL RESPONSE

Introduction

The purpose of this section is to outline spill response procedures and capability for the WHPA. To conduct this evaluation, major spill response organizations were identified. Local response organizations were contacted to determine their response capabilities, back-up assistance, and general understanding of wellhead protection issues.
Spill events can be large or small and can consist of highly toxic to inert materials. Events can occur under conditions and in locations which are easily contained or where time is plentiful, or can be such that surface water, waterways, or groundwater are under immediate threat. This range has prompted a spill response (and emergency response) system which is nationwide in scope, which can involve federal agencies, yet one which is designed to handle the more common, small scale (yet potentially dangerous) spills. This assessment takes into account this range of systems.

However, the ability of the City to affect the protocols and procedures of the national and state response systems is limited. Also, the majority of spills are small and require local response. Therefore, for the purposes of this effort, focus is given to local response capabilities and needs associated with these local response systems.

National, State, and Local Spill Response Plans

Spill response planning as been ongoing throughout King County (County) and within Washington State for many years. As a result, there are many plans in existence, each focusing on a specific geographical area or type of substance. In addition, parties involved in the storage and transportation of hazardous materials have been required to develop contingency plans. Each of these contingency plans should be consistent with each other, and fit within the context of the response plans listed and described below. The following spill responses are in effect in Washington State and cover inland, or non-marine areas, such as wellhead protection areas and aquifer recharge areas.

- National Oil and Hazardous Substances Pollution and Contingency Plan (NCP) – prepared by the Environmental Protection Agency (EPA),
- Oil and Hazardous Substance Pollution Contingency Plan for Federal Region 10 (RCP) – prepared by Region 10 of EPA,
- Washington Statewide Master Oil and Hazardous Substance Spill Contingency Plan – prepared by Ecology;
- Washington State Emergency Response Plan – prepared by the Department of Community, Trade, and Economic Development (CTED), and
- Local Emergency Response Plans – prepared by city and county governments.

Spill Response Organizations

Depending on the magnitude of the spill event, numerous organizations at all levels of government, some voluntary organizations, and the private sector may have a role in spill response and cleanup. Each of the plans mentioned above describes the relationship and roles of these organizations in terms of the particular concern. Depending on the size of the spill, some of the agencies listed below might be involved in a spill response in the WHPA.

Spill response plans require response procedure to executed effectively. For that to be accomplished, each party must be fully aware of their specific roles and responsibilities. Moreover, there must be an understanding of the roles of other parties involved in
response activities, as well as effective coordination, cooperation, and communication among responding agencies, organizations, and individuals.

The discussion below briefly summarizes the organization that may be involved in spill response within the WHP A and describes their roles and responsibilities. The discussion below is organized in order from federal to local jurisdictions.

**Federal Spill Response Teams**

The EPA has primary responsibility for all land spills and those which occur on inland U.S. water not under USCG jurisdiction. As directed by the NCP, the EPA is pre-designated as on-scene commander (OSC) for spills occurring under its jurisdiction. The EPA may call on the following response teams to assist them in responding to a spill:

- **National Response Team.** The National Response Team (NRT) consists of representatives from the various federal agencies (such as EPA, the US Coast Guard, Fish and Wildlife Service, etc.). It serves as the national body for planning and preparedness actions prior to a spill and as an emergency advisory center when a spill occurs.

- **Regional Response Team.** The Regional Response Team (RRT), consisting of representatives from selected federal and state agencies, performs functions similar to those performed nationally by the NRT. Essentially, the RRT is the regional body responsible for planning and preparedness before an oil spill occurs, and provides advice to the OSC following such incidents.

- **Technical Assistance Team.** The Technical Assistance Team (TAT) is a contractor used by the EPA Region 10 Office to provide technical oversight for spill response. Requests for the TAT are made via the EPA. Once on site, the TAT will report the situation to the EPA duty officer when then decides whether an EPA OSC needs to be on scene.

- **EPA Environmental Response Team.** The Environmental Response Team (ERT), based in Edison, New Jersey, is established to advise the OSC and RRT on environmental issues surrounding spill containment, cleanup, and damage assessment, with personnel expertise in areas such as treatment technology, biology, chemistry, hydrology, geology, and engineering.

**State Spill Response Organization**

- **Department of Ecology.** Ecology is the lead state agency for environmental pollution response within the State of Washington. As such, it has pre-designated the state OSC and the Incident Commander (IC) for many spills occurring in state jurisdiction. In the event of a spill occurring on a state highway, Ecology coordinates with the Washington State Patrol (State Patrol), which assumes responsibility as IC, and Ecology acts as the lead agency responsible for cleanup activities. Ecology may utilize the following spill response teams or coordinated with the following state organizations.

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*City of Kent Water System Plan*
*Page 7-11*
Ecology Spill Response Team. The Ecology Spill Response Team consists of Ecology regional office personnel. This team is responsible for determining the source, cause, and responsible party, as well as initiating enforcement action as appropriate. Additional responsibilities include ensuring containment, cleanup, and disposal are carried out adequately. The team coordinates its actions with other state, federal, and local agencies.

Natural Resource Damage Assessment Team. The resource damage assessment program is an Ecology-led effort designed to organize state natural resource trustee agencies into an effective resource damage assessment task force. The state Natural Resource Damage Assessment (NRDA) team consists of representatives from Ecology, the Department of Fish and Wildlife (DFW), the Parks and Recreation Commission, the Department of Natural Resources (DNR), Department of Community, Trade, and Economic Development (CTED), and the Department of Health (DOH). In the event of a major pollution event which damages natural resources, this committee's mission is to organize personnel, materials, and equipment necessary to conduct reconnaissance evaluations and initiate detailed assessments of natural resource damages.

State Patrol. The State Patrol acts as the designated Incident Command Agency for incidents on interstate and state highways, and other roads and jurisdictions as delegated. When a spill occurs on a state highway, Ecology joins the Unified Command and acts as the lead agency for cleanup response.

Department of Community, Trade, and Economic Development (CTED) - Emergency Management Division. Washington State Emergency Management Division (EMD) is responsible for the following.

- Developing and maintaining a state Comprehensive Emergency Management Plan
- Maintaining a 24-hour capability to receive notification of incidents and request for assistance and initial notification to local, state, and federal response agencies.
- Activating the state Emergency Operations Center (EOC) as needed to coordinate state resource identification and acquisition in support of Ecology response.
- Providing Public Information Officer (PIO) support to the Incident Command.
- Maintaining an updated list of NRDA team members submitted by participating agencies.
- Maintaining and updating a notification list of local, state, and federal agencies involved in emergency response.
- Coordinating the procurement of state resources for use by the OSC or as requested by local EMD or other designated local response agency or state response agencies.
- Participating in the NRDA team

Department of Fish and Wildlife (DFW). The DFW is a state agency with trustee responsibilities for wildlife, game fish, food fish, non-game fish, shellfish, and associated habitats. The agency is also responsible for state facilities (hatcheries, properties, launching ramps, and related facilities), and assorted equipment. High-value habitats used by fish and wildlife for rearing is of special concern.
Department of Health (DOH). The DOH has the responsibility for beach closures for human health and safety purposes, public health concerns from contaminated food supply (i.e., shellfish), and general health-related matters for the safety of the public. In addition, DOH is to render all appropriate laboratory support and services to the OSC. DOH is a participant in the NRDA team.

Department of Transportation (DOT). The Washington State Department of Transportation (DOT) may provide traffic control, equipment, and personnel for non-hazardous cleanup activities on state and interstate highways. The DOT may provide and mobilize equipment necessary in a major spills incident.

Local Response

Local governments have a duty to be prepared for all disaster emergencies. The county’s Emergency Management Division (EMD) is charged with establishing Local Emergency Planning Districts (LEPD) and Local Emergency Planning Committees (LEPC) to facilitate planning efforts.

LEPCs have the responsibility to create local emergency response plans. General requirements for local response plans are contained in Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Local agencies, particularly fire services and law enforcement agencies, can be activated to provide emergency response services when there is a threat to life and property. Emergency response services may include fire and explosion controls, investigation and documentation, perimeter control, evacuation, traffic controls, and initial containment or even removal, depending on the nature of the incident.

The “first responders” for the majority of spills are these local entities. They provide for immediate protection of health, property, and the environment. It is this group of responders who determine the need for additional assistance and mobilization of the additional resources provided by the state and federal government.

Local Spill Response Capability for the City of Kent WHPA. Local response to hazardous material spills is under the jurisdiction of local fire departments or districts. Local spill response for the WHPA is handled by the Fire District Nos. 37, 43, and 17, as illustrated in Figure 7-2.

Two additional Fire Districts (Nos. 44 and 47) are also shown in the study area but fall outside the WHPA.

These districts rely on the City of Kent HAZMAT team for hazardous materials response. Currently, the City of Kent has a mutual aid agreement with Fire District No. 43, and an agreement is under consideration with District Nos. 17 and 37. The City of Kent has prepared a Hazardous Materials Emergency Plan. The Plan contains the following information.
• Legal and regulatory authority;
• Map of High-Risk areas and list of facilities that require an emergency response plan;
• Operations plan,
• List of notification of response agencies;
• Incident information summary sheet;
• Public information/communication procedures,
• Resource list;
• Health and safety procedures,
• Containment and cleanup procedures; and
• Training requirements.

The Responsible Party

The primary responsibility for assessing, responding to, and containing an oil spill or discharge falls upon the individual, agency, and/or company responsible for the spill incident. The responsible party (RP), whether there is an approved contingency plan or not, is responsible for containment and cleanup of the spill, disposal of contaminated debris, restoration of the environment, and payment of damages. State and federal law specifically require that the removal of a discharge of oil or hazardous substance should be immediate.
Chapter 8
Operation and Maintenance Program

Water Department General Information

The Water Department's current mailing address and phone number is as follows.

City of Kent Water Department
220 4th Avenue South
Kent, Washington 98032-5895
Phone (253) 856-5600
Fax (253) 856-6600

The Water Department's current site address is as follows.

City of Kent Water Department
5821 South 240th
Kent, Washington 98032-5895

State Department of Health Identification Number: 381501

State Department of Health Contact Person: Mr. Bob James, P.E
State Department of Health
1511 Third Avenue, Suite 719
Seattle, WA 98277
(206) 464-7671

Water System Organization, Management, and Personnel

The City of Kent is a municipality organized with an elected mayor/council type of government. The Water system is operated and maintained under the direct supervision of a Water Superintendent holding the Water Distribution Manager 4 certification required by the Washington State Department of Health (DOH). A Public Works Operations Manager oversees the operation of the Public Works Maintenance Division, which includes the Water Department. The Public Works Director manages the entire Public Works Department, including an Engineering Division which provides support to all of the Public Works Divisions.

Overall City management, including Public Works, is provided by a City Operations Manager who acts under the direction of the Mayor/City Council. The Water Superintendent and Public Works Operations Manager handle the routine management decisions for the Water Department. The Public Works Director is involved with all decisions of a significant nature, including the planning for future needs. All major policy decisions and capital requests are reviewed and approved by the Mayor/City Council/Operations Manager. An organizational chart has been included on the following page as figure 8-1.
In the following paragraphs the asterisk (*) denotes specifically qualified and licensed/certified personnel necessary to meet requirements of the Department of Health

**Normal Day to Day Operations**

Management, supervision, and direction is provided by the Water Superintendent*. The Field Supervisors implement and follow through on the planned schedules for operation and maintenance of the water system, and also implement emergency repairs under the direction of the Water Superintendent. Routine repair needs are often requested or reported by customers or citizens of Kent, by meter reader personnel, or by other City staff; and are prioritized and merged with the work schedules by the Field Supervisors* for their specific areas of responsibility.

**Preventative Maintenance**

Weekly work schedules and personnel assignments are prepared by the Field Supervisors and reviewed with the Water Superintendent. Ongoing preventative maintenance programs are continuously improved upon by the field personnel, along with new programs, under the direction of the Field Supervisors and the Water Superintendent. An Infrastructure Management System (Hansen software) is being implemented to track system component inventory, record maintenance history, and produce preventative maintenance work schedules for the water system infrastructure.

**Field Engineering**

Three technical groups support the engineering needs of the water system. The general areas of responsibility are identified below and are shown with the group which normally handles the work in that area.

Consultant Engineers* - Normally they are retained to perform specialized studies related to the water system, as well as specialized design and construction needs; such as water treatment systems, pump stations, hydraulic analysis, and structural improvements.

Public Works Operations Engineers* - Normally manage specialized projects and smaller design and construction needs, such as water treatment project management, Seismic Vulnerability Study and improvements, water system construction standards, plan review, GIS conversion/implementation, emergency power and fall protection programs.

Public Works Engineering* - Normally design and manage water system projects, manage developer improvements to the water system, water tank painting and structural improvements, water main replacements, and construction standards as well as the Cross Connection Control Program.
Water Quality Monitoring

Daily system monitoring of water quality and the required water system monitoring is performed by the Water Quality Division Staff of the Water Department, under the direction of the Water Superintendent, a WDM 4 - in compliance with DOH requirements. Water treatment plant operation is performed by WTPO-2 certified personnel*, as required by DOH, under the direction of the Water Superintendent. Inhouse staff perform most routine water analysis functions daily, and a State certified contract lab is used for all analysis necessary to meet compliance monitoring requirements.

Emergency Response

A. After hours - The Water Superintendent is on call at all times, available by pager or telephone 24 hours a day. Kent's police department maintains callout lists of all water department personnel, and procedures for contacting them during emergencies or for customer complaints. Two water department personnel are normally on 24 hour stand by duty, with pagers and a city vehicle, on weekends and holidays.

B. Normal working hours - Most emergencies during normal working hours are routed through the Control Center for prioritization and dispatch to field crews. The Control Center monitors the Master SCADA terminal and monitors the water system operation, under the direction of the Water Superintendent. Major Emergencies are managed by the City Emergency Operations Committee (EOC), and the Kent Fire Department, coordinated with the Water Department through the Control Center.

Cross Connection Control

The CCC program is managed by a designated construction inspector * (CCS-1) under the supervision of the Construction Engineering Supervisor, Public Works Engineering (see section 6 of this chapter for a description of the CCC program). All Water Department personnel Maintenance Worker 3's and above are CCS-1 certified in order to assist with water system protection and implementation of the program.

Implementation of the improvement program

Improvements are jointly planned and prioritized by personnel of the Engineering and Operations divisions of the Public Works Department. Once developed it is submitted to the Public Works Department for review and approval and to the Mayor and City Council for adoption. Overall implementation is the responsibility of the Public Works Committee, who assigns specific elements thereof to the City Engineer or Operations Manager.

Budget Formulation

Field crews and Field Supervisors prepare and submit operating budget and capital budget requests to the Water Superintendent, who prioritizes requests and adds capital.
improvements, reviews them with the Public Works Operations Manager, and submits them to the Public Works Director for review and approval. Final approval is given by the City Operations Manager / Mayor / City Council. The Water Department rate structure and debt service is managed by the Public Works Director and staff as well as the City Finance Department.

Response to Complaints

Complaints are recorded by office staff and routed to the Water Superintendent or Field Supervisors / Control Center for follow up or crew dispatch in a timely manner. Follow up results are reviewed by the Water Superintendent and recorded by office staff. An Infrastructure Management System Customer Service module is presently being implemented to provide better complaint tracking and more effective response.

Public / Press Contact

All press related releases, related to the Water System, are generally routed to the Water Superintendent, reviewed with the Public Works Operations Manager and the Public Works Director.

Billing

Water customers billing and meter reading is managed by the Utility Billing division of the Finance Department.
conditions. The three pumps alternate every 24 hours. This is the primary mode of operation with the system water pressure signals transmitted to the PLC from a pressure transmitter connected to the discharge piping. The HAND mode of operation is for maintenance or emergencies where an operator may manually control pump operation. The programmable controller and pumps will not operate during a power failure, so system pressure is only from the Highline Water District 560 pressure zone.

When Pump Station #8 is running Pump Station #6 must be shut down, and if Pump Station #6 is running the City of Kent can, if necessary, pump into the Highline system through piping which bypasses the pumps and control valves at Pump Station #8.

West Hill Emergency Supply-Highline Water District Intertie

Water can be supplied to the West Hill of Kent during maintenance or emergencies by using the Highline Intertie at Pump Station #8. This may be supplied to the 587 system by gravity from Highline’s 560 system, although this method is normally only used during the winter. It may also be supplied by booster pumps in Pump Station #8, up to a capacity of 1,200 gpm (2 pumps). This is normally used during the summer or when a larger supply is needed. In either case there is sufficient capacity to supply the 587 zone in this manner.

Water from the Intertie can also be supplied to the 529 System through the 587 system, by using 6-inch pressure reducing valves (PRV’s) at Pump Station #6 and at 42nd Avenue S., when pumping, or by opening the check valve bypasses at Pump Station #6 (16-inch) and at Military Road (8-inch) when using gravity supply from the Highline 560 system. If the Cambridge tank is online in either of these conditions, it normally fills up and the altitude valve closes, providing a backup reservoir of water in case of extremely high demand. If the Cambridge tank is offline the system “ndes” on the Highline 560 system.

Water can also be supplied from the Highline Intertie to the 354 system, through the 529 system, by using the metered PRV Station at Pump Station 4A. The 2.5 and 6 inch PRV’s reduce the pressure from the 529 system down to a level which matches the normal 354 system pressure, with or without the Reith Road tank being online. Should the Reith Road tank be on line, it provides additional storage in the event of an extremely large demand. However, the altitude valve cannot prevent the PRV from over filling the Reith Road tank, due to its location. In addition the altitude valve bypass should be opened to allow a free flow of water from the PS #4A PRV into the 354 system.

And finally, the 2-inch metered bypass at Pump Station #3 can be opened to allow the 354 system to supply the two apartment complexes in the 240 zone which is west of the Green River, when the water main crossing the Green River on the Meeker Street Bridge is out of service.
Storage

6 MG #1

The primary function of the 6 Million #1 Reservoir is to provide storage for the Clark Springs Supply and thus serve as the peaking supply for the pumps serving the 590 System (Pump Station #5; Pump #3 and Pump #2 on high speed), the 485 system (Pump Station #5; Pump #1 and Pump #2 on low speed), as well as the 6 Million #2 Reservoir. The 6 Million #1 Reservoir fresh water storage tank is located near 239th and 98th Avenue South and was erected in 1967 by Chicago Bridge and Iron with Horton Tank Company performing the welding. The tank is 146.0 feet in diameter and 50 feet high. Ground level elevation is 370.0 feet. With the overflow water surface elevation at 418.0 feet, the reservoir contains 48 feet of water when full.

Communication between the 6 Million #1 Reservoir and the City Control Center is via radio telemetry and telephone lines. The water level information from the 6 Million #1 reservoir is sensed at the Pump Station #5 site and transmitted via telemetry to the telemetry base station on the same site, then transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries, a UPS, and a generator in case of a power failure.

The 6 Million #1 Reservoir is gravity fed water from the Clark Springs Transmission Main. When the 6 Million #1 Reservoir becomes full, the altitude valve closes. Predetermined tank level floats dictate when the 6 Million #1 Reservoir altitude valve opens/closes. The City Control Center can also open or close the altitude valve via telemetry control. The altitude valve also has an alternate pressure reducing piloting set to maintain downstream pressure at 25 psi when the 6 MG #1 reservoir is off line. This allows Clark Springs to continue to supply Pump Station #5 and 6 MG #2 reservoir with 6 MG #1 out of service.

6 MG #2 (Garnson Creek Reservoir)

The primary function of the 6 Million #2 Reservoir is to provide peaking storage for high demands and to serve the 240 system. The 6 Million #2 Reservoir fresh water underground storage tank, with tennis courts, basketball court, and play facilities on the roof slab, is located at 9615 S. 218th Street and was built in 1969. The storage facility is 242.6 feet by 158.6 feet. Ground level elevation is 211.5 feet (floor drain) with the overflow water surface elevation at 240 feet. The reservoir is constructed entirely of reinforced concrete and normally contains 28 feet of water when full. The water level information is monitored by a pressure transmitter connected to a bubbler system in the reservoir, and it provides a corresponding signal to the local RTU for transmission to the Master SCADA at the Control Center.

Communication between the 6 Million #2 Reservoir and the City Control Center is via radio telemetry and telephone lines. The radio signals from the 6 Million #2 Reservoir are received at the Pump Station #5 site and transmitted to the master SCADA via U.S.
West telephone lines  The telemetry system is backed up by batteries in case of a power failure.

6 Million #2 Reservoir has two sources for incoming water. The primary supply is flow from 6 Million #1 (located on the Pump Station #5 site) through a 16-inch transmission main which provides on average 3,000 (+/-) gpm depending upon the level of 6 Million #1. As there are customers connected to the transmission main, a back pressure feature on the 6 MG #2 altitude valve ensures that they do not experience a loss of pressure during high flow periods. Garrison Creek Well at the same site also provides up to 500 gpm. When the 6 Million #2 Reservoir becomes full, the altitude valve closes. The altitude valve reopens when the reservoir water level drops two feet, allowing water to begin refilling the reservoir. The Control Center can also signal the altitude valve to close via telemetry. When the 6 MG #2 reservoir is out of service, the 218th Street PRV, which is normally offline, is used to supply water to the 240 zone from the 6 MG #1 to 6MG #2 reservoir transmission main.

Guiberson Street Reservoir

The primary function of the Guiberson Reservoir is to provide peaking storage for high demands and to serve the 240 (Valley) system and also serve as the primary supply for the West Hill system via the 240 system. The discharge piping to the 240 system is 24-inch cast iron pipe, which branches into two 16-inch pipelines just outside the reservoir site. The Guiberson Reservoir is a three million gallon concrete reservoir constructed below grade and covered with a metal roof and walls. Guiberson Reservoir receives its water primarily from Kent Springs and Armstrong Springs, and also from Clark Springs via an intertie if needed.

Communication between the Guiberson Reservoir and the City Control Center is via radio telemetry and telephone lines. The radio signals from the Guiberson Reservoir are received at the Pump Station #5 site and transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries, in case of a power failure.

The Guiberson Reservoir inlet facilities were designed to maintain back pressure on the transmission main in order to maintain pressure for customers connected to the main. Those customers have subsequently been transferred to WD 111. The flow from the Kent Springs transmission main is discharged into the reservoir through a 10-inch butterfly valve with an Auma valve operator (or a 16-inch manifold system which is manually adjusted). This equipment has an upper and lower set point, opening or throttling to maintain the level of the reservoir. An Auma operated outlet valve has been also installed to allow control of the discharge from the reservoir. The reason leading to its installation was a problem with the summer time peak demands exceeding the capacity of the sources supplying the reservoir. Studies denoted that the Guiberson Street Reservoir feeds the southerly portion of the 240 system while also being the primary feeder to the West Hill System. By restricting the outlet flows, it thus forces the 6 Million #2 Reservoir to help service this same area. With the addition of the recent connection for Armstrong Springs Wells (and Soos Creek Well supply in 1998) to the Kent Springs Transmission Main, as
well as the addition of the 212th Treatment Plant supply directly into the northern part of the 240 system during the summer, it is anticipated that the outlet valve throttling feature will no longer be used.

A selector switch on the PLC control panel is labeled RES FILL SELECT and also has the three positions designated MANUAL, TELEMETRY, and PC. With the selector switch in PC the inlet valve is controlled by the PLC. Under PLC control the PLC adjusts the valve position to obtain the high and low flows selected to maintain the correct range of reservoir levels. With the selector switch in the TELEMETRY position, the outlet valve may be opened or throttled to predetermined setpoints via telemetry from the City Control Center.

The outlet control valve is a 16-inch butterfly valve with an Auma operator which can be throttled to reduce flow from the reservoir. There is a selector switch on the control panel labeled OUTLET VALVE SELECT. This switch has three positions designated MANUAL, TELEMETRY, AND PC. With the selector switch in the PC position, the outlet valve position is controlled by the PLC. With the selector switch in the TELEMETRY position, the outlet valve may be opened or throttled to predetermined setpoints via telemetry from the City Control Center.

3.5 MG Tank

The primary function of the 3.5 MG tank is to provide peaking storage and to serve the East Hill/590 system. The 3.5 MG fresh water storage tank, a standpipe, located at 125th Avenue S.E. and S.E. 285th Street was erected in 1978 by Chicago Budget Iron. Water enters and exits through a 12-inch ductile iron pipe. The standpipe is 74 feet in diameter and 110 feet high. Ground level elevation is 483.0 feet with the overflow water surface elevation at 590.0 feet. Capacity is 3.5 million gallons and a pressure transmitter at the base of the tank measures the levels (pressure) of the water in the tank and provides a corresponding signal to the local RTU for transmission to the Master SCADA.

Communication between the 3.5 MG tank and the City Control Center is via radio telemetry and telephone lines. The radio signals from the 3.5 MG Reservoir, Clark Springs, Kent Springs, and Armstrong Springs RTU’s are received at the 3.5 tank ‘Waternet’ RTU and are then retransmitted to the Pump Station #5 site and transmitted to the master SCADA via U S. West telephone lines. The telemetry system is backed up by batteries, and a UPS in case of a power failure.

The 3.5 MG tank has two modes of operation based upon the return flow feature of the altitude valve. When Blue Boy has filled and the altitude valve for Blue Boy has closed, the 590 pumping system (East Hill Well and Pump Station #5) will continue to pump water to fill the 3.5 MG tank. When the 3.5 MG tank becomes full, the altitude valve closes as the pumps shut off. A 2-3 psi drop in pressure in the 590 system causes the 3.5 MG tank altitude valve to open and allows return flow to the 590 system from the reservoir.
Blue Boy Tank

The primary function of the Blue Boy Tank is to provide peaking storage and to serve the East Hill/590 system. The Blue Boy Reservoir, a freshwater storage tank, a standpipe, located at 23616 112th Ave S E was erected in 1965 by Pittsburgh-Des Moines Steel Co. The tank is 42 feet in diameter and 94 feet high. Ground level elevation is 496.0 feet with the overflow water surface elevation at 590.0 feet. The tank capacity is 1 million gallons and a pressure transmitter at the base of the tank measures the levels (pressure) of the water in the tank and provides a corresponding signal to the local RTU for transmission to the Master SCADA.

Communication between the Blue Boy Reservoir and the Control Center is via radio telemetry and telephone lines. The radio signals from the Blue Boy Reservoir are received at the Pump Station #5 site and transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries, in case of a power failure.

The Blue Boy Reservoir has two modes of operation based upon the return flow feature of the altitude valve. The 590 pumping system (East Hill Well and Pump Station #5) pumps water to fill the Blue Boy Reservoir. When the Blue Boy Reservoir becomes full, the altitude valve closes and flow is diverted to the 3.5 MG Reservoir. When both tanks become full the 590 system pump(s) shutdown. As the system pressure drops an inline check valve opens and allows water from Blue Boy to flow into the 590 system, and the altitude valve reopens also.

Cambridge Tank

The primary function of the Cambridge Reservoir is to provide storage and serve the West Hill 529 system. The Cambridge Reservoir, a 300,000 gallon freshwater storage tank, a steel elevated tank, located at South 264th and 34th South was erected in 1959 by American Pipe and Construction Company. Water enters and exists through a 12-inch pipe with the supply coming from Pump Station #4 under most conditions. However, during maintenance of some emergencies the supply may come from the Highline intertie (Pump Station #8). The elevated tank is 53 feet 4 inches in diameter and 85 feet from the ground level to overflow. Ground level elevation is 441.0 feet with the overflow water surface elevation at 529.0 feet. A pressure transmitter at the base of the tank measures the levels (pressure) of the water in the tank and provides a corresponding signal to the local RTU for transmission to the Master SCADA.

Communication between the Cambridge Reservoir and the Control Center is via radio telemetry and telephone lines. The radio signals from the Cambridge Reservoir site (Pump Station #7) are relayed to the Pump Station #5 site and transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries, in case of a power failure.

The Cambridge Reservoir has two modes of operation based upon the return flow feature of the altitude valve. When the Cambridge Reservoir becomes full, the altitude valve
closes, and the pumps at Pump Station #4 turn off. A 2-3 psi drop in pressure in the 529 system causes the reservoir altitude valve to open and allow return flow to the 529 system from the reservoir. When the system pressure drops to the pump start setpoint the PLC at Pump Station #4 starts the pump(s) and refills the tank.

125,000 Gallon Tank

The primary function of the 125,000 Gallon Reservoir is to provide storage for and serve the East Hill 485 system. The 125,000 Gallon Reservoir freshwater elevated storage tank located on 98th Avenue South and 239th, was erected in 1958 by Pittsburgh-Des Moines Steel Company. The tower is approximately 75 feet high with the steel tank (water bowl) 23.5 feet high for a total height of 98.2 feet. The tank is approximately 32 feet in diameter. The ground elevation is 386.8 feet and the overflow surface elevation is 485 feet. A pressure transmitter at Pump Station #5 which is connected to the base of the tank measures the levels (pressure) of the water in the tank and provides a corresponding signal to the local RTU for transmission to the Master SCADA, as well as a control signal for the 485 system pumps.

Communication between the 125,000 Gallon Tank and the City Control Center is via radio telemetry and telephone lines. The water level information from the 125,000 gallon tank is sensed at the Pump Station #5 site and transmitted via telemetry to the telemetry base station on the same site, then transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries, a UPS, and a generator in case of a power failure.

Water from Pump Station #5 Pumps #1 or #2 low speed (or both) supply the 485 system and the water tank until the tank is full and the altitude valve closes. When the 485 system pressure drops 2-3 psi the return flow feature of the altitude valve causes it to reopen and supply the system with water. When the pressure in the system drops to the pump start setpoint the PLC in Pump Station #5 restarts the pump(s) and refills the tank. The 590/485 PRV supplies water to the 485 system at a reduced pressure from the 590 system when the 485 system pumps or the 125,000 gallon tank is out of service.

Reith Road Tank

The primary function of the Reith Road Tank is to provide peaking storage for the West Hill 354.5 system and as a source of supply for Pump Station #4. The Reith Road fresh water storage tank, a steel, ground level tank, located at 42nd Avenue South and Reith Road was erected in 1959 by American Pipe and Construction Company. The tank is 66 feet in diameter and 40 feet high. Ground level elevation is 315.33 feet with the overflow water surface elevation at 354.5 feet. A pressure transmitter at Pump Station #4 which is connected to the base of the tank measures the levels (pressure) of the water in the tank and provides a corresponding signal to the local RTU for transmission to the Master SCADA.

Communication between the Reith Road Tank and the City Control Center is via radio telemetry and telephone lines. The signals from the Reith Road Tank (PS #4) are
received at the Pump Station #5 site and transmitted to the master SCADA via U.S. West telephone lines. The telemetry system is backed up by batteries and a UPS system in case of a power failure.

The Reith Road Tank has two modes of operation based upon the return flow feature of the altitude valve. Pump Station #3 pumps water to fill the Reith Road Tank. When the reservoir becomes full, the altitude valve closes and the Pump Station #3 pump(s) turn off. A 2-3 psi drop in pressure in the 354.5 system causes the reservoir altitude valve to re-open and allow return flow to the 354.5 system from the tank. When the system pressure drops to the pumps start setpoint the PLC at Pump Station #3 starts the pump(s) and refills the tank.

**Interties**

The City currently has several intertie agreements with neighboring purveyors. The primary function of the interties is to provide an alternate supply between purveyors. Table 8-2 lists an inventory of all of the system interties.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Intertie Location</th>
<th>Meter Size</th>
<th>Direction of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn</td>
<td>78th Ave S &amp; 277th St.</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Covington Water District</td>
<td>Wax Road &amp; Kent Kangley</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water District #111</td>
<td>SE 256th St &amp; 115th Ave SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>SE 277th Pl &amp; 124th Ave SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>SE 282nd St &amp; 124th Ave SE</td>
<td>6 inch</td>
<td>Two way</td>
</tr>
<tr>
<td></td>
<td>152nd Ave SE &amp; Kent Kangley</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highline Water District</td>
<td>S 240th St. &amp; 35th Ave S.</td>
<td>8 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Renton</td>
<td>S. 180th St &amp; Lind Ave</td>
<td>10 inch</td>
<td>Two way</td>
</tr>
<tr>
<td>Soos Creek Water</td>
<td>SE 228th &amp; 113th Ave SE</td>
<td>-</td>
<td>Two way</td>
</tr>
<tr>
<td>Tukwila</td>
<td>Todd Blvd. &amp; 68th Ave S.</td>
<td>10 inch</td>
<td>Two way</td>
</tr>
</tbody>
</table>

**Routine Operation**

This section will present a schedule of inspection and maintenance for the major water system components within the Kent Water System. Detailed information regarding each specific pieces of equipment is not presented. There are two complete sets of Operation and Maintenance manuals, one set at each facility and a master set at the maintenance offices. These are upgraded regularly as equipment is replaced in order to remain current.
Lubrication and maintenance instructions specified by the manufacturers are followed closely to meet or exceed their recommendations, in order to maximize the reliability and life expectancy of each piece of equipment.

**Startup and shutdown procedures**

**Sources**

**Wells and Springs**

Exercised regularly to maintain reliability when not in use. Disinfection and bacteriological analysis performed after long periods of inactivity or rehabilitation work. When online, local PLC or remote (SCADA) controls start and stop the pumps as needed, based on reservoir levels or system pressure.

**Pump Stations**

Pumps alternate regularly, usually every 24 hours, to provide exercise in order to maintain maximum reliability. Local controls (or remote SCADA control) start and stop the pumps as needed based on system pressures or reservoir levels.

**Reservoirs**

Reservoirs are monitored regularly for chlorine residuals, daily or weekly, to assure frequent water turnover and avoid stagnation. Pump start and stop setpoints are set to assure frequent water level cycling. Reservoirs which are drained for maintenance or repairs are cleaned, disinfected, and sampled for bacteriological or VOC contaminants before being returned to service, following AWWA Standards.

**Safety Procedures**

Employees adhere to all relevant OSHA/WISHA safety requirements, and follow procedures (outlined in section 6 of this chapter) which meet or exceed those requirements, e.g., lock out/tagout for pump station repairs and maintenance. Regular training of employees during safety meetings and tailgate meeting ensures that all employees are reminded of current safety policies and procedures.

**Meter Reading**

Source, pump station, and reservoir meters are read each weekday on a regular schedule when online. The Water Department plans to implement remote totalizer reading with its new SCADA system in the near future, which will allow for system wide totals to be obtained at a preset time, even on weekends and holidays. This will allow for better record keeping of production and demand, as well as enhance daily demand planning during peak periods.
System Performance

The overall system performance is monitored in two major areas

1. Water Quality Reliability - Operations and maintenance programs and priorities are aligned to achieve optimum water quality which meets or exceeds DOH requirements throughout the water system. Water quality performance is measured by the history of MCL violations, as well as the number, frequency and type of complaints from customers regarding water quality. Performance is also measured by the daily source/system water quality parameters being above or below the average recorded. The Kent water system has an excellent record of water quality in its system over the last six years.

2. Water production and storage - Operations and maintenance programs and priorities are aligned to achieve a reliable water supply measured both in quantity stored to meet demands and system pressures exceeding 30 psi at all times. Kent's system has a good history of maintaining reservoir levels at or above 80 percent at all times and water system pressures exceeding 30 psi in all areas, even during peak summer demands and fire flow conditions/testing.

Performance is measured by monitoring and recording reservoir levels and system pressures, as well as tracking customer complaints for low pressure. Most customer complaints for low pressure can be traced to customer plumbing which is galvanized iron and has corroded severely, restricting the volume available throughout the home or business. Customers are advised of the system pressure available and what is causing the volume restrictions.

Facility or system component performance is generally reflected in one of the two areas identified above. Individual equipment or appurtenance performance is monitored for reliable performance throughout its life cycle. Those which do not meet the criteria are scheduled/budgeted for replacement. The new Hansen IMS system will assist in tracking performance and maintenance history in the future, as well as maintenance and repair costs.

Routine procedures and schedules are identified in the following section, 8.3.3.2 Scheduled Preventative Maintenance

Preventative Maintenance

Software

The City of Kent Water Department is in a state of transition with its preventative maintenance program. The existing system (which relies on memory, card files, staffing, and budget constraints) while effective, does not provide the preventative maintenance tracking and direction desired by the City.
The Public Works Operations Division has invested in a software system called HANSEN IMS (Infrastructure Management System). The City invested in this program with the purpose of tracking maintenance work on its infrastructure. This includes valves, hydrants, water mains, water meters and services, pump stations, sources/wells, treatment facilities, and storage tanks/reservoirs.

Another advantage of the Hansen system is that it can be linked to our Geographic Information System (GIS) so that technical maintenance data can be linked to a specific location.

When the Hansen system generates a work order, it also has the capability (as soon as it is linked to GIS) of printing a map of where the asset identified on the work order is located.

Presently, the City is performing an inventory of all the assets within the water system. In the forthcoming years, these assets will be recorded into the Hansen database with maintenance scheduling information. After a few years of information, we will have established a "self-thinking" database which will prompt staff when preventative maintenance work needs to be performed.

Utilizing the Hansen infrastructure management system we will be able to:

- Inventory/track all assets by ID number and physical address
- Track labor, material, and associated costs
- Schedule work by individual asset or group assets
- Generate work orders for scheduled and unscheduled preventative maintenance
- Forecast repairs and replacement part needs
- Project budgetary information

Fire Hydrants

There are approximately 3,000 hydrants within the water system that are maintained by the Water Department. Information such as location, size, type, feeder information, manufacturer, and number of turns for the foot valve are examples of the information that is collected for the database.

Presently, City Water Personnel and Fire Department Personnel share the responsibility of an ongoing program of inspecting and flushing hydrants. The Fire Department inspects and operates each hydrant annually and notifies the Water Distribution Supervisor of any items requiring maintenance. With the addition of the Hansen system, the Water Department does not anticipate changing the current inspection procedures however, it will provide the database for labor, material, and historical data.
Meters 3-inches and Larger

Large meters currently undergo bi-annual testing, with plans for annual testing. Some large meters require additional personnel to enter the confined space. The work order generated by the Hansen system will prompt crews in advance if the meter is located within a confined space, as well as the history of repairs and accuracy profile of each meter.

Water Mains/Dead End Mains

There are approximately 400 dead end mains within the distribution system. Dead end mains are flushed on a yearly basis or on a more frequent basis as required. Each dead end main has been assigned a unique identifier within the Hansen system. Each time the main is flushed, it is recorded in the database. After a few years (or sooner for mains which require more frequent flushing) the database will generate work orders for main flushing. Other distribution mains are flushed or cleaned on an as needed basis.

Pump Stations

All water sources and pump stations are visited on a daily basis while in operation. Well and pump data is recorded and monitored to identify any irregularities in system operation. Pumps and pump station equipment receive regular service on an hours-in-operation or lapsed time basis.

Storage Reservoirs

Weekly visits to the storage reservoirs are made to check security and overall site conditions. The reservoirs are taken out of service approximately every three years for cleaning and are painted every ten to fifteen years or on an as needed basis.

Pressure Reducing Valves

City owned pressure reducing valves are inspected monthly, receive complete maintenance on an annual basis, and are rebuilt every four years. Maintenance for privately owned pressure reducing valves is the responsibility of the customer.

Telemetry

The telemetry system employs primarily electronic components which require little maintenance other than calibration checks and battery replacement.

1. Annually - inspect and lubricate (if necessary) telemetry recording instruments and mechanical flow meters.

In addition to the above scheduled inspections, more frequent checks are made to monitor facilities having temporary problems. Emergency response equipment and spare parts inventory should also be checked periodically.
Watershed Inspection

To assist in maintaining the integrity of the City's watersheds (Clark & Kent Springs) the City has a watershed inspection and wellhead protection (WHPA) program. Under this program on a semiannual basis the watershed areas will be inspected for any activity therein which may affect the water quality at the City's facilities. Should a potential appear, the City would proceed with the necessary testing & studies to verify or discount its concerns. Should a concern be validated the City would take whatever steps necessary to protect the integrity of its sources which could include both physical improvements at its sources and legal action against the polluter. The City has obtained baseline sampling results from multiple sites within its watershed and WHPA's one year time of travel, for high and low aquifer level periods, as Phase one of its Wellhead Protection program.

The City also has advised the county of those areas under county jurisdiction which is suspected of lying within the watershed area and ask for consideration and cooperation therein per county land use planning and actual developments.

The City also contracts for daily security patrol services during evening and night time hours at these sources.
## Scheduled Preventative Maintenance

### Table 8-3

<table>
<thead>
<tr>
<th>Component</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Semi</th>
<th>Annual</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect online buildings and sites, pumps and chemical feed equipment, record flow and hour meter readings and electronic well levels, make adjustments, add chemicals, and sample and record water quality information.</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise generators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Inspect all facilities, manually sound and record pumping and monitoring well levels. Clean buildings and piping.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Inspect and exercise/test all equipment, perform scheduled PM, lubricate and adjust equipment as necessary per manufacturers recommendations, record pump and motor voltage, amperage, and efficiency values.</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and test motor/pump bearings – ultrasound.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Inspect and test electrical panels and motor connections - infrared.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Inspect watersheds and surrounding areas - WHPA.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Monitoring well levels recorded</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>More thorough at summer and winter.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounds maintenance, mowing, and weeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>More thorough at summer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Spring and summer.</td>
</tr>
<tr>
<td>Tree pruning and clearing fence lines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Spring/Fall.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repaint buildings and piping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>1-5 years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect/clean/test pump control valves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Rebuild pump control valves – replace all rubber parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contractor every 4 years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibrate flow meters – level and pressure transmitters, rebuild as necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Component</td>
<td>Interval</td>
<td>Comments</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump Stations</td>
<td>Daily</td>
<td>Weekly</td>
<td>Monthly</td>
<td>Semi-Annual</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>Inspect online buildings and sites, pumps, and equipment. Record flow/hour meter and pressure readings, check Cl₂ and pH readings</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise generator(s) and diesel pump(s).</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect all facilities, clean buildings and piping.</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and exercise/test all equipment, perform scheduled PM, lubricate and adjust equipment as necessary to meet manufacturer's recommendations, record pump and motor voltage, amperage, and efficiency values</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and test motor/pump bearings - ultrasound</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and test electrical panels and motor connections - infrared</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect/clean/test pump control valves</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebuild pump control valves - replace all rubber parts.</td>
<td></td>
<td></td>
<td>Contractor</td>
<td></td>
<td>every 4 years.</td>
<td></td>
</tr>
<tr>
<td>Calibrate flow meters and pressure transmitters - rebuild as necessary</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repaint buildings and piping</td>
<td></td>
<td></td>
<td></td>
<td>1-5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounds maintenance mowing and weeding.</td>
<td></td>
<td></td>
<td>Spring and summer</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree pruning and clearing fence lines</td>
<td></td>
<td></td>
<td>Spring/Fall</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*City of Kent Water System Plan Page 8-67*
<table>
<thead>
<tr>
<th>Component</th>
<th>Interval</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect online reservoirs exterior and grounds</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Record reservoir levels and chlorine, fluoride, pH values for source dosage adjustments and system water quality data.</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Inspect and clean screens, hatches, vents, control valves, and level indicators/reservoir interior. Perform scheduled PM, lubricate and adjust equipment to meet manufacturers recommendations</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Inspect/clean/test altitude valves</td>
<td>x</td>
<td>Contractor every 4 years</td>
</tr>
<tr>
<td>Rebuild altitude valves - replace all rubber parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibrate flow meters and pressure transmitters - rebuild as necessary</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Clean reservoir exterior</td>
<td>x</td>
<td>Yearly or as needed</td>
</tr>
<tr>
<td>Drain reservoir, clean sides and bottom, inspect interior for cracks and leaks or paint deterioration (reseal or recoat 20 years - as needed)</td>
<td></td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Grounds maintenance</td>
<td>x</td>
<td>As needed</td>
</tr>
</tbody>
</table>
### Table 8-6
Intertie Preventative Maintenance Schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Semi-Annual</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect online sites daily, record flow and pressure readings, water quality information</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and clean all intertie sites, vaults, hatches, and piping</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect, flush, and test/exercise all equipment</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Inspect and test electrical panels and motor connections - infrared</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Inspect, clean, and test control and PRV valves</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Inspect, calibrate, and test flow meters - rebuild as necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Every 2 years</td>
</tr>
<tr>
<td>Rebuild control valves - replace all rubber parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contractor every 4 years</td>
</tr>
<tr>
<td>Grounds maintenance</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>As Needed</td>
</tr>
</tbody>
</table>

### Table 8-7
PRV Preventative Maintenance Schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Semi-Annual</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Reducing Valve stations and vaults</td>
<td>Daily</td>
<td>Weekly</td>
<td>Monthly</td>
<td>Semi-Annual</td>
<td></td>
</tr>
<tr>
<td>Inspect and clean valve stations and vaults Record pressures and check operation</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect, clean, adjust, and test pressure reducing valves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Rebuild Control Valves - replace all rubber parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Contractor - Every 4 years</td>
</tr>
</tbody>
</table>
### Table 8-8
**Distribution System Preventative Maintenance Schedule**

<table>
<thead>
<tr>
<th>Component</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Semi-Annual</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect representative samples Cl₂, NaF, and pH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir/remote sites Cl₂, NaF, pH, and bacteriological (50)</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>DOH requirement</td>
</tr>
<tr>
<td>Flush all dead end mains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>More frequently when needed</td>
</tr>
<tr>
<td>Air/vacuum release valves - inspect, clean, and test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission mains (inspect and clean easements)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Distribution mains - leak detect program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Fire hydrants/hydrant valves - inspect, test, operate, and record pressures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Distribution valves - exercise and clean out valve box</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 and 4 inch</td>
</tr>
<tr>
<td>Test 3-inch and larger meters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Every year</td>
</tr>
<tr>
<td>Replace 2-inch and smaller meters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15 year replacement</td>
</tr>
<tr>
<td>Read commercial meters</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Read residential meters</td>
<td></td>
<td></td>
<td></td>
<td>Bi-monthly</td>
<td></td>
</tr>
<tr>
<td>Distribution main cleaning - future</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Cross connection/backflow devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

### Table 8-9
**SCADA Preventative Maintenance Schedule**

<table>
<thead>
<tr>
<th>Component</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Semi-Annual</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote units (RTU) - inspect and test batteries, calibration, and radio transmission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Base station and master SCADA - test auxiliary power supplies.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Clean and test/verify function of all discrete, analog, and control points from remote sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
System Changes when a Facility is off line or unavailable

Sources

1. Clark Springs – use alternate sources or well to augment winter demands. Use emergency interties or curtailment procedures during peak summer demands.

2. Kent Springs – use alternate sources or wells. Use 590 system interties (2) to supply the KSTM as needed to supply the Guiberson Reservoir.

3. Armstrong Springs – use alternate sources or wells.

4 Soos Creek Well – use alternate sources or wells.

5. East Hill Well – use Pump Station #5 pump(s) #3 and #2 (high) for the 590 system, as well as WD #111 Interties or alternate sources or wells to supply the 6 MG #1 Reservoir and Pump Station #5.

6 212/208 Wells – use alternate sources in winter, use emergency interties or curtailment procedures during peak summer demands.

7 Garrison Well – use alternate sources.

Pump Stations

1 Pump Station #3 – use leased emergency generator for lengthy power failures, other significant failures, or when maintenance requires the use of the Highline Water District intertie (Pump Station #8) to supply the West Hill through Pump Station #6 and 42nd Ave PRV’s (529 zone) and the Pump Station #4 PRV (354 zone).

2 Pump Station #4 – automatically use diesel engine pump during power failures. Other significant failures requires the use of the Highline Water District intertie (Pump Station #8) and the Pump Station #6/42nd Ave PRV’s to supply the 529 zone.

3 Pump Station #5 – automatically use a generator during power failures. Use East Hill Well to supply the 590 zone when Pump Station #5 pumps #3 and #2 (high) are not available, use 590 to 485 PRV when Pump Station #5 pumps #1 and #2 (low) are not available.

4. Pump Station #6 – use the Highline Water District intertie (Pump Station #8) to maintain 587 system pressures

5 Pump Station #7 – no alternative, Cambridge tank (529 zone) provides essential pressures and fire flows to meet system requirements
Reservoirs

1. 6 MG #1 Reservoir – use Clark Springs Transmission Main with 6 MG #1 altitude valve pilot switched to pressure reducing feature – set at 25 psi, to supply water to Pump Station #5 and the 6 MG #2 reservoir.

2. 6 MG #2 Reservoir (Garrison Creek) – use the 218th Street PRV station to supply water to the 240 system from the 6 MG #1 Reservoir (418 system). Use the 212th Treatment Plant and wells to provide additional supply during demand periods, or the Renton and Tukwila interties.

3. Guiberson Reservoir – use the reservoir bypass to augment the supply to the 240 zone by the 6 MG #2 Reservoir. Use the Auburn intertie, or the Renton/Tukwila interties, to provide additional supply. Use the 590 system intertiews (2) to the KSTM for alternate supply.

4. Blue Boy Reservoir – use the Pump Station #5 pump #3 continuous operation with excess flow recirculated back to the pump suction. The 3.5 MG Reservoir and East Hill Well can provide an emergency supply in the event of excessive peaking demands or Pump Station #5 failure while in this mode.

5. 3.5 MG Reservoir – use the Pump Station #5 pump #3 continuous operation with excess flow recirculated back to the pump suction. The Blue Boy Reservoir and East Hill Well can provide an emergency supply in the event of excessive peaking demands or Pump Station #5 failure while in this mode.

6. Reith Road Reservoir and Cambridge Tank – use the Highline Intertie with the Pump Station #6/42nd Ave PRV to supply the 529 zone and the Pump Station #4 PRV to supply the 354 zone.

7. 125,000 Elevated Tank – use the 590/485 PRV at Pump Station #5.

Transmission Mains

1. Clark Springs Transmission Main (CSTM) – divert water to the KSTM at Kent Springs, at Armstrong Springs, and at the 132nd interties.

2. Kent Springs Transmission Main (KSTM) – divert water to the CSTM at Kent Springs, at Armstrong Springs, and at the 132nd interties. Also augment flows from the 590 system to the KSTM at interties on Woodland Way and at 104th Ave South/SE 267th Street to supply Guiberson Reservoir.
The Water Department owns the following vehicles.

### Table 8-10

**Water Department Vehicles / Equipment**

<table>
<thead>
<tr>
<th>Vehicle #</th>
<th>Year</th>
<th>Equipment Make</th>
<th>Equipment Model</th>
<th>Life (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5317</td>
<td>89</td>
<td>Chevy</td>
<td>C20 Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5350</td>
<td>89</td>
<td>Chevy</td>
<td>Celebrity</td>
<td>120</td>
</tr>
<tr>
<td>5357</td>
<td>89</td>
<td>Chevy</td>
<td>Cargo Van</td>
<td>120</td>
</tr>
<tr>
<td>5358</td>
<td>96</td>
<td>Ford E350 Van</td>
<td>Econoline</td>
<td>120</td>
</tr>
<tr>
<td>5359</td>
<td>88</td>
<td>Dodge</td>
<td>D250 Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5360</td>
<td>88</td>
<td>Dodge</td>
<td>D1 Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5362</td>
<td>90</td>
<td>Dodge</td>
<td>D150 Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5363</td>
<td>92</td>
<td>Chevy</td>
<td>C1 Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5364</td>
<td>91</td>
<td>GMC</td>
<td>G10 Cargo Van</td>
<td>84</td>
</tr>
<tr>
<td>5365</td>
<td>88</td>
<td>Ford</td>
<td>E350 Utility</td>
<td>120</td>
</tr>
<tr>
<td>5366</td>
<td>91</td>
<td>Ford</td>
<td>E372 Econovan</td>
<td>120</td>
</tr>
<tr>
<td>5368</td>
<td>96</td>
<td>Ford E350 Van</td>
<td>Econoline</td>
<td>120</td>
</tr>
<tr>
<td>5399</td>
<td>97</td>
<td>Chevy S-10</td>
<td>Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5400</td>
<td>97</td>
<td>Chevy S-10</td>
<td>Pickup</td>
<td>120</td>
</tr>
<tr>
<td>5404</td>
<td>96</td>
<td>International 2.5 ton</td>
<td>Service Truck</td>
<td>120</td>
</tr>
<tr>
<td>5405</td>
<td>97</td>
<td>International 2.5 ton</td>
<td>Service Truck</td>
<td>120</td>
</tr>
<tr>
<td>5354</td>
<td>96</td>
<td>Case</td>
<td>Backhoe</td>
<td>120</td>
</tr>
</tbody>
</table>

Within the City of Kent there is a Fleet Services Department. The Fleet Services Department owns and rents vehicles and equipment to all departments as needed. Following is a list of the heavy equipment which is available to the water department.
### Table 8-11
**Fleet Services Vehicles**

<table>
<thead>
<tr>
<th>Vehicle #</th>
<th>Year</th>
<th>Equipment Make</th>
<th>Equipment Model</th>
<th>Life (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8729</td>
<td>95</td>
<td>Ford</td>
<td>1 Ton Dump</td>
<td>120</td>
</tr>
<tr>
<td>8731</td>
<td>75</td>
<td>Ford</td>
<td>5 Yard Dump</td>
<td>180</td>
</tr>
<tr>
<td>8732</td>
<td>90</td>
<td>International</td>
<td>5 Yard Dump</td>
<td>180</td>
</tr>
<tr>
<td>8733</td>
<td>90</td>
<td>International</td>
<td>5 Yard Dump</td>
<td>180</td>
</tr>
<tr>
<td>8734</td>
<td>95</td>
<td>International</td>
<td>5 Yard Dump</td>
<td>180</td>
</tr>
<tr>
<td>8735</td>
<td>96</td>
<td>International</td>
<td>5 Yard Dump</td>
<td>180</td>
</tr>
<tr>
<td>8736</td>
<td>82</td>
<td>Mack</td>
<td>10 Yard Dump</td>
<td>240</td>
</tr>
<tr>
<td>8737</td>
<td>90</td>
<td>Ford</td>
<td>10 Yard Dump</td>
<td>240</td>
</tr>
<tr>
<td>8739</td>
<td>83</td>
<td>John Deere</td>
<td>Loader</td>
<td>240</td>
</tr>
<tr>
<td>8745</td>
<td>87</td>
<td>Traileze</td>
<td>Trailer</td>
<td>240</td>
</tr>
</tbody>
</table>

Appendix D contains an inventory of additional equipment, tools, and supplies used by the water system which are on-hand and readily available at all times.

The following table identifies the typical types and amounts of chemicals stored/used by the water system continuously or when the facility is in operation.

### Table 8-12
**Chemical Inventory**

<table>
<thead>
<tr>
<th>Site</th>
<th>Chemicals Used/ Stored</th>
<th>Estimated Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>Chlorine (Gas)</td>
<td>2,500 lbs.</td>
</tr>
<tr>
<td></td>
<td>Sodium fluoride</td>
<td>50,000 lbs.</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Chlorine (Gas)</td>
<td>2,500 lbs</td>
</tr>
<tr>
<td></td>
<td>Sodium fluoride</td>
<td>1,500 lbs.</td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Chlorine (Gas)</td>
<td>450 lbs.</td>
</tr>
<tr>
<td></td>
<td>Sodium fluoride</td>
<td>1,500 lbs.</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Chlorine (Gas)</td>
<td>450 lbs.</td>
</tr>
<tr>
<td></td>
<td>Sodium fluoride</td>
<td>1,500 lbs.</td>
</tr>
<tr>
<td>O'Brien Well</td>
<td>Sodium hypochlorite (12.5%)</td>
<td>150 gallons</td>
</tr>
<tr>
<td>Armstrong Springs</td>
<td>Chlorine (Gas)</td>
<td>300 lbs.</td>
</tr>
<tr>
<td>Emergency backup</td>
<td>Sodium fluoride</td>
<td>1,500 lbs.</td>
</tr>
<tr>
<td>212th Street Treatment Plant</td>
<td>Sodium fluoride</td>
<td>1,500 lbs.</td>
</tr>
<tr>
<td></td>
<td>Sodium hydroxide (25%)</td>
<td>4,200 gallons</td>
</tr>
<tr>
<td></td>
<td>Sodium hypochlorite (12.5%)</td>
<td>1,420 gallons</td>
</tr>
<tr>
<td></td>
<td>Potassium permanganate (Dry)</td>
<td>2,000 lbs.</td>
</tr>
<tr>
<td></td>
<td>Potassium permanganate (4% solution)</td>
<td>2,202 gallons</td>
</tr>
</tbody>
</table>
Service Representatives and Suppliers


Manufacturers Technical Specifications

1. Equipment specifications are maintained in a full set of Operation and Maintenance Manuals kept at each facility and a master set is kept in the Operations Office for staff use.

2. Chemical specifications are identified in the Warehouse/Purchasing agents files as well as the MSDS records, as well as being posted on site wherever used for water treatment.

Comprehensive Monitoring (Regulatory Compliance) Plan

Existing Water Quality

The City of Kent's water supply is currently classified as groundwater at each source. In keeping with current Department of Health guidelines, the City is conducting added monitoring for the determination of potential groundwater under the direct influence of surface water at the Clark Springs and Kent Springs sources. The City is also conducting an extensive Wellhead Protection Monitoring Program to serve as an early detection of possible aquifer contamination. The Program involves monitoring from selected wells within the 1 year, 5 year, and 10 year zones of influence for the sources most susceptible to contamination; Clark Springs, Kent Springs, and Armstrong Springs.

The current quality of Kent's water supply is excellent with only minor secondary contaminant concerns. Secondary contaminants are classified by the Environmental Protection Agency (EPA) as aesthetic concerns and not a threat to human health. These contaminants are primarily iron and manganese. They are treated by dilution at the Soos Creek and Garrison Creek well sites, and oxidation followed by filtration for the 208th and 212th wells #1 and #2 sites. The City chlorinates its water supply for public health protection from bacteriological pathogens. The City also fluoridates the water supply for dental health benefits for consumers. The City's water supply is also moderately hard, with a relatively low pH, consequently, it is corrosive to plumbing fixtures. The City is currently in the design phase of facilities to adjust the pH of the water to make it less corrosive. As noted earlier, the 212th Treatment Plant adjusts the pH of its product water to a pH of 8.2 whenever it is operating.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type of Treatment</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Chlorination, fluoridation</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Chlorination, fluoridation</td>
<td>Blended with Clark Springs or Kent Springs</td>
</tr>
<tr>
<td>Armstrong Springs Wells #1 &amp; #2</td>
<td>Chlorination, fluoridation</td>
<td>None</td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>No Treatment</td>
<td>Blended with treated water at 6 MG #2 Tank</td>
</tr>
<tr>
<td>O'Brien Well</td>
<td>Chlorination, Fluoridation</td>
<td>None</td>
</tr>
<tr>
<td>208th Well and 212th Wells #1 and #2</td>
<td>Chlorination, fluoridation Filtration and pH adjustment</td>
<td>208th and 212th Wells treated together at the 212th Street Treatment Plant</td>
</tr>
<tr>
<td>Analytical Parameter</td>
<td>Monitoring Location</td>
<td>Monitoring Frequency</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>pH</td>
<td>Each on-line source</td>
<td>Daily</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Each on-line source</td>
<td>Daily</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Selected Distribution System Locations</td>
<td>Daily</td>
</tr>
<tr>
<td>Fluoride</td>
<td>Selected Distribution System Locations</td>
<td>Daily</td>
</tr>
<tr>
<td>Bacteriological</td>
<td>Source/Selected Distribution System Locations</td>
<td>Daily</td>
</tr>
<tr>
<td>Inorganic Chemicals</td>
<td>Each source</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Nitrite / Nitric</td>
<td>Each source</td>
<td>Every year</td>
</tr>
<tr>
<td>Trihalomethanes</td>
<td>Each source</td>
<td>Every year</td>
</tr>
<tr>
<td>Radionuclides</td>
<td>Each source</td>
<td>Every 4 years</td>
</tr>
<tr>
<td>Arsenic</td>
<td>From Distribution System</td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Lead / Copper</td>
<td>From selected customer taps throughout Distribution System</td>
<td></td>
</tr>
<tr>
<td>Volatile organic</td>
<td>Each source</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Synthetic organic</td>
<td>Each source</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Groundwater under direct surface infl. monitoring</td>
<td>Clark Springs, Kent Springs, from source and the nearest surface waters</td>
<td>Daily</td>
</tr>
<tr>
<td>Source</td>
<td>Sample Location</td>
<td>Parameters Monitored for</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
</tr>
<tr>
<td>Clark Springs</td>
<td>Gravity flow from infiltration gallery - sample from sample tap on gravity supply line</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, Radionuclides, GWUI, Chlorine, Fluoride</td>
</tr>
<tr>
<td></td>
<td>Pumping from well field - sample from taps at well head</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mainline sample tap inside surge tank building</td>
<td></td>
</tr>
<tr>
<td>CSTM</td>
<td>125K Gallon Tank - sample at tank base</td>
<td></td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Gravity flow from infiltration gallery - sample from sample tap on gravity supply line</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, Radionuclides, GWUI</td>
</tr>
<tr>
<td></td>
<td>Pumping from well field - sample from taps at well head</td>
<td></td>
</tr>
<tr>
<td>KSTM</td>
<td>Guiberson Reservoir - incoming line sample tap</td>
<td></td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Sample tap on well building Sample on mainline</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>Sample tap on mainline piping prior to discharge into 6 MG #2 Tank</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Sample tap on mainline piping</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>O'Brien Well</td>
<td>Sample tap on mainline piping</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>Armstrong Springs Wells #1 &amp; #2</td>
<td>Sample taps on mainline piping</td>
<td>pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides</td>
</tr>
<tr>
<td>208th Well and 212th Wells #1 &amp; #2</td>
<td>Sample lines at sample sink inside 212th Street Water Treatment Plant</td>
<td>Pre-filtration: pH, turbidity, bacteriological, IOC, VOC, SOC, THM, radionuclides, iron, manganese Post-filtration: pH, turbidity, chlorine, fluoride, iron, manganese</td>
</tr>
</tbody>
</table>
The following is a partial list of Analytical Laboratories used by the City for routine and specific analysis of drinking water samples. These laboratories are EPA and DOH certified for compliance with Department of Health Regulations.

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Phone Number</th>
<th>Address</th>
<th>Analysis performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Management Labs Inc</td>
<td>(253) 531-3121</td>
<td>1515 80th Street E</td>
<td>Bacteriological, IOC, VOC, SOC, THM, general chemistry and other water quality analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tacoma, WA 98404</td>
<td></td>
</tr>
<tr>
<td>Laucks Testing Laboratories, Inc</td>
<td>(206) 767-5060</td>
<td>940 S Harney</td>
<td>Bacteriological, IOC, VOC, SOC, THM, general chemistry and other water quality analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seattle, WA</td>
<td></td>
</tr>
<tr>
<td>AM Test, Inc</td>
<td>(425) 885-1664</td>
<td>14603 NE 87th</td>
<td>Organic and general chemistry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Redmond, WA</td>
<td></td>
</tr>
<tr>
<td>Weyerhauser Analytical</td>
<td>(253) 924-6872</td>
<td>32901 Weyerhauser Way S</td>
<td>Organic and general chemistry (also Clark Springs 129 priority pollutants analysis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Federal Way, WA 98477</td>
<td></td>
</tr>
<tr>
<td>State of Washington Department of</td>
<td>(206) 361-2898</td>
<td>1610 NE 150th</td>
<td>Maximum total Trihalomethane potential (MTTP's), radionuclides, general organic chemistry</td>
</tr>
<tr>
<td>Public Health Laboratories</td>
<td></td>
<td>Street Seattle, WA 98155</td>
<td></td>
</tr>
<tr>
<td>Sample Date</td>
<td>08/27/97</td>
<td>08/27/97</td>
<td>03/09/00</td>
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<td>-------------</td>
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<tr>
<td>Sample From</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>0.006</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.05</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Barium</td>
<td>0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.004</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.005</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.1</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Copper</td>
<td>0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Iron</td>
<td>0.3</td>
<td>&lt;0.05</td>
<td>0.16</td>
</tr>
<tr>
<td>Lead</td>
<td>3</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.05</td>
<td>0.132</td>
<td>0.335</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.002</td>
<td>&lt;0.0005</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.1</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
</tr>
<tr>
<td>pH</td>
<td>NR</td>
<td>78</td>
<td>78</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.05</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Silver</td>
<td>0.1</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Sodium</td>
<td>5</td>
<td>NR</td>
<td>6</td>
</tr>
<tr>
<td>Thallium</td>
<td>0.002</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Zinc</td>
<td>5</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Hardness</td>
<td>64</td>
<td>88</td>
<td>55</td>
</tr>
<tr>
<td>Conductivity</td>
<td>700</td>
<td>129</td>
<td>162</td>
</tr>
<tr>
<td>Turbidity</td>
<td>1</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Color</td>
<td>15</td>
<td>&lt;5.0</td>
<td>&lt;5.0</td>
</tr>
<tr>
<td>Chloride</td>
<td>250</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cyanide</td>
<td>0.2</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Fluoride</td>
<td>2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Nitrate</td>
<td>10</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Nitrite</td>
<td>1</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Silica (1996)</td>
<td>NR</td>
<td>-</td>
<td>27.6</td>
</tr>
<tr>
<td>TDS (1996)</td>
<td>500</td>
<td>-</td>
<td>72</td>
</tr>
<tr>
<td>Percent to</td>
<td>100</td>
<td>13-27%</td>
<td>8-13%</td>
</tr>
<tr>
<td>System</td>
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<tr>
<td>DOH #</td>
<td>Source Name</td>
<td>Source Category</td>
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<tr>
<td>-------</td>
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<tr>
<td>501</td>
<td>Kent Springs</td>
<td>Infiltration Gallery</td>
<td>10 feet 72-75 feet</td>
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<tr>
<td>502</td>
<td>Clark Springs</td>
<td>Infiltration Gallery</td>
<td>15 feet 51-72 feet</td>
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<tr>
<td>505</td>
<td>East Hill Well</td>
<td>Well</td>
<td>251 feet</td>
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<td>506</td>
<td>Garrison Creek Well</td>
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<td>422 feet</td>
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<td>507</td>
<td>Soos Creek Well</td>
<td>Well</td>
<td>430 feet</td>
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<td>508</td>
<td>Armstrong Springs Well #1</td>
<td>Well</td>
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<td>Armstrong Springs Well #2</td>
<td>Well</td>
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<tr>
<td>510</td>
<td>212⁰ Street Well #1 &amp; #2</td>
<td>Well Field</td>
<td>367 feet</td>
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<td>511</td>
<td>208⁰ Street Well</td>
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<td>512</td>
<td>O'Brien Well</td>
<td>Well</td>
<td>262 feet</td>
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<td>Table 8-19</td>
<td>Major System Components</td>
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<tr>
<td><strong>Storage Reservoirs</strong></td>
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</tr>
<tr>
<td>Name</td>
<td>Location</td>
<td>Capacity (Gallons)</td>
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<tr>
<td>6 MG #1</td>
<td>23825 98th Avenue S</td>
<td>6,000,000</td>
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<tr>
<td>6 MG #2</td>
<td>9615 S. 218th Street</td>
<td>6,000,000</td>
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<tr>
<td>Guiberson Reservoir</td>
<td>700 East Guiberson Street</td>
<td>3,000,000</td>
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<tr>
<td>Blue Boy Tank</td>
<td>23616 112th Avenue SE</td>
<td>1,000,000</td>
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</tr>
<tr>
<td>3.5 MG Tank</td>
<td>28502 124th Avenue SE</td>
<td>3,500,000</td>
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</tr>
<tr>
<td>Cambridge Tank</td>
<td>3301 S. 264th Street</td>
<td>300,000</td>
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</tr>
<tr>
<td>125,000 Gallon Tank</td>
<td>23825 98th Avenue S.</td>
<td>125,000</td>
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</tr>
<tr>
<td>Reith Road Tank</td>
<td>25601 Reith Road</td>
<td>1,000,000</td>
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<tr>
<td><strong>Total Storage Capacity</strong></td>
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<td><strong>20,925,000</strong></td>
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<table>
<thead>
<tr>
<th>Pressure Boosting Stations</th>
<th>Location</th>
<th>Pressure Zones</th>
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<tbody>
<tr>
<td>Pump Station #3</td>
<td>25000 Lake Fenwick Road</td>
<td>240 zone to 354 4 zone</td>
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<tr>
<td>Pump Station #4</td>
<td>25601 Reith Road</td>
<td>354 5 zone to 529 zone</td>
</tr>
<tr>
<td>Pump Station #5</td>
<td>23825 98th Avenue S</td>
<td>416 zone to 485 &amp; 590 zones</td>
</tr>
<tr>
<td>Pump Station #6</td>
<td>25716 38th Avenue S</td>
<td>529 zone to 587 zone</td>
</tr>
<tr>
<td>Pump Station #7</td>
<td>3301 S. 264th Street</td>
<td>529 zone to 565 zone</td>
</tr>
<tr>
<td>Pump Station #8</td>
<td>3401 S. 240th Street</td>
<td>Highline WD to 587 zone</td>
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<table>
<thead>
<tr>
<th>Pressure Reducing Station</th>
<th>Location</th>
<th>Pressure Zones</th>
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<tbody>
<tr>
<td>Alvord PRV</td>
<td>414 Alvord</td>
<td>Middle to Lower 485 zone</td>
</tr>
<tr>
<td>Hilltop PRV</td>
<td>925 Hilltop</td>
<td>Middle to Lower 485 zone</td>
</tr>
<tr>
<td>Seattle Street PRV</td>
<td>802 East Seattle Street</td>
<td>Middle to Lower 485 zone</td>
</tr>
<tr>
<td>Weland PRV</td>
<td>1257 Weland Street</td>
<td>Middle to Lower 485 zone</td>
</tr>
<tr>
<td>*Totem PRV</td>
<td>26800 40th</td>
<td>565 zone to 529 zone</td>
</tr>
<tr>
<td>*42nd Avenue PRV</td>
<td>42nd &amp; 252nd</td>
<td>587 zone to 529 zone</td>
</tr>
<tr>
<td>Pump Station #4 PRV</td>
<td>23825 98th Avenue S</td>
<td>529 zone to 354.5 zone</td>
</tr>
<tr>
<td>Stetson PRV</td>
<td>802 Stetson</td>
<td>Middle to Lower 485 zone</td>
</tr>
<tr>
<td>*218th &amp; 93rd PRV</td>
<td>9231 S. 218th</td>
<td>416 zone to 240 zone</td>
</tr>
<tr>
<td>*590/485 PRV</td>
<td>23825 98th Avenue S</td>
<td>590 zone to 485 zone</td>
</tr>
<tr>
<td>* Normally off</td>
<td></td>
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<table>
<thead>
<tr>
<th>Interties</th>
<th>Location</th>
<th>Pressure Zone Served</th>
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<tbody>
<tr>
<td>Renton Intertie - two way</td>
<td>8814 S 180th Street</td>
<td>240 zone</td>
</tr>
<tr>
<td>Tukwila Intertie - two way</td>
<td>18601 West Valley Hwy.</td>
<td>240 zone</td>
</tr>
<tr>
<td>Highline Intertie - two way</td>
<td>3401 S 240th Street</td>
<td>560 zone</td>
</tr>
<tr>
<td>Covington</td>
<td>Wax Road &amp; Kent Kangley</td>
<td>-</td>
</tr>
<tr>
<td>Soos Creek Water</td>
<td>SE 228th &amp; 113th Ave SE</td>
<td>-</td>
</tr>
<tr>
<td>Auburn Intertie - two way</td>
<td>78th Ave S &amp; S 277th Street</td>
<td>240 zone</td>
</tr>
<tr>
<td>Water District #111 - two way</td>
<td>256th &amp; 124th</td>
<td>590 zone</td>
</tr>
<tr>
<td></td>
<td>282nd &amp; 124th</td>
<td>590 zone</td>
</tr>
<tr>
<td></td>
<td>276th &amp; 124th</td>
<td>590 zone</td>
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City of Kent Water System Plan
Page 8-82
<table>
<thead>
<tr>
<th>Source Name</th>
<th>Source ID #</th>
<th>Type of Treatment</th>
<th>Free Chlorine Residual</th>
<th>Fluoride Concentration</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Kent Springs</td>
<td>S01</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Future pH adjustment</td>
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<tr>
<td></td>
<td></td>
<td>Fluoridation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clark Springs</td>
<td>S02</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluoridation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Hill Well</td>
<td>S05</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Future pH adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluoridation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garrison Creek Well</td>
<td>S06</td>
<td>None</td>
<td></td>
<td></td>
<td>Blended with treated water</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>S07</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Blended with either Clark or Kent Springs</td>
</tr>
<tr>
<td>Armstrong Springs Well #1</td>
<td>S08</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Blended with either Clark or Kent Springs</td>
</tr>
<tr>
<td>Armstrong Springs Well #2</td>
<td>S09</td>
<td>Chlorination</td>
<td>0.6 mg/L</td>
<td>1.0 mg/L</td>
<td>Combined with Armstrong Springs #1</td>
</tr>
<tr>
<td>212th Street Well</td>
<td>S10</td>
<td>Chlorination</td>
<td>0.8 mg/L</td>
<td>1.0 mg/L</td>
<td>Iron and manganese oxidation and filtration followed by chlorination, fluoridation and pH adjustment</td>
</tr>
<tr>
<td>208th Street Well</td>
<td>S11</td>
<td>Chlorination</td>
<td>1.3 mg/L</td>
<td>1.0 mg/L</td>
<td>None</td>
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<tr>
<td>O'Brien Well</td>
<td>S12</td>
<td>Chlorination</td>
<td>1.3 mg/L</td>
<td>1.0 mg/L</td>
<td>None</td>
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<tr>
<td></td>
<td></td>
<td>Fluoridation</td>
<td></td>
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</table>
Sampling Information: Minimum number of routine monthly samples – 50 per DOH
Table 2 WAC246-290-300  Total number of routine sampling sites for representative
coverage = 17

<table>
<thead>
<tr>
<th>Sample Site and follow-up Sites</th>
<th>Sample Location</th>
<th>Pressure Zone</th>
<th>Reservoir Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>27012 47th Avenue S #109</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Cambridge Tank</td>
</tr>
<tr>
<td>27114 46th Avenue S</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>4714 272nd Street S</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Cambridge Tank</td>
</tr>
<tr>
<td>3807 Reith Road (Church)</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>3720 S. 257th Street</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>26018 36th P1 S</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>24629 42nd Avenue S</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>4221 S 247th Street</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>24712 42nd Avenue S.</td>
<td>Outside hose bibb</td>
<td>529 zone</td>
<td>Reith Road Tank</td>
</tr>
<tr>
<td>25000 Lake Fenwick Road (PS #3)</td>
<td>Outside hose bibb</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>4822 252nd P1 S</td>
<td>Outside hose bibb</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>25027 46th Avenue S</td>
<td>Outside hose bibb</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>5821 S 240th Street (City Shops)</td>
<td>Lab sink</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>21861 Russell Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21814 Russell Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>525 N 4th Avenue (Kent Commons)</td>
<td>Drinking fountain</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>713 N. 4th Avenue</td>
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<td></td>
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</tr>
<tr>
<td>310 N 4th Avenue</td>
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<tr>
<td>5801 S. 212th Street (KOA)</td>
<td>Outside hose bibb</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>6329 S 212th Street</td>
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<tr>
<td>22230 Russell Road</td>
<td></td>
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<tr>
<td>8206 S. 192nd Street (Tri-Tec)</td>
<td>Hose bibb in back</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>8256 S 192nd Street</td>
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<td>8040 S. 192nd Street</td>
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<tr>
<td>1234 Central Avenue N (Kent Bowl)</td>
<td>Drinking fountain</td>
<td>240 zone</td>
<td>Guiberson and 6 MG #2</td>
</tr>
<tr>
<td>1246 Central Avenue N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1157 Central Avenue N</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1209 Central Avenue S</td>
<td>Hose bibb</td>
<td>240 zone</td>
<td>Guiberson</td>
</tr>
<tr>
<td>1036 Central Avenue S</td>
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<tr>
<td>1303 Central Avenue S</td>
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Table 8-20
Sample Site Locations Cont.

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<thead>
<tr>
<th>Sample Site and follow-up Sample Sites</th>
<th>Sample Location</th>
<th>Pressure Zone</th>
<th>Reservoir Served</th>
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<tbody>
<tr>
<td>700 E. Guiberson Street (Reservoir)</td>
<td>Inside sample line</td>
<td>240 zone</td>
<td>Guiberson</td>
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<tr>
<td>519 Kennebeck Avenue S.</td>
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<td>418 Kennebeck Avenue S</td>
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<tr>
<td>23825 98th Avenue S. (PS #5)</td>
<td>Sample tap at 125,000 Tank</td>
<td>485 zone</td>
<td>125,000 Tank</td>
</tr>
<tr>
<td>23925 98th Avenue S.</td>
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</tr>
<tr>
<td>23816 98th Avenue S</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10220 SE 228th Street</td>
<td>Outside hose bibb</td>
<td>590 zone</td>
<td>Blue Boy Tank &amp; 6 MG #1</td>
</tr>
<tr>
<td>10320 SE 228th Street</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10122 SE 228th Street</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24225 104th Avenue SE (Parker Paints)</td>
<td>Outside hose bibb</td>
<td>590 zone</td>
<td>Blue Boy Tank &amp; 6 MG #1</td>
</tr>
<tr>
<td>24037 104th Avenue SE</td>
<td></td>
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</tr>
<tr>
<td>24245 104th Avenue SE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10432 Kent Kangley Road (East Hill Hardware)</td>
<td>Coffee bar sink</td>
<td>590 zone</td>
<td>3.5 MG Tank and 6 MG #1</td>
</tr>
<tr>
<td>10618 Kent Kangley Road</td>
<td></td>
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<tr>
<td>10248 SE 256th Street</td>
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<tr>
<td>12018 SE 284th Street</td>
<td>Outside hose bibb</td>
<td>590 zone</td>
<td>3.5 MG Tank and 6 MG #1</td>
</tr>
<tr>
<td>12005 SE 284th Street</td>
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<tr>
<td>12025 SE 284th Street</td>
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</table>

Sample Frequency: 13 Samples taken per week
4 Sample cycles taken per month
52 Total samples per month

Sample Gathering Information: The City of Kent Water Department contracts routine coliform sampling out to Water Management Laboratories, Incorporated. Water Management personnel take thirteen (13) routine coliform samples on each Tuesday of the week. They take these samples on a rotating basis to insure adequate coverage. Water Management also provides the City of Kent with after hours and emergency contact phone numbers for emergencies or disasters. These numbers are (253) 841-0732 (answering service) or (253) 312-1650 and (253) 312-1651 (cellular phones). They have emergency power and extra supplies to provide bacteriological analysis in the event of a natural disaster.
<table>
<thead>
<tr>
<th>Route T1</th>
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<tbody>
<tr>
<td>#1-12018 SE 284° Street</td>
<td>#1-10432 Kent Kangley Rd. (E. Hill Hardware)</td>
</tr>
<tr>
<td>#1A 12018 SE 284° Street</td>
<td>#1A 10432 Kent Kangley Road</td>
</tr>
<tr>
<td>#1B 12005 SE 284° Street</td>
<td>#1B 10618 Kent Kangley Road</td>
</tr>
<tr>
<td>#1C 12025 SE 284° Street</td>
<td>#1C 10248 S 256°</td>
</tr>
<tr>
<td>#2-10432 Kent Kangley Rd. (E. Hill Hardware)</td>
<td>#2-24225 104° Avenue SE (Parker Paint)</td>
</tr>
<tr>
<td>#2A 10432 Kent Kangley Road</td>
<td>#2A 24225 104° Avenue SE</td>
</tr>
<tr>
<td>#2B 10618 Kent Kangley Road</td>
<td>#2B 24037 104° Avenue SE</td>
</tr>
<tr>
<td>#2C 10248 S 256°</td>
<td>#2C 24245 104° Avenue SE</td>
</tr>
<tr>
<td>#3-24225 104° Avenue SE (Parker Paint)</td>
<td>#3-10220 SE 228° Street</td>
</tr>
<tr>
<td>#3A 24225 104° Avenue SE</td>
<td>#3A 10220 SE 228° Street</td>
</tr>
<tr>
<td>#3B 24037 104° Avenue SE</td>
<td>#3B 10320 SE 228° Street</td>
</tr>
<tr>
<td>#3C 24245 104° Avenue SE</td>
<td>#3C 10122 SE 228° Street</td>
</tr>
<tr>
<td>#4-10220 SE 228° Street</td>
<td>#4-23825 98° Avenue S. (PS #5)</td>
</tr>
<tr>
<td>#4A 10220 SE 228° Street</td>
<td>#4A 23825 98° Avenue S</td>
</tr>
<tr>
<td>#4B 10320 SE 228° Street</td>
<td>#4B 23925 98° Avenue S</td>
</tr>
<tr>
<td>#4C 10122 SE 228° Street</td>
<td>#4C 23816 98° Avenue S</td>
</tr>
<tr>
<td>#5-23825 98° Avenue S. (PS #5)</td>
<td>#5-1234 Central Avenue N. (Kent Bowl)</td>
</tr>
<tr>
<td>#5A 23825 98° Avenue S</td>
<td>#5A 1234 Central Avenue N</td>
</tr>
<tr>
<td>#5B 23925 98° Avenue S</td>
<td>#5B 1246 Central Avenue N</td>
</tr>
<tr>
<td>#5C 23816 98° Avenue S</td>
<td>#5C 1157 Central Avenue N</td>
</tr>
<tr>
<td>#6-1234 Central Avenue N. (Kent Bowl)</td>
<td>#6-21409 84° Avenue S. (Restaurant)</td>
</tr>
<tr>
<td>#6A 1234 Central Avenue N</td>
<td>#6A 21409 84° Avenue S</td>
</tr>
<tr>
<td>#6B 1246 Central Avenue N</td>
<td>#6B 21417 84° Avenue S</td>
</tr>
<tr>
<td>#6C 1157 Central Avenue N</td>
<td>#6C 21237 84° Avenue S</td>
</tr>
<tr>
<td>#7-21409 84° Avenue S. (Restaurant)</td>
<td>#7-8206 S. 192° Street (Tri-Tee)</td>
</tr>
<tr>
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<td>#7C 8040 S 192° Street</td>
</tr>
<tr>
<td>#8-8206 S. 192° Street (Tri-Tee)</td>
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<tr>
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<td>#9-5821 S. 248° Street (City Shops)</td>
</tr>
<tr>
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<td>#9A 5821 S 248° Street</td>
</tr>
<tr>
<td>#9B 6329 S 212° Street</td>
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<tr>
<td>#9C 22230 Russell Road</td>
<td>#9C 21814 Russell Road</td>
</tr>
<tr>
<td>#10-5821 S. 248° Street (City Shops)</td>
<td>#10-25000 Lake Fenwick Road (PS #3)</td>
</tr>
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<td>#10A 5821 S 248° Street</td>
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</tr>
<tr>
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<td>#10B 4822 252° PI S</td>
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<tr>
<td>#10C 21814 Russell Road</td>
<td>#10C 25027 46° Avenue S</td>
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<tr>
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</tr>
<tr>
<td>#11A 25000 Lake Fenwick Road</td>
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<tr>
<td>#11B 4822 252° PI S</td>
<td>#11B 4221 S 247° Street</td>
</tr>
<tr>
<td>#11C 25027 46° Avenue S</td>
<td>#11C 24712 42° Avenue S</td>
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<tr>
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<td>#12-3807 Reith Road (Church)</td>
</tr>
<tr>
<td>#12A 24629 42° Avenue S</td>
<td>#12A 3807 Reith Road</td>
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<tr>
<td>#12B 4221 S 247° Street</td>
<td>#12B 3720 S 257° Street</td>
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<tr>
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<td>#1C 1303 Central Avenue S</td>
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<td>#2-70432 Kent Kangley Rd. (E. Hill Hardware)</td>
</tr>
<tr>
<td>#2A 700 E Gulberson Street</td>
<td>#2A 10432 Kent Kangley Road</td>
</tr>
<tr>
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<td>#2B 10618 Kent Kangley Road</td>
</tr>
<tr>
<td>#2C 418 Kennebeck Avenue S</td>
<td>#2C 10248 S 256th</td>
</tr>
<tr>
<td>#3-10432 Kent Kangley Rd. (E. Hill Hardware)</td>
<td>#3-24225 104th Avenue SE (Parker Paint)</td>
</tr>
<tr>
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<td>#3B 24037 104th Avenue SE</td>
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<td>#3C 24245 104th Avenue SE</td>
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<td>#5B 23925 98th Avenue S</td>
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<td>#6-1234 Central Avenue N. (Kent Bowl)</td>
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<td>#6A 1234 Central Avenue N</td>
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<td>#6C 1157 Central Avenue N</td>
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<td>#7-21409 84th Avenue S. (Restaurant)</td>
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<td>#7A 21409 84th Avenue S</td>
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<td>#8-5801 S. 212th Street (KOA)</td>
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<td>#9-525 N. 4th Avenue (Kent Commons)</td>
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</tr>
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</tr>
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<tr>
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<td>#10B 4822 252nd Pl S</td>
</tr>
<tr>
<td>#10C 21814 Russell Road</td>
<td>#10C 25027 46th Avenue S</td>
</tr>
<tr>
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<td>#11-25000 Lake Fenwick Road (PS #3)</td>
</tr>
<tr>
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<td>#11B 25022 42nd Avenue S. (School)</td>
<td>#11B 25022 42nd Avenue S. (School)</td>
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<td>#12-3807 Reith Road (Church)</td>
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<td>#12A 3807 Reith Road</td>
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<tr>
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<td>#12B 3720 S 25th Street</td>
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<tr>
<td>#12C 26018 36th Pl S</td>
<td>#12C 26018 36th Pl S</td>
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</tr>
<tr>
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</tr>
<tr>
<td>#13C 4714 272nd Street S</td>
<td>#13C 4714 272nd Street S</td>
</tr>
</tbody>
</table>
Maximum Contaminate Levels (MCL):

Acute MCL: An acute MCL for coliform bacteria occurs when there is:

- Fecal coliform presence in a repeat sample from the distribution system
- E Coli presence in a repeat sample from the distribution system
- Coliform presence in a set of repeat samples collected as a follow-up to a sample with fecal coliform or E Coli presence

Non-Acute MCL: A non-acute MCL for coliform bacteria occurs when:

- More than 5 percent of the monthly samples with a coliform presence or 3 or more samples out of 52 sample taken from the distribution system

MCL Compliance: The City shall determine compliance with the coliform MCL for each month the system provides drinking water to the public. In determining MCL compliance, the Purveyor shall

- Include routine and repeat samples from the distribution system
- Not include samples invalidated under WAC 246-290-320 and special purpose samples

Follow-up Action when a MCL violation occurs:

When Coliform Bacteria are present: When any sample is not invalidated under WAC 246-290-320, the City shall ensure the following actions are taken:

- The sample shall be analyzed for fecal coliform or E Coli. When a sample with a coliform presence is not analyzed for E Coli or fecal coliform, the sample shall be considered as having fecal coliform presence for MCL compliance purposes
- Repeat samples are collected as described below
- The Department of Health is notified as described below
- The cause of the coliform presence is determined and corrected.

Repeat Samples

The City shall collect and submit for analysis, a set of repeat samples for every sample in which the presence of coliform is detected. A set of repeat samples consists of three (3) samples, one (1) sample each from the following three (3) locations in the distribution system:

1. Site of previous sample with a coliform presence
2. Within five (5) active services upstream from a site of sample with a coliform presence
3. Within five (5) active services downstream from a site of sample with a coliform presence
All samples in a set of repeat samples shall be collected on the same day and submitted for analysis within twenty-four hours after notification by the laboratory of a coliform presence

When repeat samples have coliform presence, the City shall:

1. Contact the Department of Health and collect a minimum of one additional set of repeat samples as directed by the Department of Health.
2. Collect one additional set of repeat samples for each sample where coliform presence was detected.

If a sample with a coliform presence was collected from the first two or last two active services, the City shall monitor as directed by the Department of Health.

The City may change the previously submitted routine sample to a sample in a set of repeat samples when the City:

1. Collects the sample within five adjacent service connections of the location from which the initial sample, with a coliform presence, was collected
2. Collects sample after the initial sample with a coliform presence was submitted for analysis.
3. Collects the sample on the same day as other samples in the set of repeat samples.
4. Notifies the Department of Health of the change

The Department of Health may determine the sets of repeat samples are not necessary during a month when a non-Acute coliform MCL violation is determined for the system.

Invalid Samples

When a coliform sample is determined to be invalid, the City shall collect and submit for analysis

1. An additional coliform sample from the same location as each invalid sample within twenty-four hours of notification of the invalid sample or,
2. Additional coliform samples as directed by the Department of Health

When the Department of Health of Laboratory invalidates a sample, the sample shall not be counted toward the City's minimum coliform monitoring requirements.
Public Notification for Non-Compliance

Prior to notifying the public, coordinate with the following:

### Table 8-22
**City of Kent**

**Public Notification Contacts**

<table>
<thead>
<tr>
<th>Employee</th>
<th>Position</th>
<th>Work Number</th>
<th>Home Number</th>
<th>Pager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don Wickstrom</td>
<td>PW Director</td>
<td>253-856-5500</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Eddy Chu</td>
<td>PW Operations Manager</td>
<td>253-856-5600</td>
<td>425-451-3338</td>
<td>206-314-0763</td>
</tr>
<tr>
<td>Brad Lake</td>
<td>Water Superintendent</td>
<td>253-856-5600</td>
<td>425-413-3975</td>
<td>206-314-0815</td>
</tr>
<tr>
<td>David Chak</td>
<td>Water Quality Supervisor</td>
<td>253-856-5600</td>
<td>253-863-7208</td>
<td>206-314-0953</td>
</tr>
<tr>
<td>Chris Hall</td>
<td>Water Project Supervisor</td>
<td>253-856-5600</td>
<td>253-631-8112</td>
<td>206-314-0888</td>
</tr>
<tr>
<td>Callout list</td>
<td>Kent Police (Records)</td>
<td>253-856-5800</td>
<td>N/A</td>
<td>N/A</td>
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</table>

### Table 8-23
**Washington State Department of Health**

**NW Drinking Water Public Notification Contacts**

<table>
<thead>
<tr>
<th>Section Contact</th>
<th>Position</th>
<th>Work Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethan Moseng, P E</td>
<td>Section Head</td>
<td>206-464-7671</td>
</tr>
<tr>
<td>Robert James, P E</td>
<td>Regional Engineer</td>
<td>206-464-7671</td>
</tr>
<tr>
<td>Jennifer Predzuski</td>
<td>Water Quality Monitor</td>
<td>206-464-6752</td>
</tr>
</tbody>
</table>
Public Notification for Non-Acute MCL Non-Compliance

Newspaper Notice: The City shall provide newspaper notice of a Non-acute coliform MCL violation within fourteen (14) days of violation. The content of the newspaper notice shall include the following:

A. A clear, concise, and simple explanation of the violation
B. Discussion of potential adverse health effects and any segments of the population that may be at a high risk
C. Mandatory health effects information as follows:

Public Notifications

Mandatory Language.

Total Coliforms

The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the presence of total coliforms is a possible health concern. The total coliforms are common in the environment and are generally not harmful themselves. The presence of these bacteria in drinking water, however, generally is a result of a problem with water treatment or the pipes which distribute the water, and indicates that the symptoms may include diarrhea, cramps, nausea and possible jaundice, and any associated headaches and fatigue. These symptoms, however, are not just associated with disease causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water. EPA has set an enforceable drinking water standard for total coliforms to reduce the risks of these adverse health effects. Drinking water, which meets this standard, is usually not associated with health risks from disease causing bacteria and should be considered safe.

D. A list of steps the City has taken or is planning to take to remedy the situation
E. A list of steps the consumer should take including advice on seeking an alternative water supply if necessary
F. Additional information to further explain the situation.

Direct Mail Notice or Hand Delivery to all Consumers:

The City shall provide direct mail notice or hand delivered notice to all consumers of a non-acute coliform MCL violation within forty-five (45) days of violation. The content of the notice shall include all of those items listed above for newspaper notice. The mailed or hand delivered notice must be repeated every three (3) months until the violation is corrected. The Department of Health may waive the City’s mailed or hand delivered notice if the violation is corrected within forty-five (45) days. The waiver shall be made in writing and made within the forty-five (45) day period.
Posted Notice.

The City shall place notices in conspicuous locations and present the notices in a manner making them easy to read. Notices shall remain posted until the violation is corrected. The content of the notice shall include all of those items listed above for newspaper notice.

Notices to New Billing Units or New Hookups:

The City shall give a copy of the most recent public notice for all outstanding violations to all new billing units or hookups before or at the time water service begins.

Copy of Notice to Department of Health:

The City shall provide the Department of Health with a copy of the public notification at the time the City notifies the public.
Public Notification for Acute Coliform MCL Non-Compliance:

Notice to radio and television stations

The City shall provide notice to radio and television stations serving the area within seventy-two (72) hours of the violation of an Acute coliform MCL violation. The content of the notice shall be the same as listed above for newspaper notice for non-acute violation except that the mandatory health effects information shall be as follows:

Public Notifications

Mandatory Language:

Fecal Coliform/E Coli

The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the presence of fecal coliforms or E. coli is a serious health concern. Fecal coliforms and E. coli are generally not harmful themselves, but their presence in drinking water is serious because they usually are associated with sewage or animal waste. The presence of these bacteria in drinking water is generally a result of a problem with water treatment or the pipes that distribute the water and indicates that the water may be contaminated with organisms that can cause disease. Disease symptoms may include diarrhea, cramps, nausea and possibly jaundice, and associated headaches and fatigue. These symptoms, however, are not just associated with disease causing organisms in drinking water, but may also be caused by a number of factors other than your drinking water. EPA has set an enforceable drinking water standard for fecal coliform and E. coli to reduce the risk of these adverse health effects. Under this standard, all drinking water samples must be free of these bacteria. Drinking water which meets this standard is associated with little or none of this risk and should be considered safe. State and local health authorities recommend that consumers take the following precautions.

The City of Kent recommends that customers boil their water or seek an alternative water supply (bottled water) during this outbreak.

Customers undergoing chemotherapy or customers with compromised immune systems should refrain from drinking the water until it is deemed safe. The City of Kent is working with the State and local authorities to take every possible step to remedy the situation. Steps include flushing, chlorinating, and sampling the entire distribution system. The City is also investigating the possible causes for the contamination and measures to prevent it from happening in the future. The City of Kent apologizes for the inconvenience that this unfortunate situation has caused.

Please contact the City of Kent Water Operations and Maintenance office at (253) 856-5600 if you have any questions regarding this matter.
Newspaper Notice:

The City shall provide newspaper notice of an acute coliform MCL violation within fourteen (14) days of violation. The content of the newspaper notice shall be the same as that for the radio and television station notification.

Direct Mail Notice or Hand Delivery to all Consumers:

The City shall provide direct mail notice or hand delivered notice to all consumers of an acute MCL violation within forty-five (45) days of violation. The Department of Health may waive the City’s mail or hand delivery if the violation is corrected within forty-five (45) days. The waiver shall be made in writing and made within the forty-five (45) day period. The content of the notice shall include all of those items listed above for radio and television station notice. The mail or hand delivery notice must be repeated every three (3) months until the violation is corrected.

Posted Notices:

The City shall place posted notices in conspicuous locations and present the notices in a manner making them easy to read. Notices shall remain posted until the violation is corrected. The content of the notice shall include all of those items listed above for the radio and television station notice.

Notices to New Billing Units or New Hookups

The City shall give a copy of the most recent notice for all outstanding violations to all new billing units or new hookups before or at the time water service begins.

Copy of Notice to DOH:

The City shall provide the Department of Health with a copy of the public notification at the time the City notifies the public.
Media Contacts:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley Daily News (News Department)</td>
<td>253-872-6721</td>
</tr>
<tr>
<td>Valley Daily News ( Classified Ads)</td>
<td>253-872-6620</td>
</tr>
<tr>
<td>Seattle Post-Intelligencer (South Bureau)</td>
<td>206-870-7851</td>
</tr>
<tr>
<td>Seattle Post-Intelligencer (Classified Ads)</td>
<td>206-624-7355</td>
</tr>
<tr>
<td>Seattle Times (South Bureau)</td>
<td>253-946-3970</td>
</tr>
<tr>
<td>Seattle Times (Classified Ads)</td>
<td>206-624-7355</td>
</tr>
<tr>
<td>KING 5</td>
<td>206-448-5555</td>
</tr>
<tr>
<td>KIRO 7</td>
<td>206-728-8250</td>
</tr>
<tr>
<td>KOMO 4</td>
<td>206-443-4000</td>
</tr>
<tr>
<td>KIRO (radio)</td>
<td>206-726-7000</td>
</tr>
<tr>
<td>KOMO (radio)</td>
<td>206-223-5700</td>
</tr>
</tbody>
</table>

Emergency Response

All water supply systems are subject to damage and interruption from unusual emergency events. This section presents a discussion of the vulnerability of the Kent system and outlines a general program for responding to a variety of emergency conditions. To establish an effective emergency program, more detailed schedules and assignments are developed by Water Department personnel within the outline presented here.

Water System Personnel Emergency Call-up List

The following table identifies, in ranked order (based on DOH certification level and experience), water system personnel responsible for making decisions in specific emergency situations. Job titles and phone numbers (work and home) are included. Position descriptions are available previously in this chapter. Phone number accuracy may change over time. The Kent Police Department (phone 253-856-5800) has a current list of all phone numbers on file and available 24 hours a day as well as procedures for emergency callout of the proper personnel.
Table 8-25
Water System Personnel
Emergency Call-up List

<table>
<thead>
<tr>
<th>Employee</th>
<th>Position</th>
<th>Work Numbers</th>
<th>Home Number</th>
<th>Pager Number</th>
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</thead>
<tbody>
<tr>
<td>Brad Lake</td>
<td>Water Superintendent</td>
<td>253-856-5600</td>
<td>425-413-3975</td>
<td>206-314-0815</td>
</tr>
<tr>
<td>Chris Hall</td>
<td>Distribution Field Supervisor</td>
<td>253-856-5600</td>
<td>253-631-8112</td>
<td>206-314-0888</td>
</tr>
<tr>
<td>Dave Chihak</td>
<td>Treatment Field Supervisor</td>
<td>253-856-5600</td>
<td>253-863-7208</td>
<td>206-314-0953</td>
</tr>
<tr>
<td>Phil McConnell</td>
<td>Distribution Field Supervisor</td>
<td>253-856-5600</td>
<td>253-537-2423</td>
<td>206-314-0910</td>
</tr>
<tr>
<td>Trevor Giles</td>
<td>Facilities Field Supervisor</td>
<td>253-856-5600</td>
<td>253-939-1185</td>
<td>206-314-0961</td>
</tr>
<tr>
<td>Kevin Swinford</td>
<td>MW 4 Electrical Technician</td>
<td>253-856-5600</td>
<td>425-432-3435</td>
<td>206-314-0965</td>
</tr>
<tr>
<td>George Jett</td>
<td>Control Center Technician</td>
<td>253-856-5600</td>
<td>253-630-0530</td>
<td>N/A</td>
</tr>
<tr>
<td>Harry Deling</td>
<td>Utility Locator</td>
<td>253-856-5600</td>
<td>253-874-4349</td>
<td>206-314-0899</td>
</tr>
<tr>
<td>Denny Scott</td>
<td>Facilities MW 3</td>
<td>253-856-5600</td>
<td>253-639-9132</td>
<td>N/A</td>
</tr>
<tr>
<td>Tim Stegner</td>
<td>Distribution MW 4</td>
<td>253-856-5600</td>
<td>206-938-1433</td>
<td>N/A</td>
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<tr>
<td>Pat Alconcel</td>
<td>Distribution MW 3</td>
<td>253-856-5600</td>
<td>253-862-4870</td>
<td>N/A</td>
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<tr>
<td>Paul Johnson</td>
<td>Distribution MW 2</td>
<td>253-856-5600</td>
<td>253-863-3423</td>
<td>N/A</td>
</tr>
<tr>
<td>Shawn Ralph</td>
<td>Facilities MW 2</td>
<td>253-856-5600</td>
<td>253-850-8331</td>
<td>N/A</td>
</tr>
<tr>
<td>Jason Roller</td>
<td>Distribution MW 2</td>
<td>253-856-5600</td>
<td>253-630-8657</td>
<td>N/A</td>
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<tr>
<td>John Sizemore</td>
<td>Distribution MW 3</td>
<td>253-856-5600</td>
<td>253-859-9497</td>
<td>N/A</td>
</tr>
<tr>
<td>Steve Reynolds</td>
<td>Distribution MW 3</td>
<td>253-856-5600</td>
<td>360-897-9369</td>
<td>N/A</td>
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<tr>
<td>Ron Halverson</td>
<td>TPO MW 4</td>
<td>253-856-5600</td>
<td>360-886-9758</td>
<td>N/A</td>
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<tr>
<td>Brandon Lynch</td>
<td>Distribution MW 2</td>
<td>253-856-5600</td>
<td>360-393-5173</td>
<td>N/A</td>
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<tr>
<td>Heather McIntosh</td>
<td>Treatment MW 2</td>
<td>253-856-5600</td>
<td>206-824-8469</td>
<td>N/A</td>
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<tr>
<td>Spike English</td>
<td>Distribution MW 1</td>
<td>253-856-5600</td>
<td>360-886-9050</td>
<td>N/A</td>
</tr>
<tr>
<td>Eddy Chu</td>
<td>Operations Manager</td>
<td>253-856-5600</td>
<td>425-227-6262</td>
<td>206-314-0763</td>
</tr>
<tr>
<td>Don Wickstrom</td>
<td>Public Works Director</td>
<td>253-856-5500</td>
<td>N/A</td>
<td>N/A</td>
</tr>
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</table>

*Position - description available previously in this chapter
<table>
<thead>
<tr>
<th>Employee</th>
<th>Position</th>
<th>Generate 6 million CUB</th>
<th>Generate 8 million CUB</th>
<th>System wide water</th>
<th>Troubleshoot main breaks</th>
<th>Troubleshoot pump station failure</th>
<th>Transmission or distribution system failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don Wickstrom</td>
<td>Public Works Director</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Eddy Chu</td>
<td>Operations Manager</td>
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<tr>
<td>Brad Lake</td>
<td>Water Superintendent</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Chris Hall</td>
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<tr>
<td>Trevor Giles</td>
<td>Facilities Field Supervisor</td>
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<tr>
<td>Kevin Swinford</td>
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<tr>
<td>Dave Chihak</td>
<td>Treatment Field Supervisor</td>
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<tr>
<td>Phil McConnell</td>
<td>Distribution Field Supervisor</td>
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<tr>
<td>George Jett</td>
<td>Control Center Technician</td>
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<td>Ron Halverson</td>
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<tr>
<td>Denny Scott</td>
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<td>Tim Stegner</td>
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<td>John Sizemore</td>
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<td>Steve Reynolds</td>
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<td>Pat Alconcel</td>
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<tr>
<td>Harry Deling</td>
<td>Utility Locator</td>
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<tr>
<td>Shawn Ralph</td>
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<tr>
<td>Jason Roller</td>
<td>Distribution MW 2</td>
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<tr>
<td>Paul Johnson</td>
<td>Distribution MW 2</td>
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<tr>
<td>Brandon Lynch</td>
<td>Distribution MW 2</td>
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<tr>
<td>Spike English</td>
<td>Distribution MW 1</td>
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<tr>
<td>Heather McIntosh</td>
<td>Treatment MW 2</td>
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<tr>
<td>Dave Brock</td>
<td>Utility Engineer</td>
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</tr>
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</table>

Ranking 1 - most able to manage / 10 - least able to manage

Note: This ranking will change with time as employees gain additional experience, certification, and knowledge.
Notification Procedures

A Boil Water Notice may be approved or distributed by the following City employees. In all cases, the Public Works Director, City Operations Manager and/or the Mayor are to be notified of any action taken as soon as possible.

### Table 8-27

City of Kent

<table>
<thead>
<tr>
<th>Employee</th>
<th>Position</th>
<th>Work Number</th>
<th>Home Number</th>
<th>Pager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don Wickstrom</td>
<td>PW Director</td>
<td>253-856-5500</td>
<td>N/A</td>
<td>206-314-0763</td>
</tr>
<tr>
<td>Eddy Chu</td>
<td>PW Operations Manager</td>
<td>253-856-5600</td>
<td>425-451-3338</td>
<td>206-314-0815</td>
</tr>
<tr>
<td>Brad Lake</td>
<td>Water Superintendent</td>
<td>253-856-5600</td>
<td>425-413-3975</td>
<td>206-314-0953</td>
</tr>
<tr>
<td>David Chak</td>
<td>Water Quality Supervisor</td>
<td>253-856-5600</td>
<td>253-863-7208</td>
<td>206-314-0953</td>
</tr>
<tr>
<td>Chris Hall</td>
<td>Distribution Supervisor</td>
<td>253-856-5600</td>
<td>253-631-8112</td>
<td>206-314-0888</td>
</tr>
<tr>
<td>Trevor Giles</td>
<td>Facilities Supervisor</td>
<td>253-856-5600</td>
<td>253-939-1185</td>
<td>206-314-0961</td>
</tr>
</tbody>
</table>

Prior to notifying the public, coordinate with the following:

### Table 8-28

Washington State Department of Health

<table>
<thead>
<tr>
<th>Section Contact</th>
<th>Position</th>
<th>Work Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethan Mosene, P E</td>
<td>Section Head</td>
<td>206-464-7671</td>
</tr>
<tr>
<td>Robert James, P E</td>
<td>Regional Engineer</td>
<td>206-464-7671</td>
</tr>
<tr>
<td>Jennifer Prodzinski</td>
<td>Water Quality Monitor</td>
<td>206-464-6752</td>
</tr>
</tbody>
</table>

Public Notification for Non-Acute MCL Non-Compliance

Newspaper Notice The City shall provide newspaper notice of a Non-acute coli form MCL violation within fourteen (14) days of violation. The content of the newspaper notice shall include the following:

G A clear, concise, and simple explanation of the violation
H Discussion of potential adverse health effects and any segments of the population that may be at a high risk
I Mandatory health effects information as follows:

Vulnerability Analysis

Dames and Moore completed a seismic vulnerability assessment of the City of Kent water system in 1996. The objectives of the study were to determine the potential for damage, disruption or services, and injury or loss of life (life-safety) due to an earthquake, and to develop preliminary mitigation recommendations and estimated construction costs.
Earthquake Hazards

Seismologic and geologic data indicate the Puget Sound region is threatened from three types of earthquakes.

1. A deep intraplate subduction-zone event 40 to 60 kilometers directly below the Puget Sound similar to the Magnitude 7.1 (M7.1) 1949 Olympia Earthquake and the M6.5 1965 Seattle-Tacoma Earthquake.
2. An interplate subduction-zone earthquake of M8.5 or larger along the Pacific North-west Coast.
3. Shallow earthquakes from near-surface faults (i.e., the Seattle Fault) that were responsible for the recent 1995 M5.0 Point Robinson and 1996 M5.3 Duvall earthquakes.

Earthquake source locations, magnitudes, and recurrence intervals are combined to estimate ground motions for an Operating Basis Earthquake (OBE) scenario and a Design Basis Earthquake (DBE) scenario. The OBE ground motion has a 72-year average return and is considered the earthquake that typical public utility facilities are likely to experience during their lifetimes. The DBE ground motion has a 475-year average return interval and is representative of larger events which are unlikely, but have a reasonable possibility of occurring. Hazards caused by earthquakes include ground shaking, surface rupture, landslides, and liquefaction. The alluvial soils in the Green River Valley floor are especially hazardous as they can amplify ground shaking and are highly susceptible to liquefaction and other ground deformations.

Post-Earthquake Performance Objectives

Because the OBE is considered likely to occur, it is desirable to have minimum system disruption, public health consequences, and property or environmental damage. A DBE is considered unlikely to occur, consequently, larger amounts of potential system disruption, and property or environmental damage are considered acceptable. However, life safety hazards and disruption of water for fire fighting should not be considered acceptable under either earthquake scenario. Consideration of these operational goals is used to prioritize recommendations for reducing earthquake hazards.

Systems Vulnerability

Water system buildings include source (well) buildings, pump stations, and the 212<sup>th</sup> Street Treatment Plant. The buildings are primarily compact structures which are expected to perform well in earthquakes. Some minor deficiencies such as insufficient roof to wall attachments were noted. Many of the pump stations and other facilities are located in underground precast concrete vaults which are expected to perform well. Storage facilities include concrete reservoirs, on grade steel tanks, and elevated steel tanks. Both of the concrete reservoirs have leakage and deterioration problems in addition to minor seismic deficiencies. Three of the four on grade steel tanks have
deficiencies which may cause damage in an earthquake. Both of the elevated steel tanks are highly susceptible to damage and possible collapse in either OBE or DBE.

Much of the non-structural equipment in the facilities are well anchored. However that are still items such as tanks, gas cylinders, piping, transformers, and fire extinguishers which are not restrained and are likely to be damaged in an earthquake. Bracing of items which are critical to system operations or may cause injury is an efficient means of reducing seismic risk.

Damage algorithms based on pipeline response in previous earthquakes and system characteristics are used to assess pipeline vulnerability. The estimated number of pipeline damages is expected to be significantly higher in an DBE than in an OBE, and may severely disrupt system operations. As much as 90 percent of the damage is expected to occur in the Green River Valley, particularly near the banks of the Green River. The damages will most likely occur in concentrated areas where pipeline replacement may be more economical than repair of individual damage. Damage in the East Hill and West Hill areas would be expected primarily in any pockets that liquefy or experience landslide.

**Earthquake Performance of System**

Functionality of the water system will be significantly affected by expected damage in the Green River Valley from liquefaction/lateral spread. Even in an OBE, pipeline damage may be severe enough to cause loss of water pressure throughout the Green River Valley and possibly also affect the East Hill and West Hill areas. Because the Kent and Clark Springs transmission lines would likely remain functional along with most East Hill reservoirs and distribution lines, water pressure could remain as much of the East Hill as long as pipe breakage in the Green River Valley did not create an overwhelming demand on the higher East Hill zones. Because the West Hill area would be cut off from the sources (with the exception of the Highline intertie) and the two reservoirs are more vulnerable, the West Hill zones would be more likely to lose pressure than the East Hill zones.

After a DBE, it is likely that all of the Green River Valley will be without water. Due to potential Green River Valley pipe damage, tank failure and failure of the Kent and Clark Springs Transmission lines, widespread water unavailability would also be possible in the East Hill zones. The West Hill area would likely be similarly affected.

**Seismic Upgrade Prioritization**

Seismic upgrade prioritization is based on system performance objectives, seismic vulnerability, and upgrade cost-effectiveness. We believe that mitigation of life-safety hazards and requiring all new construction (including buried piping and equipment installation) to meet or exceed current seismic requirements and standards are the highest priority mitigation measures that can be implemented by the City. Other higher priority seismic upgrades include restraining critical non-structural equipment, strengthening of
the 125,000 Gallon Elevated Tank and Reith Road Standpipe, and strengthening of connections in critical structures.

The high liquefaction susceptibility throughout most of the Green River Valley and high cost of pipeline replacement makes it difficult to address pipe damage and system functionality concerns. Water system upgrade should concentrate on maintaining service in the East Hill and West Hill areas. This can be accomplished with installation of valves capable of isolating Green River Valley pressure zones, and by upgrade of key East Hill and West Hill facilities. Alternate sources of fire-fighting water should be developed for the Green River Valley.
<table>
<thead>
<tr>
<th>UPGRADE/LOSS MITIGATION STRATEGY</th>
<th>PRIORITY/DISCUSSION</th>
<th>ORDER-OF-MAGNITUDE COST ESTIMATED</th>
<th>COMPLETED YES/NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Properly restrain chlorine cylinders, other hazardous material containers and other items that may affect life-safety at all facilities (LS Exposure = 3 or greater)</td>
<td>HIGH - Chlorine gas release from improperly restrained cylinders is a common occurrence after earthquakes. Proper anchorage can be achieved with minimal expense. For practical reasons, all nonstructural upgrades, regardless of priority, may be best implemented at the same time</td>
<td>$8,200</td>
<td>Yes</td>
</tr>
<tr>
<td>Require all new facilities to meet UBC and AWWA Seismic Zone 3 requirements with an Importance Factor of 125. Provide special attention to equipment anchorage, pipe bracing, pipe flexibility and other nonstructural elements that are not specifically addressed in current codes (see the AWWA publication, Minimizing Earthquake Damage, A Guide for Water Utilities)</td>
<td>HIGH - The incremental cost to make new facilities seismic resistant is usually less than five percent of the total cost</td>
<td>N/A</td>
<td>Ongoing</td>
</tr>
<tr>
<td>For new piping 1)Use ductile pipe (welded steel, ductile iron or polyethylene); 2)When feasible, avoid the liquefaction-and landslide-susceptible areas, 3)Use restrained joints in liquefaction-and landslide-susceptible areas that cannot be avoided</td>
<td>HIGH - Use of ductile pipe with restrained joints will reduce pipe damage by an order-of-magnitude or more (than if brittle pipe and unrestrained joints are used)</td>
<td>N/A</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Upgrade the 125,000 Gallon Elevated Tank</td>
<td>MODERATE-TO-HIGH - The tank is near residences and emergency communications facilities (a 911 facility is located below the tank)</td>
<td>$250,000 or 75,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Upgrade anchorage/bracing of electrical (including emergency generator components) at facilities</td>
<td>MODERATE-TO-HIGH - Can be performed at minimal cost. Will greatly reduce fire hazards and increase likelihood facility will remain functional. Should be implemented at the same time the other nonstructural upgrades are implemented</td>
<td>$3,000</td>
<td>Ongoing</td>
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## Table 3-29
Seismic Upgrades Cont.

<table>
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<th>UPGRADE/LOSS MITIGATION STRATEGY</th>
<th>PRIORITY/DISCUSSION</th>
<th>ORDER-OF-MAGNITUDE COST ESTIMATED</th>
<th>COMPLETED YES / NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install valves that can be used to isolate the 240 zone</td>
<td>MODERATE-TO-HIGH – Valves (possibly seismically-activated, excess flow and/or remote-operated) should be installed so that the 240 zone can quickly be isolated. An earthquake valve is recommended for either Guiberson or Garrison Creek reservoir. These valves should complement existing valves and should be included in the current valve exercise program.</td>
<td>Dependent upon number and type needed</td>
<td>No</td>
</tr>
<tr>
<td>Develop more detailed earthquake-specific emergency response plans</td>
<td>MODERATE-TO-HIGH – These plans should include 1) damage assessment procedures, 2) repair and recovery (where to get materials, qualified contractors, mutual aid agreements, purchase of flexible hose to temporarily bridge broken mains, etc.), 3) communications with other agencies (e.g., the fire department, Puget Power, etc.) and residents, 4) employee home preparedness (so that employees will feel comfortable about family safety and be more effective in recovery efforts, and 5) administrative issues such as emergency assignment of authority.</td>
<td>$25,000 (dependent upon how much is done in-house)</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Open dialogue with fire department on potential for unavailability of water so fire department can establish other source (i.e., drafting stations)</td>
<td>MODERATE-TO-HIGH</td>
<td>N/A</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Make sure that all nuts are tight on 3.5 million gallon reservoir</td>
<td>MODERATE-TO-HIGH – Can be done by City maintenance staff</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Install roof truss-to-wall anchors and at the glulam saddle at Pump Station No 5</td>
<td>MODERATE-TO-HIGH – Pump Station No 5 is important for the East Hill area. Damage and loss of station functionality can be significantly reduced at nominal cost.</td>
<td>$3,400</td>
<td>No</td>
</tr>
<tr>
<td>Install roof truss-to-wall anchors at Pump Station No 4</td>
<td>MODERATE – Would greatly reduce the likelihood of significant damage for only a nominal cost.</td>
<td>$2,900</td>
<td>No</td>
</tr>
<tr>
<td>UPGRADE/LOSS MITIGATION STRATEGY</td>
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<tr>
<td>Upgrade the West Hill (Reith Road) Standpipe</td>
<td>MODERATE – Both West Hill storage reservoirs are considered vulnerable. However, Reith Road provides more capacity and will likely be less expensive to retrofit. The Highline intertie can be used as a back-up source for the higher West Hill zones.</td>
<td>$150,000</td>
<td>No</td>
</tr>
<tr>
<td>Anchor all other nonstructural elements not prioritized as High or Moderate-to-High</td>
<td>MODERATE – Damage can be significantly reduced at only a nominal cost by anchoring and/or bracing nonstructural elements. These upgrades should be performed at the same time the other higher priority nonstructural upgrades (chlorine/hazardous materials and electrical) are implemented.</td>
<td>$12,000</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Install roof-to-wall anchors in Clark Springs Surge Tank building</td>
<td>MODERATE – Would greatly reduce the likelihood of significant damage for only a nominal cost.</td>
<td>$2,800</td>
<td>No</td>
</tr>
<tr>
<td>Install roof panel-to-CMU wall anchors at Pump Station No 3</td>
<td>MODERATE – Would greatly reduce the likelihood of significant damage for only a nominal cost. Note that due to anticipated damage in the 240 zone, this pump station will likely not be able to draw suction from the 240 zone following a major earthquake.</td>
<td>$2,500</td>
<td>No (Station scheduled to be replaced in 2001)</td>
</tr>
<tr>
<td>Strengthen Guiberson Reservoir end piles and jacket interior concrete columns. Monitor condition of steel joints and connection bolts. Install a reinforced screen over the inlet and outlet.</td>
<td>MODERATE – Reservoir expected to remain functional in an OBE. Severe roof damage possible in a DBE. Degradation of steel members would lead to significant reduction in overall strength. Addition of screen will decrease likelihood that debris will clog inlet/outlet.</td>
<td>$30,000</td>
<td>Yes</td>
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<tr>
<td>UPGRADE/LOSS MITIGATION STRATEGY</td>
<td>PRIORITY/DISCUSSION</td>
<td>ORDER-OF-MAGNITUDE COST ESTIMATED</td>
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</tr>
<tr>
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<td>-----------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Install roof-to-wall connection and reinforced screen over outlet at Garrison Creek Reservoir</td>
<td>MODERATE – Addition of screen will decrease likelihood that debris will clog inlet/outlet. Roof-to-wall connection will reduce the likelihood of severe column damage</td>
<td>$50,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Upgrade anchorage, foundation, braces and connections at Cambridge Tank</td>
<td>LOW-TO-MODERATE – Retrofit will be fairly expensive. A less expensive alternative is to rely on pumped water from the West Hill Standpipe and the Highline Intersect</td>
<td>$200,000 (structural) or $50,000 (energy dissipation)</td>
<td>No</td>
</tr>
<tr>
<td>Repair cracked ringwall and add flexibility to inlet/outlet to the James Street Tank</td>
<td>LOW-TO-MODERATE – Tank is expected to remain functional after a DBE. However, addition of flexibility to inlet/outlet would increase likelihood of tank remaining functional if some uplift occurred</td>
<td>$50,000</td>
<td>No</td>
</tr>
<tr>
<td>Increase anchorage to the Blue Boy Tank</td>
<td>LOW-TO-MODERATE – Existing anchorage is probably adequate for an OBE. Flexible coupling on inlet/outlet will accommodate a very small amount of uplift. Other East Hill reservoirs (i.e., the 3.5 Million Gallon Tank) are expected to remain functional</td>
<td>$50,000</td>
<td>No</td>
</tr>
<tr>
<td>Add bracing and flexible couplings to evaluate/upgrade Clark Springs Transmission Main Soos Creek Crossing</td>
<td>LOW-TO-MODERATE – Upgrade should only be considered if bridge is found to be seismically sound and complete slope failure is not expected</td>
<td>$50,000</td>
<td>No</td>
</tr>
</tbody>
</table>
Water System Component Vulnerability was assessed in the following areas: major fire, earthquake, chlorine gas, mechanical failure, bomb, power, employee accident/illness, sub-zero weather, flooding, and windstorm. The areas in which they were found to be vulnerable are listed with the status of corrective action.

<table>
<thead>
<tr>
<th>Source</th>
<th>Vulnerability</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs</td>
<td>Wind/Power</td>
<td>1998 emergency power addition</td>
</tr>
<tr>
<td></td>
<td>Source Contamination</td>
<td>Fenced/WHPA plan implemented</td>
</tr>
<tr>
<td></td>
<td>Earthquake</td>
<td>See seismic analysis</td>
</tr>
<tr>
<td></td>
<td>Chlorine Gas</td>
<td>Leak alarm system/containment plan</td>
</tr>
<tr>
<td>Kent Springs</td>
<td>Wind/Power</td>
<td>1998 emergency power addition</td>
</tr>
<tr>
<td></td>
<td>Source Contamination</td>
<td>Fenced/WHPA plan implemented</td>
</tr>
<tr>
<td></td>
<td>Earthquake</td>
<td>See seismic analysis</td>
</tr>
<tr>
<td></td>
<td>Chlorine Gas</td>
<td>Leak alarm system/containment plan</td>
</tr>
<tr>
<td>Armstrong Springs</td>
<td>Minimal</td>
<td>Fenced/WHPA plan implemented</td>
</tr>
<tr>
<td>Soos Creek Well</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>East Hill Well</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>212th/208th Well</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>Treatment Plant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garrison Well</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>Pump Station #3</td>
<td>Power</td>
<td>Scheduled for replacement in 1999 to</td>
</tr>
<tr>
<td></td>
<td>Seismic</td>
<td>include emergency power option</td>
</tr>
<tr>
<td>Pump Station #4</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>Pump Station #5</td>
<td>Major Fire Demands</td>
<td>Scheduled for additional pump in 1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for the 590 system</td>
</tr>
<tr>
<td>Pump Station #6</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>Pump Station #7</td>
<td>Minimal</td>
<td></td>
</tr>
<tr>
<td>6 MG #1</td>
<td>Seismic</td>
<td>See seismic study</td>
</tr>
<tr>
<td>6 MG #2</td>
<td>Seismic</td>
<td>See seismic study Retrofit scheduled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for winter 1998.</td>
</tr>
<tr>
<td>Guiberson</td>
<td>Seismic</td>
<td>Seismic retrofit completed Spring 1998</td>
</tr>
<tr>
<td>Blue Boy</td>
<td>Seismic</td>
<td>See study</td>
</tr>
<tr>
<td>3.5 MG Reservoir</td>
<td>Seismic</td>
<td>See study</td>
</tr>
<tr>
<td>Reith Road Tank</td>
<td>Seismic</td>
<td>See study</td>
</tr>
<tr>
<td>Cambridge Tank</td>
<td>Seismic</td>
<td>See study</td>
</tr>
<tr>
<td>125,000 Tank</td>
<td>Seismic</td>
<td>Retrofit scheduled for 1998.</td>
</tr>
</tbody>
</table>

Note: No very vulnerable facilities were identified in this analysis. Those with identified deficiencies are included in the Water System Improvement Plan, Chapter 10.
Contingency Operational Plan

Following are alternate methods or procedures to follow when normal system operations cannot be followed, or a state of emergency exists which affects Kent's Water System. Under extreme emergencies the Kent Emergency Operations Committee (EOC) would take charge and direct all personnel activities and responses.

System Changes when a Facility is off line or unavailable

Sources

1. Clark Springs failure - use alternate sources or well to augment winter demands. Use everyday interties or curtailment procedures during peak summer demands.

2. Kent Springs failure - use alternate sources or wells.

3. Armstrong Springs failure - use alternate sources or wells.

4. Soos Creek Well failure - use alternate sources or wells.

5. East Hill Well failure - use Pump Station #5 pump(s) #3 and #2 (high) for the 590 system, as well as alternate sources or wells to supply the 6 MG #1 Reservoir and Pump Station #5.

6. 212th/208th Wells failure - use alternate sources in winter, use emergency interties or curtailment procedures during peak summer demands.

7. Garnson Well failure - use alternate sources.

8. O'Brien Well failure - use alternate sources.

Pump Stations

1. Pump Station #3 failure - use leased emergency generator for lengthy power failures, other significant failures or maintenance requires the use of the Highline Water District intertie (Pump Station #8) to supply the West Hill through Pump Station #6 and 42nd Ave PRV's (529 zone) and the Pump Station #4 PRV (354 zone).

2. Pump Station #4 failure - automatically use diesel engine pump during power failures. Other significant failures require the use of the Highline Water District intertie (Pump Station #8) and the Pump Station #6/42nd Ave PRV's to supply the 529 zone.

3. Pump Station #5 failure - automatically use a generator during power failures. Use East Hill Well to supply the 590 zone when Pump Station #5 pumps #3 and #2 (high)
are not available, use 590 to 485 PRV when Pump Station #5 pumps #1 and #2 (low) are not available.

4 Pump Station #6 failure – use the Highline Water District Intertie (Pump Station #8) to maintain 587 system pressures

5. Pump Station #7 failure – no alternative, Cambridge tank (529 zone) provides essential pressures and fire flows to meet system requirements

Reservoirs

1. 6 MG #1 Reservoir failure – use Clark Springs Transmission Main with 6 MG #1 altitude valve pilot switched to pressure reducing feature – set at 25 psi, to supply water to Pump Station #5 and the 6 MG #2 reservoir.

2 6 MG #2 Reservoir (Garnson Creek) failure – use the 218th Street PRV station to supply water to the 240 system from the 6 MG #1 Reservoir (416 system). Use the 212th Treatment Plant and wells to provide additional supply during demand periods, or the Renton and Tukwila interties.

3 Guiberson Reservoir failure – use the reservoir bypass to augment the supply to the 240 zone by the 6 MG #2 Reservoir. Use the Auburn Intertie, or the Renton/Tukwila interties, to provide additional supply.

4 Blue Boy Reservoir failure – use the Pump Station #5 pump #3 continuous operation with excess flow recirculated back to the pump suction. Use the 3.5 MG Reservoir and East Hill Well supply emergency supply in the event of excessive peaking demands or Pump Station #5 failure while in this mode.

5 3.5 MG Reservoir failure - use the Pump Station #5 pump #3 continuous operation with excess flow recirculated back to the pump suction Use the Blue Boy Reservoir and East Hill Well supply emergency supply in the event of excessive peaking demands or Pump Station #5 failure while in this mode.

6 Reith Road Reservoir and Cambridge Tank failure – use the Highline Intertie with the Pump Station #6/42nd Ave PRV to supply the 529 zone and the Pump Station #4 PRV to supply the 354 zone

7 125,000 Elevated Tank failure – use the 590/485 PRV at Pump Station #5.

Transmission Mains

1 Clark Springs Transmission Main (CSTM) failure – divert water to the KSTM at Kent Springs, at Armstrong Springs, and at the 132nd interties.

2 Kent Springs Transmission Main (KSTM) failure – divert water to the CSTM at Kent Springs, at Armstrong Springs, and at the 132nd interties Also augment flows from
the 590 system to the KSTM at interties on Woodland Way and at 104th Ave South/SE 267th Street to supply Guiberson Reservoir.

Preparation Common to All Emergencies

<table>
<thead>
<tr>
<th>PREPARATION: COMMON TO ALL EMERGENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERSONNEL</strong></td>
</tr>
<tr>
<td>Advise personnel to arrange for safety of families in advance.</td>
</tr>
<tr>
<td>Prepare emergency schedule and brief personnel.</td>
</tr>
<tr>
<td>Put all personnel on emergency status.</td>
</tr>
<tr>
<td>Strategically locate and station crews.</td>
</tr>
<tr>
<td><strong>FACILITIES</strong></td>
</tr>
<tr>
<td>Check vehicles, auxiliary electrical power, and pumping units.</td>
</tr>
<tr>
<td>A. Sufficient fuel.</td>
</tr>
<tr>
<td>B. Operation of emergency power/battery operated lights.</td>
</tr>
<tr>
<td>C. Operation of vehicles</td>
</tr>
<tr>
<td>Check emergency communication equipment for readiness.</td>
</tr>
<tr>
<td>Maintain emergency rations, water, clothing, and bedding at the maintenance shops sufficient for 72 hours.</td>
</tr>
<tr>
<td>Secure equipment and supplies in exposed areas; secure buildings; install storm shutters, if available and appropriate.</td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
</tr>
<tr>
<td>Review possible repair materials for local purchase of items on short notice in an emergency</td>
</tr>
<tr>
<td>Arrange with local suppliers and nearby utilities for access to stored chemicals, tools, repair parts, etc., which may be required immediately after the disaster.</td>
</tr>
<tr>
<td>Determine the need to relocate certain materials to outlying sites</td>
</tr>
</tbody>
</table>
Assumed Emergency Scenario: Multiple alarm blaze at major commercial establishment during weekend of peak summer demand period.

<table>
<thead>
<tr>
<th>System Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoirs - Heavy demand will cause drop in water level</td>
<td>At first communication of fire demand, check reservoir levels. Start wells if not already automatically started.</td>
</tr>
<tr>
<td>Pumps - Reduction of reservoir levels should automatically activate pumps</td>
<td>Maintain all pumps, motors, and controls to provide full supply capacity.</td>
</tr>
<tr>
<td>Personnel - During off-hours and weekends, only two employees are on call.</td>
<td>Provide weekend list of staff who will likely be available for emergency help.</td>
</tr>
<tr>
<td>Communication - Communicate with fire fighting personnel to advise on the status of available pressure during fire fighting efforts</td>
<td>Make arrangements with fire and police officials to relay messages by radio.</td>
</tr>
<tr>
<td>Power Supply - None</td>
<td>None required</td>
</tr>
<tr>
<td>Repair Inventory - use of hydrants at fire location may result in damage</td>
<td>Maintain supply of hydrant parts.</td>
</tr>
</tbody>
</table>
## System Component and Effects

### Mains - Multiple breaks. Fire fighting demand also causing high flows
1. Have adequate supply of repair fittings and know locations of other supplies, such as supply distributors.
2. Have detailed system maps in all vehicles, so staff can locate valves quickly for isolation of breaks. Have valve wrench in each vehicle.
3. Loop system as much as is practical to avoid vulnerability of single feeders.
4. Prepare action plan to indicate priority of actions to be taken.

### Reservoirs - Some damage likely. Fire fighting demand may cause rapid drawdown.
1. Have some plan for rapid inspection of tanks after disaster and isolate from system if damaged beyond use.
2. Have levels transmitted by radio to headquarters if SCADA is not functioning so fire department can be informed.

### Pumps and Wells - Well pump out of service due to casing displacement and power failure All electrical drives without power
1. Have plan for rapid inspection of all pumping facilities, starting with emergency pumps/generators to ensure start of the diesel engines. Isolate failed units.
2. Call power company to inform them of power needs.

### Personnel - Mobile units isolated from headquarters by road damage Coping with personal disaster effects.
1. Make all personnel knowledgeable of their duties before a disaster occurs.
2. Cover the topic of disaster aid in inter-local agreements with neighboring water suppliers.
3. Have clear lines of authority pre-established.
4. Have a reliable communication system in place for coordinating with field personnel at home.
<table>
<thead>
<tr>
<th>System Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications - Telephone system severely crippled and overloaded. Telemetry out</td>
<td>1. Maintain mobile radios and train all personnel in their use. Use mobile units to relay information until phone service is restored.</td>
</tr>
<tr>
<td></td>
<td>2. Obtain formal recognition from phone company on need for emergency service priority. Obtain phone number of local commercial radio stations to have public service announcements broadcast.</td>
</tr>
<tr>
<td>Power Supply - Supply line down Most power interrupted</td>
<td>1. Establish priority status with power company.</td>
</tr>
<tr>
<td></td>
<td>2. Inform power company of disaster status via mobile units.</td>
</tr>
<tr>
<td></td>
<td>3. Maintain standby diesel generators at pump stations and emergency wells/springs.</td>
</tr>
<tr>
<td>Repair Inventory - High demand for repair fittings and replacement pipe. High demand for chlorine to disinfect system due to breakage repair and likelihood of broken sewers</td>
<td>1. Maintain supply of repair fittings and extra pipe consistent with the various diameters of pipe and quantities of pipe material used in the water system.</td>
</tr>
<tr>
<td></td>
<td>2. Maintain supply of powdered sodium hypochlorite consistent with the manufacturer's storage recommendations.</td>
</tr>
<tr>
<td></td>
<td>3. Maintain list of suppliers with water system parts inventories.</td>
</tr>
</tbody>
</table>
Assumed Emergency Scenario: Leakage or rupture of chlorine gas cylinder.

<table>
<thead>
<tr>
<th>System/Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains – No effect</td>
<td>None required.</td>
</tr>
<tr>
<td>Reservoirs – No effect</td>
<td>None required.</td>
</tr>
</tbody>
</table>
| Source – Gas fills rooms where chlorine is stored and any other connected areas, especially low lying spaces. Severe corrosion of all metal in contact with the gas. | 1. Isolate gas-contaminated areas, notify local Fire Department and ventilate to atmosphere.  
2. Install and maintain chlorine gas detectors and alarms.  
3. Isolate gas storage area from all electrical and mechanical equipment.  
4. Inspect for damage after area is safe to enter. |
| Personnel – Extreme danger to life from gas. | 1. Train all personnel in chlorine safety practices  
2. Make approved breathing devices readily available and have staff trained in their use |
| Communications – Police and Fire Departments should be informed. | Use mobile radio units |
| Power Supply – No effects.   | None required.     |
| Repair Inventory – Need for approved breathing apparatus | Maintain breathing units in serviceable condition Periodically check air supply |
Assumed Emergency Scenario: Unanticipated sudden failure of a well pump during periods of high demands.

<table>
<thead>
<tr>
<th>System/Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains – No effect.</td>
<td>None required.</td>
</tr>
<tr>
<td>Reservoirs – Loss of supply during peak demand will draw down reservoir levels.</td>
<td>Make arrangements for appropriate repair</td>
</tr>
</tbody>
</table>
| Pump Stations – Auxiliary pumps should start automatically. | 1. Have list showing pump supplier or manufacturer’s representative for each pump. Also, local pump and motor repair shops.  
  2. Monitor reservoir levels closely.          |
| Source – 1 or more wells out of operation, infiltration galleries still operable | Monitor reservoir levels closely.                                                  |
| Personnel – Necessity for repair will cause some personnel to neglect routine activities | Develop clear job descriptions indicating who should be involved in actual repair, who should be involved in substituting for personnel involved in the repair, and who will make necessary decisions. |
| Communications – Reduced supply of water may require reduced consumption. | Have list of local commercial broadcasting companies and have them announce conservation methods, if appropriate |
| Power Supply – No effects                    | None required.                                                                     |
| Repair Inventory – Pump may fail due to small part, such as shaft coupling | 1. Maintain supply of field replaceable parts for each pump.  
  2. Have a list showing phone numbers and addresses of local parts suppliers. |
Assumed Emergency Scenario: The City receives a call containing a threat of sabotage by explosives, probably by phone call or by letter.

<table>
<thead>
<tr>
<th>System/Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains - No immediate problem as these would be unlikely targets.</td>
<td>None required.</td>
</tr>
</tbody>
</table>
| Reservoirs - Likely target        | 1. Attempt to get caller to reveal the location of the bomb.  
2. Immediately notify Police and Fire Departments with location of target or, if not known, all possible targets.  
3. Make arrangements to start draining the target reservoir, if at all possible, by wasting water through hydrants. |
| Source - Likely target.           | 1. Same as Step 1 for Reservoirs.  
2. Same as Step 2 for Reservoirs.  
3. Proceed to shut down targeted facilities and isolate from the system.  
4. Make special point to inform Police and Fire Departments about the location of chlorine gas at facilities. |
| Personnel - Office will receive call; field crew will respond. | Instruct all staff that might handle calls on how to respond to caller with bomb threat. Keep a copy of the form shown here or something comparable near the main switchboard and at Fire Department switchboard. |
| Communications - Clear, concise communication will be required to ensure timely response. | Train all staff in response to threatening calls. Consider the possibility of an unannounced drill on some periodic basis. Be sure to coordinate with Police and Fire Units. |
| Power Supply - Likely to be affected only peripherally to other facilities | No action required other than those already outlined.                                                                                                           |
| Repair Inventory - Unlikely target. | Well stocked inventory will facilitate repairs                                                                                                           |
**REPORTING BOMB THREATS**

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person receiving call</td>
<td>1. Attempt to retain the caller long enough to obtain all pertinent information, such as where it is located, what type of bomb it is, and when it is set to go off.</td>
</tr>
<tr>
<td></td>
<td>2. Listen carefully to the exact words of the message so that you can repeat the information clearly and accurately.</td>
</tr>
<tr>
<td></td>
<td>3. Listen for background noises, voice accent, work pronunciation, voice pitch (high or low), male or female voice, and child or adult.</td>
</tr>
<tr>
<td></td>
<td>4. Try to signal another person near you to pick up the same telephone line and listen in.</td>
</tr>
<tr>
<td></td>
<td>5. Prepare a list of the following information: Date and Time of Call, Type of Bomb, Location of Bomb, Description of Bomb, What caller actually said, Sex of caller, Estimated age of caller, Type of voice (soft, loud, whisper, normal, drunk), Background noises heard if any, Your name and location.</td>
</tr>
<tr>
<td></td>
<td>6. Report the threat to the Police Department and the Director of Public Works.</td>
</tr>
<tr>
<td>Operations Manager</td>
<td>1. Notify employees to search the areas.</td>
</tr>
<tr>
<td></td>
<td>2. Notify local law enforcement agency having jurisdiction.</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Action</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
</tr>
</tbody>
</table>
| Employees | 1. Search own work areas for suspicious objects or packages as follows: Desks, Wastebaskets, File Cabinets, Supply Room, Closets, Ashtray Receptacles, Locked Doors, Underside of Horizontal Surfaces.  
2. Turn off electrical machine or other noise making equipment.  
3. Notify immediate Supervisor of the results of search.  
4. If results of search are negative, proceed as follows: Notify immediate Supervisor and remain calm and in work areas.  
Search non-work areas in assigned area including: Restrooms, Conference Rooms, Coffee Shops, Store Rooms, Hallways, Stairways, and Lobbies |
| Immediate Supervisor | Notify Supervisor’s Office by telephone or in person of negative results. |
| Employees | If a suspicious object or package is discovered at any time, whether or not a bomb threat call has been received, proceed as follows: Do not move, touch or disturb the object or package in any way, Immediately notify the immediate Supervisor or next available Supervisor. |
| Immediate Supervisor | Clear all persons from the immediate area and notify the supervisor of location and description of the suspicious objects or package. |
| Supervisor | 1. Evaluate available information and make decision on evacuation.  
2. Notify employees of evacuation decision or all clear decision. |
| Employees | 1. When directed to evacuate, leave building.  
2. Take coats, jackets, purses, and briefcases when leaving the work area.  
3. Lock Cash Drawers and other valuable items |
CITY OF KENT
EMERGENCY RESPONSE PLAN
TYPE OF EMERGENCY: Major Power Outage

Assumed Emergency Scenario: Entire City loses power during high power demand period (cold weather).

<table>
<thead>
<tr>
<th>System Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains – No immediate effect</td>
<td>None required.</td>
</tr>
<tr>
<td>Reservoirs – Extended outage will cause reservoir drawdown in high service areas.</td>
<td>Monitor levels closely. Use mobile radios if telephone system is affected.</td>
</tr>
<tr>
<td>Source – Wells out of service; gravity supply continued</td>
<td>No action required as pumps will automatically restart with restoration of power.</td>
</tr>
<tr>
<td>Pump Station – Pump Station #3 out of service. Pump Stations #4 and #5 operating on diesel generators.</td>
<td>Monitor West Hill reservoir levels carefully, monitor James Street tank level to ensure adequate supply for East Hill area. Close valve from James Street tank to Valley system if necessary.</td>
</tr>
<tr>
<td>Personnel – Routine maintenance will be ignored while staff monitors system condition</td>
<td>All personnel should at least be on standby status to assist with emergency lighting and power distribution.</td>
</tr>
</tbody>
</table>
| Communication – Telephone circuits operable, but over-crowded | 1. Maintain all mobile radio units in excellent condition  
2. Consider requesting help from Police or Fire Departments in notifying key personnel, if telephones and radio are operable. |
| SCADA System – loss of communication. | 1. Replace backup battery systems when fully discharged |
| Power Supply – Power off Emergency power required | 1. Check status of diesel unit at Pump Stations #4 & #5, as well as other sites with auxiliary power.  
2. After power is restored, inspect all electrical equipment and check for return of normal operations. |
| Repair Inventory - demand for lantern batteries | Stock and maintain supply of portable lights. |
Assumed Emergency Scenario: A member of the City's staff becomes seriously ill or suffers an accident on the job resulting in inability to work.

Note. All accidents occurring on the job, no matter how minor, must be reported to the appropriate supervisor.

<table>
<thead>
<tr>
<th>System/Component</th>
<th>Effect</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains</td>
<td>No immediate effect. Routine maintenance may be delayed.</td>
<td>Provide more than one staff member with knowledge of or access to necessary maintenance information.</td>
</tr>
<tr>
<td>Reservoirs</td>
<td>No immediate effect. Routine maintenance may be delayed</td>
<td>Same as Mains.</td>
</tr>
<tr>
<td>Source and Pump Stations</td>
<td>No immediate effect. Routine maintenance may be delayed.</td>
<td>Same as Mains.</td>
</tr>
<tr>
<td>Personnel</td>
<td>Staff may be faced with situation requiring first aid. Long term effect will be short-handed staff.</td>
<td>1. In the event of any serious accident, immediately call or radio for a doctor or ambulance. Give name, location and brief description of incident. 2. Have all staff trained in first aid and cardio pulmonary resuscitation (CPR). 3. Have chain of command clearly displayed and frequently updated. 4. Have at least two staff members trained in each critical maintenance function.</td>
</tr>
<tr>
<td>Communications</td>
<td>No immediate or long range effect. May be needed in the event of an accident.</td>
<td>Maintain all mobile radios in good condition.</td>
</tr>
<tr>
<td>Power Supply</td>
<td>No effect.</td>
<td>None required.</td>
</tr>
<tr>
<td>Repair Inventory</td>
<td>No immediate effect. Routine restocking may be delayed</td>
<td>Provide more than one staff member with knowledge of or access to necessary information.</td>
</tr>
</tbody>
</table>
CITY OF KENT
EMERGENCY RESPONSE PLAN
TYPE OF EMERGENCY: Subzero Weather

Assumed Emergency Scenario: Extended freezing weather has promoted deep frost penetration in the soil, especially under cleared streets. Local service connection lines are freezing, especially on isolated runs. Water demand high due to tap running. Condition will be similar throughout State affecting all neighboring water purveyors.

<table>
<thead>
<tr>
<th>System Component and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains - Effects are unlikely Routine maintenance will likely be disrupted by repair of frozen service lines</td>
<td>1. Discontinue meter reading until after weather warms to above freezing 2. Fill meter boxes with insulating material to resist pipe freezing 3. Areas of widespread problems should be documented and examined for preventative measures, such as deeper mains, insulated meter boxes, special customer notification of problem and solutions, and so forth</td>
</tr>
<tr>
<td>Reservoirs - No immediate effect. Demand may result in excessive drawdown</td>
<td>1. Monitor levels closely</td>
</tr>
<tr>
<td>Source - No immediate problem. High demand will cause longer than normal operation. Power outage or space heater failure could threaten source piping</td>
<td>1. Check condition of space heaters prior to winter cold weather period 2. Schedule normal maintenance prior to periods of possible cold weather 3. Maintain sources of emergency space heating or the Water Department. Rentals cannot be relied on because of the heavy demand on heaters throughout the region</td>
</tr>
<tr>
<td>Personnel - Routine maintenance will be slowed due to cold working conditions and staff needed to thaw out service lines</td>
<td>1. Make staff aware of proper cold weather work clothing and symptoms of frostbite 2. Establish system of priority for thawing service lines so that field staff will not have to make decisions without guidance</td>
</tr>
<tr>
<td>Communication - Base antennas could ice up and be damaged</td>
<td>1. Use backup systems</td>
</tr>
<tr>
<td>Power Supply - Outages likely due to overloading or power pole accident</td>
<td>1. Inform power company immediately of any supply problems 2. Check status of all emergency power and heat units</td>
</tr>
<tr>
<td>Repair Inventory - Repairs to frozen service lines and emergency heating will require adequate inventories</td>
<td>Check items used in frozen line repair, fuels and equipment for emergency power prior to cold weather season. During cold weather, suppliers will likely be out of stock.</td>
</tr>
</tbody>
</table>
Assumed Emergency Scenario. Severe flooding in all areas of Kent/surrounding areas and heavy rainfall expected to continue for several days.

<table>
<thead>
<tr>
<th>System Components and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
</table>
| **Water Sources** – Severe flooding may inundate buildings and contaminate spring sources or wells | 1. Test flood alarms for functionality.  
2. Monitor stream levels for changes. Sandbag or divert stream flows to protect sources, especially at Clark Springs.  
3. Isolate or turn off sources when inundation becomes imminent. Turn on alternate sources.  
4. Increase chlorine levels to ensure adequate disinfection at the sources and in the water system. |
| **Reservoirs/Pump Stations** – Flooding may submerge or damage structures or equipment | Monitor flooding and sandbag to protect structures. Install dewatering pumps if necessary. |
| **Mains** – Stream crossings may wash out, air vacs may be submerged, water mains may separate in flooded areas. | 1. Monitor stream crossings for damage.  
2. Check air vacs in low areas, isolate to prevent back siphonage in flooded areas. Maintain adequate system pressure in all areas. Thoroughly disinfect main breaks. |
| **Personnel** – May not be able to travel roads due to flooding, alternate routes may have to be used. | 1. Identify alternate routes.  
2. Ensure that vehicles are stocked with adequate parts, supplies, and fuel for extended travel and emergency repairs at sites. |
Assumed Emergency Scenario: High winds exceeding 50 mph and gusts as high as 80 mph are forecast.

<table>
<thead>
<tr>
<th>System Components and Effects</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoirs – Trees (blown down) may damage telemetry or tanks.</td>
<td>1. Keep trees removed within falling distance of water tanks.</td>
</tr>
<tr>
<td></td>
<td>2. Secure telemetry cables and antennas.</td>
</tr>
<tr>
<td>Pump Station/Sources – Wind/trees may disrupt power/damage buildings</td>
<td>1. Keep trees removed from within falling distance of facilities</td>
</tr>
<tr>
<td></td>
<td>2. Test emergency power regularly under load to ensure reliability.</td>
</tr>
<tr>
<td></td>
<td>3. Top off water tanks.</td>
</tr>
<tr>
<td>Communications – Phones may be out, telemetry crippled from the base to Control Center SCADA.</td>
<td>1. Supply employees with portable radios or vehicle radios.</td>
</tr>
<tr>
<td></td>
<td>2. Set up regular site visits to monitor essential facilities integrity, provide for safety of personnel.</td>
</tr>
<tr>
<td></td>
<td>3. Notify telephone company of vital phone line link between base station and Master SCADA plan for alternate/backup system.</td>
</tr>
</tbody>
</table>
Conditions of Service

Throughout the year, three distinctive conditions of service (green, yellow, or red) can exist. The conditions are explained below. The Water Superintendent is responsible for making all changes in the condition or service, with the approval of the Public Works Director.


2. Condition Yellow – Caution is necessary with all water/hydrant use. All inspections/water main flushing and/or hydrant flows must be cleared through the Water Department in advance.

3. Condition Red
   Level #1 – No hydrant use. No inspection water flows. Contact Water Department on all emergency hydrant use or water flows.
   Level #2 – Same as Level #1 except public irrigation on alternate days, ONLY.
   Level #3 – Same as Level #1 except that public irrigation is prohibited.

Other Public Notifications

Many of the plans which follow call for notification of the public of emergency conditions and of required demand curtailment measures. Sample announcements are presented here in increasing order of severity. The City should contact newspapers and several local radio and television stations, which broadcast in the service area, to make prior arrangements concerning emergency announcements.

Sample I

For Immediate Release

The City of Kent is experiencing unusually high water demand and is having difficulty maintaining adequate reservoir reserves. Residents of the City are requested to reduce water consumption and to avoid wasting water wherever possible. It will be particularly helpful if homeowners will make every effort to reduce lawn irrigation. The problem is expected to be temporary in nature, and a public announcement will be made when normal water consumption can be resumed.
Sample II

For Immediate Release

The City of Kent is experiencing a major loss of its water production capacity. The City's customers are directed to stop all irrigation and to make every effort to conserve valuable water. Failure to do so may result in the application of fines of up to $50/day, according to City ordinance #2227. The City is doing everything possible to correct the situation, and will make a public announcement as soon as the problem has been rectified.

Sample III

For Immediate Release.

This is a Community Emergency Announcement. The City of Kent has experienced a major loss of its water production capacity, and, therefore, is unable to maintain normal water deliveries. It is mandatory that all irrigation, industrial, and commercial use be discontinued. Water must be conserved for sanitary and potable use only. Your cooperation is urgently requested. Failure to eliminate unessential uses of water may result in the application of fines of up to $50/day, according to City ordinance #2227. The City is doing everything possible to restore the water system to normal operations. You will be notified of any change in the situation. Note: repeat the above message.

Sample IV

For Immediate Release

The City of Kent has experienced a total loss of its water production capacity; as a result, the water mains have been shut off and normal water deliveries have been discontinued. The City has made arrangements to deliver water by tank truck or bottled water to residential areas for potable and sanitary uses only. The following is a schedule of tank truck deliveries and locations.
### Table 8-31
Emergency Water Delivery Locations

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kent City Hall</td>
<td>220 4th Ave S.</td>
</tr>
<tr>
<td>City Maintenance Shops</td>
<td>5821 S 240th</td>
</tr>
<tr>
<td>Blue Boy Tank</td>
<td>23616 112th Ave SE</td>
</tr>
<tr>
<td>6 MG #1</td>
<td>23825 98th Ave S.</td>
</tr>
<tr>
<td>6 MG #2</td>
<td>9615 S 218th St.</td>
</tr>
<tr>
<td>Guiberson Tank</td>
<td>700 E Guiberson St</td>
</tr>
<tr>
<td>3.5 MG Tank</td>
<td>28502 124th Ave SE</td>
</tr>
<tr>
<td>Cambridge Tank</td>
<td>3301 S 264th St.</td>
</tr>
<tr>
<td>125,000 Gallon Tank</td>
<td>23825 98th Ave S.</td>
</tr>
<tr>
<td>1 MG Tank (Reith Road)</td>
<td>25601 Reith Road</td>
</tr>
<tr>
<td>Pump Station #3</td>
<td>25000 Lake Fenwick Road</td>
</tr>
<tr>
<td>Pump Station #4</td>
<td>25601 Reith Road</td>
</tr>
<tr>
<td>Pump Station #5</td>
<td>23825 98th Ave S.</td>
</tr>
<tr>
<td>Pump Station #6</td>
<td>25716 38th Ave S.</td>
</tr>
<tr>
<td>Pump Station #7</td>
<td>3301 S 264th St.</td>
</tr>
<tr>
<td>Pump Station #8</td>
<td>3401 S 240th St.</td>
</tr>
</tbody>
</table>

When picking up water at the tank truck locations, please bring your own clean containers. The City is doing everything possible to resume normal water service and will notify you as soon as water service has been restored.

State law, WAC 248-54-750, Reporting and Public Notification, clearly outlines the District’s responsibilities for both oral and written communication with water users in situations which may be caused by emergencies. All staff with authority for public announcements should be familiar with these regulations.

In addition to public announcements, communication with emergency services is vital. Important phone numbers are included on the following page and should be posted at all phones.

**System Vulnerability**

An overall assessment during summertime conditions (low aquifer levels) the existing Kent Water System shows a reliable available water supply of 17.0 MGD. This is enough to meet expected near future one-day peak demands. Emergency power is available at Pump Station #5 on East Hill and at Pump Station #4 on the West Hill. Emergency power is currently being added at Kent Springs and Clark Springs and is scheduled to be added at Pump Station #3 in 1999.

Other system vulnerability upgrades have been identified in consultant reports and have been included in chapter 8, the System Improvement Program. The identification and
addition of all system improvements will increase the reliability of the water system in the event of an emergency

SAFEY PROCEDURES

Areas of potential workplace hazards which have been identified by the Water Department personnel are:

1. Confined Space hazards - primarily atmospheric or oxygen deficiency
2. Electrical and mechanical hazards
3. Hazardous chemicals and materials
4. Asbestos pipe hazards
5. Fall hazards
6. Excavation hazards
7. Equipment operation hazards

The City has compiled programs to ensure the safety of its employees and citizens in each of the areas above. The employees are thoroughly trained in each of the safety programs as they apply to their job duties, and there are daily safety tailgate meetings with crews by Field Supervisors to review specific safety procedures for the scheduled tasks and assignments. The department crews meet together monthly for mandatory safety training organized and coordinated by the safety committee, made up of representatives from each department. The committee also regularly inspects facilities and maintenance practices, as well as investigating incidents and accidents, to aggressively reduce workplace accidents and injuries of employees. First Aid training is required for all employees, and First Aid equipment (10 unit packs) are maintained in all vehicles and at major facilities. 911 is called whenever needed for medical aid. Following is a synopsis of each hazard, where it is commonly found and the procedures the employees use to protect themselves and others as well as the work environment.

1 Confined Space Hazard - Found primarily in meter and PRV vaults and manholes, excavations, water tanks, and below ground structures. Employees follow the confined space program which includes atmospheric monitoring and ventilation to protect them from hazardous atmospheres, as well as lock out/tag out procedures to protect from other hazards. The City owns and maintains 2 hoists, 4 portable ventilation systems, as well as 8 air monitors for confined space entry. The Kent Fire Department responds to all confined space entry rescues.

2 Electrical and Mechanical Hazards - Found in all parts of the water system. Due to the water pressures, electrical, hydraulic and mechanical hazards present when maintaining the system employees follow the lock out/tag out program to protect themselves, others, and the equipment from hazards when performing repairs or maintenance. All employees have been issued 3-5 individually keyed lock out devices and tags for lock out/tag out use.

3 Hazardous Chemicals and Materials - The City aggressively maintains its chemical feed equipment to protect employees and the environment. Chlorine cylinders are
changed by two people wearing SCBA equipment (air packs). Other types of hazardous chemicals and paints require the use of protective face masks and respirators, which is outlined in the respirator program for negative pressure respirators. All employees have been individually issued and fit tested for half or full face respirators. The City also maintains remote monitoring equipment at each site where chemical treatment is used, as well as eyewash/shower facilities wherever chemical treatment is present. A copy of the Material Safety Data Sheets (MSDS) for the water department are located in Appendix E.

4. Asbestos Pipe Hazards – Employees exposed to asbestos (AC) pipe during water main repairs are certified to work with AC pipe and also follow the respirator program for negative pressure respirators. All employees are supplied and fitted with individual respirators.

5. Fall Hazards – The City has upgraded all of its reservoirs and ladders with fall protection where required, with the exception of the 3.5 MG Reservoir – which is scheduled for improvements in 1998. Vehicles have been equipped with harnesses and latching devices for the cable or rail systems installed.

6. Excavation Hazard – All backhoe operators (MW3 or above) have been trained as an "Excavation Safety Competent Person(s)". The City has purchased an engineered "concore" system for routine excavations, with arrangements made with local suppliers to lease additional shoring whenever needed. Employees are trained and follow the Excavation, Trenching, and Shoring procedures as outlined.

7. Equipment Operation Hazards – Each employee must be certified as being able to safely operate a specific piece of equipment prior to being authorized to use or be issued the equipment. Experienced operators, Field Supervisors, and factory representatives conduct training and testing procedures for all employees as needed. A list of certified users is maintained for all supervisors to refer to when assigning work schedules.

Confined Space

The Public Works Operations Division of the City of Kent believes in the dignity and importance of the individual employee and his or her right to derive personal satisfaction from the job. The prevention of occupational injuries and illness is of such a consequence to this belief that it will be given top priority at all times. We will establish and require a Confined Space Entry Program which emphasizes the integration of safety and health measures into each job task so that safety, health, and job performance become inseparable. This will be accomplished through the cooperative efforts of the Water Superintendent, the Supervisors, and Employees of the Water Division who will seek to obtain the lowest possible accident rates. Safety orientation for new and transferred employees, timely and appropriate training, a management-employee confined space entry program, permit process, proper lockout procedures, and personal protective equipment will be some of the tools used to reduce work hazards.
SAFETY PROCEDURES FOR ENTRY INTO CONFINED SPACES AND PERSONAL HYGIENE

1 PURPOSE:

To establish effective, practical, and safe procedures required for entry into confined spaces.

2. ORGANIZATIONS AFFECTED

Water Divisions.

3. REFERENCE

Washington State General Occupational Health Standards

4. POLICY

It is the policy of the City of Kent Public Works Operations Department to require all employees entering confined spaces to rigidly follow the procedures set forth here and to be adequately trained and protected from any of said hazards that might be encountered.

5 DEFINITIONS

A. Confined Space - means any space that contains all of the following:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and

(3) Is not designed for continuous employee occupancy

Confined spaces include but are not limited to, manholes, utility vaults, water reservoirs and tanks, pump stations, pipelines, settlements, pits, tubes, vaults, tanks, and open top spaces, such as utility ditches.

B. Permit-Required Confined Space (Permit Space) means a confined space that has one or more of the following characteristics
(1) Contains or has a potential to contain a hazardous atmosphere;

(2) Contains a material that has the potential for engulfing an entrant;

(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, or

(4) Contains any other recognized serious safety or health hazard

C Alternate Procedures - procedures which may be used to enter a permit space when it can be shown that continuous forced air ventilation is sufficient to maintain the permit space safe for entry

D. Lockout - Tagout - procedures which must be used to maintain a safe working environment in areas with electrical, mechanical, or hydraulic hazard potential.

E Toxic Atmospheres - atmospheres having concentrations of airborne chemicals in excess of Threshold Limit Values as defined in WAC 296-62-075 through WAC 296-62-07517 which includes fumes, chemicals, gasses, etc., which cause sickness or discomfort to the employee. Toxic gases can also be fatal.

F Oxygen - Deficient Atmospheres - are deemed to exist if the atmosphere at sea level has less than 19.5% or above 23.5% oxygen by volume or has partial pressure of 135 millimeters of mercury or less.

G Flammable Atmospheres - atmospheres in excess of 20% of lower explosive limit (LEL)

H Blower - Ventilation Equipment - gasoline, diesel, electrical, propane or hand-powered equipment used to ventilate confined spaces shall be able to deliver tempered air and not provide excessive air velocities. Blower ventilators shall conform to NFPA requirements and not create an ignition hazard.

I Contaminants - a contaminant is any organic or inorganic, dust, fume, mist, vapor or gas, whose presence in air may be harmful to human beings.

J Gases - refers to gases most commonly found in manholes, sewers, storm drainage systems, wet wells, dry wells, vaults.

K Detector - portable atmosphere testing equipment with an audible and visual alarm used for testing the atmosphere in a confined space.

L Shall - is used to indicate provisions which are mandatory.
6. RESPONSIBILITIES/COMPLIANCE

A. Superintendents and Field Supervisors of personnel who enter confined spaces shall know the procedures thoroughly and ensure that these provisions are enforced and be responsible for insuring that their employees are trained in the safe entry procedures.

B. Every employee who enters a confined space shall ensure that all provisions of this procedure have been satisfied prior to entry and/or commencement of work.

C. Superintendents and Field Supervisors or Leadmen responsible for safe entry or procedures shall be responsible for the issuance of all detectors and/or safety equipment listed in this procedure. They shall know the proper procedure for operation of all detectors and/or safety equipment. The person responsible for filling out the permit on the job site shall know the proper operation of all equipment to be used.

D. For each project or job, all individuals who are required to enter a Water Department identified confined space shall follow these procedures whether they work for the water division or not.

E. Field Supervisors shall instruct all employees in their divisions in the safe procedures to be followed. This shall be done for all new employees and on an annual basis for all employees. This can be accomplished in conjunction with the Public Works Operations Safety Program, tailgate safety lectures, or with your separate division.

F. All employees shall read and follow these procedures and sign their signature and date on the sheet provided, indicating that they understand and have been given the proper training. This sheet of signatures of understanding will be made a part of this procedure.

G. Superintendents and Field Supervisors will maintain and update this procedure as necessary. A copy will be kept in the following locations: Superintendent's office, Field Supervisor's office, and a copy readily available for the employees at all times.

H. All employees are expected to be certified in First Aid and Artificial Respiration and carry a validated card on their person at all times.

I. Anyone noting a malfunction of any detector, ventilation equipment, tripod, harness, or any device required for safe entry shall write a discrepancy report and remove the equipment from service and turn it into the Warehouse for repair and replacement and notify their supervisor. Note: terminate job if unable to use safety equipment because of malfunction.
7. **SAFE ENTRY PROCEDURES INTO CONFINED SPACES**

A. **Safety equipment** - for the purpose of this procedure, at least the following shall be available:

1. Oxygen and gas detector - EXOTOX - 40 or 50 or equivalent issued on a daily basis through the Warehouse.

2. Blower with auxiliary equipment as designated for entering confined spaces. Issued on a daily basis through the Warehouse or carried in assigned vehicles.

3. Tripod carried on crew truck or issued through the Warehouse.

4. Hard hat, goggles, ear protection, coveralls, rain gear, rubber gloves, other gloves, safety vest, leather safety high top shoes, rubber safety knee boots. These items are issued when each individual starts work for the water division and are maintained in a serviceable condition by the individual. These items are carried on their assigned crew truck at all times and are to be readily available for use when arriving at job site. If an individual is assigned to a different vehicle for the job, it is their responsibility to make sure they have all of their personal equipment with them.

5. All manholes or vaults over four (4) feet deep shall be entered via safety installed manhole steps or a separate ladder of appropriate length. Ladder may be issued through the Warehouse.

6. Appropriate traffic control signs-devices and guards to protect the jobsite and workers shall be utilized. U.S. Department of Transportation Standards and Guidelines manual shall be used.

7. Guardrail for manholes and hatches - carried on crew truck or issued through the Warehouse. Shall be utilized where required.

8. Valve lockout equipment - devices for locking out wheel valves or gate valves in valve boxes. Carried in designated crew trucks or issued through the Warehouse.

9. Electrical/hydraulic lockout equipment - devices for locking out electrical or hydraulic equipment. Carried in designated crew trucks or issued through the Warehouse.

10. Other safety equipment which may be necessary to enter and work safely at all times.
B  Alternate Procedures for Permit Space Entry

(1) Permit spaces may be entered under the following conditions for alternate procedures

A) The only hazard posed by the permit space is an actual or potential hazardous atmosphere, as determined by an evaluation of the hazards which can be reasonably expected to occur.

B) Continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry, verified and documented by continuous or frequent sampling with an air/gas monitor (EXOTOX or equivalent).

C) The determination and monitoring documentation is available to each employee who may enter the permit space.

(2) Alternate Procedures for entry.

A) When first arriving at the jobsite, all traffic control and protective equipment shall be installed and maintained.

B) Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

C) When entrance covers are removed, the opening shall be promptly guarded by a railing or other temporary barrier.

D) Before an employee enters the space, the internal atmosphere shall be tested for the following conditions, in the order given, and the results recorded:

1) Oxygen content
2) Flammable gasses and vapors
3) Toxic atmosphere

E) There shall be no hazardous atmospheres within the space whenever any employee is inside the space.

F) Continued forced air ventilation shall be used, as follows:

1) An employee shall not enter the space until the forced air ventilation has eliminated any hazardous atmosphere,

2) The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within
the space and shall continue until all employees have left the space;

3) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

G) The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

H) If a hazardous atmosphere is detected during entry:

1) Each employee shall leave the space immediately;

2) The space shall be evaluated to determine how the hazardous atmosphere developed; and

3) Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place

WHEN THERE ARE CHANGES IN THE USE OR CONFIGURATION OF A NON-PERMIT OR ALTERNATE PROCEDURES CONFINED SPACE THAT MIGHT INCREASE THE HAZARDS TO ENTRANTS, THE EMPLOYER SHALL REEVALUATE THAT SPACE AND, IF NECESSARY, RECLASSIFY IT AS A PERMIT-REQUIRED CONFINED SPACE.
Permit Space - Alternate Procedures
Documentation and Monitoring Data

Space Identification Number __________________________ Location __________________________
*Acceptable condition for entry - continuous mechanical ventilation must be provided

Safety Hazards Identified

<table>
<thead>
<tr>
<th>Initials</th>
<th>Date</th>
<th>Corrected</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1)</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>2)</td>
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<td></td>
<td>5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Monitoring Data

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Oxygen</th>
<th>Explosive 10%</th>
<th>Toxic</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.5% Min</td>
<td>Maximum LEL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23.5% Max</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

New Form Installed Date ________________ Time ________________ Initials ________________

Last Recorded Entry Transferred ______
### Permit Required Confined Space

**Inventory Sheet**

<table>
<thead>
<tr>
<th>Permit Designation</th>
<th>Other Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Springs.</td>
<td></td>
</tr>
<tr>
<td>CS-1 Surge Vault</td>
<td>Alternate Procedures</td>
</tr>
<tr>
<td>CS-2 Clearwell -</td>
<td>Permit Required</td>
</tr>
<tr>
<td>Kent Springs.</td>
<td></td>
</tr>
<tr>
<td>KS-1 Clearwell</td>
<td>Alternate Procedures</td>
</tr>
<tr>
<td>KS-2 18&quot; meter</td>
<td>Alternate Procedures</td>
</tr>
</tbody>
</table>

**Distribution:**

- Section 6035W
- 113th & 240th - Air Vac: Alternate Procedures, Traffic
- 23806 98th Ave S - 4" meter: Alternate Procedures, Traffic
I) Entering Permit Required Confined Spaces - Alternate Procedures not Applicable

(1) Entry Permits - An entry permit (Enclosure A) will be issued by the supervisor before leaving for the work site each day. Since the water crews work in two (2) person crews when entering these permit spaces, one person will be assigned as the crew chief and his name entered on the permit as person responsible for safe entry by his supervisor. When arriving at the jobsite, this person will be responsible for safely completing the entry permit as the permit won't be dated and signed until actual entry is necessary at the jobsite. This permit will be kept at the jobsite until the job has been completed and turned into the supervisor at the end of the day. This permit will insure the pre-planning of the availability of required safety equipment, its serviceability and a thorough analysis of potential hazards from unplanned events or actions which could alter the plan.

(2) When first arriving at the jobsite, all traffic control shall be installed to provide protection.

(3) a) Do not open manhole or confined space cover. If possible, initial testing of a manhole atmosphere can be done through holes in the cover using an aspirator attachment which comes with a monitor. If there is no access for this, open the cover allowing just enough space to insert the device to get an accurate test. CAUTION This should be done without scraping to avoid sparks. Never use an open flame to thaw ice around a cover. Never strike a seated cover with a steel or iron tool. If needed, a hardened bronze cold chisel or some other non-sparking implement should be used (Monitor issued through Warehouse).

b) If the initial test checks okay, remove the manhole or confined space cover and install the protective barrier or railing and make additional tests at various levels in the manhole or space.

c) Even after testing all levels of a manhole (confined space) for toxic gasses, explosive conditions and oxygen deficiency, run the ventilation blower for at least five (5) atmosphere changes with the hose outlet positioned all the way down to the bottom of the manhole (confined space). Ventilation can be improved by removing the nearest upstream or downstream manhole or hatch cover. Ventilation shall continue while work is being conducted in the manhole (confined space). All work shall stop and the area shall be evacuated if ventilation fails or an alarm condition occurs.

d) After ventilation of five (5) atmosphere changes, the manhole will be tested again at all levels of the manhole confined space. If any gasses,
explosive or oxygen deficiency is noted at this time, DO NOT ENTER
the manhole, notify your immediate supervisor.

e) If no toxic gas, explosive or oxygen deficiencies are detected, the
confined space may be entered following this procedure:

(1) Entry Permit must be fully completed and understood by
each employee involved with the job task.

(2) The person entering manhole (confined space) shall put on
and wear during entry, appropriate protective clothing, i.e.
rubber safety knee boots, coveralls or rain gear, rubber
gloves, hard hat, goggles or face shield, monitor will be
worn on the chest at all times.

(3) A visual inspection of the manhole (confined space) shall
be made. If any unusual material (or hazardous substance
is noted inside, the manhole (confined space) will be
cleaned out and washed down using a vacuum truck and
jet rodder or other methods.

(4) Steps shall be checked to make sure they are in good
condition. If not steps are present, a ladder will be used.

(5) Sweep and clean area around manhole (confined space)
including the manhole ring and lid edge.

(6) Make sure the ventilation blower is working properly
The blower should be located in an area upwind of the
manhole and at least ten feet from the manhole opening. If
the blower has a gas driven engine, the exhaust must be
downwind from the manhole (confined space).

(7) The person may enter manhole at this time with a safety
harness and retrieval device in place. WAC.296-62-
145193 ABC.

(8) If at any time an "alarm condition" develops, the manhole
(confined space) will be evacuated.

(9) No smoking shall be permitted inside or within ten (10)
feet of a manhole (confined space).

(10) At least one person shall remain outside the manhole
(confined space) while it is occupied. This person's job
task shall be that of a watch person and to maintain
communications with employee(s) inside the confined.
space. This person shall remain at the entrance of the confined space as long as it is occupied. A two-way radio will be available either hand held or in a crew truck at all times.

If assistance is needed for rescue efforts, the Operations Control Center or Police Records (after hours), will be called with the following information: identify yourself, give nature of emergency, location, and ask that an Aid Car or Fire Unit be dispatched through 911.

(11) If a necessary piece of equipment is in need of repair or missing, shall be halted until replaced or repaired.

(12) Hot work shall not be permitted if the atmosphere contain explosive gasses greater than 10% LEL. The definition of “hot work” as used in this procedure includes, but is not necessarily limited to burning, welding, soldering, cutting, heating, grinding, or drilling.

(13) Any hazardous condition encountered shall be entered on the Confined Space Entry Permit for future reference, (i.e., steps in manhole are in poor condition, etc.). Keep in mind that when you and other members of your crew sign this form, you agree to follow the listed procedures. If you then elect not to follow the established procedures and your action results in an injury or fatality, you have assumed the responsibility for your actions (and those of your crew, if you are a Field Supervisor). You could be held legally liable for the consequences of your actions or those of your crew.

f. If you did receive an “alarm condition” on the initial test and you cleared the condition, the above procedure shall still be used and the Safety Harness with Lifeline, Tripod and Winch shall be used. The Safety Harness, Lifeline, Tripod with Winch is carried on the crew truck as needed. It is the Field Supervisor and assigned driver’s responsibility to make sure these are on the crew truck and in proper working condition as they are needed.

g. Even under extreme circumstances the water system employee should not work in a confined space when the atmosphere presents an immediate danger to life or health. In other words, if you are getting an atmospheric alarm condition, get out and stay out until the condition is cleared.
There may be rare occasions when an operator cannot avoid working in a confined space under these circumstances, and therefore self-contained breathing apparatus must be used (i.e., to retrieve a worker). In general though, the self-contained breathing apparatus (SCBA) will be used by rescue personnel only. THE CITY FIRE DEPARTMENT WILL BE CALLED FOR THIS RESCUE. Call the Control Room either by radio or if phone is available, dial 911.

The Water Divisions do not have or maintain self-contained breathing apparatuses for rescue purposes. This is handled by our Fire Department.

**FINAL PRECAUTIONS BEFORE MANHOLE ENTRY (Permit Space)**

1. Health Condition of Operators. Any operator entering a manhole (permit space) should conform to the following rules at the time of entry:

   a) Be in good health. If you are recovering from a recent injury, illness or surgery, do not enter a manhole (permit space) until fully recovered.

   b) Be in sound physical condition.

   c) Be completely free from the influence of alcoholic beverages or drugs and from the impairment of a hangover.

   d) Have no open sores, skin irritation (including such problems as poison oak), fungus infections, (i.e., athlete's foot) or serious sunburn that cannot be properly protected from contamination. If in doubt, refer the employee to Valley Occupational Clinic for clearance.

   e) Have current immunizations. Employees in a Water System should have current immunizations against illnesses and diseases which might be encountered (i.e., typhoid and tetanus shots).

   f) Before entry into a manhole (confined space), carefully inventory and examine the condition of all required tools, materials, and equipment needed for the work. Exposure to injury is greatest while an employee is descending into or climbing out of a manhole (confined space). Therefore, job organization and equipment should be arranged to permit all work to be accomplished with a single entry and exit of the manhole (confined space).

   g) Tools for use by an employee in a manhole (confined space) must be lowered to them and recovered from them by the use of a bucket and tag line. Lower or raise the bucket using a hook rope with a safety clasp that will swivel. Dropping tools for employees to catch and allowing employees to toss tools out, has resulted in many injuries and
shall result in immediate disciplining of the employee responsible for such actions.

h) Thoroughly clean your hands before eating, or leaving the jobsite. Cleaning can be accomplished using waterless soap and paper towels.

i) Clothing is furnished by the City to include laundering and a change of clothing for every day, including coveralls. No clothing will be taken home for laundering.

j) Showers are provided at the Shops. Medicated soap for washing hands at the Shop is also provided. Wash your hands, etc., when returning to the Shop.
PERMIT  
CITY OF KENT  
PUBLIC WORKS OPERATIONS  
WATER  

Job Description: ____________________________________________

Purpose of Entry: ____________________________________________

Location: ____________________________________________

Field Supervisor Signature: ________________________________

Employees Assigned: ____________________________________________

Other Onsite (Name & Company): ____________________________

Person Responsible for Safe Entry on Site: ____________________________

Signature

Date and time of Entry: ____________________________

Left Jobsite: ____________________________________________

All Yes/No tasks will be filled in either yes or no. If not applicable, N/A will be entered in that space.

Have the following tasks been performed? Yes No

1. Discussions of hazards and safety

2. Traffic Control

3. Confined Space, tested for toxicity, explosive gases and oxygen

4. Discussion: use of communication procedures and equipment used by authorized entrants and attendants to main contact.

5. Entrant wearing proper protective clothing: hard hat, goggles, ear protection, coveralls/rain gear, rubber gloves, rubber safety knee boots, detector worn on chest

6. Blower set up properly and blowing for at least 5 air exchanges.
7. Tripod, w/winch, Lifeline and Safety Harness onsite

8. Discussion of respirators and call for Fire Department if needed. Call Control Room by radio and have them call Fire Department if rescue assistance is needed.

9. Discussion of the measures such as lockout, tagout, equipment, and procedures for purging, ventilating and flushing to remove or control potential hazards.

10. A person qualified as an observer posted to warn of an emergency and coordinate a rescue, if necessary.

Detector equipment to be used

<table>
<thead>
<tr>
<th>Type</th>
<th>Serial #</th>
<th>Date of Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By Whom: ________________________________

<table>
<thead>
<tr>
<th>Test Conducted</th>
<th>Time</th>
<th>Results</th>
<th>Time</th>
<th>Results</th>
<th>Maximum Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen Deficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19.5% Minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23.5% Maximum</td>
</tr>
<tr>
<td>Flammability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10% LEL</td>
</tr>
<tr>
<td>Toxicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 PPM CO (carbon monoxide)</td>
</tr>
</tbody>
</table>

No one shall enter any confined space until it has been properly tested for oxygen deficiency and toxic or flammable gasses, and appropriate procedures are followed.

I certify that I have evaluated the situation and assigned personnel, and that the procedures to be followed are in compliance with the “Confined Space Procedures”

_____________________________________
Signature  Field Supervisor

Entry Comments

____________________________________
____________________________________
____________________________________

Page 2 of 2
SECTION #2 LOCKOUT/TAGOUT PROCEDURES

A. Electrical Safety

(1) The first rule that applies to electrical systems is "IF YOU ARE NOT QUALIFIED, DO NOT, UNDER ANY CIRCUMSTANCES, ATTEMPT TO WORK ON ELECTRICAL SYSTEMS.

(2) If any electrical equipment is going to be worked on in the station, the employee that is working in the station shall lockout the main circuit breaker usually located within the confines of the station with his lock provided and carry a key into the station with him. Locks and keys provided with crew truck or assigned to individuals.

(3) Wear safety glasses when working on live equipment.

B. Lockout Procedure

(1) Water System employees are frequently required to work on mechanical and hydraulic systems in a pump station. Whenever it is necessary to work on a piece of equipment or machinery, the following procedure shall be adhered to:

a) The main power source shall be locked out, in the off position, with a multiple lockout device and padlock. (NOTE: the pulling of fuses shall not be considered a substitute for locking out).

b) All hydraulic and other fluid lines shall be drained, purged, or blanked off to prevent pressure and/or contents from causing movement and mechanisms under spring tension or compression shall be blocked, clamped, or chained in position.

c) Never place locks where the disconnect can be by-passed at other locations.

d) Each lock shall be individually keyed to prevent unauthorized removal from the lockout device. The employee using the padlock is the only person authorized to remove it.

e) A tagging system shall be used which will advise other employees of the work performed.

f) CAUTION: It is mandatory that the disconnect or valve be tried to make sure it cannot be moved to "on." In addition, the machine controls themselves shall be tried to make certain that the energy is "off."
g) After all work is completed, the person working inside of the station is responsible to remove all lockout devices and make sure the station is in automatic mode and fully operational before leaving the station.
RESPIRATOR PROGRAM FOR NEGATIVE PRESSURE RESPIRATORS

The intent of this program is to maintain a safe and well trained group of employees with regard to respiratory hazards involved in certain job duties in the workplace.

Individuals that meet the minimum criteria to wear a negative pressure respirator and are required to wear one due to job duties, will be thoroughly trained on the proper use, cleaning, inspection and maintenance of respirators.

Each affected employee whose job duties may require the use of a respirator, will be asked to fill out a medical questionnaire. Individuals who do not meet the minimum medical criteria will either be sent to a medical doctor (at City expense) to have their status evaluated further or may not be eligible to use a respirator. Facial hair, glasses and other obstructions which may interfere with the effectiveness of the respirators may disqualify an individual from safely being a participant of this program. Once a respective employee completes the medical questionnaire without any negative or questionable responses, then they may be asked to be properly fitted for a respirator. At the time of respirator selection, only NIOSH and MSHA approved respirators will be allowed for use. These respirators will be furnished to the designated employees by the City.

For ease of reference, this program will be separated into eleven specific categories. The categories are:

1. General
2. Availability of Respirators
3. Use of Respirators
4. Selection of Respirators
5. Training
6. Fitting of Respirators
7. Procedures for field testing the seal of the respirator to the wearer
8. Cleaning, inspection and maintenance
9. Medical Surveillance
10. Respirator Program evaluation
11. Recordkeeping
1. GENERAL

The intent of this written program is to define the City of Kent, Water Department rules now in effect regarding the use of respirators for personal protection against the following airborne contaminants:

<table>
<thead>
<tr>
<th>Air Contaminants</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Chrysotile Fibers (Asbestos water pipe)</td>
<td>Various pipelines throughout the City</td>
</tr>
<tr>
<td>B. Vapors (i.e., paint, solvent, caulkng, etc.)</td>
<td>Any location which requires painting</td>
</tr>
<tr>
<td>C. Herbicide &amp; Pesticide chemical application</td>
<td>Various planters, pump stations, and other City-owned facilities</td>
</tr>
<tr>
<td>D. Chlorine Gas and Liquid Chlorine fumes</td>
<td>Any water facility that chlorinates</td>
</tr>
<tr>
<td>E. Welding gasses (arc &amp; gas) and other fumes</td>
<td></td>
</tr>
</tbody>
</table>

The requirements contained herein are not optional for the employee. The City considers this safety program to be mandatory and a condition of employment.

2. AVAILABILITY OF RESPIRATORS

Each employee that requires a respirator will be issued one at the City's expense with replacement parts, cartridges, and filters available as needed.

3. USE OF RESPIRATORS

Each employee that requires a respirator shall wear NIOSH and MSHA approved respirators, properly fitted, at all times while performing an operation defined as potentially hazardous; or an employee in the immediate area of another employee performing a potentially hazardous operation at risk of an over exposure. No alterations of the respirators are permitted. The following operations are considered potentially hazardous:

- A. Asbestos cement watermain repair
- B. Asbestos cement watermain service tap
- C. Any waterwork appurtenance installation or repair which is installed or will be installed to an asbestos cement watermain
- D. Painting, caulking, gluing, etc.
- E. Chemical application
F. Weed control application (herbicide & pesticide)
G. Chlorine gas/Liquid chlorine, caustic soda, and other water treatment chemical applications
H. Welding and other activities which create hazardous gasses and fumes

4. SELECTION OF RESPIRATORS

Only NIOSH and MSHA approved respirators have been authorized for use in this program. The choice between these respirators is dependent upon the airborne contaminant present, the operation performed, and on the basis of comfort and ease in obtaining proper individual fit. Negative pressure respirators may only be used for slight to moderate toxic dusts, fumes and mists, or vapors with good odor warning properties (10% less concentration of the allowable limit). Half face respirators may only be used up to 10 times the permissible exposure limits (PEL), full face respirators for up to 50 times the PEL's. They are not allowed for use in unknown concentrations, emergency or rescue, immediately dangerous to life and health situations or oxygen deficient atmospheres.

The City will provide these respirators, maintaining a supply of new replacement cartridges and anti-bacterial germicidal detergent for disinfection purposes.

These respirators are noted to have the following limitations:

<table>
<thead>
<tr>
<th>Type of Cartridge</th>
<th>Contaminants Protected Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. High efficiency particulate air (HEPA)</td>
<td>Approved for respiratory protection against dust, fumes, mists, asbestos containing dusts, mists, and radionuclides having a TWA less than 0.05 milligrams per cubic meter.</td>
</tr>
<tr>
<td>B. Organic Vapor</td>
<td>Approved for respiratory protection against not more than 1,000 parts per million organic vapors by volume</td>
</tr>
<tr>
<td>C. Combination organic vapor and high efficiency particulate air</td>
<td>Pesticide application, paint vapors, dust, fumes, mists and radionuclides. Having a TWA less than 0.05 milligrams per cubic meter. No more than 1,000 parts per million organic vapors.</td>
</tr>
</tbody>
</table>
5. **TRAINING**

Each respirator user will be shown and trained how to use and maintain their assigned respirator. Training will include the capabilities and limitations associated with each type of respirator and the nature of the hazard which they are protected against. Users will be trained to change cartridges or disposable respirators when the odor of the chemical "breaks through" the filter, or there is an increased resistance to breathing. This training will be provided by a designated supervisor.

Employee's proof of the training and instruction received shall consist of the following: In addition to the training and instructions received, the respirator user must have read, understood, and been able to apply the contents of this respirator program in the daily use, care, and safekeeping of their assigned respirators. Infrequent use shall require retraining prior to use of the respirator.

To ensure the availability of the respirator program at all times, copies of same shall be distributed as follows:

A  Public Works Operations file  
B  Operations Manager  
C  Superintendents  
D.  Supervisors  
E  Safety Committee file  
F  Employee

6. **FITTING OF RESPIRATORS**

Proper fitting of respirators is essential if employees are to receive the protection for which this program was designed. Air which passes around the edges of the respirator rather than through it, is not filtered air. In order to ensure a good face seal, the following rules must be observed:

A  The respirator and straps must be in place and worn in the appropriate position. To adjust headbands, pull the free ends tight until a comfortable fit is obtained. All straps shall be secure.

B.  To adjust the face piece properly, simply position your chin firmly in the chin cup and manually shift the rubber mask until the most comfortable position is located. Make final adjustments with the headbands and do not break the nasal seal. Modifications to the respirator or straps shall not be made.

C  Proper fit must be checked each time the respirator is worn according to the manufacturer's instructions. Respirators shall not be worn when
projections under the face piece prevent a good face seal. Note: such conditions may be the growth of a beard, sideburns, temple pieces on glasses or a skull cap that projects under the face piece.

D Prior to issuing a respirator to an individual, the respirator must be tested using the appropriate qualitative fit tests. Isoamyl acetate may be used to check respirator fit when using organic vapor cartridges on respirators by determining if the wearer can detect the "banana oil" odor. Irritant smoke tests can also be used. The advantage of the irritant smoke method is that the subjective employee responses are eliminated since a poor fit results in an involuntary coughing response.

E. The fit test exercises for testing a respirator equipped with a face piece have to include the following for at least two minutes each:

1. Normal breathing
2. Deep breathing
3. Turning head from side to side
4. Nodding head up and down
5. Talking
6. Normal breathing

In the event an employee is unable to obtain a satisfactory fit with the type of respirator furnished, the City will make efforts to correct the problem (i.e., provide a different size respirator or a different brand of respirator).

7. PROCEDURES

(For Field Testing the Seal of the Respirator to the Wearer)

Negative-Pressure Sealing Test. A negative air pressure sealing test can be used on air purifying respirators equipped with tight-fitting respirator inlet coverings. The inlet opening of the respirator's canister(s), cartridge(s), or filter(s), is closed off by covering with the palm of the hand(s), or blocking its inlet so that it will not allow the passage of air. Then the wearer inhales gently and holds his breath for at least 10 seconds. If a face piece collapses slightly and no inward leakage of air into the face piece is detected, it can be reasonably assured that the fit of the respirator to the wearer is satisfactory.

Positive-Pressure Sealing Test. A positive-air-pressure test can be used on respirators equipped with tight-fitting respiratory-inlet coverings which contain exhalation valves. The exhalation valve is closed off and then the wearer exhales gently. The fit of a respirator equipped with a face piece is considered to be satisfactory if a slight positive pressure can be built up inside the face piece without the detection of any outward leakage of air between the sealing surface of the face piece and the respirator wearer's face. For some respirators, this test...
method requires that the respirator wearer first remove an exhalation cover from the respirator and then replace it after completion of the test. These tasks often are difficult to carry out without disturbing the fit of the respirator to the wearer.

**Warning Concerning Negative-Pressure and Positive-Pressure Sealing Tests**

Care must be taken in carrying out a negative-pressure or positive-pressure sealing test, otherwise, the results of the sealing test may be unreliable. Thorough training in carrying out these tests should be given to respirator wearers.

**Irritant Smoke Test.** The irritant smoke test can be used for air-purifying respirators. When an air-purifying respirator is tested, it should be equipped with a high-efficiency particulate filter. The irritant smoke is produced by air flowing through a commercially available smoke tube normally used to check the performance of ventilation systems. Ventilation should be provided when carrying out a test to prevent contaminating the room where the test is carried out with smoke. The respirator wearer should keep his eyes closed during the test, even if the respirator provides eye protection. If the respirator wearer detects the penetration of the smoke into the respirator during the test, the wearer should be permitted to readjust the seal of the respirator. The test operates the smoke tube to direct smoke over the respirator, keeping the smoke tube about two feet from the respirator and watches the reaction of the respirator wearer. If the respirator wearer does not detect penetration of smoke into the respirator, the test operator moves the smoke tube closer to the respirator and observes the reactions of the respirator wearer. When the smoke tube has been moved to within six inches of the respirator and the respirator wearer still has not detected penetration of smoke into the respirator, the smoke may be directed at potential points of leakage in the seal of the respirator to the wearer. If the respirator wearer still does not detect penetration of the smoke into the respirator, the wearer should carry out a series of exercises such as deep breathing, turning head from side to side, nodding head up and down, and talking while smoke is directed at the respirator. If the respirator wearer is unable to detect the penetration of smoke into the respirator, the wearer has achieved a satisfactory fit with the respirator.

**Odorous Vapor Test.** The odorous vapor test can be used for both air-purifying respirators and atmosphere supplying respirators. When an air-purifying respirator is tested, it should be equipped with a cartridge or canister which removes the test vapor from the air. An odorous material commonly used in the test is isoamyl acetate. If isoamyl acetate is employed as the test agent, an air-purifying respirator should be equipped with an organic vapor cartridge or canister. The simplest means of carrying out the test is to saturate a piece of fabric or sponge with liquid isoamyl acetate or to fill a stencil brush with liquid isoamyl acetate and then move the fabric, sponge, or stencil brush around the respirator worn by a person. The fabric, sponge, or stencil brush should be passed close to the potential points of leakage in the seal of the respirator while the wearer carries out exercises such as normal breathing, deep breathing, turning.
head side to side, nodding head up and down, and talking. If the wearer detects the odor of isoamyl vapor during the test, the wearer should be permitted to readjust the seal of the respirator. If the respirator wearer is unable to detect the odor of isoamyl acetate vapor, the wearer has achieved a satisfactory fit with the respirator.

8. CLEANING, INSPECTION AND MAINTENANCE OF RESPIRATORS

Respirators should be cleaned after each daily use and placed in a plastic bag and stored in the employee's personal respirator storage locker.

Cleaning and Disinfection Procedures:

A. Remove the air-purifying elements from the respirator. Air purifying elements must never be washed or disinfected. Used cartridges must be properly disposed of after each use.

B. Immerse the respirator in a warm (140 degrees F - 160 degrees F) aqueous solution of germicidal detergent. The respirator may be scrubbed gently with a cloth or soft brush. Make sure that all foreign matter is removed from all surfaces of the rubber exhalation valve flap and plastic exhalation valve seats.

C. After washing and disinfecting the respirator, rinse with clean water (140 degrees F - 160 degrees F) and then allow the respirator to air dry.

D. After the respirator is dry, attach new air purifying elements (cartridges).

E. Store the respirator in a container provided for that purpose.

Any malfunction of the respirator shall be reported to your immediate supervisor. If repair parts are necessary, inform your supervisor of the defects and parts needed. After inspection, cleaning, and necessary repair, or after each day's use, the respirator shall be stored in the plastic bag and container provided for that purpose. In storing the respirator, the face piece and exhalation valve must be in the normal position. This is to prevent the abnormal set of elastomer parts during storage.

Each worker assigned to use a respirator will maintain and routinely inspect it before and after each use. Respirators will be inspected monthly by the worker's supervisor to assure that they are kept clean and in satisfactory condition.

9. MEDICAL SURVEILLANCE

A medical determination of a respirator user's physical capacity to wear a respirator must be conducted prior to any assigned work involving respirator usage. This medical determination will be conducted by your immediate
supervisor and will consist of filling out a medical questionnaire at least once a year

Physiological and Psychological Limitations for Respirator Wearers:

A. A qualified physician will determine if a person with one or more of the following conditions may wear respiratory protection:

1. Emphysema
2. Chronic obstructive pulmonary disease
3. Bronchial asthma
4. X-ray evidence of pneumoconiosis
5. Evidence of reduced pulmonary function
6. Coronary artery disease or cerebral blood vessel disease
7. Severe or progressive hypertension
8. Epilepsy
9. Anemia, pernicious
10. Diabetes
11. Punctured eardrum
12. Pneumomediastinum gap
13. Communication of sinus through upper jaw to oral cavity
14. Breathing difficulty when wearing a respirator
15. Claustrophobia or anxiety when wearing a respirator

B. A respirator medical questionnaire will be completed by each respirator wearer

C. The Respirator Program administrator or other qualified person will observe the respirator wearer during training and fit testing for factors (such as anxiety or breathing difficulties) affecting the wearer's ability to wear a respirator

D. All respirator wearers will have their medical status evaluated annually by completing a medical questionnaire

E. The medical questionnaire will be maintained in the wearer's respirator file

10. RESPIRATOR PROGRAM EVALUATION

The City will monitor the effectiveness of this program by.
A. Frequent unscheduled observation of employee activities throughout the operation to confirm proper respirator use and continual supervisory enforcement to ensure that employees are wearing proper respirators and maintaining them properly.

B. Observation of and discussion with, new and relocated employees to confirm that proper training has been carried out.

C. Periodic discussion with personnel during appropriate scheduled meetings to reinforce previous training.

11. RECORDKEEPING

Records should be kept to document that each respirator wearer has been subject to all of the above. Records will be kept of all applicable training, fit testing, medical surveillance and each time the respirator was worn for protection. All other elements of the program will be documented as much as possible. These records will be kept in a master file and in a personal file for each user.
City of Kent
Water Department

RESPIRATOR MEDICAL QUESTIONNAIRE

Name: ______________________  Date: ___________

RESPIRATOR TYPE ____________________________

Have you ever had any health difficulties from wearing a respirator? Yes  No

If yes, please explain ____________________________________________

Have you had or do you now have any of the following:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| 1   | Lung disease
| 2   | Persistent cough
| 3   | Heart trouble
| 4   | Shortness of breath
| 5   | Fainting or seizures
| 6   | High blood pressure
| 7   | Diabetes
| 8   | Fear of tight or enclosed places
| 9   | Heart exhaustion or stroke
| 10  | Ruptured ear drum
| 11  | Vision deficiencies
| 12  | Hearing deficiencies
| 13  | Contact lenses or glasses

Please explain YES answers _________________________________________

Signature ______________________  Date: __________

Supervisor ______________________  Date: __________
City of Kent
Water Department

QUALITATIVE RESPIRATOR FIT TEST RECORD

Name ___________________________ Date __________________
Job Title ___________________________ Department: __________________

EVALUATION. _______ Original Issue _______ Periodic _______ Special _______

POTENTIAL FIT PROBLEMS. (e., facial hair, scars, hollow temples, receding chin, glasses, dentures, etc.)

TESTING MEDIA: (irritant smoke, isoamyl acetate, etc.)

(Allow two minutes for each exercise) 

<table>
<thead>
<tr>
<th>Respirator 1</th>
<th>Respirator 2</th>
<th>Respirator 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fit</td>
<td>No Fit</td>
<td>Fit</td>
</tr>
<tr>
<td></td>
<td>No Fit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Negative Pressure Test
Positive Pressure Test
Normal Breathing
Head Side to Side
Head Up and Down
Talking
Normal Breathing

Page 1 of 2
City of Kent
Water Department

QUALITATIVE RESPIRATOR FIT TEST RECORD

Are you aware of any other condition which might interfere with your ability to wear a respirator? Explain ____________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Please list any medications you are now taking:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Employee signature ___________________________ Date: ________________

Supervisor signature ___________________________ Date: ________________
# FALL PROTECTION PLAN

**Date** ___________  
**Supervisor / Department:** ____________________________________________

**Location of Fall Hazard:** ______________________________________________

**Description of Work** ___________________________________________________

## Recognized Fall Hazard (check any applicable)

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Ladders</th>
<th>Scaffold</th>
<th>Bridge Decks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forming</td>
<td>Pouring</td>
<td>Excavation</td>
</tr>
<tr>
<td></td>
<td>Catwalks</td>
<td>Welding at Height</td>
<td>Drillin Shafts</td>
</tr>
<tr>
<td></td>
<td>Sloped Access</td>
<td>Set Girders</td>
<td>Connect Girders</td>
</tr>
<tr>
<td></td>
<td>Work over Water</td>
<td>Leading Edge</td>
<td>Perimeter Edge</td>
</tr>
<tr>
<td></td>
<td>Work Decks</td>
<td>Walkways/Ramps</td>
<td>Stairwell, Roof,</td>
</tr>
<tr>
<td></td>
<td>Stressing</td>
<td>Tieback Strands</td>
<td>Window Opening</td>
</tr>
</tbody>
</table>

## Personnel Hoisting (check any applicable)

<table>
<thead>
<tr>
<th>Method of Protection</th>
<th>Crane</th>
<th>Boom Truck</th>
<th>Forklift</th>
<th>Other</th>
</tr>
</thead>
</table>

## Method of Protection

### Fall Restraint

<table>
<thead>
<tr>
<th>Type of Harness</th>
<th>Type of Harness</th>
<th>Anchorage</th>
</tr>
</thead>
</table>

| Control Zones / |
| Warning Lines |
| and Monitor |

<table>
<thead>
<tr>
<th>Guardrail</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nets</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Fall Arrest

<table>
<thead>
<tr>
<th>Type of Harness</th>
<th>Type of Lanyard</th>
<th>Anchorage</th>
</tr>
</thead>
</table>

| Deceleration Device | Yes | No |
| Other Type of Equipment Used |

## Overhead Protection (check applicable)

<table>
<thead>
<tr>
<th>Overhead Protection</th>
<th>Tool Handling, Storage and Securing</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hard Hats</th>
<th>3 5&quot; Toe Boards</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 5&quot; Toe Boards</td>
<td>Debris Nets</td>
</tr>
<tr>
<td>Warning Signs</td>
<td>Tool Buckets</td>
</tr>
<tr>
<td>Debris Nets</td>
<td>Tool Belts</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>

## Procedure for Assembly, Maintenance, Inspection and Disassembly of System

Assembly, Disassemble and maintenance of all equipment will be done according manufacturer’s recommended procedures. A visual inspection of all safety equipment will be done daily or before each use. Any defective equipment will be tagged and removed from service immediately.
EMERGENCY ACTION PLAN

First Aid / CPR
Names of Trained Personnel on Site

Location of First Aid Equipment

Initiate Emergency Services (call or radio 911)
Location of Phone or Radio
Phone # of Police: 911
Phone # of Emergency Response Team 911

Describe Procedure For Removal of Injured Employee (Note No removal will be attempted without supervision of qualified emergency rescue personnel)

<table>
<thead>
<tr>
<th>Crane</th>
<th>Yes</th>
<th>No</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoist</td>
<td>Yes</td>
<td>No</td>
<td>Location</td>
</tr>
<tr>
<td>Wench</td>
<td>Yes</td>
<td>No</td>
<td>Location</td>
</tr>
<tr>
<td>Block</td>
<td>Yes</td>
<td>No</td>
<td>Location</td>
</tr>
<tr>
<td>Tackle</td>
<td>Yes</td>
<td>No</td>
<td>Location</td>
</tr>
</tbody>
</table>

Other (describe)

Plan Reviewed at Job Site? Yes No

Supervisor or Foreperson Signature

Employee Signature

Employee Signature

Page 2 of 2
City of Kent
Water Division
Excavation, Trenching and Shoring

1.0 Purpose:

To protect the City of Kent’s Water Department employees who enter excavations and trenches that are four (4) feet or more in depth.

1.01 To establish a policy for shoring and sloping excavations and trenches that are four (4) feet or more in depth in keeping with W.A.C Chapter 296-155, Part N, page 1 through 19 and amendment thereto in its entirety.

2.0 Organizations Affected:

Public Works Operations/Water Department

3.0 Policy.

It shall be the policy of the City of Kent Water Department to shore or slope all excavations or trenches that are four (4) feet or more in depth.

3.0.1 All sloping and shoring will comply to W.A.C. Chapter 296-155, Part N, page 1 through 19 and any revisions thereto. All sloping will be a minimum of one to one (1 to 1).

3.0.2 Water Department employees shall not enter excavations or trenches dug by contractor and/or others that are not adequately sloped or shored and in keeping with W.A.C. Chapter 296-155, Part N, in its entirety.

3.0.3 It shall be the policy of the Water Department to ensure that adequate training is given to employees engaged in excavation requiring shoring.

3.0.4 A person certified as a Competent Person - Excavation and Trenching shall be on site at all times when work is in progress.

4.0 Tools and Equipment Required:

4.0.1 Trench boxes (Camcore) accompanied by Manufacturer’s tabulated data sheets. Ladder, personal protective equipment, air monitor, ventilation equipment and other equipment or devices if required.

4.0.2 If, for any reason, a specialized shoring system needs to be designed due to conflicting circumstances Field personnel shall contact an approved Engineer to assist with its design, i.e., Public Works Operations Manager, Public Works Engineer, etc., or if they are not available, the Water Superintendent for assistance.
5.0 Safety Rules and Regulations

Washington State Department of Labor and Industries W.A.C Chapter 296-155, Part N, in its entirety All established City safety rules/regulations shall be observed.

6.0 Procedures

The sides of every excavation four (4) feet or more in depth or wherever other circumstances warrant, shall be supported by an approved apparatus or means, or the sides of the excavation sloped to the angle of repose of the material being excavated as provided in paragraph 3.0 and 5.0 of this document.

6.0.1 All underground utilities to be excavated will be measured by the best available means prior to the excavation to ensure that proper materials or devices are on hand at the time of excavation, if warranted.

6.0.2 Underground locates for other utilities will be requested forty eight (48) hours in advance unless an emergency exists, then “One Call” will be utilized with crew on-site requirements for emergency locates.

6.0.3 All excavations in the right-of-way will have proper traffic control cones, barricades, signing, and flaggers when warranted by excavation site.

6.0.4 All employees will wear appropriate hard hat, safety reflection vests, safety shoes and any additional safety clothing or devices for equipment noise, eye protection, or other hazards that may be encountered.

6.0.5 Employees shall not be allowed to work alone in a trench of four (4) feet or greater in depth unless there is a top person in constant attendance. The top person shall be in addition to the equipment operator.

6.0.6 Entry and exit from excavations shall be made by the use of ladders that extend three (3) feet above the top of the excavation.

6.0.7 Any excavated material shall be stored at least two (2) feet from any edge of excavation.

6.0.8 If evidence of possible a cave-in or a slide is apparent, all work in the excavation or trench shall cease. All necessary precautions to shield or slope the excavation will be taken to safeguard the employees before work is resumed.

6.0.9 If employees are unsure of the safety of the worksite, work will cease. A supervisor will be notified to make the appropriate decisions to protect and safeguard the employees before the work will resume.

6.0.10 A copy of W.A.C Chapter 296-155, Part N, will be on hand and available for reference and compliance when employees are engaged in excavation, trenching, and shoring operations.

6.0.11 All trenches and excavations shall be considered a "Confined Space". All requirements from the Water Department Safety Programs and Procedures booklet, Section 1, Confined Space Entry Program and Chapter 296-155, WAC, Part N, Page #3, 7 (a) (I) shall be adhered to.
Cross Connection Control

The City has adopted ordinance number 2394 for the Cross Connection Control Program. A copy of this ordinance can be found in Appendix F.

In the City of Kent, all approved backflow assemblies are tested by a Department of Health Certified Backflow Assembly Tester upon installation, repair, relocation, reactivation, and tested annually. The backflow assembly test log includes the permit number, date installed, address and valve location, phone number, date certified, specific valve test results, valve make / model / size, backflow assembly tester name and certification number.

Cross Connection Control Requirements are first identified during the Plan Review process which the Cross Connection Control Specialist partake in. The Cross Connection Control Requirements are also addressed in preconstruction meetings with developers and contractors. Developers and Contractors are informed that permits are required and failure to comply can result in the Certification of Occupancy being denied. Building inspection is the responsibility of the City's Building Department. Building inspectors inspect buildings as they are constructed. All building inspectors have been informed that if they see a cross connection potential while performing their plumbing code inspections, they are to notify the Public Works Engineering Department Cross Connection Control Specialist.

Existing cross connections are surveyed on a degree of hazard priority and also through notification of plumbing changes without a permit. Non-compliance can result in locking off the water service at the City meter. The 6th edition of the AWWA CCC Manual is used as a guideline in administering the program.

CUSTOMER COMPLAINT RESPONSE PROGRAM

The City has adopted the following policy and procedures for taking and responding to complaints/inquiries.

To contact the Water Department, citizens contact the Public Works Operations Department through the public number which is (253) 856-5600. The phone is operated by City employees Monday through Friday (except Holidays) between the hours of 7:30 a.m. and 4:00 p.m. During non-working hours, the phones are answered by a voice message system. In the case of emergencies during non-working hours, the calls are forwarded to the City Police Department who contact the Water Department employee on call or the Water Superintendent.

During standard working hours, the individual receiving the call shall record all of the pertinent information (i.e. - name, address, location of the problem, date, phone number, and the nature of the call) on a complaint/inquiry form. Each form has a unique identifying number to assist in tracking. Once all of the pertinent information is recorded, a copy of the form is given to the corresponding supervisor or superintendent.
Field Supervisors/Supervisors are responsible for contacting the citizen as soon as possible. After the citizen has been contacted and the situation assessed, the response given to the citizen is recorded on the complaint/inquiry form. When the form is fully completed, it is returned to the superintendent who in-turn gives it to office staff for filing/archiving.

Table 8-32 below shows the number of complaints/inquiries for the year 1995-1997. The records show that the number of complaints/inquiries have increased over the past few years for distribution related complaints/inquiries and decreased for water treatment complaints/inquiries. The increase in distribution related complaints/inquiries was anticipated with growth within the system.

<table>
<thead>
<tr>
<th>Water System Complaint/Inquiry</th>
<th>1995</th>
<th>1996</th>
<th>1997</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water turn on requests</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Flow test requests</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Low pressure/no water</td>
<td>69</td>
<td>38</td>
<td>51</td>
<td>158</td>
</tr>
<tr>
<td>High pressure</td>
<td>42</td>
<td>30</td>
<td>32</td>
<td>104</td>
</tr>
<tr>
<td>Water system leaks</td>
<td>46</td>
<td>59</td>
<td>62</td>
<td>167</td>
</tr>
<tr>
<td>Meter leaks/repairs/problems</td>
<td>18</td>
<td>46</td>
<td>49</td>
<td>113</td>
</tr>
<tr>
<td>Hydrant leaking</td>
<td>30</td>
<td>31</td>
<td>12</td>
<td>73</td>
</tr>
<tr>
<td>Hydrant out of service/hit/down</td>
<td>20</td>
<td>15</td>
<td>24</td>
<td>59</td>
</tr>
<tr>
<td>Hydrants need painting/clearing</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Valve box cover/casing damaged</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Air in lines</td>
<td>11</td>
<td>2</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Water system questions/general</td>
<td>38</td>
<td>18</td>
<td>34</td>
<td>90</td>
</tr>
<tr>
<td>Questions re: chlorine in water</td>
<td>26</td>
<td>22</td>
<td>13</td>
<td>61</td>
</tr>
<tr>
<td>Discolored water</td>
<td>26</td>
<td>48</td>
<td>43</td>
<td>117</td>
</tr>
<tr>
<td>Questions re: health effects of water</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>General water quality requests for info/analysis</td>
<td>8</td>
<td>31</td>
<td>22</td>
<td>61</td>
</tr>
<tr>
<td>Copper stains</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>349</td>
<td>346</td>
<td>345</td>
<td>1040</td>
</tr>
</tbody>
</table>

Complaint Response

Following are the established procedures for responding to the most common complaints/inquiry:

High chlorine – Contact customer by phone, explain chlorination practices and monitoring, follow up with visit to customer location (if necessary) and perform field analysis – Explain results to customer and give advice on procedures to lessen chlorine tastes and odors.
Stains on Plumbing Fixtures – Contact customer by phone, determine type of stain (i.e., result of type of plumbing), explain water quality and need to eliminate leakage that is leaving stain.

Request for Water Quality Results – Contact customer by phone to determine type of result they are looking for or reason for needing the information. Follow up with mailing or faxing results needed by customer.

Inquiry on Fluoride – Contact customer by phone. Generally customer inquiry is “do we fluoridate the water?” Check customer address to verify City of Kent customer, inform them of fluoride concentration.

Bad Tasting/Smelling Water – Contact customer by phone to determine type of smell or taste causing concern. Set up site visit to check water quality; check chlorine residuals to determine quality of water. Meet with customer to review concerns, ways to eliminate or lessen concerns (i.e., flushing, refrigeration), dispatch distribution crews for main flushing if necessary.

“Ill Because of Water” – Contact customer by phone and get information on the reason for this concern and schedule and appointment for meeting with the customer. Meet with customer, take chlorine residual to determine possibility of high chlorine demand; determine necessity of bacteriological sampling and sample if necessary with sample going to certified laboratory for analysis. Contact customer with results and also inform them of physician responsibility to report suspected waterborne illness to local Health Department and the fact that the Health Department is not reporting a problem, advise customer to follow up with a doctor if necessary. If concern is related to other causes such as minerals or chlorine we inform them of water quality, and methods for lessening exposure to these areas. If customer is still concerned, suggestion may be made to drink bottled water.

Inquiry of Lead Content – Inform customer of lack of lead in water supply, but concern for lead in plumbing. Explain lead/copper monitoring program, city water quality characteristics, future Corrosion Control Facilities, and ways to eliminate exposure (i.e., flushing standing water, using cold water for cooking and drinking), provide customers with lead information packets.

Specks of Material in Water – Call customer and determine type of specks. Schedule an appointment with customer for determination of material. If it is related to the customer’s plumbing, suggest ways to clear. If related to distribution system, dispatch distribution crew for main flushing and determine cause.

Rusty Water – Call customer and determine if problem is internal to building or if it is from distribution system. If internal, suggest ways to clear problem. If external, dispatch distribution crew for main flushing and determine cause (i.e., dead-end main or hydraulic incident)
Procedures for Record Reporting to DOH

For coliform monitoring and chemical analysis of water for compliance issues, the contracted certified laboratory sends a copy of the results to the City and a copy of the results directly to the State Department of Health. The City maintains water quality analysis results and provides these results to the Department of Health upon request. For special programs such as lead/copper rule or synthetic organic susceptibility, the City mails results directly to the Department of Health Drinking Water offices in Olympia.

Reporting to the Department of Health

For coliform monitoring any instance of a positive coliform present analysis the City follows procedures outlined in the Coliform Monitoring Plan.

**RECORDKEEPING AND REPORTING**

<table>
<thead>
<tr>
<th>Type of Record</th>
<th>Period</th>
<th>Records Room</th>
<th>Supervisor Office</th>
<th>Electronic</th>
<th>Length of Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Complaints</td>
<td>1984-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>DOH Water Facilities Inventory (WFI)</td>
<td>1974-Present</td>
<td></td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Ground Water Under Direct Surface Influence (GWUI)</td>
<td>1988-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Wellhead Protection Plan Monitoring (WHPP)</td>
<td>1997-Present</td>
<td></td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Source Production</td>
<td>1946-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Water Quality Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coliform Monitoring</td>
<td>1938-1953</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td></td>
<td>1972-Present</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluoride/Chlorine</td>
<td>1972-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Inorganics (IOC's)</td>
<td>1972-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Volatile Organics (VOC’s)</td>
<td>1988-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Synthetic Organics</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic (SOC’s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trihalomethanes (THM’s)</td>
<td>1982-Present</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Radionuclides</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead/Copper Rule (LCR) Monitoring</td>
<td>1992-Present</td>
<td></td>
<td>x</td>
<td>x</td>
<td>Permanent</td>
</tr>
<tr>
<td>Water Department Time Books/Journals/Log Books</td>
<td>1933-Present</td>
<td>x</td>
<td></td>
<td>x</td>
<td>Permanent</td>
</tr>
</tbody>
</table>
Chapter 9
Distribution Facilities Design and Construction Standards

GENERAL

This chapter sets forth the requirements and conditions that apply to all improvements or extensions of the City of Kent water system. Also included are design requirements for private developments and their interface with the City water system. It is the responsibility of the developer, developer's engineer and contractor to follow these standards.

PERMITS AND APPROVALS

General

The purpose of this section is to advise property owners, developers, builders, contractors, and other interested persons of the pre-development, design, construction, and permit requirements of the City of Kent Public Works Department. The conditions as stated herein and in the City of Kent Development Assistance Brochures apply to all improvements made by private developer.

Construction Permits

Prior to the initiation of any construction activity within public rights-of-way or easements, or work on private property as herein described, all permits, licenses, and approvals shall be secured by the owner or authorized agent. The permittee shall be responsible for compliance with all conditions, requirements, or special instructions specified or implied by the approved permit.

The following are the permits or approvals required for construction within the City of Kent:

A. Environmental (SEPA) Process
B. Zoning Permits
C. Grade and Fill Permits
D. Building Permits
E. Plat and Short Plat Considerations
F. Street Use Permits
G. Developer Extension Approvals
H. Preconstruction Meeting
I. Project Finalization
J. Latecomers Agreements
K. Utility Connection Permits
Environmental Approvals

An Environmental Checklist may be required by the City of Kent Planning Staff prior to a predevelopment meeting or the issuance of the above permits. If required, a Declaration of Non-Significance (DNS), Mitigated Declaration of Non-Significance (MDNS) or an Environmental Impact Statement (EIS) may be required prior to proceeding with the project.

Zoning Permits

The City of Kent Zoning Code, requires that a zoning permit, issued by the Planning Department shall be required for all grade and fill permits; building permits for new construction, alteration, repair, or house moves; and for use of vacant lands or land use changes within any zoning district. The zoning permit certifies that the proposed land use is consistent with the City of Kent Zoning Code.

Grade and Fill Permits

A Grade and Fill permit (G&F) is required for clearing, excavation, filling, grading and earthwork construction as adopted by the City of Kent and stated in Chapter 70, Appendix of the 1991 Uniform Building Code. The exception to the Code is that the issuance of the permit shall be administered by the Public Works Department. A Grade & Fill (G&F) permit will not be issued prior to plan approval of engineering or building plans related to the entire project unless otherwise approved by the Director.

Building Permits

Chapter 3 of the Uniform Building Code, as adopted by City Ordinance, specifies that

“No person, firm, or corporation shall erect, construct, enlarge, alter, repair, move, improve, remove, convert, or demolish any building or structure in the City, or cause the same to be done, without first obtaining a separate building permit for each such building or structure from the Building Official.”

In addition to the building construction itself, the associated approved civil and site plans authorize construction of the on-site storm drainage detention and conveyance system and all incidental site construction work. The connection of on-site utilities to the City water, sewer, or storm drainage system typically requires separate permits.
To obtain a City of Kent Commercial Building Permit the applicant shall complete the following process:

A. Complete the City of Kent environmental review (SEPA) process. The site plan is then revised to comply with the SEPA checklist conditions, and a Pre-development Meeting is scheduled with the Planning Department. At the Pre-development Meeting, the developer is advised of the conditions, requirements and applicable codes that will apply to the proposed project. The Pre-development Meeting is attended by representatives of all City Departments involved in the plan review process.

At the Pre-development Meeting, Public Works will identify, on a checklist, the specific conditions of the Determination of Non-Significance (DNS) that must be satisfied prior to obtaining plan approval. The actual completion of each condition is administered by the Property Management Division of the Public Works Department. The developer will need to complete the following before plan review begins:

1. Sign for and receive a developer extension packet if a public system is involved.
2. Sign the Engineer’s Agreement if a public system is involved.
3. Pay 50% of the Public Plan Review fee (this will require a preliminary engineer’s estimate. The actual estimate may be submitted before plan approval).
4. Satisfy the requirements of Code Enforcement and Planning Departments (i.e. plan check fee, etc.)

Once all required conditions have been met, the plans will be approved.

B. At the time of permit application, the developer shall submit working drawings plus additional copies of the plans as specified by the Building, Fire, Planning and Public Works Departments, to the Building Official along with a completed application for a Building Permit and the following submittals as applicable:

1. Threshold Determination on the Environmental Checklist
2. Application for Street Use Permit
3. Structural Calculations
4. Storm Drainage Detention Calculations
5. Soils Analysis
6. Energy Code Calculations  
7. Landscape Plan  
8. Site Plan  
9. Utility, Storm, Road and Onsite Grading Plan  
10. Temporary Erosion Sedimentation Control Plan  
11. State Flood Zone Control Permit (if required)  
12. Payment of Building Department plan check fee  
13. Other submittals as specifically requested at the Pre-development Meeting.

C. The City will review plans and calculations for conformance with City development requirements, standards, codes, policies, rules and regulations. Red-line drawings and plan review comments will be returned to the applicant or the designated contact person for corrections. Plans shall be revised by the applicant’s engineer to address all red-line comments and plan review checklist requirements.

A minimum of five (5) sets of revised Civil Plans and two (2) sets of Storm Drainage Detention Calculations shall be resubmitted to the Engineering Department. If the revision changes the Site and Landscaping Plans, the revised plans shall be submitted to the Building Department as a Plan Revision Submittal. Nine (9) sets of revised plans may be required for this type of re-submittal.

Prior to approval of the respective Design Plans by the Public Works, Planning, Fire Prevention and Building Departments, submittal of necessary easements, mitigation agreements, and any other documents as specifically required by the above departments shall be completed. The building official will issue an approved Building Permit subsequent to submittal of necessary bonds, liability insurance, fees, required documents in the Developer Extension packet and other requirements of the Code Enforcement and Planning Departments.

D. Prior to the issuance of the Building Permit the following fees are paid

1. Building Permit Fee  
2. Zoning Permit Fee  
3. Street Use Permit and Cash Bond if required.  
4. Engineering Department Plan Review and Inspection Fee  
5. Storm Drainage Utility Connection Fee.
Plat and Short Plat Considerations

The regulations and procedures for the subdivision of the land in the City of Kent are found in the Kent Subdivision Code. Construction plans are submitted directly to the Public Works Engineering Department for approval once the developer has obtained short plat committee or preliminary plat approval, and has satisfied any prerequisites specified in the plat conditions or SEPA DNS conditions.

As a minimum it is necessary to submit five (5) sets of construction plans consistent with the requirements of the Construction Standards, two (2) sets of storm water calculations, and any other documents required by the Director.

To begin plan review it is necessary to pay 50% of the Plan Review fee and sign out and receive a Developer Extension Packet if applicable. Prior to construction, it will be necessary to obtain a Grade & Fill (G&F) permit and any other Permits deemed necessary by the Public Works Department. Once plans are approved and plan review fees have been paid a Preconstruction Conference may be scheduled.

Street Use Permit

City Ordinance #2286 specifies that: "No person, firm or corporation shall be issued a Building or Grade & Fill permit except as follows without first obtaining a separate Street Use Permit from the Public Works Department."

A. An application for a Permit to make an addition, alteration or repairs to a single family residence.

B. An application for a Permit to make an alteration, repair, or minor (less than $20,000 in value) addition to any structure other than a single family residence.

A Street Use Permit required with each Grade and Fill or Building Permit shall be used to insure that the applicant shall continuously keep the streets and storm drainage systems clear and free from all debris associated with the work performed under the respective Permit. A cash indemnity deposit is required at the discretion of the Director.

Street and Curb Cut Permit

City Ordinance No. 2202 specifies that “No person, firm or corporation shall cut a street or curb and sidewalk without first obtaining a separate Street Use Permit.
Permit for each cut of a street or curb and sidewalk from the Public Works Department.

The Street Use Permit shall apply to all utility construction including, but not limited to natural gas, underground telephone, power and cable TV services, as well as water, sanitary sewer and storm drainage connections. All curb and sidewalk cuts for private driveway entrances to City streets also require a Permit. A Traffic Control Plan must be approved before a permit is issued.

The basic permit fee is based on each cut plus the cost per hour for inspection time exceeding one hour. A cash deposit or surety bond and certificate of liability insurance may be required to guarantee maintenance of the street cut at the discretion of the Director.

Developer Extension Approvals

Any extension, addition or modification of the City of Kent water, sanitary sewer, storm drainage or street system requires the completion of a Developer Extension agreement with the City. Developer Extension agreements are also required for the construction of plat improvements required by the subdivision code, construction of new streets or utilities (excluding private service connections) within public rights-of-way or easements, or any utility installation that the City has determined must be owned and operated by the City.

Upon review of the proposed development, the Director of Public Works shall make the determination of when a mainline extension is required and the extent of improvements necessary.

The procedure to receive Development Extension Approval is as follows:

A. The developer or his agent shall meet the Director of Public Works or his designated representative to verify the extent of improvements required. Compliance with the appropriate Comprehensive Plans and the procedure to complete a developer extension agreement with the City will be discussed at the meeting. Water or sewer extensions outside the City Limits, but within the City's franchise area, may require approval of the King County Boundary Review Board prior to extension. If Boundary Review Board approval is required, a meeting with the City of Kent Property Manager is necessary to discuss the procedures.

B. The developer shall retain a civil engineer registered in the State of Washington to prepare the engineering plans, specifications and cost estimates for the mainline utility and/or street improvements. The
engineering plans shall conform to the general criteria and standards as outlined in the Standard Specifications.

C. Five (5) copies of the design plans shall be submitted to the Property Management Division. Prior to engineering review of the design plans, the developer must execute the application for permission to extend utilities, complete the engineering agreement contained within the packet and pay 50% of the plan check fees. Following receipt of the design plans, the developer will receive a Developers' Extension Guide Packet and instructions on how to proceed with the project.

D. Following review and approval of the design plans by the Director of Public Works, the developer shall secure all necessary outside agency approvals, including but not limited to King County Industrial Waste Division, Washington State Departments of Ecology (sewer), Corps of Engineers, Fisheries (stream impacts), Transportation (right-of-way and access), Social and Health Services (water systems); King County Public Works (right-of-way or easements); King County Department of Health (septic systems).

E. After all necessary permits and approvals have been secured and verified, the following submittals are required:

1. General Guarantee and Warranty

2. An Engineer's or Contractor's Detailed Cost Estimate for Construction of Public Works improvements, as reviewed and approved by the City.

3. Construction Bonds - A Specific Performance Bond in the amount of the construction cost of the public improvements shall be required for the following:

   a. All improvements located within public rights-of-way. (100% of construction cost estimate as approved by the City Project Engineer or per approved contractor's bid)

   b. All improvements located within off-site easements to the City of Kent (100%)

   c. The on-site extension of public improvements required as a part of the approved City Comprehensive Facility Plans for the water, sanitary sewer, street or storm drainage systems (100%)
d. The Performance Bond (plat bond) for construction of public improvements required as a condition of any inside City plat approval shall be for 150% of estimated construction costs if the plat is to be recorded prior to construction of the required improvements.

4. Indemnification & Insurance - The Developer shall, in a form provided and approved by the City, indemnify the City from all claims, damages, losses or suits, including attorney fees, arising out of or in connection with the performance of the work proposed herein.

The Developer shall also provide, both during construction and throughout the specified maintenance term, Automobile Liability and Commercial General Liability insurance in such amounts and under such terms and conditions as the City may, from time to time, require. In certain instances, the City may also require Environmental Impairment Insurance.

Typically, the minimum limit for Automobile Liability Insurance will be $1,000,000 combined single limit per accident for bodily injury and property damage; the minimum limits for Commercial General Liability Insurance typically will be $1,000,000 combining single limit and $2,000,000 in the aggregate.

5. Current title reports and all other necessary documents to convey the required easement rights to the City of Kent. Recorded easements are required for all mainline improvements located outside the City right-of-way. A legal description of the easement area must be prepared by a professional land surveyor registered in the State of Washington with his/her seal affixed to said document.

6. Plan Review and Inspection Fee - Ordinance #3085.

7. A preconstruction meeting will not be scheduled until all requirements of the Developer's Extension Packet have been completed.

F. Upon completion of items and conditions as heretofore described, the Director of Public Works will approve the plans for construction. Once the plans are approved, a Preconstruction Meeting is scheduled. The engineer shall submit to the City nine (9) sets of approved construction...
plans and SEPIA reproducible plans at least three (3) working days prior to the Preconstruction Meeting.

Preconstruction Meeting

Upon completion of items and conditions as described, the Preconstruction Meeting will be scheduled with the Construction Engineering Staff, the Operations Division, representatives of private utilities, and the owner, his/her contractor and engineers. At the Preconstruction Meeting, construction schedules, performance testing, and construction details will be confirmed. The authorization to proceed is given at the Preconstruction Meeting.

Project Finalization

Following completion of construction, and testing, the owners, engineer is required to provide PLS Certified photo mylar copies of the field surveyed As-Built Plans for the project. The As-built drawings shall be per the Construction Standards - an addendum to the Bill of Sale stating that the figures used came from the As-built Plans prepared by a Professional Land Surveyor registered in the State of Washington is required to accompany the Bill of Sale.

After submittal of the As-built Plans, Bill of Sale, any addendum’s to the Bill of Sale, and the inspector’s preliminary completed site approval, a final walk-thru field inspection of the completed public improvements is scheduled with the City’s Project Engineer, contractor, inspector and the Operations Division. A minimum of five (5) working days notice is required for this inspection.

At the walk-thru, a punch list of construction deficiencies is generated and prepared. Upon completion of this punch list, the contractor must notify the inspector for final acceptance of the constructed improvements.

The Public Works Department will then schedule the project on the Council agenda for official City and Council acceptance of the public improvements. Upon acceptance by the Kent City Council, performance bonds and other cash bonds are then released upon submittal of the required maintenance bonds as outlined in the Developer’s Extension Packet.

Latecomers Agreements

Any person who constructs a water, sewer, storm drainage or street extension at the direction of the City, in excess of that which is required to meet minimum standards or which meets minimum standards and will benefit properties abutting the new improvements, may, with the approval of the Director of Public Works, enter into a contract with the City which will allow the
Developer to be reimbursed for that portion of the construction cost that benefits the adjoining properties and/or is in excess of the minimum standard. This contract is commonly termed a "Latecomers Agreement." The format for a Latecomers Agreement must be submitted for review and approval by the City prior to plan approval to be considered.

The developer is responsible for preparing the Latecomers Agreement for City review and approval. The City will be responsible for recording the Latecomers Agreement. The Agreement shall include a list of those properties which will benefit from the improvements, a map outlining and designating these properties, legal descriptions as required by the City, and backup data supporting the costs submitted. The City will collect the Latecomers Fee from persons wanting to connect to or use said public improvements and subsequently see that the developer receives the payment.

The City shall be reimbursed for all costs associated with the review and approval of the Latecomers Agreements.

Utility Connection Permits

The connection of private services to the City of Kent Utility System requires the issuance of the following permits:

A. Side Sewer Permits - Prior to the construction, replacement, repair, connections or addition to a side sewer, the owner or authorized agent must obtain a Side Sewer Permit from the City. To obtain the Side Sewer Permit, the owner or authorized agent must file an application with the Public Works Engineering Department. The application shall include the name and address of the owner, the legal description of the property to be serviced, the design plans and specifications for the side sewer installation in accordance with the side sewer application instructions, and any submittals and attachments for review as required by the Director. The City shall review the application, require or make changes if needed, approve the side sewer plan, assess the property for latecomer charges, charge in lieu of assessments, traffic mitigation fees, permit fees, tapping charges, street restoration bonds and other charges as required. Permits will not be issued for connection to a new main until the system is ready for Council acceptance (except for projects where multiple buildings are approved for phased occupancy).

B. Water Meter Permits - Prior to the construction of a domestic water service, the owner or authorized agent, shall obtain a Water Meter Permit from the City. To obtain the Permit the owner or agent must submit an application to the Public Works Department. The application
shall include the name and address of the owner, the legal description and tax lot number of the property to be serviced, and the size of meter requested. The City shall review the application, assess the property for latecomer charges, charge in lieu of assessments, system development fees, traffic mitigation fees, permit fees, street cut permits and bonds, and other charges as may be applicable. Permits will not be issued for connection to a new main until the system is ready for Council acceptance (except for projects where multiple buildings are approved for phased occupancy).

For large, new developments, no permits will be issued until As-builts are in, walk-thru inspections are completed and the Bill of Sale is Council ready.

C. Fire Hydrant Permit - Prior to the installation of a public fire hydrant, the owner/agent shall obtain a Fire Hydrant Permit from the City and approved from the City Fire Marshal. A fire hydrant is located on public right-of-way, and on private property in easements, and it will be maintained by the City. Upon submittal of an application, the City shall review the application, assess the property for connection charges, purity testing, inspection fees, and other charges as applicable, and issue the permit. The maximum length of fire hydrant installations shall be limited to fifty (50) lineal feet from the public main for a six (6) inch dead end line only.

D. Fireline Connection Permit - Prior to the installation of a private fire sprinkler system, private yard hydrant or connection to a City water main, the owner/agent shall obtain a Fireline and/or Yard Hydrant Connection Permit and approval from the City Fire Marshal. A Fireline and/or yard hydrant system is considered private and shall be isolated from the City water system by an approved Backflow prevention assembly as herein described. Upon submittal of an application, the City shall review the application and design plan, assess the property for the connection charges, purity tests, inspection fees, and other charges as applicable. Fireline and/or yard hydrant plans are jointly approved by both the Fire Department and Public Works Department.

E. Outside Agency Permits - In addition to the permits listed above, the developer is responsible for securing and abiding by the conditions imposed by permits required by outside agencies. These permits include County and State DOT right-of-way permits, Hydraulic Permits, Shoreline Permits, Corps of Engineers, Department of Fisheries Permits, etc.
F. For Utility Extensions in King County right-of-way, the City shall obtain a King County right-of-way permit prior to the Preconstruction Meeting. Conditions and requirements set forth by the County shall be complied with in accordance with King County Road Standards. The City and the Contractor must schedule and attend a Preconstruction meeting with King County right-of-way inspection staff prior to starting any work. Permit and Inspection Fees charged to the City by the County will be billed to the Contractor or owner in full. All construction and restoration must be completed to the satisfaction of the County and City.

G. Deduct, Water Use Only, and Backflow Assembly Permits – Prior to the installation of a water use only, deduct meter and Backflow assembly the owner/agent shall obtain a Water Service Permit from the City. Upon application, the City will review the application and design, then issue the Permit.

H. Sewer Rate Meter Permit – Prior to the installation of a Sewer Rate Meter and/or Backflow Assembly the owner/agent shall obtain a Side Sewer Permit from the City. Upon submittal of an application, the City will review the application and design then issue the Permit.

I. Waste Discharge Permit – Prior to discharge of industrial waste to the City’s sewer system or King County’s trunk lines, the owner/Agent shall obtain a waste discharge permit from the City and discharge authorization from King County Industrial Water Division. Upon submittal of an application for Side Sewer Permit to the City and a Waste Discharge Permit to King County Industrial Waste Division, the City and King County will review the respective applications and design, assess applicable charges, arrange for metering and billing of the discharge, then issue the permit.

GENERAL CONDITIONS AND REQUIREMENTS

General

These are general conditions and requirements for all improvements or extensions of the City of Kent’s Street or Utility Systems. The conditions as herein and as stated in the City of Kent Development Assistance Brochures apply to all improvements made by private developers.

Definitions

In the interpretation of the contracts, extension agreements, plans, specifications, or other contract documents, the following abbreviations, words,
terms, or pronouns in place of them, are used, the meaning shall be construed as follows:

ADT - Average Daily Traffic - The total number of vehicles traveling past a particular point in an average 24 hour period. Typically used in quantifying the combined number of vehicles traveling either direction on a particular roadway.

Applicant - The person, partnership, joint venture, firm, or corporation, who has applied for a development permit or approval.

As-built Certification - Certification specified in Appendix “E” of the Construction Standards.


Bike Lane - A travel lane, located within the paved area of a roadway, which is provided for the exclusive use of non-motorized vehicles (bicycles).

Bikeway - A paved roadway provided for the exclusive use of non-motorized vehicles (bicycles)

Biofiltration - The process of reducing pollutant concentrations in water by filtering the polluted water through vegetation.

Bond - A surety bond, cash deposit, or escrow account, assignment of savings, irrevocable letter of credit, or other means acceptable to, or required by the Director of Public Works to guarantee that work is completed in compliance with the projects approved plan, and in compliance with City of Kent requirements.

California Bearing Ratio (CBR) - A penetration test expressed as a percentage of the penetration resistance to that of a standard value for crushed stone

Certified Testing Laboratory - A materials testing laboratory approved by the City of Kent

Certificate of Materials - An approved list of materials certified by the contractor.

Charge In Lieu of Assessment - The fee charged to a subject party when their development of a parcel of land is contingent upon use of public facilities built
under a City LID or ULID, when the owner of the subject parcel was not included within the original LID or ULID boundaries.

City - The City of Kent, acting through its legally constituted elected officials, employees or agents.

Commercial Development - The construction of any building or project constituting more than one single family or duplex housing unit. Commercial developments include residential/industrial plats, apartment complexes, or commercial, office or industrial buildings.

Construction Engineer - The engineer authorized to oversee the review, conditioning, inspection and acceptance of right-of-way permits, road and drainage projects constructed pursuant to permits administered by the Department.

Conveyance System - The drainage facilities, both natural and man-made, which collect, contain and provide for the flow of surface and stormwater and sanitary sewage from the highest points on the land down to the receiving waters or receiving treatment facility. The natural elements of storm water conveyance systems include swales, and small drainage courses, streams, creeks, rivers, lakes and wetlands. The man-made elements of conveyance systems include gutters, ditches, pipes, channels, and retention/detention facilities.

Culvert - Pipe or concrete box structure which drains open channels, swales or ditches under a roadway or embankment; typically with no catch basins along its length.

Dead Storage - The volume available in a depression in the ground below the elevation of conveyance system, or surface drainage pathway, or outlet invert elevation that could allow the discharge of surface and storm water runoff.

Design Capacity - The traffic volume at which a particular class of road will operate at an established acceptable Level-of-Service. Typically, the design capacity of a roadway is the number of vehicles, in a 24 hour period (one day) at which that roadway would operate at a Level-of-Service “C” or “D”.

Design Engineer - The professional civil engineer who prepares the analysis, design, and engineering plans for an applicant's permit or approval submittal.

Design Speed - The vehicle speed which is used to determine the design elements of a street, including but not limited to, sight distance, stopping sight distance, super-elevations, curve radii, etc.
Design Storm - A rainfall, or other precipitation, event or pattern of events, for use in analyzing and designing storm drainage facilities.

Detention - Release of surface and storm water runoff from the site at a slower rate than it is collected by the storm drainage facility, with the difference being held in temporary storage.

Detention Pond - The pond which is constructed for temporary storage to collect and hold the surface water and/or storm water runoff while the discharge is regulated to the approved design flow rate.

Determination of Non-Significance (DNS) - The written decision by the responsible official of the lead agency that a proposal is not likely to have a significant adverse environmental impact, and therefore an Environmental Impact Statement (EIS) is not required.

Developer - the person, partnership, firm, or corporation having an agreement with the City granting permission to extend or connect to the utility system. This term shall also include the developer's contractor, subcontractors, employees, and/or agents.

Developer or Mainline Extension - The extension or expansion of the system of water mains, sanitary sewer mains, storm sewer drainage systems, streets, and all other related appurtenances to be constructed in whole or in part via the performance of City Extension Agreements. Generally, mainline extension refers only to improvements that, following City Council acceptance, become part of the City utility or street systems.

Director - The City of Kent Director of Public Works, including such assistants as are authorized to represent him/her.

Drainage, Sewer, or Utility Easement - A legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the facilities contained within the boundaries of the easement.

Drainage Master Plan - The Comprehensive City of Kent Drainage Plan prepared as part of the City of Kent Surface Drainage Utility Ordinance. See also Master Drainage Plan.

Energy Dissipater - Any means by which the total energy of flowing water is reduced. In storm water design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include but are not limited to rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.
Engineering Plan - A plan prepared, stamped and signed by a professional civil engineer. An engineering plan may be supplemented with detailed drainage calculations, structural calculations, or other supporting documents needed to assess the total plan.

Engineering Review - An evaluation by the Department of a proposed project's compliance with the Construction Standards and other applicable City, State, and Federal regulations, ordinances, and policies.

Environmental Impact Statement (EIS) - A document that discusses the likely significant adverse impacts of a proposal, ways to lessen the impacts, and alternatives to the proposal. They are required by the National and State Environmental Policy Acts when projects are determined to have significant environmental impacts.

Flood Plain - The total area subject to inundation by the base flood, including the flood fringe and the floodway.

Floodway - The channel of the river or stream and those portions of the adjoining flood plains which are reasonably required to carry and discharge the base flood flow.

Geometric Design Vehicle - The type of vehicle (such as “WB-50”, BUS, or SU) that is used to establish the design of a particular roadway, intersection, or driveway; or the on-site maneuvering area required in the parking/loading area of a private business.

Hammerhead Turnaround - A type of roadway design used to provide a place for vehicles to turn around at the end of a “dead-end” street. The turnaround is shaped like a hammer - or the letter "T".

Hydrograph - A graph of runoff rate, inflow rate, or discharge rate, past a specific point over time.

Hydrologic Soil Groups - A soil characteristic classification system defined by the U.S. Soil Conservation Service (SCS) in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties.

Hyetograph - A graph of percentages of total precipitation for a series of time steps representing the total time in which precipitation occurs.
Impervious surface - A hard surface which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development, and/or a hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of surface and storm water runoff.

Impoundment - A natural or man-made containment for surface or storm water runoff.

Improved City Street - A term referring to a public street paved with asphaltic concrete (typically), and that has such features as sidewalks, a paved area for parked vehicles, curbs and gutters, etc. This is in contrast to an “unimproved” roadway which might be built with only a gravel surface, or that does not have sidewalks, curbs, or gutters.

Infiltration Facility - A drainage facility designed to use the hydrological process of surface and storm water runoff soaking into the ground (commonly referred to as percolation) to dispose of surface and storm water runoff.

Ingress/Egress - Points of access to and from a property or parcel.

Inspector - The City’s authorized representative assigned to make all necessary inspections of work performed, or of materials furnished or being furnished by the Contractor.

Isopluvial Map - A map with lines representing constant depth of total precipitation for a given return frequency.

King County DNR - IWD - The King County Department of Natural Resources Industrial Waste Division, acting through its legally constituted elected officials, employees or agents.

King County DNR - WTD - The King County Department of Natural Resources Wastewater Treatment Division acting through its legally constituted elected officials, employees or agents.

Level-of-Service - A qualitative measurement that incorporates the factors of vehicle speeds, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs provided by a roadway facility at a
particular traffic volume. Level-of-Service is ranked from Level “A” (the best operating conditions) to Level “F” (the worst operating conditions).

Longitudinal Roadway Gradient - The slope of a roadway in the direction of vehicle travel.

Lumen - The unit of measurement for lighting levels.

Mainline Extension - The extension or expansion of the system of water mains, sanitary sewer mains, storm drainage systems, streets, and all related appurtenances to be constructed in whole or in part through the performance of the extension agreements. Generally mainline extension refers only to improvements that, following City Council acceptance, become part of the City utility or street systems.

Manning’s Equation - The following equation for calculating steady uniform flow: \( Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2} \);

where
- \( Q \) = discharge rate, cfs
- \( n \) = factor of resistance, Manning’s \( n \)
- \( A \) = cross-sectional area, sq. ft.
- \( R \) = hydraulic radius, ft.
- \( S \) = slope of energy line, ft. per ft.
- \( A \) = power to 2/3 or ½

Mitigation - Any of the following actions based on SEPA rules, WAC 197-11-768:

1. Avoiding the impact altogether by not taking a certain action or parts of an action; or

2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts; or

3. Rectifying the impact by repairing, rehabilitating, or restoring the affected sensitive area; or

4. Reducing or eliminating the impact over time by preservation or maintenance operations during the life of the development proposal; or

5. Compensating to the impact by replacing, enhancing, or providing substitute sensitive areas
National Pollutant Discharge Elimination System (NPDES) - The part of the federal Clean Water Act which requires point source discharges to obtain permits. These permits are referred to as NPDES Permits and are administered by the Washington State Department of Ecology.

Ordinary High Water Mark - The mark that will usually be found by examining the bed and banks of a stream or river, and ascertaining where the presence and action of waters are so common and usual, and so long maintained in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, with respect to vegetation.

Orifice - An opening with closed perimeter, usually sharp-edged, and of regular form in a plate, wall, or partition through which water may flow, generally for the purpose of measurement or control of such water.

Outfall - That portion of the man-made drainage system which actually discharges into a river, stream, creek, pond, lake, or wetland.

Overtopping - To flow over the limits of a containment or conveyance element in such a way that a suitable conveyance system is not used to route such water into the drainage system.

Parkway - The area outside the paved area of the roadway, but still inside the right-of-way. Typically the area where sidewalks, utility poles, street signs, landscaping etc. are installed.

Permeable Soils - Soil materials with a sufficiently rapid infiltration rate (10 minutes per inch or better) so as to greatly reduce or eliminate surface and storm water runoff. These soils are classified as SCS hydrologic soil type A.

Perviousness - Related to the size and continuity of void spaces in soils; related to a soils infiltration rate.

Plans - The official drawings, plans, profiles, typical cross-sections and supplemental drawings, or reproductions thereof, approved by the City Engineer, which show the location, character, dimensions and details of work to be performed. All such documents are to be considered as a part of the plans whether attached to the specifications or separate. The terms “standard drawing” generally used in the specification text, and “Standard Plan”, generally appearing in the titles of drawings, are synonymous for reference purposes.

Pre-developed Condition - The most likely condition of the subject parcel before initial development began.
Professional Engineer - A person registered with the State of Washington as a professional civil engineer.

Protected Storage - The area within an exclusive (one turning movement permitted, only) turn lane, either right turn or left turn, in which vehicles can be stopped without interfering with the movement of vehicles in adjacent lanes.

Release Rate - The computed peak rate of surface and storm water runoff for a particular design storm event and drainage area conditions.

Retention - The process of collecting and holding surface and storm water runoff with no surface outflow.

Retention Pond - A type of drainage pond designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration and/or infiltration into the ground; or to hold surface and storm water runoff for a short period of time and then release it to the surface and storm water management system.

Right of Way - Land owned by the City either in fee simple or through the process of dedication.

SCS Method - A hydrologic analysis based on the Curve Number Method (National Engineering Handbook - Section 4· Hydrology, August, 1972) and using any acceptable analytical technology as delineated in the Construction Manual, and/or City of Kent Storm Water Drainage Ordinance.

SEPA - State Environmental Policy Act.

Sight Distance - The distance measurement of a driver's visibility on a roadway. The sight distance required for a particular roadway is a function of that roadway's design speed, and increases with increasing design speed.

Source Control BMP - A BMP that is intended to prevent pollutants from entering stormwater. A few examples of source control BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the sanitary sewer or a dead end sump.

Specific Performance Bonds - The approved form of security furnished by the developer prior to construction of the improvements to guarantee design, materials and workmanship of the respective improvements.
Standard Details - Those Standard Details contained in the City of Kent Construction Standards


Stopping Sight Distance - The sight distance required for an average passenger vehicle driver moving at some speed, to identify a situation which requires them to stop, decide to stop their vehicle, and bring a vehicle in average working condition to a stop.

SU - The designation for a particular class of 2 axle truck.

Super-elevation - The change of the roadway from a cross-section where the elevation of the edge of the paved area, in a curve in the road, is either higher or lower than normal. Super-elevation of the roadway has been commonly referred to as "banking the curve", and is used to permit a sharper (smaller radius) curve to be used.

Surety - A company that is bound with the Contractor to ensure performance of the work shown in the approved plans and specifications; payment of all obligations pertaining to the work, and fulfillment of other such conditions as are specified in the Contract, Contract Bond, or otherwise required by law.

Swale - A shallow open drainage conveyance with relatively gentle side slopes, generally with flow depths less than one (1) foot.

Tail Run - That piece of water service pipe running from the water meter setter to the property line.

Test Tee - That tee installed at the end of the sanitary sewer stub-out for the purpose of air testing the integrity of the sanitary sewer installation.

Thermoplastic - A type of plastic, bonded to the roadway surface with a heat source, which is used for marking the roadway pavement.

Time of Concentration - The time period necessary for surface runoff to reach the outlet of a sub-basin from the hydraulically most remote point in the tributary drainage area.
Traveled Way - That part of the roadway made for vehicle travel including shoulders and auxiliary lanes.

Travel Time - The estimated period of time for surface water to flow between two points of interest.

Water Quality Swale - An open vegetated drainage swale intended to optimize water quality treatment of surface and storm water runoff by following the specific design criteria for those swales which is generally much more stringent than for a biofiltration swale.

WB-50 - The designation for a particular class of truck and trailer combination, with a wheelbase (WB) measurement of 50 feet (-50). This is the most common large truck (typical Gross Vehicle Weight of 80,000 pounds).

WB-63 - The designation for a particular class of truck and trailer, with a wheelbase (WB) measurement of 63 feet (-63). This is the largest truck in general use.

Wetpond and Wetvaults - Drainage facilities for water quality treatment that contain a permanent pond of water, usually four (4) feet in depth, that are filled during the initial runoff from a storm event. They are designed to optimize water quality by providing detention time (on the order of a week or more) in order to settle out particles of fine sediment to which pollutants such as heavy metals adsorb, and to allow biologic activity to occur that metabolizes nutrients and organic pollutants.

Wetlands - Those areas that are inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A wetland will have hydric soils present. Wetlands generally include swamps, marshes, bogs and similar areas.

Abbreviations

These abbreviations are used in the Construction Standards and are defined as follows:

AASHTO - American Association of State Highway and Transportation Officials.

ACP - Asphalt Concrete Pavement.

APWA - American Public Works Association
AREA - American Railway Engineering Association.
ATB - Asphalt Treated Base.
AWWA - American Water Works Association.
BMP - Best Management Practice.
BST - Bituminous Surface Treatment.
CB - Catch Basin
CBR - California Bearing Ratio.
cfs or CFS - Cubic Feet per Second
CMP - Corrugated Metal Pipe.
CY or Cu. Yd - Cubic Yard(s)
Diam. - Diameter
DIPRA - Ductile Iron Pipe Research Association
DNS - Determination of Non-Significance.
DSHS - Department of Social and Health Services.
EIS - Environmental Impact Statement.
EPA - Environmental Protection Agency.
FHWA - Federal Highway Administration.
FIRM - Flood Insurance Rate Map.
Gph or GPH - Gallons per Hour.
GVW - Gross Vehicle Weight.
In. - Inch(es)
THE CITY OF KENT WATER SYSTEM PLAN

Scope of Work

Responsibility of Owner/Developer

The owner/Developer is responsible for completing all work and improvements in full compliance with the approved plans and specifications. The developer shall furnish all labor, materials, tools, equipment, transportation, necessary supplies and incidentals required to make each and every item complete as documented by said plans and specifications. Any deviation from these requirements must be approved in writing by the Director.

Additional Instructions or Changes

In the event it is found that the instructions and drawings contained in the contract documents are not sufficiently clear to permit the developer to proceed with the work, the developer shall, either upon his/her own initiative or upon the request from the Director, furnish such additional drawings as may be necessary. When such request is made, the changes must be reviewed and approved by the Director before the construction of the work covered by them is undertaken. Such additional instructions and drawings shall be consistent with the contract documents and shall have the same force and effect as if contained in the contract documents.

Control of Work

Authority of Director

It is understood and agreed by and between the parties hereto that the work included in the contract is to be done to the complete satisfaction of the Director of Public Works and that the decision of the Director as to the true meaning of the contract, plans, specifications, and estimates, and as to all questions arising as to proper performance of the work shall be final.

The Director shall decide any and all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the rate of
progress of the work, and all questions as to acceptable fulfillment and performance of the contract on the part of the developer.

Nothing contained in this section or in the contract shall be construed as requiring the Director to direct the method or manner of performing any work under this contract, however, the work progress shall be open to inspection by the Director at all times.

The Director may appoint assistants and inspectors to inspect the materials used and the work performed.

Authority and Duties of Inspectors

The Director may designate a representative to inspect all materials used and all work performed. Such inspection may extend to any or all parts of the work and to the preparation and/or manufacture of the materials to be used. The designated representative will not be authorized to revise, alter, enlarge or relax the provisions of these specifications. A designated representative is placed on the work to keep the engineer informed as to the progress of the work and the manner in which it is being done; also to call the attention of the developer to any infringements upon plans, or specifications.

Failure of the designated representative or the engineer to call the attention of the developer to faulty work or infringements upon the plans or specifications shall not constitute acceptance of said work. The Director or his designated representative will be authorized to approve or accept any portion of the work or to require revisions to the plans and/or specifications by the licensed professional engineer when necessary due to conflicting field conditions. The designated representative will have authority to reject defective material and to suspend any work that is being improperly done, subject to the final decision of the Director.

The designated representative will exercise such additional authority as may, from time to time be especially delegated to him by the Director. Work beyond the normal working hours of the inspector will be paid for by the contractor at time and one half according to the overtime rates determined by the City.

Cooperation by Contractor/Developer

A set of approved plans, specifications, permits and any special provisions and authorized alterations must be kept available on the job site at all times. The developer or his duly authorized representative shall be at the job site continually during its progress. The developer may receive explanations as necessary from the Director to allow the satisfactory performance and
completion of the work. The developer shall not cause any unnecessary delay or hindrance to other contractors on adjacent work, but shall be required to cooperate with other contractors to the fullest extent.

Conformity with Plans and Specifications

The work shall be done in strict conformity with the approved plans and specifications and according to such necessary instructions as may be given by the Director. The contractor shall protect and preserve in their original position, all survey stakes, points, or marks set for the work in order to allow proper inspection.

Removal of Defective or Unauthorized Work

Defective work or materials may be condemned by the Director any time before the final acceptance of the work. Notice of such condemnation will be given in writing by the Director. Such condemned work shall be immediately removed or disposed of to the satisfaction of the Director. Failure or neglect on the part of the Director to condemn unsatisfactory material or reject inferior workmanship will in no way release the developer, nor shall it be construed to mean the acceptance of such work, nor shall the final acceptance bar the City from recovering damages in case of fraud, or defective work resulting from dishonesty.

Protection of Public and Private Utilities

The contractor shall be responsible for locating all existing underground utilities and protecting the same against damage whether shown on the plans or not. The contractor shall support and protect all pipes, curbs, conduits, poles, wires or other apparatus which may be in any way affected by the work, and do everything to support, sustain, and protect the same, under, over, along, or across said work. In case any of said public or private utilities should be damaged, they shall be repaired by the contractor whenever feasible on the private/public utility having control of same, and the expense of such repairs, shall be the responsibility of the developer or contractor.

Damage to Private Property and Improvements

The Developer's work shall be confined to the job site premises and necessary off-site easements and he/she shall not enter upon or place materials on other private premises except by written consent of the individual owners, and shall hold harmless the City from all suits and actions of every kind that might result from the use of private property.
The contractor shall take adequate precautions to protect existing lawns, trees and shrubs outside public rights-of-way, sidewalks, curbs, pavements, utilities, adjoining property, and structures and to avoid damage thereto, and shall at his/her own expense completely repair any damage thereto caused by his/her operations to the satisfaction of the Director. All impacted property owners must be notified in advance of said work.

Defective Work

The developer, upon notification by the Director and within one (1) year after acceptance thereof by the City, shall remove or reconstruct, or make good without cost to the City any work which the Director may deem to have been defectively executed.

Final Inspection

Following acceptance of all public improvements, the developer shall be held responsible to guarantee materials and workmanship for a period of one year of satisfactory performance and operation. Any defects that appear during this year shall be corrected by the developer at no cost to the City under the terms of the maintenance bond.

The Director will not make the final inspection until the work required by the contract, including final cleanup has been completed.

The contractor shall, at any time requested, submit to the Director properly authenticated documents or other satisfactory proofs as to his compliance with the contract requirements.

As soon as practical after completion the project will be examined by the Director after the Bill of Sale, Addendum to the Bill of Sale and approved as-built plans have been submitted. When the work is found to be satisfactory, it will be accepted and such final acceptance will not be reopened after having once been made, except on evidence of collusion, fraud or obvious error.

If the examination of the above documents reveals any defects in the work, such defects should be repaired or replaced as the Director may direct before final acceptance. The cost of all such repairs and replacements shall be borne by the developer.

The City's right to conduct inspections is to determine if acceptable construction practices are followed and the inspection process does not make the City an insurer or guarantor of contractor compliance or competence. Responsibility for
any failures to follow these standards rests solely with the developer and its agents.

Final Acceptance

Following the correction of all defects as noted on the final inspection, the respective improvements shall be considered ready for acceptance.

Final acceptance of improvements requires the following

A. As-Built plans - the original construction drawings or a photo mylar copy shall be revised to reflect actual constructed improvements. The field surveyed as-built plans shall be PLS certified as to actual field construction by a professional land surveyor registered in the State of Washington.

B. Bill of Sale - The Developer shall submit a completed bill of sale to the City Project Engineer itemizing the respective improvements to be accepted by the City and the addendum to the Bill of Sale.

C. Addendum to the Bill of Sale - Verification letter by PLS that the Bill of Sale accurately reflects the as-built conditions.

D. City Council Acceptance - Following approval of the as-built plans and the Bill of Sale, the Director will recommend formal City Council action to accept the improvements for City operation and maintenance

Maintenance of Work After Acceptance

The Developer shall be responsible for the entire improvement and maintain said improvements until it has been accepted by the City. The City reserves the right to utilize any portion of the improvements prior to final acceptance and in such event the City will assume responsibility for its use in case of damage caused by normal use

Control of Materials

Source of Supply and Quality of Materials

The Contractor shall notify the Director of proposed sources of supply for all materials to be furnished. At the option of the Director, the source of supply of each of the materials shall be approved by the Director before the delivery is started. Representative preliminary samples or test data of the character and quality prescribed may be required to be submitted by the contractor or
producer for examination by the Director. Only materials conforming to the requirements of the specifications and approved by the Director shall be used in the work. Any of the materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after testing, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the contractor shall furnish approved materials from other approved sources. No materials which after approval have in any way become unfit for use shall be used in the work.

Samples and Tests

At the direction of the Director, the developer shall direct a certified testing laboratory to conduct necessary field and/or lab tests of materials or methods.

All testing shall be in accordance with commonly recognized standards of the appropriate national organizations, the Washington State Department of Transportation or common industry standards.

The field tests of materials shall be made as deemed necessary by the Director at no cost to the City. In general, tests shall be made at the frequency as outlined by the applicable sections of the Standard Specifications.

The Developer shall furnish without charge samples of all materials as requested by the Director. Materials shall not be used until approved. The Director shall be furnished certified copies of the complete test reports direct from the testing lab.

Materials shall be delivered on the work in advance in such quantities as to afford the Director an opportunity to make tests before the materials are to be used.

Inspection by Director

All materials provided by the Contractor shall be subject to the inspection and approval of the Director at any time during the progress of the work until final completion thereof. The materials shall be delivered by the Contractor sufficiently in advance of the work to enable the Director to make the proper tests and inspections. As soon as materials have been tested and inspected, the contractor shall immediately remove all rejected materials from the work to such place distant therefrom as the Director may require, and shall arrange for replacement of rejected materials at his/her own expense. The neglect or failure on the part of the Director to condemn or reject inferior materials or work shall not be construed as an acceptance of the materials or work.
The contractor shall furnish, at his/her own expense, such labor and facilities as may be required to enable the engineer to make a thorough inspection of the materials. A certificate of materials shall be provided as requested.

Storage of Materials

All materials intended for use in the work shall be stored by the contractor by means that will prevent damage from exposure to the elements, from admixture of foreign materials, or from any other cause. The Director will refuse to accept, or to sample for testing any materials that are improperly stored.

Defective Materials

All materials not conforming to the requirements of these specifications will be rejected by the Director and all such materials whether in place or not, shall be immediately removed from the site of the work by the developer.

Design Plans and Specifications

Content of Final Engineering Plans

All plans for the construction or extension of City of Kent water, sewer, street and storm drainage systems shall bear a title showing the name of the project, the name of the owner (City of Kent), the name, address, seal, date, and signature of the design engineer. The cover sheet and all plan sheets shall include the same general title block including consecutive sheet numbers. The title block shall generally be located in the lower right hand corner of the drawing. Kent standard notes, applicable details, vicinity map and legend of symbols shall also be included in the plan set.

The size of the plans shall be either 24” x 36” or 22” x 36”. Profile drawings shall have a horizontal scale or not more than 50 feet to the inch or a vertical scale of not more than 10 feet to the inch. Plan views shall be of a corresponding horizontal scale.

All plans submitted to the City shall be ink on Mylar drawings and shall be clear, legible, containing north arrow, and drawn to a scale (show scale with a scale bar) which permits all necessary information to be shown plainly. Where modifications to existing roads and utilities are to be constructed, existing features shall be “screened or ghost lined”. New construction/improvements shall be indicated with heavy bold lines with proper symbolism.

The following items must be incorporated into all engineering plans:

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City of Kent Water System Plan
Page 9-31
Horizontal Plan

1. Roadway or proposed utility alignments, reading from left to right, showing stationing of points of curvature, tangency, intersection angle points, and with ties to section or quarter corners, also including all necessary curvature data.

2. Bearings on roadway or utility centerline, referenced to the City of Kent datum as provided by the City Surveyor. Also location of and description and elevation for closest City bench mark.

3. Right-of-way and easement lines for existing and proposed improvements, including identification of all roadways, easements (including auditors file numbers), adjacent lot and tax lot numbers, and subdivision identifications.

4. All topographic features within and adjacent to proposed improvements and within sufficient area to assess impacts of slopes, drainage, access, future extensions, availability of service connections, etc.

5. All existing and proposed (if known) public and private utilities, including telephone, electrical power, cable television, natural gas, water and/or sewer districts and any other known utilities that may affect the proposed construction.

6. Existing and proposed drainage facilities, including culverts, catch basins, ditches, etc., indicating direction of flow, size, type of pipe, invert and run elevations.

7. Identification of adjacent roads, subdivisions, building addresses, or any other information.

8. Curb return elevations shall be shown at quarter points at all intersections at a minimum (larger radii should have more points), to verify drainage and a smooth transition.

9. The following requirements must be met so that as-built plans can be used to update the City's infrastructure database. Each sheet within a set of original engineering drawings, as well as final as-builts, must have at least two control grid points, referenced to the State Plane Coordinate System, with coordinate values. The points can be placed randomly, but must be at opposite ends of the drawing.
Profile Plan

1. Profile drawings shall be prepared with all sanitary sewer, storm drain, and street design plans and with any other plans where vertical control is deemed to be important.

2. In general, the existing centerline profile shall be plotted, denoting grade breaks, topographic features and any other information important to the design.

3. The finish grade roadway and/or utility profile shall be shown with the same stationing as the horizontal plan.

4. Roadway profiles shall include centerline elevations at least at 50 foot stations; centerline grades and vertical curves, including station and elevations at PVC'S, PVI'S, PVT'S, top of vertical curve, bottom of sag curve, flow line top and bottom of curves, etc. having a minimum grade of 0.30% within 50 ft of the level point for a sag vertical curve.

5. Sanitary sewer and storm drain profiles shall include pipe slopes, diameters, lengths, rim and invert elevations, manhole and/or catch basin locations, type and numbers, and any other information relevant to the design.

Detail Plans

1. Where special construction procedures or structures are required, special detail drawings are required. Standard details can be referenced to the Standard Specifications or the Standard Details.

2. Special Detail Drawings shall contain adequate dimensions, sections, views, notes, and call outs to construct the structure, or permit preparation of detailed shop drawings by the fabricator when necessary.

Detail Drawings for facilities such as buildings, water wells, sewage, pump stations, etc. shall be prepared under the supervision of a licensed Professional Engineer registered in the State of Washington experienced in the complete design of these types of facilities.

3. Scaled plan view and cross-section of the outlet control structure shall be provided at one (1) inch equals two (2) feet.
Public Utility Access

Placement of permanent structures or objects in such a manner that blocks ready access to public utilities and the appurtenances connected thereto unless approved by the Director shall not be allowed.

STANDARDS FOR WATER SYSTEM IMPROVEMENTS

General

These specifications contain the design criteria and improvement standards for the extension or connections to the City of Kent water system. The conditions as stated herein and in the City of Kent Development Assistance Brochures apply to all improvements made by private developers. These improvements may include the following:

A. Water main extensions, modifications and replacements
B. Fireline and/or yard hydrant or fire hydrant connections to City mains
C. Water service and water use only meter installations

Easements and Rights-of-Way

Permanent onsite easements for access, maintenance, and construction are required for all water main extensions located outside of public right-of-way. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City of Kent lock must be placed in “series” to facilitate access by the City. When easements are required, legal descriptions shall be submitted with a Professional Land Surveyors stamp on the document. Also at this time a current title report covering the properties to be encumbered by the easements shall accompany said description. Under no circumstances shall a bill of sale be placed on the City Council agenda for action until all easements have been approved and recorded.

When offsite easements and/or onsite easements for the extension of approved comprehensive water plans are required, these easements shall be approved and recorded prior to any preconstruction meeting being held. Also the same conditions shall apply regarding legal description and title reports.

Private improvements such as buildings, garages, carports, utilities, signs, light standards, etc are not allowed in public easements and rights-of-way. Where an encroachment occurs, the Contractor shall remove and relocate the
conflicting private improvement immediately upon direction from the Public Works Director or his representative.

A. Easement Requirements - The minimum easement widths are as follows:

1. Water main (under five (5) feet deep) - fifteen (15) feet wide
2. Water main (over five (5) feet deep) - twenty (20) feet minimum
3. Access and/or maintenance roads (where required) - twelve (12) feet wide.

Note. Special conditions or installation requirements may require greater easement widths.

B. Right-of-way

Where possible, utility extensions shall be located within City right-of-way. Work inside County and State right-of-way requires special permits from the appropriate agencies. State right-of-way permits and others must be obtained by the developer/owner.

Standard Specifications

The installation of all water mains and appurtenances shall be in accordance with the applicable provisions of the latest edition of the AWWA or WSDOT/APWA Standard Specifications. The manufacturer's recommended installation procedures should be adhered to and not conflict with AWWA or WSDOT/APWA standards. In the event of conflict, the Director shall determine any exceptions to WSDOT/APWA procedures.

Water Main Extension Design Requirements

General

All water main extensions shall conform to the design requirements of the City of Kent and the Washington State Department of Health. Main extensions are also subject to Permits and Plan Review Fees.

Comprehensive Water System Plan

The Comprehensive Water Plan indicates the location and configuration of the major elements of the existing and proposed City supply mains, distribution system, interties and loops. The exact location or configuration of this system may be modified, provided the proposed system remains consistent with the
overall intent of the plan. Minor modifications to the Comprehensive Plan require specific approval by the Director

A  Mainline Water Main Extensions - Mainline extensions will be required when the property does not front on a water main or when the existing main is deemed inadequate for the proposed use.

It is a City policy that the water main must be extended to the far edge of the property to be serviced, regardless of where the service connection is to be made.

B. Water System Design Standards

1. The desirable system working pressure shall be approximately 60-70 psi, but not less than 35 psi under Peak Hourly Demand (PHD). The minimum pressure in the water system under fire flow conditions shall be 20 psi.

2. A Pressure Reducing Valve (PRV) shall be installed and maintained on water service lines, by the property owner, when system pressures are in excess of 80 psi. See Standard Details for services up to two (2) inches in size.

3. The minimum diameter of water main for commercial, industrial, multi-family and residential developments shall be eight (8) inches. Six (6) inch diameter mains may be acceptable for looped systems within single family residential areas containing fire hydrants on the eight (8) inch or larger system, and for "dead end" mains servicing less than twenty (20) single family residences where a fire hydrant is not required. The size of main in all cases must meet fire flow requirements as determined by the Fire Marshal.

4. Connections to existing water mains shall be accomplished by "Extension", "Wet Tap" or "Cut In" when mainline valves are required on the existing main. Once the new valve has been installed on the existing water main, the Water Division shall be responsible for placing a lock on the connecting valve and operation of the connecting valve. If the Contractor, for any reason, operates the connecting valve, they shall be responsible for paying a fine of $1,000.00 for each incident. Further, if the Contractor's action of operating the valve causes any health complaints or additional work by the Water Division, they shall
be responsible for paying all costs and claims filed against and by
the City of Kent.

5. Two cubes for “Pigging” shall be installed in the new water main
at the initial connection and at each lateral from the new water
main. The Water Division shall provide the cubes picked up by
the contractor at the Water Division Shop located at 5821 South
240th Street.

6. Dead End mains shall be avoided whenever possible. Where
dead end mains are unavoidable, a minimum two (2) inch blowoff
assembly is required. The diameter of the blowoff and tap must
be sized to achieve a minimum flow of 2.5 ft/sec in the water
main (See Table 3.8.6). Where cubes for “Pigging” are required
in the main installation, the blowoff size shall be four (4) inch for
six (6) through eight (8) inch water mains and six (6) inch for ten
(10) through twelve (12) inch water mains. A fire hydrant is
preferable in lieu of a blow off assembly only if pressures and
flows warrant a hydrant.

7. Water Main Location

a. Water mains shall be laid at least ten (10) feet horizontally
from any existing or proposed sanitary sewer. The
distance shall be measured edge-to-edge. Any deviation
from this requirement shall meet DOE and Washington
State Department of Health (WSDOH) requirements and
be allowed only upon approval of the Director.

b. Perpendicular water main crossings of sanitary sewers shall
be laid to provide a minimum vertical distance of eighteen
(18) inches above the sewer line, measured from the
bottom of the water line to the top of the sewer line.
Where separation between the water line and sewer line is
less than eighteen (18) inches, the sewer line shall be
ductile iron. All sanitary sewer lines which cross above a
water main, regardless of the separation, shall be ductile
iron as well, with no joints within a nominal ten (10) feet
of the water main.

c. Installation of water mains near other potential sources of
contamination may be subject to written approval by the
Director of Public Works on a case by case basis. They
would include but not be limited to, storage ponds, land
disposal sites for wastewater or industrial process water containing toxic materials or pathogenic organisms, solid waste disposal sites, or any other facility where failure of said facility would subject the water in the main to toxic chemical or pathogenic contamination.

d. Water mains shall be located at least five (5) feet away from any other utility, including but not limited to storm drains, power, natural gas, CATV, private firelines, etc.

C Water Valves

1 Water Valves are required at the following locations:

a. Four hundred (400) foot maximum intervals in commercial/industrial and multi-family residential areas. Locations involving hospitals, medical clinics, and others determined by the City of Kent to be critical applications, may be required to have intervals reduced.

b. Eight hundred (800) foot maximum intervals in residential districts.

c. All sides of mainline tees and crosses

d. At all water service, fireline, and hydrant connections to the City main. Where water services or hydrants are installed on a fireline run a valve is required prior to the fireline vault, but after the water service or hydrant connections.

e. At both sides of all bridge crossings, railroad crossings and casing/bores.

f. Existing gate valves may be subject to replacement with a new resilient wedge gate valve or a new resilient wedge gate valve installed at property line per City of Kent Construction Standards at the discretion of the Director.

2. Water Valve Type

a. Twelve (12) inch diameter valves and smaller shall be resilient wedge gate valves.
b. Valves larger than twelve (12) inch shall be butterfly valves.

D. Combination Air/Vacuum Release Valves

1. Located at high points along main. As a guide, valves are necessary where the difference between high and low points is two (2) feet on a gradual rise, or any abrupt rise. Actual locations should be in accordance with good engineering judgment and approval of the Director. The air inlet/discharge opening shall be thirty-six (36) inches above finished grade and provided with a screened downward facing vent opening. It shall be located outside of traffic areas and installed to prevent damage to landscaping and pedestrians.

E. Blow off Valves

1. Located at the dead end of all mains for flushing and “Pigging” purposes. Blowoff Assemblies must be sized and designed to achieve a minimum flow of 2.5 ft/sec in the Water main (See Table 9-6). These flows are to be used as a guideline but does not relieve the Contractor from assuring a clean line. Two (2) inch is the minimum blowoff size.

2. Where cubes for “Pigging” are required in the main line installation, the blowoff size shall be four (4) inch for six (6) through eight (8) inch water mains and six (6) inch for ten (10) through twelve (12) inch water mains. Fire hydrants are preferred in lieu of blow off devices where flows and pressures warrant a hydrant.

3. Using water from blowoffs require a use permit, meter and check valve assembly issued by the Water Division. Persons using water illegally will be prosecuted.

F. Fire Hydrants

1. Location - Actual fire hydrant locations shall be reviewed and approved by the Fire Marshall prior to plan approval. In general fire hydrants shall be installed at the following locations:

   a. At all street intersections.

   b. Six hundred (600) foot maximum intervals in single family residential area.
c Three hundred (300) foot intervals in multi-family and commercial areas.

d At locations noted on approved project site plans.

e Upstream of a fireline vault, if an existing hydrant is not available within fifty (50) feet of the Fire Department connection.

f At other locations as directed by the Fire Marshal.

2. Connection to Existing Main

a Hydrant lead shall be Class 52 ductile iron.

b Hydrant lead shall not exceed fifty (50) feet in length.

c Wet tap connection with heavy-duty tapping sleeve and resilient wedge tapping valve is required.

d No service connections are allowed to hydrant leads

e Using water from hydrants require a use permit, meter and check valve assembly issued by the Water Division. Persons using water illegally will be prosecuted.

3. Assemblies

Fire hydrant assemblies shall be shackled on runs eighteen (18) feet or less, or restrained with an approved type of mechanical restrained joint on runs longer than eighteen (18) feet, to the main line per the Standard Details.

A. Public fire hydrants shall be painted white.

B. Private fire hydrants assemblies require an approved Double check Assembly located on private property.

C. Private fire hydrants shall be painted Yellow.

G. Deletion of Mains, Stubs, Valves and Water Services

The Developer or his authorized agent shall be responsible for abandoning existing water mains, stubs, valves, water services and/or
appurtenances adjacent to the property being developed when there is no further need for them and required by the Director as described below

1. Water mains and appurtenances shall be abandoned by removal and disposal and/or plugging the cut ends with concrete at the discretion of the Director. The plug shall be two and one half (2 ½) times as long as the diameter of the pipe being abandoned.

2. Stubs, their valves and appurtenances shall be removed and disposed of and the tee shall be plugged with a mechanical joint plug.

3. Gate valves on stubs to properties to be serviced not meeting current City of Kent Construction Standards shall be removed and replaced with a new resilient wedge gate valve or a new resilient wedge gate valve shall be installed at the end of the stub prior to extending the main.

4. Water Services – The Owner must write a letter to the City of Kent Finance Services Division requesting the service be deleted. The water service(s) shall then be abandoned by turning the corporation stop off at the main, cutting and removing a minimum one (1) foot section of the service line from the corporation stop and capping the corporation stop with a brass cap.

5. Water Services larger that two (2) inch shall be abandoned per number 2 above.

The Director reserves the right to change the above requirements to better fit unforeseen existing conditions in the field as they are discovered.

Private Fire Systems

Because of the varying degrees of hazard associated with private fire protection systems, the Director shall review each specific system to determine the degree of backflow prevention required.

Backflow prevention assemblies shall be installed at each fire service connection to the City water mains. All backflow assemblies shall be from the latest approved list of the Washington State Department of Health, and approved by the City of Kent prior to installation.
The double check detector assembly, reduced pressure detector assembly or double check valve assembly shall be designed in accordance with the latest edition of the AWWA's "Cross Connection Control Manual" Pacific Northwest Section; and the standard design details. Single detector check assemblies are not recognized nor allowed by the City of Kent as backflow prevention devices (Handouts for Standards for Installation of Underground Firelimes handouts are available upon request.)

A. Detector Double Check Assemblies - Approved double check detector assemblies are required on the following fire protection systems:

1. Wet systems with an in-line booster pump or buildings over thirty (30) feet high.

2. Systems with a pumper connection within seventeen hundred (1700 feet) of an approved auxiliary water supply source, as designated by the Kent Fire Marshal and the Director.

3. Looped systems or any system with private yard hydrants

B. Reduced Pressure Detector Assembly - Approved reduced pressure detector assemblies are required for all high hazard fire systems including but not limited to the following:

1. Systems where an unapproved source is permanently connected to the fire system, including private storage reservoirs.

2. All foamite or chemically charged installations.

3. Systems in which anti-freeze is allowed.

C. Double Check Valve Assembly - Approved DCVA's are required for all residential fire systems including but not limited to the following:

1. When grades exceed twelve (12) on accessible routes of travel to required Fire Department locations. Construction is not allowed if grades exceed fifteen (15) percent.

2. When the Residence exceeds four thousand (4000) square feet.

3. Where fire hydrants are not within acceptable limits from the Residence.
4. Where fire flows are less than one thousand (1000) gallons per minute.

5. Where an approved Fire Department vehicle turn-around is not available.

D Installation Requirements - The required backflow prevention assembly shall be installed in accordance with the following:

1. Double check detector assemblies shall be located on private property in a location approved by the Director in a reinforced concrete vault of adequate size and structural design for the specific site application, as indicated in the Standard Details.

2. With prior approval of the Director, the DCDA may be located within the building when circumstances preclude locating the DCDA outside.

3. Double Check Valve Assemblies shall be required on all detached single family residences requiring automatic sprinkler systems.

E. Where an existing fireline and/or yard hydrant system is extended to service a new building or a building addition, the existing fireline and/or yard hydrant and its backflow assembly shall be upgraded to comply with current City Codes and Standard Details and the latest edition of the AWWA "Cross Connection Control Manual" Pacific Northwest Section.

Private Service Connections to City Mains

These specifications contain the design criteria and requirements for private service connections to the City water mains. Unless otherwise noted, these standards apply to the following:

A. Domestic Water Service Connections 1", 1½", and 2"

B. Domestic Water Service Connections 3" and larger

C. Water use only or Deduct Meters

D. Sewer Rate Meters
Connection Permits

All connections to the City water system require approved permits from the City.

Domestic Water Service

All domestic and industrial consumption of water, except for fires, shall be metered. Water service connections and plumbing shall conform to relevant Washington State Plumbing Codes and City of Kent Standards. All domestic water service connections require an approved Water Service Permit from the Public Works Department. The City of Kent shall own and maintain the water service from the water main to and including the water meter, as well as the meter box and setter. The service line, from the setter to the premises or building served by the City water, is the sole responsibility of the owner per Kent City Code 7.02.040.

Water Meters

Each service connection to the City water main shall be metered. Unless specifically approved otherwise, all buildings shall have a separate service connection and a single meter. All water meters shall be located within a City easement or right-of-way and shall be located in such a manner as to provide easy access for the meter reader.

A. Service Installation - The contractor shall be responsible for the installation of new services. The Contractor shall also be responsible for relocation, reconnection, replacement and abandonment of existing services. Water services may be upgraded to current City Construction Standards at the discretion of the Director of Public Works when a remodel, demolition, or change in type of business is made. All costs are to be absorbed by the property owner. The location of the service line shall be as shown on the approved plans or as directed by the Director. The Director or the Director's representative shall inspect the installation and verify the pressure test prior to approval to backfill. The meter box shall be installed to final grade and final approval granted prior to the installation of the water meter.

B. Meter and Meter Box Location

1. New Service (Inside and Outside City). The meter shall be located so the box is directly behind the sidewalk and perpendicular to the street and with the top of the angle stop eight (8) to ten (10) inches below the finish grade.
2. Exception - If there is no sidewalk between the edge of pavement and the property line, the meter box will be installed behind the shoulder and/or ditch at a location approved by the Director. It will be necessary to tight line the ditch at the meter location for meter reading access.

3. In some cases, it may be necessary to place the meter box in the sidewalk. In such cases, the edge of the meter box shall be no closer than six (6) inches to any edge of the sidewalk. A minimum of eight (8) inches (edge to edge) must be maintained between adjacent meter boxes.

4. It shall be the owner's responsibility to install and maintain the service from the setter connection to the premises or building served by City water (Kent City Code 7.02.040)

All work or repairs performed in the City Right-of-Way or Easement shall be in accordance with Kent City Standards.

C Meter Box - The type of box shall be as follows or approved equal in writing by the City of Kent Public Works Director:

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Location Specifications</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8x3/4 and 3/4 inch</td>
<td>sidewalks, driveways or pavements</td>
<td>Carson 1220-12 Olympic Foundry #SM29</td>
</tr>
<tr>
<td>1, 1-1/2, and 2 inches</td>
<td>sidewalks, driveways or pavements</td>
<td>Carson 1730-15 Olympic Foundry #SM30</td>
</tr>
<tr>
<td>3 inch and larger</td>
<td>concrete vaults per the Standard Details</td>
<td></td>
</tr>
</tbody>
</table>

1. All plastic boxes are to be black polyethylene. Carson 1220-12 or Carson 1730-15
2. Installation is sidewalks, driveways or pavements will not be allowed.

D Irrigation Box - The type of box will be as follows or approved equal in writing by the City of Kent Public Works Director:
Table 9-2
Irrigation Meter Box Specifications

<table>
<thead>
<tr>
<th>DCVA or PRV Size</th>
<th>Box Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ to 1 inch (&amp; all PRV’s)</td>
<td>Carson 1324-15G</td>
</tr>
<tr>
<td></td>
<td>(Green lid, solid) 1324-2L</td>
</tr>
<tr>
<td>Extension Boxes – 6”</td>
<td>Carson 1324B-1L</td>
</tr>
<tr>
<td>1-1/4 to 2 inch</td>
<td>Carson 1730C-1B for 15” high</td>
</tr>
<tr>
<td></td>
<td>Carson 1730D-1B for 18” high</td>
</tr>
<tr>
<td></td>
<td>(Green lid, solid) 1730-P2L</td>
</tr>
</tbody>
</table>

E. Premises Isolation – The type of box will be as follows or approved equal in writing by the City of Kent Public Works Director:

Table 9-3
DCVA & RPBA Box Specifications

<table>
<thead>
<tr>
<th>DCVA Size</th>
<th>Box Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ to 2 inch</td>
<td>Same as Table 9-2</td>
</tr>
<tr>
<td>3 inch and larger</td>
<td>Concrete Vault</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RPBA Size</th>
<th>Box Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ and larger</td>
<td>Insulated Enclosure</td>
</tr>
</tbody>
</table>

Enclosures shall be large enough to meet the minimum clearances noted in the Standard Details.

F. Meter Setter - The meter setter shall have dual-purpose end connections for iron pipe thread male adapters on both ends. It will be used with type “K” copper tubing or polyethylene plastic pipe with a brace pipe eye to hold the setter vertical. The setter will be equipped with an angle shut off valve with padlock wings, and on the outgoing side a check valve to prevent backflow. The check valve is to be spring loaded, of brass and stainless steel construction with a removable back for maintenance purposes. This check must be of the same type used at the present time in the City of Kent Water Department.

1. The following products are pre-approved. Other approved equal products require written approval of City of Kent Public Works Department:
Table 9-4

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Meter Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ inch</td>
<td>Ford VH 72-15W</td>
</tr>
<tr>
<td>¾ inch x 15 inch</td>
<td>Mueller H1422-2 (Double purpose connection)</td>
</tr>
<tr>
<td>1 inch</td>
<td>Ford VH 74-15W</td>
</tr>
<tr>
<td>1 inch x 15 inch</td>
<td>Mueller H1422-2 (Double purpose connection)</td>
</tr>
<tr>
<td>1-1/2 inches</td>
<td>Ford VFH 66-15x3 L/BP</td>
</tr>
<tr>
<td>1-1/2 inches x 15 inch</td>
<td>Mueller H1422-2 L/BP</td>
</tr>
<tr>
<td>2 inch</td>
<td>Ford VFH 77-15x17 L/BP</td>
</tr>
</tbody>
</table>

Water Service Laterals

A. Depth - The service lateral shall have a minimum cover of twenty-four (24) inches at the meter connection and shall increase in depth to the elevation at the main. The corporation stop shall be installed at a 22 degree upward angle from the center line of the main, and must be tapped on the same side of the water main as the service lateral. A minimum separation of two (2) feet must be maintained between service taps through the end of the service run.

B. Type - The service lateral shall be a minimum of one (1) inch diameter (iron pipe size). Service lateral materials shall be:

1. Copper - Type K, per 9-30 6(3)A of the WSDOT/APWA Standard Specifications.

2. Polyethylene - Conforming to AWWA C901, high molecular weight with a 200 psi rating, per 9-30-6(3)B of the WSDOT/APWA Standard Specifications. Plastic pipe shall not be used in areas subject to contamination by petroleum distillates or other contamination that potentially could leach into pipe as determined by the Director.

3. One and one half (1-1/2) and two (2) inch service laterals shall be polyethylene. Service laterals larger than two (2) inch shall be four (4) inch diameter ductile iron.

C. Locator Wire - A 12 gauge solid copper single strand continuous locating wire with plastic insulation is to be wound on the outside of all
polyethylene laterals. The wire shall be securely and permanently connected to the corporation stop and to the meter setter so as to maintain continuity. No splices will be allowed in the locator wire.

D. Service Saddles - The service saddle shall be an approved equal to Smith Blair, Romac, or Mueller double strap style.

E. Corporation Stops - Ford Corporation Stops or approved equals shall be brass and are to be used to isolate the service lateral from the City of Kent water main. They are to have Iron Pipe Thread to connect to the saddle and the Adapter. One and one half (1-1/2) and two (2) inch shall be ball corporation stop type.

F. Connections - Ford Pack joint or Mueller Insta-tite adapters or approved equals shall be brass and are to be used to connect the service line pipe to the corporation stop and meter setter. The connection from the setter for the water line going to the structure or premises is the customers responsibility per Kent City Code Section 7.02.040.

G. Water Meter Installation - The water meter shall be set by the City Water Department following approval of the water service permit by the Director and approval of the water service installation and final inspection by the Director.

H. Using water form water services prior to meter installation require a use permit, meter and check valve assembly issued by the Water Division. Persons using water illegally will be prosecuted.

Three (3) inch and Larger Compound Meters

Compound meters for service connections three (3) inches and larger shall be installed within a pre-cast concrete vault pre-approved by the Director and be constructed in accordance with the Standard Details. Compound meters shall be provided and installed by the applicant. Turbine Type Compound Meters will only be allowed on a case by case basis. All services larger than two (2) inch shall be pressure tested (not including the meter), disinfected, flushed, and have acceptable purity sample results prior to being accepted and turned on by the City. All meters are to be tested by an approved meter testing company for accuracy after installation. The test report shall be reviewed and approved by the City Water Department prior to acceptance of the meter.
Water Use Only or Deduct Meter

The deduct meter is a private meter, purchased, installed and maintained by the owner downstream of the domestic meter. The reading on the deduct meter is deducted from the reading on the domestic meter to determine the monthly sewer charge. The installation on a deduct meter requires an approved water service permit and the approval of both City of Kent and King County Industrial Waste Division. The permittees contact is the City of Kent. The City of Kent obtains approval from King County Industrial Waste Division.

The landscape irrigation deduct meter shall be located on private property adjacent to the City meter. The location shall be as indicated in the Standard Details. The Public Works Director may approve other locations prior to installation. Deduct meters located inside buildings require remote readouts to be located near the City meter. The type of meter and remote assembly shall be approved by the City and shall be subject to periodic inspections and certifications.

The water use only meter is a direct service connection to the City main. The meter assembly and installation is the same as all domestic meters, however, there is no sanitary sewer charge computed for this type of service. A drawing is required for deducts used for processing equipment.

Sewer Rate Meters

The sewer rate meter is a private meter purchased, installed and maintained by the owner. The metering system is subject to approval by the Director of Public Works and King County DNR – IWD. There are several use applications:

A When the sewer rate meter is used to meter all public and/or private sources of water discharged to the sewer, the domestic meter is changed to water use only (deduct meters are not used in this system). The sewer rate meter determines the sewer charges. This application is installed in two ways:

1. In a manhole, in line with the side sewer.

2. In the building water plumbing pipes at location(s) that will read all public and private water that discharge to sewer and do not include the portion used for landscape irrigation and process equipment systems that do not discharge to sewer.

B When the Sewer Rate Meter is used to meter part of public and/or private sources of water discharged to the sewer and Deduct Meters are
used to meter the uses not discharged to the sewer. The domestic meter determines water and sewer charges. The sewer rate meter is added to the sewer charges. The deduct meter(s) are deducted from the sewer charges. The meter for this type of installation is located in three ways.

1. In the building water plumbing pipes at a location that will pick up that portion of the public and/or private sources of water discharged to the sewer but prior to its use.

2. In line with the discharge pipes of processing equipment fed from the public meter prior to discharge to the Building Plumbing or Side Sewer. (This water is free of debris that could clog the meter used).

3. In line with the discharge pipes of processing equipment fed from the public meter or private source of water. (This water may contain debris).

The Sewer Rate Meter shall be located on private property in a location that is convenient to the owner with a remote readout located conveniently for meter reading. The type of meter and remote used is subject to the approval of the Director of Public Works and shall read in cubic feet only.

The sewer rate meter requires a waste discharge or side sewer permit from the City and a discharge permit from King County DNR-IWD. An industrial rate charge is normally added to the sewer bill for waste discharge permits as determined by King County DNR-IWD.

Cross Connections

There shall be no cross connection whatsoever between the City water distribution system and any unapproved pipes, wells, pumps, private hydrants, tanks, non-potable fluid or any other contaminating materials that may Backflow into the potable water system.

Backflow Prevention

The degree of Public Health protection required must be commensurate with the degree of hazard presented. In situations of known or potential physical or toxic health hazards, air gap separation and/or reduced pressure Backflow assemblies shall be required. Double check valve assemblies or pressure vacuum breakers are generally utilized where aesthetic or detrimental effects on water quality may occur.
Each water system connection has unique problems arising from location, climatic conditions, service demands, and other factors. Consequently, each cross-connection shall be examined on an individual basis and the City shall make the final determination as to the degree of Backflow protection required.

Backflow protection assemblies proposed for use can be found on the current list of approved assemblies by the Washington State Department of Health. All Backflow assemblies are required to be tested annually by a Washington State certified Backflow assembly tester. Copies of these inspection reports shall be provided to the City.

Premises Isolation

Where the City determines protection of the public water distribution system is necessary a Backflow Preventer shall be installed at the property line commensurate with the degree of hazard as defined in WAC 246-290-010. Installation of Air Gap's shall be approved by submitted drawings in accordance with the latest edition of the Cross Connection Control Manual, Pacific Northwest Section AWWA. DCVA's and RPBA's shall be per the Standard Details.

Irrigation System

Cross-connection protection is required for all irrigation systems. In general, pressure vacuum breaker assemblies may be acceptable for some irrigation system applications. Pressure vacuum breakers need to be freeze protected. In areas of flooding, on hillside installations, or where injection systems are used, double check valve assemblies or reduced pressure Backflow assemblies are required.

Water Main Materials

The installation of water mains and the materials used shall be in accordance with the applicable sections of WSDOT/AWWA Standard Specifications except as herein modified.

Water Mains and Fittings

The following materials and appurtenances are accepted for City water mains.

A. Pipe - Ductile iron pipe, thickness Class 52, with cement mortar lining.

B. Joints - Mechanical or push-on joints with rubber gaskets.
C. Fittings - Cast iron or ductile iron, with cement mortar lining.

D. Fitting Joints - Mechanical or flanged joints with rubber gaskets.

E. Jointing - Coupling pipes and cut-ins shall be joined by mechanical joint ductile iron long pattern sleeves unless prior approval is given by the City Engineer. "Dresser type" couplings will not be allowed except to join different sizes or dissimilar piping materials and only upon pre­approval by the City Engineer.

Water Valves

A. Gate Valves – Shall be used for Twelve (12) inch diameter and smaller applications and shall be resilient wedge per AWWA standards.

B. Butterfly Valves - Shall be used for larger than twelve (12) inch diameter applications and shall be per AWWA standards.

C. Valve Operation – All valves must open by rotating the valve stem in the counter clockwise direction.

D. Valve Joints - Mechanical or flanged fittings

E. Stem Nuts - Valve stem nuts shall be no shallower than one and one half (1-1/2) feet and no deeper than three (3) feet below finished grade. In cases where valves are deeper, an extension rod assembly with a rock guard must be installed on the operating nut.

F. Valve Marker Posts - Concrete valve marker posts shall be furnished and installed for each gate valve located outside of the paved street. Marker posts shall be painted white with black lettering. Fiberglass posts are acceptable upon approval.

Valve Box Covers

A. All areas except as described in item B below

1. Valve Box Bottom Section - Valve box bottoms shall be VB1C or Rich twenty-four (24) inch bottom compatible with the top section.

2. Valve Box Top Section with Covers - Valve box tops and covers shall be VB 940 with a two (2) inch "deep skirt" cover and "WATER" cast in the cover.
Covers shall be installed with the ears in line with the water flow. Alternates must be pre-approved equals.

B. Transmission Main, Zone Separation or other applications specified by the Director.

1. Valve Box Bottom Section - Valve box bottoms shall be VB1C or Rich twenty-four (24) inch bottom compatible with the top section

2. Valve Box Top Section with Covers - Valve box tops and covers shall be VB-045D/T with compatible cover and "WATER" cast in the cover. Covers shall be installed with set screws in line with the water flow. Alternates must be pre-approved equals.

Fire Hydrant Assemblies

Fire hydrants shall be compression type, break-away (traffic model) hydrants conforming to AWWA C502 except as herein modified. (Corey style hydrants are not allowed)

A. Valves and Nozzles - Fire hydrants shall have a bottom valve size of at least five (5) inches, one 4-1/2 inch pumper nozzle and two 2-1/2 inch nozzles. Nozzles shall have NST threads, with 1-1/4 inch pentagonal nuts on the nozzle caps and also on the operating nut

B. Hydrant Leads - The hydrant leads shall be a minimum of six (6) inches in diameter. An auxiliary valve shall be installed in the hydrant lead located at the connection to the City main

C. Drainage - All hydrants shall be equipped with a drain. A gravel pit or dry well shall be provided. Hydrant drains shall not be connected to or located within ten (10) feet of sanitary sewers or storm drains.

D. Painting - Public owned hydrants shall be painted with two (2) coats of Farwest Wonderglow Quickset V1814-W (white gloss alkyd enamel #1100 series). Private hydrants shall be painted with two (2) coats of Farwest Wonderglow Quickset V1814-Y (yellow gloss alkyd enamel #1100 Series #X3472)

E. Fire Hydrant Guard Posts - Concrete fire hydrant guard posts shall be furnished and installed with fire hydrants as required by the City. After installation the posts shall be painted with two (2) coats of Farwest
Wonderglow Quickset Gloss Alkyd Enamel #1100 Series and match the color of the hydrant installed.

F. Pre-approved Fire Hydrant types shall be Waterous WB-67, Clow 2500, Mueller Centurion or M&H 929. **No Corey type hydrants allowed.**

G. Three (3) foot clearance shall be provided around all fire hydrants, as well as clear access to/from the closest vehicle traveled way, and be in accordance with the Standard Details.

**Water Main Installation**

**Standards**

The installation of all water mains and appurtenances shall be in accordance with the applicable provisions of the WSDOT/APWA Standard Specifications and AWWA Standards Specifications and/or the manufacturer's recommended installation procedures as approved by the City.

**Pipe Bedding and Foundation Material**

In most cases, imported bedding is not required for water main installations. The native material shall be worked to form a continuous and uniform trench bottom for all buried pipe. When 5/8 inch minus crushed rock bedding material is used it shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe to 95% compaction ASTM D-1557. Material larger than six (6) inches in diameter found in the trench shall be removed for a depth of at least six (6) inches around the pipe.

Pipe bedding shall conform to the following gradation:
<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>5/8 inch rock gradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ Inch</td>
<td>100 %</td>
</tr>
<tr>
<td>5/8 Inch</td>
<td>95 - 100 %</td>
</tr>
<tr>
<td>¼ Inch</td>
<td>45 - 65 %</td>
</tr>
<tr>
<td>U.S. No 40</td>
<td>6 - 18</td>
</tr>
<tr>
<td>U.S. No 200</td>
<td>7.5 Maximum</td>
</tr>
<tr>
<td>% Fracture</td>
<td>75 Minimum</td>
</tr>
<tr>
<td>Sand Equivalent</td>
<td>40 Minimum</td>
</tr>
</tbody>
</table>

LA wear 500 rev. 35% Max., Degradation 25% min. Free from wood waste, bark and other deleterious material.

Bedding shall be placed six (6) inches under around the pipe and six (6) inches over the pipe where, in the opinion of the Director, existing material is found unsuitable.

Where determined necessary by the Director, ballast material shall be used below bedding to stabilize the trench. Ballast shall meet the following requirements.

Foundation material shall be Class I and Class II conforming to the following gradations.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 inch square</td>
<td>100</td>
</tr>
<tr>
<td>4 inch square</td>
<td>---</td>
</tr>
<tr>
<td>2 inch square</td>
<td>0</td>
</tr>
<tr>
<td>1 inch square</td>
<td>---</td>
</tr>
<tr>
<td>¼ inch square</td>
<td>---</td>
</tr>
<tr>
<td>U.S. No. 100</td>
<td>---</td>
</tr>
</tbody>
</table>

Table 9-6

All percentages are by weight

In addition, all rock shall be sound, angular ledge rock or recycled cement concrete pavement meeting the following specifications:
Suppliers of recycled cement concrete products shall have a quality assurance program reviewed and approved by the City.

Each rock or piece of recycled cement concrete pavement shall have at least two fractured faces.

Absorption
(Corps of Engineers CRD-C-107) 3% max

Accelerated Expansion (15 days)
(CRD-C-148) 15% max

Soundness
(MgSO4 at 5 cycles) 5% max loss

Density (Solid Volume) 155 pcf min.

Specific Gravity 2.48 min

**Pipeline Cover (Backfill)**

All water mains shall be covered with sufficient earth or other insulation to prevent freezing. In no case shall less than thirty-six (36) inches of cover be maintained over the pipe. Local variations in ground surface shall not control, but the average depth shall be the controlling factor.

The minimum depth of cover for water mains is:

<table>
<thead>
<tr>
<th>Main Size</th>
<th>Minimum Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 inch and smaller</td>
<td>36 inches cover</td>
</tr>
<tr>
<td>12 inch and larger</td>
<td>48 inches cover</td>
</tr>
</tbody>
</table>

Pipe trench backfill shall be bank run gravel if, in the opinion of the Director, existing trench excavation soils are unsuitable. Bank run gravel shall be from a pit approved by the Engineer and shall be as specified in the Standard Specifications. Each layer shall be compacted to 95% in paved areas and 90% in unpaved areas in accordance with ASTM D 1557, in lifts not to exceed eighteen (18) inches. The maximum particle size shall not exceed six (6) inches or 2/3 the depth of the layer being placed whichever is less.

Pipe trench backfill for lateral runs crossing existing or proposed improved City streets, shall be one and one quarter (1-1/4) inch minus crush rock in conformance with the Standard Specifications.
In paved areas the material used for patching shall match the existing street section unless otherwise directed by the Director. In no case shall the thickness of the asphalt concrete be less than three (3) inches of Class B asphalt concrete.

Blocking

All fittings shall be installed with Class 3,000 cement concrete thrust blocking in conformance with the Standard Specifications. Blocking shall bear against solid undisturbed earth at the sides and bottom of the trench excavation and shall be securely wrapped with four (4) mil polyethylene sheeting. Where soil conditions consist of peat, have low bearing strength or are determined to be soils highly susceptible to liquefaction (UBC Earthquake Zone 3), restrained joint pipe shall be required as approved by the Director. Tie rods can be used in conjunction with thrust blocking for hydrant installations or fittings as approved by the Director. Mega Lugs or Mechanical Restrained Joint Pipe may be used in place of blocking only upon approval by the Director.

Connection to Existing Water System and Valve Operation after Installation

Not more than one connection shall be made between the new main and the existing mains until the new piping has been flushed, pigged, disinfected, pressure tested, and satisfactorily tested for bacteriological purity accordance with these Construction Standards and the most current AWWA Standard C651-92. This activity must be approved by and coordinated with the City. Temporary plugs, blowoffs and blocking shall be installed at all other points of connection to the existing system.

The City of Kent Water Division shall be notified two (2) days prior to any water main shut downs. When drawing water from a City water apparatus an approved double check valve and meter assembly shall be used.

The Water Division shall be available during normal working hours to operate the connecting valve for filling, flushing, Chlorine injections and sampling newly installed or relocated mains, hydrants, firelines and appurtenances. Water sampling may be limited to only morning hours on Fridays.

First Flush and Pigging

Sections of pipe to be disinfected shall first be cleaned. This shall include pigging at the discretion of the Director of Public Works in accordance with these Construction Standards and AWWA Standard C651-92, Section 4.5 to remove any solids or contaminated material that may have become lodged in the pipe. Flushing velocities should be a minimum of 2.5 ft/sec in the new water.
main when practical to assure that all debris is removed during the flushing process. Table 9-7 below may be used as guidelines but does not relieve the contractor from assuring a clean line.

Table 9-7
Required Flow & Openings to Flush Mains
40 psi (276 kPa) residual pressure in water main *

<table>
<thead>
<tr>
<th>Diameter of Pipe</th>
<th>Required Flow (gpm)</th>
<th>Size of Tap in Inches</th>
<th>Number of Taps on Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>200</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>400</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>900</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>1600</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

* With a 40 psi (276 kPa) pressure in the main and the hydrant flowing to atmosphere, a 2-1/2 inch (64 mm) hydrant outlet will discharge approximately 1000 gpm (63.1 L/s); and 4-1/2 inch (114 mm) hydrant outlet will discharge approximately 2500 gpm (160 L/s)

** Number of taps on pipe based on discharge through 5 feet (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

The Contractor shall be responsible for flushing all new mains under the supervision of the Public Works Department. The Storm System shall be the preferred option for disposal of the flush water. The City shall approve disposal into available storm systems, provided that the rate of disposal will not overload the storm or flow turbid water into waterways. See the Chlorinating section of the Construction Standards for flushing of chlorinated water.

The Water Division shall retrieve the foam cubes when the contractor performs the flush. The Contractor shall be responsible for locating and retrieving any lost, missing, or partial cubes from the main.

Chlorinating

All new water mains, extensions of existing mains or repaired water mains shall be disinfected as described below. These Specifications include detailed procedures for adequate disinfection.
A. Requirements

After flushing and pigging and before being placed into service, all new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 25 mg/l remains in the water after standing for 24 hours in the pipe. The initial chlorine content of the water shall not less than 50 mg/l. The Contractor wishes the Water Division to do the injection, they must sign a waiver holding the City harmless for any failure of purity samples due to the injection process by the Water Division, as well as agree to reimburse the City for costs associated with the disinfection process.

B. Form of Application

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 mg/l of available chlorine.

1. Liquid Chlorine – A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

2. Chlorine-Bearing Compounds in Water – A mixture of water and high-test calcium hypochlorite (65-70% Cl) may be substituted for the chlorine gas-water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 percent chlorine solution by adding water to give a total quantity of 7.5 gallons to water per pound of dry powder. This solution shall be injected in one end of the Section of main to be disinfected while filling the main with water.

3. Sodium Hypochlorite – Sodium hypochlorite, commercial grade (12.5% Cl) or in the form of liquid household bleach (5-6% Cl), may be substituted for the chlorine gas-water mixture. This liquid chlorine compound may be used full strength of diluted with water and injected into the main in correct proportion to the fill water so that dosage applied to the water will be at least 50 mg/l.

C. Point of Application

The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it, and through a corporation stop inserted in the horizontal axis of the pipe. The water injector for delivering the
chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of applications may be used when approved by the Director.

D. Rate of Application

Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly-laid pipeline during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion to the rate of water entering the newly-laid pipe that the dosage applied to the water will be at least 50 mg/l.

E. Cross Connection Control

No connections shall be made between the existing distribution main and the chlorinating device without proper backflow protection.

F. Retention Period

Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremes and at other representative points shall be at least 25 mg/l.

G. Tees, Crosses, Valves, Repairs, Connection points and Appurtenances

In the process of chlorinating newly-laid pipe, valves, hydrants, and other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure. All connections or appurtenances, less than eighteen (18) feet in length to existing mains not required to be chlorinated with new main, shall be swabbed or chlorinated by an approved method, with a minimum solution at least as strong as liquid household bleach (5-6% Cl) prior to installation.

Second Flush

After the disinfection period, the Contractor shall dispose of all chlorinated water until the residual chlorine is the same as the levels of the existing water main (Normally 0.5 mg/l).

The Contractor shall be responsible for disposal of treated water flushed form mains. The sanitary sewer shall be preferred option for disposal of all flush water. The City shall approve disposal into available sanitary sewers, provided that the rate of disposal will not overload the sewer.
All discharges to the storm system shall be tested for total residual chlorine using a portable "HACH" kit or equivalent, prior to discharge. NO DISCHARGE TO SURFACE WATERS OR THE STORM SYSTEM IS ALLOWED AT CONCENTRATIONS OF TOTAL RESIDUAL CHLORINE ABOVE 20 ug/l (0.02 mg/l) (Because the minimum detection limit for this test is about 10 ug/l (0.01 mg/l) under ideal conditions, field testing may lack precision).

If no acceptable discharge for the treated water is identified, the Contractor shall be required to dechlorinate the water prior to discharge.

After the initial flush has been completed, chlorinated water below 0.5 mg/l may be discharged to open ground area or a storm system provided that there is no discharge of the chlorinated water to open water systems or streams.

**First Purity Samples**

Following the flushing and pigging procedure, the contractor shall arrange with the Public Works inspector for coliform (purity) tests to be taken by the Water Division. Two (2) samples taken at least 24 hours apart are required from each apparatus. The Contractor shall pay for purity tests and handling as required by the City of Kent. Purity samples shall not be taken when the chlorine residual in the new main exceeds that of the existing water system (normally 0.5 mg/l). Water services two (2) inch and smaller installed prior to water main testing shall be tested with the water main.

The Water Division Personnel shall take the first purity sample at each apparatus 24 hours after the chlorine is removed, and tests at 0.5 mg/l or less. No water shall be flushed in the 24-hour incubation period. It shall be the contractors responsibility to transport the sample(s) to a laboratory approved by the Water Division, except for Tuesday mornings the Water Division shall transport the samples.

After the samples have been taken, the pressure in the new main shall be reduced to at least twenty (20) pounds below the existing main.

**Pressure and Leakage Tests**

All new water mains, extensions of existing mains, appurtenances and water services larger than two (2) inch shall be pressure tested for leakage in accordance with Section 7-11.3(11) of the WSDOT Standard Specifications after the first purity sample results are satisfactory (coliform absent). Services two (2) inch and smaller installed prior to water main testing shall be tested with the water main.
Final Flush

After approval of the pressure test(s) by the inspector the Contractor shall flush the injection water from the pressure testing.

Second Purity Samples

After approval of the pressure test(s) by the inspector and final flush by the contractor the Water Division shall take the second purity sample at each apparatus. The second sample(s) shall be taken a minimum of twenty-four (24) hours after the final flush.

Final Connections to Existing Water System

After new piping has been flushed, pigged, disinfected, pressure tested, and passed purity testing, the remaining connections to the existing main and water services two (2) inch and smaller can be made. All closure pieces and fittings shall be swabbed with an appropriate chlorine solution. The maximum length of swabbed section of water main pipe shall be less than eighteen (18) feet (1 section of pipe).

The Contractor shall take all precautions to prevent contamination of the newly purified mains when making final connections.
NOTES

1. FIRE HYDRANT SHALL BE A CENTER OPERATING VALVE SUCH AS MUELLER CENTURION, WATEROUS WB-67 CLAW #2500, N & H 929 OR PRE-APPROVED EQUIVALENT MEETING AWWA STD C502. ALL OPERATING NUTS SHALL BE 1 1/4" PENTAGONAL.

2. PAINT HYDRANTS WITH TWO (2) COATS OF FARWEST WONDERGLO QUICKSET HI-PERFORMANCE ENAMEL. PUBLIC HYDRANTS ARE WHITE #1100 SERIES AND PRIVATE HYDRANTS ARE YELLOW #X3472.

3. ALL FIRE HYDRANTS SHALL BE LOCATED BEHIND SIDEWALK OR AS SHOWN ON PLANS. THE PORT CAP SHALL NOT BE OVER THE SIDEWALK.

4. PROVIDE EXPANSION JOINT AND FILLER AROUND HYDRANT WHERE ADJACENT TO SIDEWALK. PROVIDE NOMINAL 3 FT SQUARE CONCRETE PAD IN ALL AREAS, INCLUDING SIDEWALKS.

5. SEE STANDARD DETAIL 3-1(a) FOR GUARD POST DETAILS.

6. WHEN FIRE HYDRANTS FALL BEHIND DITCH LINE, PLACE CULVERT IN DITCH FOR MIN OF 18' BACK FILL WITH CRUSHED SURFACING RIP RAP ENDS AS NEEDED FOR EROSION CONTROL.

7. NO HYDRANT SHALL BE INSTALLED LESS THAN 10 FEET FROM THE EDGE OF A DRIVEWAY APPROACH.

8. FIRE HYDRANT SHALL FACE THE ADJACENT STREET UNLESS DIRECTED OTHERWISE BY CITY OFFICIALS.

9. A USE PERMIT, METER AND CHECK VALVE ASSEMBLY ARE REQUIRED FOR DRAWING WATER FROM HYDRANTS. PERSONS DRAWING WATER ILLEGALLY WILL BE PROSECUTED.
**TYPICAL PLACEMENT DETAIL**

The Fog-Tite Hydrant Guard Post is pre-approved. All others require written approval of the engineer prior to installation.

**NOTES:**

1. Guard posts set plumb and buried at least 3-foot deep.
2. Guard post are installed with tops no higher than hydrant if more than one post is set. They shall be set at the same height.
3. Guard posts are located no closer than 3 feet from outside face of fire hydrant.
4. Exposed portion of guard posts are to be painted with two (2) coats of white paint (see standard detail 3-1 note 2 for type).
5. See standard detail 3-1 for fire hydrant details.
6. Guard posts are not used where fire hydrant is located behind curb and gutter.

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**CITY OF KENT**

**ENGINEERING DEPARTMENT**

**GUARD POST**

[Diagram and details of typical placement, including dimensions and additional notes on placement and painting requirements.]
THE FOLLOWING PRODUCTS ARE PRE-APPROVED. ALL OTHERS REQUIRE WRITTEN APPROVAL OF THE ENGINEER.

1. OLYMPIC FOUNDRY "SM 30" METER BOX WITH FULL STEEL LID
2. RICH 940 VALVE BOX TOP WITH TWO (2) INCH "DEEP SKIRT" COVER OR PRE-APPROVED EQUAL. THE COVER SHALL BE MARKED "WATER" INSIDE DIAMETER SHALL BE 5-7/8
3. BASE SHALL BE COMPATIBLE WITH TOP SECTION LENGTH AS REQUIRED USE OLYMPIC 9B1C BOTTOM SECTION OR PRE-APPROVED EQUAL
4. FITTINGS TO BE BRASS FOR PERMANENT INSTALLATIONS AND GALVANIZED FOR TEMPORARY INSTALLATIONS
NOTES:

1. TEE, VALVE AND PIPING SHALL BE PER SECTION 3.7 OF THE CITY OF KENT CONSTRUCTION STANDARDS.

2. CONCRETE BLOCKING SHALL BE CLASS 3000 (SEE SECTION 3.8.4 OF THE CITY OF KENT CONSTRUCTION STANDARDS).

3. VALVE BOX SHALL BE OLYMPIC FOUNDRY VB940 WITH TWO (2) INCH "DEEP SKIRT" COVER. THE COVER SHALL BE MARKED WATER EARS SHALL ALIGN IN THE DIRECTION OF FLOW (SEE CITY OF KENT STANDARD DETAIL 3-12).

4. OLYMPIC FOUNDRY #SM30 USE IN TRAFFIC SIDEWALK AND PLANTER AREAS.
1) Use Utility Vault Co. #444 LA for 2 installations or approved equal with 3'x3' water tight Bilco hatch (H20 rated) for planter areas only.

2) Discharge riser shall be installed in planter areas only. Anchor riser w/ 2"x1/4" stainless steel straps and 3/8 Hilti expansion bolts. Paint the aboveground piping w/ two (2) coats of Farwest WonderGlo Quickset Hi-Performance Enamel #1100 Series White.

3) Pipe and fittings to be brass for inlet side of air release valve.

4) Pipe and fittings to be galvanized for outlet side of air release valve.

5) Optional installation for shallow water main depths.

6) Where possible, install air release valve in dry, free draining areas, or install a 6" drain to an approved location.

7) Center Air Vac Assembly in the vault.
EXISTING GRADE

VALVE BOX & EXTENSION (SEE STD DET 3-12)

3-90 BENDS SWING JOINT

2' IFT X IFT CORP STOP

PRECAST CONCRETE (ECCENTRIC)

16" MAX, 4 MIN

3/4" WASHED ROCK

2" 90 ELL (2 EA)

2" GALVANIZED NIPPLES LENGTH AS REQUIRED

4" MIN AIR GAP

2" APCO HEAVY DUTY AIR RELEASE VALVE NO 145C OR EQUIVALENT

2" BRASS PIPE (TYP)

2" RESILIENT WEDGE GATE VALVE

ALL BRASS FITTINGS

DOUBLE STRAP SADDLE SMITH BLAIR NO 313-18888-14 OR EQUIVALENT

NOTES.

1. INSTALL AIR RELEASE VALVE IN LOCATION WHERE THERE SHALL BE NO STANDING WATER AT ANY TIME IN THE CHAMBER.

2. IN WET AREAS INSTALL 6" DRAIN TO DAYLIGHT OR STORM SYSTEM AS DIRECTED BY ENGINEER OR INDICATED ON PLANS.

3. FOR NONTRAFFIC AREAS ONLY.

4. ALL PIPE AND FITTINGS ARE TO BE BRASS.
8" GV 7"  

- **TYPICAL 2" HIGH BLACK STENCIL MARKINGS ON THIS FACE ONLY**

- **SIZE OF VALVE**

- **DISTANCE TO VALVE OR BLOWOFF**

- **1" PRE-CAST GROOVE IN TOP OF POST**

- **CLASS 3000 CONCRETE**

- **FINISHED GRADE**

- **LOWER LIMIT FOR 2 COATS OF WHITE PAINT ON ALL FACES (SEE STD DET 3-1) NOTE 2 FOR TYPE**

- **#3 REINFORCED BAR**

- **1 1/4" TYP**

- **WEIGHT 53-60 LBS**

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THE FOG TITE INC VALVE MARKER POST WITH THE "WATER LEGEND" IS THE PRE-APPROVED PRODUCT. ALL OTHERS REQUIRE THE WRITTEN APPROVAL OF THE ENGINEER PRIOR TO INSTALLATION.

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CITY OF KENT  
ENGINEERING DEPARTMENT  

VALVE MARKER POST  

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<thead>
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<th>8</th>
<th>SCALE</th>
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3-4
BACK OF SIDEWALK (OR BACK OF CURB IF THERE IS NO SIDEWALK)

7 1/4" SPACER PIPE HOLE IN SPACER (DO NOT INSTALL GASKETS)

ANGLE METER STOP W/PADLOCK WINGS

METER SETTER (3/4" OR 1 DEPENDING ON METER)

1" PACK JOINT x 3/4" IP THREAD MALE ADAPTER (3/4" SETTER ONLY)

VARIANCE FOR INSTALLATION OF METER IN PLANTER OR ASPHALT AREA (SEE KENT WATER SERVICE CODE 351 AND WASH STD SPECS (TYP) SECTION 7-15)

FEATURING INLET

CUSTOMER SERVICE LINE TO HOUSE OR BUILDING

END OF CITY OF KENT MAINTENANCE RESPONSIBILITY PER KENT CITY CODE SECTION 702-040

INSTALL AN 18' PIECE OF SCHEDULE 80 PVC PIPE IN METER SETTER BRACE EYE

NOTES:
1. SEE CONSTRUCTION STANDARD SPECS SEC 351 FOR PRE-APPROVED METER SETTERS
2. SEE STD DETAIL 3-9 IF PRESSURE REDUCING VALVE IS REQUIRED
3. SERVICE MUST CONFORM TO CITY OF KENT STANDARD SPECIFICATIONS, WATER SERVICE CODE & STD SPECS 351
4. PROVIDE 8" CLEARANCE BETWEEN OUTSIDE EDGES OF METER BOXES WHICH ARE ADJACENT
METER BOX (SEE KENT WATER SERVICE CODE 3.51 AND WASH STD SPECS (TYP) SECTIONS 7-15 & 9-30 FOR APPLICATION)

7-1/4" SPACER PIPE HOLE IN SPACER (DO NOT INSTALL GASKETS)

CURB

STREET

SIDEWALK

INSPECTION LID (OPEN)

INSTALLATION IN S/W VARIES SIDEWALK

VARIATES FOR INSTALLATION OF METER IN PLANTER OR ASPHALT AREA (SEE KENT WATER SERVICE CODE 3.51 AND WASH STD SPECS (TYP) SECTION 7-15)

CENTER METER SETTER IN METER BOX

PLAN VIEW

METER SETTER (3/4" OR 1' DEPENDING ON METER)

1' PACK JOINT X 3/4 I P THREAD MALE ADAPTER (3/4' SETTER ONLY)

INLET

6" MIN (TYP)

2" MIN

10" TO 10"

22 GAUGE INSULATED SOLID COPPER LOCATING WIRE, PLASTIC COATED. NO SPLICES WILL BE ALLOWED.

1" PACK JOINT ADAPTER X 1" I P FEMALE THREAD

1" CORP DOUBLE STRAP SADDLE (SEE KENT WATER SERVICE CODE & STD SPECS (TYP) SECTION 9-30)

1" MIN TYPE "K" COPPER PIPE OR POLYETHYLENE PLASTIC PIPE (IRON PIPE SIZE) TO PROPERTY LINE (SEE KENT WATER SERVICE CODE & STD SPECS SECTION 3.52)

CUSTOMER SERVICE LINE TO HOUSE OR BUILDING

END OF CITY OF KENT MAINTENANCE RESPONSIBILITY PER KENT CITY CODE SECTION 7.02.040

INSTALL AN 18 PIECE OF SCHEDULE 80 PVC PIPE IN METER SETTER BRACE EYE

NOTES:

1. SEE CONSTRUCTION STANDARD SPECS SEC. 3.51 FOR PRE-APPROVED METER SETTERS
2. SEE STD DETAIL 3-9 IF PRESSURE REDUCING VALVE IS REQUIRED
3. SERVICE MUST CONFORM TO CITY OF KENT STANDARD SPECIFICATIONS, WATER SERVICE CODE & STD SPECS 3.51
4. PROVIDE 8" CLEARANCE RTWBN OUTSIDE EDGES OF METER BOXES WHICH ARE ADJACENT
2. METER BOX
(SEE KENT STD SPECS 3.5.1 AND
WASH STANDARD SPECS SECTIONS
7-15 & 9-30 FOR APPLICATION)

ANGLE METER STOP
W/PADLOCK WINGS

BACK OF SIDEWALK (OR
BACK OF CURB IF THERE
IS NO SIDEWALK)

CURB

SIDEWALK

STREET

METER SETTER (BOTH
SIDES) SEE CONSTRUCTION
STD SPECS Sec 3.5.1
FOR PRE-APPROVED

SPACER PIPE
W/ HOLE IN
SPACER (DO NOT
INSTALL GASKETS)

DRILL HOLE

INLET

PACK JOINT
ADAPTER (TYP )

ADJUSTABLE BRACE
(NO BY-PASS)

I.P.S. HIGH DENSITY CLASS 200 OR GREATER
POLYETHYLENE PIPE TO PROPERTY LINE
(SEE KENT WATER SERVICE CODE & STD
SPECS (TYP) SECTIONS 3.5.1)

NOTES:

1. 12 GAUGE INSULATED SOLID COPPER LOCATING
WIRE, PLASTIC COATED BARE WIRE ENDS FOR
POLYETHYLENE PLASTIC PIPE ONLY NO SPLICES
WILL BE ALLOWED

2. OLYMPIC CI SM 30, (PAVEMENT OR DRIVEWAYS)
FOG-TITE #2T (SIDEWALKS) OR CARSON SUPER
JUMBO PLASTIC WATER METER 1730-12
(PLANTERS)

3. FORD NO FB-500 CORPORATION STOP OR
APPROVED EQUAL

4. METER SETTER MUST BE CENTERED IN METER
BOX

5. REDUCERS INSIDE SETTERS ARE NOT ALLOWED

6. PERMANENTLY CONNECT BARE WIRE ENDS TO
METER SETTER WITH STAINLESS STEEL HOSE
CLAMPS

CITY OF KENT
ENGINEERING DEPARTMENT

SERVICE CONNECTION
(BEHIND S/W OR CURB WITH NO S/W)
PLASTIC 1-1/2" & 2" SERVICE

DESIGNED
DRAWN
CHECKED
APPROVED

KENT
WASHINGTON

STANDARD DETAIL

3-7(a)
CITY OF KENT
ENGINEERING DEPARTMENT
SERVICE CONNECTION
(IN SIDEWALK)
PLASTIC 1-1/2" & 2" SERVICE

NOTES:

1. 12 GAUGE INSULATED SOLID COPPER LOCATING WIRE. PLASTIC COATED BARE WIRE ENDS FOR POLYETHYLENE PLASTIC PIPE ONLY. NO SPLICES WILL BE ALLOWED.

2. OLYMPIC C1 SM 30. (PAVEMENT OR DRIVEWAYS) FOG-TITE #2T (SIDEWALKS) OR CARSON SUPER JUMBO PLASTIC WATER METER 1730-12 (PLANTERS).

3. FORD NO FB-500 CORPORATION STOP OR APPROVED EQUAL.

4. METER SETTER MUST BE CENTERED IN METER BOX.

5. REDUCERS INSIDE SETTERS ARE NOT ALLOWED.

6. PERMANENTLY CONNECT BARE WIRE ENDS TO METER SETTER WITH STAINLESS STEEL HOSE CLAMP.
**PLAN VIEW**

**HERSEY OR ROCKWELL COMPOUND WATER METER W/ BYPASS**

**NOTES**

1. ALL FITTINGS AND VALVES TO CONFORM TO AWWA STANDARDS AND CITY OF KENT WATER SERVICE CODE & STD SPECS 7-15 9-30

2. DIMENSIONS ARE APPROXIMATE, FLANGE COUPLING ADAPTER TO BE ROCKWELL 912 OR APPROVED EQUAL

3. 3"-6" COMPOUND WATER METERS TO COMPLY WITH HERSEY MAINTENANCE FIELD SERVICE TESTING PROGRAM
1. Grinnell #264 or equal pipe supports to be installed under each valve and two places under the meter as shown.

**HERSEY OR ROCKWELL COMPOUND WATER METER W/ BY-PASS**

**VAULT**

Gate valves to be installed within lid opening for "Key" operation above ground or core drill lid & install valve box per City of Kent code, flush with top & bottom of lid ladder required per OSIA & WISHA requirements.
NOTES

BOX TO BE LOCATED BEHIND WATER METER ON PRIVATE PROPERTY AND SHALL BE THE PROPERTY OWNER’S RESPONSIBILITY TO MAINTAIN METER BOX PER CITY OF KENT WATER SERVICE STANDARDS

WILKINS NO 600 REGULATOR ALL BRONZE WATER REDUCING VALVE AND STRAINER 3/4" 1' 1 1/2", OR 2" BY-PASS, MONEL TRIM MAX INITIAL PRESSURE SETTING 50 LBS FOR WATER-AIR OR PRE-APPROVED EQUAL

MINIMUM 2 BURY REQUIRED OVER SERVICE- (BOTH ENDS)

FITTINGS SHOWN AS STREET ELLS AND 2 INCH NIPPLES MAY BE REPLACED WITH 90 BENDS AND LONGER NIPPLES TO CONFORM WITH DIMENSIONS REQUIRED ALL FITTINGS TO BE BRASS

* SEE WATER SERVICE DETAIL
HAT FLANGE
(CERTIFIED WELDER REQUIRED)
SEE NOTE

FLX-MJ TAPPING VALVE OR
CORPORATION STOP FOR WATER
SERVICE APPLICATIONS
(SEE WATER SERVICE CODE)

1/8" FILLET WELD
ALL AROUND-
FIELD WELD
OUTSIDE AND
INSIDE

NOTE
CERTIFIED WELDER SHALL BE PRE-APPROVED BY THE CITY
OF KENT WATER DEPARTMENT

* SIZE PER CITY OF KENT APPROVAL
APPLY CEMENT MORTAR TO COVER ALL EXPOSED STEEL
(1/2 UNIFORM THICKNESS) EXCEPT THE BOLTED FLANGE
AREA

SECTION A-A

SECTION B-B

CONNECTION FLANGE
10 GA STEEL

WELD

HAT FLANGE
(WESTERN UTIL)
CONCRETE CYLINDER
PIPE

FIELD WELD INSIDE AND OUTSIDE

1/8" FILLET WELD ALL AROUND

NOTE
CERTIFIED WELDER SHALL BE PRE-APPROVED BY THE CITY OF KENT WATER DEPARTMENT

2" OD FORGED STEEL 3000 POUND HALF COUPLING-SA-105 MATERIAL (3" OD x 2" TALL) WITH FEMALE IRON PIPE THREADS

APPLY CEMENT MORTAR AROUND PERIMETER OF SLEEVE 1/2" UNIFORM THICKNESS

WELD WIRE MESH TO SLEEVE

CHAPTER 3-10(b)

EXPOSE STEEL

TAPER END OF SLEEVE TO CONTOUR OF MAIN

THREADED FITTING

CITY OF KENT ENGINEERING DEPARTMENT

2" CONNECTION TO CONCRETE CYLINDER MAIN

DESIGNED: DATE: 6-11-99
DRAWN: CHECKED: APPROVED: 3-10(b)

SCALE: NONE
STANDARD DETAIL

KENT
OLYMPIC FOUNDRY VB 940 WITH TWO (2) INCH "DEEP SKIRT" COVER
THE COVER SHALL BE MARKED 'WATER'
SEE NOTES 5 & 6

BASE SECTION RICH 24' VALVE BOX BOTTOM, OLYMPIC NO VBIC OR APPROVED EQUAL

EXTENSION AS NEEDED

VALVE BOX WITH OPERATING NUT EXTENDER

NOTES
1 EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN THREE (3) FEET BELOW FINISHED GRADE
2 EXTENSIONS SHALL BE A MINIMUM OF ONE (1) FOOT LONG
3 EXTENSIONS SHALL BE SIZED AS NOTED, AND PAINTED WITH TWO (2) COATS OF METAL PAINT
4 EXTENSIONS ARE MANUFACTURED OR AVAILABLE FROM HD FOWLER OR PACIFIC WATERWORKS
5 EARS LUGS OR STAINLESS CAP SCREWS ON COVEP SHALL BE ALIGNED WITH DIRECTION OF WATER FLOW
6 FOR ADDITIONAL REQUIREMENTS AND USE SEE SECTION 7.7.3 OF THE CITY OF KENT CONSTRUCTION STANDARDS
TO LANDSCAPE IRRIGATION

DEDUCT METER

P.R.V. IF REQUIRED FOR IRRIGATION

BACK FLOW ASSY

P.R.V. IF REQUIRED FOR BUILDING (SEE STD DETAIL 3-9)

PROPERTY LINE OR EASEMENT LINE

INSTALL TEE AFTER P/L

WATER USE ONLY METER

DOMESTIC WATER METER

TYPICAL DEDUCT INSTALLATION

TYPICAL WATER USE ONLY INSTALLATION

P/L SEE NOTE 5

SEE NOTE 4

6" VALVE BOX

METER BOX

1" SETTER-CARSON 1220-12

1 1/2" TO 2" SETTER-CARSON 1730-15

FOR WATER USE ONLY INSTALLATION, THE DCVA AND IRRIGATION BOX SHALL BE INSTALLED PRIOR TO THE METER BEING SET. THE DCVA CAN BE CERTIFIED AFTER INSTALLATION OF THE METER

NOTES

1. DCVA SHALL HAVE A MINIMUM CLEARANCE OF 12" FROM ANY OBSTRUCTION ON THE TEST SIDE
2. DCVA SHALL BE ON THE LATEST DOH APPROVED LIST AND SHALL NOT BE ALTERED
3. APPROVED METERS ARE BADGER OR SENSUS REGISTERING IN CUBIC FEET ONLY
4. IRRIGATION BOX
   1" DCVA-CARSON 1324-15G W/UD #1324-2L
   6" EXT-CARSON 13248-1L
   1/4" TO 2" DCVA-CARSON 1730C-1B (15 h)
   17300-1B (15 h) W/UD #1730-P2L

CITY OF KENT
ENGINEERING DEPARTMENT

IRRIGATION SERVICE INSTALLATION

DESIGNED
DRAWN
CHECKED
APPROVED

3-13(b)
DOUBLE CHECK VALVE ASSEMBLY

DOMESTIC WATER METER

TO BUILDING

REDUCED PRESSURE BACKFLOW ASSEMBLY WITH INSULATED ENCLOSURE

PROPERTY OR EASEMENT LINE

DOMESTIC WATER METER

PLAN VIEW — TYPICAL INSTALLATION

METER BOX (SEE WATER SERVICE CODE)
CHECK ELL
UNION (TYP) SEE NOTE 2
FROM WATER MAIN

PROPERTY OR EASEMENT LINE

12' - 14'

DOUBLE CHECK VALVE ASSEMBLY SEE NOTES 1, 2
TO DOMESTIC OR INDUSTRIAL USE

METER SETTER (SEE WATER SERVICE CODE)

12 LAYER PEA GRAVEL

PROFILE VIEW — WATER SERVICE AND DOUBLE CHECK VALVE ASSEMBLY (LOW HAZARD)
(SMALLER SERVICE SHOWN)

INSULATED ENCLOSURE 2

3 MIN (TYP) INSTALL UNIONS (TYP) FOR 2 AND SMALLER ASSEMBLIES

12' MIN

INSULATED ENCLOSURE 2

PROPERTY OR EASEMENT LINE

GRADE

CONC SLAB

FLOW

FROM WATER MAIN

PROFILE VIEW — WATER SERVICE AND REDUCED PRESSURE BACKFLOW ASSEMBLY (HIGH HAZARD)
(LARGER SERVICE SHOWN)

3" MIN WHEN VALVE IS FULLY OPEN

DRAIN (TYP) BOTH ENDS

PVC SLEEVE ELECTRICAL HEAT (OPTIONAL)

TO DOMESTIC OR INDUSTRIAL USE

NOTES:
1) DRAWINGS ARE ILLUSTRATIONS ONLY. SIZE OF METER AND BACKFLOW PREVENTER SHALL BE PER THE APPROVED PLANS AND PERMIT
2) DCVA BOXES OR VAULTS SHALL PER SECTION 3.5.1(E) OF THE CITY OF KENT CONSTRUCTION STANDARDS
3) INSULATED ENCLOSURES SHALL ALLOW MINIMUM CLEARANCES OF ASSEMBLY
4) BACKFLOW PREVENTER SHALL BE PER SECTION 3.6 OF THE CITY OF KENT CONSTRUCTION STANDARDS
NOTES

MINIMUM CLEARANCES IN VAULT ARE DEPENDENT UPON LOCATION OF PUMPER CONNECTION

BYPASS LINE TO BE ON OPPOSITE SIDE OF PUMPER LINE

INSTALL THREADED PLUGS IN ALL 8 TEST COCKS

SEE STD DETAILS 3-14(b) & 3-14(c) FOR PARTS LIST & NOTES
SEE CITY FIRELINE CODE AND
STD DETAIL 3-14(c) FOR NOTES

SEE STD DETAIL 3-14(a) FOR PLAN, ELEVATION & SECTION

1. CONC BLOCKING AS REQ'D W/ LOCKING FOLLOWER RING AS SHOWN SEE DETAIL "A"
2. 4" MIN D1 CLASS 52
3. PRECAST CONC VAULT SEE CITY OF KENT FIRELINE CODE
4. APPROVED DCVA IN BYPASS LINE (LATEST HEALTH DEPARTMENT APPROVED LIST) SHALL BE ON OPPOSITE SIDE OF PUMPER LINE (PART OF DCDA)
5. DCDA IN MAIN LINE (LATEST DSHS APPROVED LIST)
6. CONC SUPPORT PADS UNDER CHECK VALVE
7. 10" 8", 6" OR 4" FL COUPLING ADAPTER
8. 10", 8", 6" OR 4" PExFL PIPE
9. CROUT INTERIOR & EXTERIOR ALL AROUND PIPE
10. 10", 8", 6" OR 4" RESILIENT WEDGE GATE VALVE, FL W/ POST INDICATOR W/ TAMPER SWITCH
11. 10", 8", 6" OR 4" TEE, FL
12. 10", 8", 6" OR 4" REDUCING 90 BEND, FL AS REQ'D
13. 6" OR 4" LONG RADIUS 90 BEND, FL
14. 6" OR 4" SPOOL, FL
15. 6" SWING TYPE GRAVITY OPERATED CHECK VALVE, FL W/ BALL DRIP
16. 4" OR 6" 90 BEND, FL
17. 4" OR 6" SPOOL, FLxFL
18. 6 OR 4" BEND, FLxFL
19. FLxFL ADAPTER
20. 6 OR 4" GALV PIPE THREADED LENGTH AS REQ'D (SEE STD DET 3-14C)
21. * 4'x4'x6" BULL HEAD THREADED TEE
22. * UL LISTED FD CONNECTION & UL LISTED BREAK AWAY CAPS, LOCATE WITHIN 50' MAX OF A PUBLIC FIRE HYDRANT
23. O'S & Y VALVES TO BE RESILIENT SEATED W/ TAMPER SWITCHES ADD WIRING IN ACCORDANCE W/ L & I (SEE NOTE 11 ON STD DETAIL 3-14C)
24. GALV CONDUIT SLEEVE, SEALED BOTH ENDS FOR ELECTRONIC MONITORING WIRES
25. LADDER AS REQ'D PER OSHA

*21) & 22) ARE GENERALLY 6" WITH THE BULL ELBOW AS INDICATED IN CASES WHERE A 4" DCVA IS APPROVED THE BULL ELBOW IS ELIMINATED AND THE FD CONNECTION IS ATTACHED DIRECTLY TO THE GALV PIPE
4 INCH OR GREATER DOUBLE CHECK DETECTOR
ASSEMBLY AND VAULT NOTES

1) VAULT DIMENSIONS BASED ON SIZE OF APPARATUS AND MEETING MINIMUM CLEARANCES

2) ALL VAULT LIDS SHALL HAVE DOUBLE DOORS WITH LID DRAINS TO EXTERIOR OF VAULT

3) MINIMUM APPARATUS SIZE SHALL BE 4 INCHES

4) VAULT SHALL BE SEALED TO PREVENT WATER LEAKAGE

5) LADDERS SHALL BE REQUIRED WHEN DEPTH FROM TOP OF LID TO TOP OF APPARATUS EXCEEDS 30", AND/OR THE APPARATUS IS MORE THAN 12" ABOVE THE FLOOR INSTALLATION OF ALL LADDERS SHALL BE IN COMPLIANCE TO OSHA

6) ALL BACK FLOW PREVENTORS SHALL BE ON THE LATEST APPROVED LIST APPROVED BY THE CITY OF KENT

7) MAKE ALL ATTEMPTS TO LOCATE VAULT IN PLANTING AREA NOT IN PAVING AREA

8) ALL BENDS AND ELBOWS TO BE CAST IRON, CLASS 250, CEMENT LINED (SEE APWA AND AWWA)

9) TEMPORARY SUPPORT SHALL BE PROVIDED UNDER VALVES AT THE TIME OF INSTALLATION AFTER COMPLETE INSTALLATION REMOVE THE TEMPORARY SUPPORT AND INSTALL CONCRETE SUPPORT PAD WITH 6" BRICK SHIMS AS REQUIRED

10) GROUT INTERIOR AND EXTERIOR ALL AROUND PIPE

11) ALL PIPE TO BE DUCTILE IRON CEMENT LINED CLASS 52 PIPE EXCEPT WHERE INDICATED INSTALLATION MUST ALLOW CLEARANCE FOR PROPER OPERATION OF ALL O'S AND Y'S

12) GALVANIZED STEEL PIPE SHALL BE WRAPPED WITH POLYETHYLENE WRAPPING 10mm THICKNESS

SEE STD DETAIL 3-14(a) FOR PLAN, ELEVATION & SECTION
SEE STD DETAIL 3-14(b) FOR PARTS LIST
Less than 50' to water main per approval by engineer.

Less than 100'

From sprinkler system:
- Stem wall mounted pin (s)
- METER
- Double check detector assembly - inside building detail (4" or greater)

To building sprinkler system:
- Fire Dept responsibility
- Public Works responsibility
- Do not block access

Building wall

City of Kent Engineering Department

Designed: [Signature]
Drawn: [Signature]
Checked: [Signature]
Approved: [Signature]

Approved Date: 5-11-99
INSIDE BUILDING ASSEMBLY LIST (4" OR GREATER):

1) PERIMETERS OF MINIMUM CLEARANCES TO BE PAINTED ON FLOOR IN WHITE ENAMEL PAINT WITH 2" STENCILED BLACK LETTERS "DO NOT BLOCK ACCESS"

2) 4' MINIMUM D1 CLASS 52

3) FLOOR DRAIN IN BUILDING TO STORM SYSTEM

4) DCVA IN BYPASS LINE (LATEST HEALTH DEPT APPROVED LIST) SHALL BE ON OPPOSITE SIDE OF PUMPER LINE

5) DCDA IN MAIN LINE (LATEST HEALTH DEPT APPROVED LIST)

6) CONCRETE SUPPORT PADS UNDER CHECK VALVE

7) 10", 8", 6" OR 4" FL COUPLING ADAPTER

8) 10", 8", 6" OR 4" PE x FL PIPE

9) 2" CLEARANCE INTERIOR AND EXTERIOR ALL AROUND PIPE

10) 10", 8", 6" OR 4" RESILIENT WEDGE GATE VALVE, FL WITH WALL MOUNTED POST INDICATOR WITH TAMPER SWITCH

11) 10", 8", 6" OR 4" DIP, CL 50

12) 10", 8", 6" OR 4" 90 DEGREE BEND, FL WITH BALL DRIP IN VAULT

13) 6" OR 4" DIP, CL 50

14) 6" OR 4" SPOOL, FL

15) 6 SWING TYPE GRAVITY OPERATED CHECK VALVE, FL WITH BALL DRIP IN VAULT

16) 4" OR 6" SPOOL 90 DEGREE BEND

17) 4 OR 6" SPOOL FL x FL

18) DRAIN ROCK 1/2 CY

19) FL x IP ADAPTER

20) 6 OR 4" GALV PIPE THREADED LENGTH AS REQUIRED (SEE STD DETAIL 3-14c)

21) 4"x4 x6 BULL, ELBOW, THREADED

22) UL LISTED FD CONNECTION AND UL LISTED BREAK AWAY CAPS LOCATE WITHIN 50' MAX OF A PUBLIC FIRE HYDRANT

23) O.S AND Y VALVES TO BE RESILIENT WEDGE WITH TAMPER SWITCHES ADD WIRING IN ACCORDANCE WITH L & I (SEE NOTE 11 ON STD DETAIL 3-14c)

24) 10" 8', 6', OR 4" RESILIENT WEDGE GATE VALVE, FL W/POST INDICATOR W/TAMPER SWITCH

25) SIGN ON OUTSIDE OF BUILDING FIREFIELD DOUBLE CHECK INSIDE BLDG.
INSIDE BUILDING
4" OR GREATER DOUBLE CHECK DETECTOR ASSEMBLY NOTES

1) ROOM IN WHICH DCDA IS PROPOSED TO BE LOCATED SHALL
   A  HAVE FLOOR DRAINS CONNECTED TO STORM OR SANITARY SEWER
   B  HAVE A HEATING SYSTEM (40°F MIN TEMP) NO HEAT TAPE
   C  NOT BE USED FOR STORAGE AROUND THE DCDA
   D  HAVE CLEARLY DELINEATED ACCESS WAYS TO DCDA AND WALL MOUNTED PIVs

2) MINIMUM APPARATUS SIZE SHALL BE 4 INCHES

3) ALL BACKFLOW PREVENTERS SHALL BE ON THE LATEST LIST APPROVED BY THE
   DEPARTMENT OF HEALTH AND THE CITY OF KENT

4) MAKE ALL ATTEMPTS TO LOCATE SWING CHECK VAULT IN PLANTING AREA & NOT IN
   PAVING AREA

5) ALL BENDS AND ELBOWS TO BE CAST IRON, CLASS 250, CEMENT LINED (SEE
   APWA AND AWWA)

6) TEMPORARY SUPPORT SHALL BE PROVIDED UNDER VALVES AT THE TIME OF INSTALLATION
   AFTER COMPLETE INSTALLATION REMOVE THE TEMPORARY SUPPORT AND INSTALL CONCRETE
   SUPPORT PAD WITH 6' BRICK SHIMS AS REQUIRED

7) GROUT ALL AROUND PIPE WHERE IT ENTERS THE BUILDING

8) ALL PIPE TO BE DUCTILE IRON CEMENT LINED CLASS 52 PIPE EXCEPT WHERE INDICATED
   INSTALLATION MUST ALLOW CLEARANCE FOR PROPER OPERATION OF ALL D'S AND Y'S

9) GALVANIZED STEEL PIPE SHALL BE WRAPPED WITH POLYETHYLENE WRAPPING (10mm THICKNESS)

10) IF A NEW CITY HYDRANT IS NOT REQUIRED ON FIRELINE UPSTREAM OF BUILDING, (THERE IS
     AN EXISTING CITY HYDRANT WITHIN 50' OF FDC) THEN INSTALL A 2" B.O PER KENT
     STANDARD DETAIL 3-2 60' FROM CITY MAIN

11) IF PRIVATE HYDRANTS ARE REQUIRED FOR THE PROJECT, ENTIRE SYSTEM (HYDRANTS
     AND FIRELINE) SHALL BE ISOLATED FROM CITY SYSTEM BY A DCDA LOCATED IN A VAULT
     AT THE PROPERTY LINE PER STANDARD DETAILS 3-14(a), 3-14(b) AND 3-14(c)

12) INSTALLATION OF DCDA IS APPROVED BY HORIZONTAL ALIGNMENT ONLY

13) A HEATED, R-19 INSULATED WOOD FRAMED ENCLOSURE IS AN ACCEPTABLE ALTERNATIVE
    TO A ROOM IF DCDA IS TO BE LOCATED IN AN UNHEATED BUILDING. THE ENCLOSURE
    MUST MEET ALL REQUIREMENTS OF THE DEVELOPMENT SERVICES DIVISION
NOTE

ALL MATERIALS, CONSTRUCTION, APPARATUS, CONNECTIONS AND APPURTENANCES SHALL BE IN ACCORDANCE WITH KENT CITY CODES, STANDARDS AND DETAILS.

*CITY 1" METER/SETTER

* 1" FIRE LINE (32 GPM MAX)

APPROVED DOUBLE CHECK VALVE ASSEMBLY AND APPURTENANCES (HEATED OR INSULATED IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF HEALTH AND UPC REQUIREMENTS)

* 1 MINIMUM SIZE INCOMING LINE AND DCVA IN ACCORDANCE WITH FIRE DEPT REQUIREMENTS

** 1" 1-1/2" OR 2" METER SHALL MATCH PIPE SIZE (PER KENT WATER METER STANDARDS)
NOTE

ALL MATERIALS, CONSTRUCTION, APPARATUS, CONNECTIONS AND APPURTENANCES SHALL BE IN ACCORDANCE WITH KENT CITY CODES, STANDARDS AND DETAILS.

FIRE LINE SYSTEMS EXCEEDING FLOW RATES OF 2 INCH DOMESTIC WATER METER, SHALL BE REQUIRED TO USE DOUBLE DETECTOR CHECK VALVE ASSEMBLIES PER DETAILS 3-14(a) TO 3-14(g).

ALTERNATIVE #2

1. WETTAPPING SLEEVE (FL) ON EXISTING MAIN, OR 4" TEE (FL) ON NEW MAIN.
2. 4" RESILIENT WEDGE GATE VALVE (FLxFL).
3. 4" REDUCER COMPANION (FL W/ 2' TAP).
4. 2" NIPPLE BRASS MIPT x MIPT.
5. 2" FEMALE IP THREAD x 2' PACK JOINT ADAPTER.
6. 2' COPPER TUBING TYPE K.

1-1/2' MINIMUM, OR SIZE INCOMING LINE AND DCVA IN ACCORDANCE WITH FIRE DEPT REQUIREMENTS. ACCESS TO DOUBLE CHECK HAS TO BE APPROVED.

SPRINKLER SYSTEMS WITH 20 HEADS OR MORE REQUIRE A FIRE DEPT CONNECTION CHECK VALVE ASSEMBLY.

* OUTSIDE LOCATION REQUIRES APPROVAL OF UNDERGROUND FIRELINE PLAN.

CITY OF KENT
ENGINEERING DEPARTMENT

MULTI-FAMILY RESIDENTIAL
DOMESTIC WATERLINE/FIRELINE

DESIGNED
DRAWN
CHECKED
APPROVED

SCALE
NONE

STANDARD DETAIL

3-15(b)
CONCRETE BLOCKING

NOTE
1) MECHANICAL JOINT SLEEVES SHALL BE HEAVY DUTY CAST DUCTILE IRON, HAVE END AND SIDE GASKETS

HEAVY DUTY CAST DUCTILE IRON TAPPING TEE

2) TAPPING SLEEVE & VALVE ASSEMBLY TO BE PRE-APPROVED BY THE ENGINEER. PRESSURE TESTING SHALL BE APPROVED BY CONSTRUCTION INSPECTOR PRIOR TO TAPPING. FOLLOW AWWA REQUIREMENTS FOR DISINFECTION OF TAPPING SLEEVES (AWWA STD C651)

STEEL TAPPING TEE

NOTE WET TAPS SHALL NOT BE ALLOWED ON SAME SIZE OR SMALLER MAINS
Chapter 10
The Capital Improvement Program

Integral components of the plan are the East Hill Reservoir, Tacoma's Second Supply project and the Storage Impoundment Reservoir project. Tacoma's Second Supply project and the Storage Impoundment Reservoir project are critical to the City's ability to meet its ultimate supply needs.

The Capital Improvement Program (C.I.P) tabulated in Table 10-1 is predicated on Tacoma's Second Supply project being fully implemented by 2005. As such, the City's supply capabilities would then be adequate until 2011 for which the projected high peak day demand would then become the critical factor. At that point the Storage Impoundment Reservoir project including its respective treatment facility (7 MGD) would be brought on line. With the added treatment capabilities (4 MGD) to the impoundment facility in 2020, the City's supply needs would be satisfied to saturation development.

Tacoma Green River Second Supply Project

In November of 1999 the City along with the other participants of the Green River Second Supply project executed a declaration concurring with the final language and terms of the agreement necessary for implementing the project. (See Appendix B) At the time the last remaining significant issues per implementing the project were the issuance of the Incidental Take permit by the US National Marine and Fisheries Service and resolution of I-695 impact on utility rate adjustments. The Incidental Take permit is on tract to be issued some time this year (2000) while the I-695 issue may be resolved by this fall. As noted elsewhere the Department of Ecology (DOE) has recently taken issue with the water right recanting earlier commitments relating to the projects place of use and raising the possibility of imposing new conditions should a further extension be required. Such actions by DOE if followed through jeopardizes the implementation of the project. If this project is dropped because participants such as Tacoma no longer find it viable for them then Kent would be forced to declare a moratorium on all new water service request. Presently Kent is proceeding on the assumption that these issues will be resolved. To that end Kent and Covington Water District recently executed an Early Design agreement with Tacoma for the Green River Second Supply project (See Appendix B) The Early Design agreement allows Kent and/or Covington Water District to proceed with the design of the easterly segment of the pipeline portion of the Second Supply project. It also allows Kent and Covington Water District to proceed with the construction thereof should implementation of the Supply project get delayed. This easterly portion would enable Kent and Covington Water District to get interim water (5MGD each) from Tacoma to 2007 after which said supply would dwindle to 0 by 2012. Water via this interim source could be available by the fall of 2001. Should all the issues surrounding the Second Supply project get resolved then water would be available from it in 2005.
The Storage Impoundment Reservoir

The Storage Impoundment Reservoir denoted as part of this plan would be located northwest of the intersection of SE 304th Street and 124th Avenue SE in an upland area between the Green River Valley, about ¾ of a mile to the south and west and the Soos Creek Valley, about ½ mile to the southeast (Figure 10-1). The site itself is in a small northwest, southeast trending valley with an average surface elevation of 400 feet above sea level and formerly contained a small lake.

A geotechnical study of the site concluded that this is an excellent place for an impoundment storage reservoir, since the former existence of a lake indicated that seepage losses would be reasonably low. Ample quantities of site materials are suitable for construction of embankments, and recommendations regarding construction are included in the report of the study. Due to environmental constraints (wetlands) one configuration of the storage reservoir facility favored at this time is included in Figure 10-2. With a bottom elevation at 375 embankments will permit a water surface elevation up to elevation 450, enclosing a potential total capacity of 2,500 AF.

A hydrogeologic study of the site reveals two aquifers of limited extent, which are possibly connected. The site does not seem to offer sufficient yield of high quality water to warrant drilling production wells.

In 1983 the City purchased the site totaling approximately 157 acres.

One more important factor to be considered in building the Impoundment Storage Reservoir is the effect that the storage will have on the quality of water to be delivered to the consumer. Currently, the City only chlorinates and fluoridates the water because all sources are groundwater and all storage is covered, but State regulations require treatment of surface water supplies before distribution. The anticipated quality of the water in the storage impoundments has been studied. It is expected to be of high quality even before treatment.

Issues have been raised regarding contamination of the water while it is being stored in the reservoir. On-site sewage systems will be at least 100 feet away from the reservoir. Development of the area is expected to be single family residences on sewer lots. Further, the seepage from the unlined reservoir should form a mound of water beneath the reservoir. This should prevent any groundwater contamination from reaching the reservoir. Although it is true that the reservoir will be subject to effects of air pollution, such effects are minor. Furthermore, they are a regional problem that must be addressed on a regional basis. Wind effects causing erosion of the banks should be minimized by installation of riprap along the shore. Vandalism will be discouraged by a fence surrounding the site and by a security patrol, which will check the property periodically. Even if some contamination should occur from one of these sources, the filtration process should remove any offending elements.
A water treatment feasibility study commissioned by the City and reported in 1983, focused on the alternatives of gravity granular media filtration, pressure granular media filtration, and pressure diatomaceous earth filtration. It also considered alternative sites for the treatment facility. The recommended least cost alternative was a diatomaceous earth filtration facility located near Guiberson Street Reservoir to take advantage of the 112 foot hydraulic gradient elevation differential between the impoundment and this site. This could eliminate the need for pumping.

A literature survey done at the time on diatomaceous earth filtration of municipal water supplies confirmed the feasibility of using diatomaceous earth filtration in this situation. The water is low in turbidity, diatomaceous earth filters can be effective in high turbidity situations, but are especially effective in low turbidity waters. The finished water is consistently of high quality and the backwash water and solids are more manageable than are those of a granular media filtration plant. It is, however, recognized that the final selection of the treatment process will be predicated upon the results of further study.

One factor that might be a problem for a diatomaceous earth filtration plant is a high concentration of algae. Actually the filter would continue to produce high quality water in such a situation, but the pores would clog more quickly and the run would be shortened. The water quality study of the proposed impoundment reveals that the total phosphorus concentration in the impoundment should be no more than 10 micrograms per liter. Since phosphorus is the limiting nutrient and its level is relatively low, there should be no algal nuisance in the impoundment. The summer chlorophyll-a content should be about 2 micrograms per liter and transparency of the water should extend to about five meters. Thus, algae should not be a major problem, nor should they cause any problems for the filtration system.

Because the alignment of Tacoma's Green River Second Supply project is through the impoundment property, a supply therefrom is an ideal situation. Were the Green River Second Supply project to proceed as scheduled, implementation of this project could be deferred to 2011 when once again projected high peak day demand approach available supply. Lead time for this project is however 5 years or more. Therefore early action on same needs to be proposed particularly as environmental laws are getting more restrictive.

**East Hill Reservoir**

The Hydraulic modeling denoted that the City's East Hill system (590 pressure level) would experience low pressures along SE 248th St west of 116th Ave under saturated development water demands. The City recently purchased a site to construct a 5 million gallon stand pipe in the vicinity of 124th Ave and SE 248th St. Construction of the reservoir is reflected in the capital improvement program to be completed in 2004.
### Table 10-1
20 Year Capital Improvement Program ($1,000)

<table>
<thead>
<tr>
<th>IMPROVEMENT PROJECT</th>
<th>2000</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>2005</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>2010</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. East Hill Reservoir</td>
<td></td>
<td>1,050</td>
<td>1,300</td>
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<tr>
<td>2. Tacoma Green River Second Supply Project</td>
<td>750</td>
<td>8,200</td>
<td>1,487</td>
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<tr>
<td>3. Construct Impound Storage &amp; 7 MGD Treatment Facility</td>
<td>600</td>
<td>800</td>
<td>1,250</td>
<td>1,500</td>
<td></td>
<td>22,000</td>
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<td>4,000</td>
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<tr>
<td>4. Add 4 MGD Treatment</td>
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</tbody>
</table>
FIGURE 10-1
Existing Land Contours
Purpose of Financial Analysis

The purpose of this financial analysis is to evaluate the ability of the City of Kent to financially support necessary capital improvements identified in the Capital Improvement Plan. It also addresses rate and financing options for meeting those needs, including both capital and operating requirements. The various sources considered include outside low-interest loan/grant programs, bonds, rates and other charges.

Funding Options

The funding options available to the City for capital projects consist primarily of debt mechanisms or cash funding through various user charges. Historically, Federal and State grant programs were available for financial assistance, however, these have been mostly eliminated or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, the benefit of even low-interest loans makes the effort of applying worthwhile.

State Funding Programs

The state funding programs which are potentially applicable for the utility improvements currently envisioned are briefly summarized below,

- **Public Works Trust Fund** - The Public Works Trust Fund is a state revolving loan fund that assists local governments with low-interest loans for public works programs. The City could obtain assistance of up to $10 Million every two years (per project) from this source. The purpose of the loan must be for planning, design and construction of public works projects such as roads, domestic water, sanitary sewer, storm sewer, and capital planning. Eligible projects should not be growth-related, and the loan cannot cover rolling stock or routine maintenance and operating costs. Replacements and upgrades of the existing sewer system, including water treatment facilities would be eligible, even if done in conjunction with system expansion. The interest rate depends on the level of local contribution, which can come from cash or other borrowing sources. With a 30% contribution by the City, the PWTF will loan 70% of the project at a 1% interest rate. The maximum loan is 90%, at 3% interest.

- **Community Economic Revitalization Board** - Managed by the Department of Community Trade and Economic Development, this program provides grants and loans to fund public facilities that result in specific private sector development. Eligible projects include water, sewer, roads, and bridges. Funding varies...
• **Community Development Block Grant (CDGB) Program** – Also, administered by the State Department of Community Trade and Economic Development, the CDBG program provides grants and loans for infrastructure improvements (including water projects) for business development that create or retain jobs for low and moderate income residents.

• **Department of Ecology** – The department of Ecology Water Quality Financial Assistance Program sponsors three grant and loan programs: the Centennial Clean Water Fund, State Revolving Fund Loans, and the Aquatic Weeds Grant Programs. While most of the funding goes to wastewater programs, projects such as development and implementation of groundwater and wellhead protection programs are included. Funding is generally limited to 50% and comes in the form of either a grant or low interest loan (0% for up to 5 years, increasing to 4.8% for 15 to 20 years).  

• **Bonds** – Three types of long-term debt financing are available to the City. These include assessment bonds, general obligation bonds, and revenue bonds.

Assessment bonds are typically used to finance capital facilities that will benefit a discrete area. One-time assessments are assigned to properties based on the benefits that will accrue to them. Assessment bonds are secured by the properties assessed. Issuance costs are higher than other types of bonds because they require public notification to all property owners within the assessment area, public hearings, and usually costly engineering and legal expense associated with the assessment spread. A project like the proposed comprehensive improvement program does not lend itself to assessment bond financing because:

a. Issuance costs are high
b. Changes in use of properties cannot be reflected in assessments, which are fixed at the time of bond issue.

General obligation (G.O.) bonds can be repaid either with an ad valorem tax levy, or, if bond proceeds were used for utility facility construction, with system user charge revenue. These bonds are therefore secured by the full faith credit of the issuing agency, as well as system revenues. Consequently, interest costs are lower than for other types of debt financing, as much as 60 basis points (6/10 of 1 percent) below the yields which could be expected from revenue bonds.

Councilmanic G.O. bonds can be issued by authorization of the City Council, subject to the constraint that the current principal outstanding is limited to ¼ of 1 percent of the assessed value within the City's corporate limits.
Currently, the City committed to utilization of its councilmanic capacity to other types of municipal improvements.

In addition to councilmanic bonds, G.O. debt can be issued upon authorization by the City’s electorate. It is necessary to place the measure before the public for 60 percent ratification by those voting in the election. To achieve such a margin can be expensive in terms of public relations programs, plus the long time necessary to schedule the bond election. This latter point is particularly critical during inflationary periods in which project costs can rise substantially and more than offset the nominal savings that G.O. bonds can achieve through lower interest rates and reserve/coverage requirements.

Revenue bonds are serviced and secured by the revenues generated through utility operations. Advantages of revenue bonds include ease of authorization by the City Council without a bond election, no ad valorem tax security requirements, and the capacity to recover associated debt service costs from users in proportion to the benefits accorded thereto. Disadvantages include slightly higher interest costs, which can range up to 1 percent; and, in some cases, debt coverage requirements that may require the accumulation of revenues in excess of total annual expenditure needs as a guarantee to bond investors that the debt can be serviced adequately. Utility activities have traditionally been financed by revenue bonds.

- **Developer Extension** – In general, developers are required to finance mains connecting their developments with the existing water system. They are also required to meet specific on-site fire flow requirements and to provide hydrants and the associated connections to the water system, according to City Ordinance 2434. After construction and approval by the City, ownership of the mains is transferred to the City. In this way, many of the additional distribution mains required by the City will be financed by private developers.

Service requests outside the City limits follow the same developer extension requirement; plus, and in accordance with Council policy, they either annex or as determined by the Director of Public Works execute an annexation covenant.

- **Systems Development Charge** - Since 1981 the City has had a Systems Development Charge which applies to all applications for water service from the City of Kent. This systems development charge is in addition to the tap charge and any latecomers fee or charge in lieu of assessment that might be due. On November 16, 1999, Kent City Council in essence doubled the existing Systems Development Charge to assist in the financing of the Water Capital program denoted in Table 11-1. The Systems Development Charge is as follows.
$1,100 for each meter less than 1 inch in size
$1,958 for each meter 1 inch in size
$4,400 for each meter 1-1/2 inches in size
$7,822 for each meter 2 inches in size
$17,600 for each meter 3 inches in size
$31,284 for each meter 4 inches in size
$48,884 for each meter 5 inches in size
$70,400 for each meter 6 inches in size
$125,158 for each meter 8 inches in size
$195,558 for each meter 10 inches in size

11.1 Short-term Program

The estimated costs of proposed projects over the next five years are tabulated in Table 11-1. It is anticipated that these projects will be financed from a combination of new debt and cash generated from system operating revenues after maintenance and operation and debt service costs have been deducted. The anticipated revenues and operating expenses over the next five years are included in Table 11-2.

Based on same the existing rates as reflected in Table 11-3 are assumed to be adequate until 2006 or possibly longer.
Table 11-1
Water Capital Projects

<table>
<thead>
<tr>
<th>Project Description</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
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</thead>
<tbody>
<tr>
<td>Pump Station #3 (Replacement)</td>
<td>300,000</td>
<td></td>
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<tr>
<td>Water Reservoirs Seismic Upgrades</td>
<td>100,000</td>
<td></td>
<td></td>
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<tr>
<td>Impoundment Reservoir</td>
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<td></td>
</tr>
<tr>
<td>Miscellaneous Water Improvements</td>
<td>286,000</td>
<td>297,000</td>
<td>309,000</td>
<td>521,000</td>
<td>334,000</td>
<td>347,000</td>
</tr>
<tr>
<td>East Hill Reservoir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tacoma 2nd Supply Project</td>
<td>8,200,000 (1)</td>
<td>1,486,737 (1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Update Water Comp Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75,000</td>
</tr>
<tr>
<td>Citywide Automation Plan</td>
<td>500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endangered Species Act Study</td>
<td>200,000</td>
<td></td>
<td></td>
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<tr>
<td>Alternative Supplemental Supply</td>
<td>500,000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Corrosion Control</td>
<td>350,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump Station #5 Improvements</td>
<td>225,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design of M &amp; O Facility</td>
<td>400,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11,061,000</td>
<td>1,783,737</td>
<td>2,109,000</td>
<td>2,621,000</td>
<td>1,584,000</td>
<td>1,847,000</td>
</tr>
</tbody>
</table>

(1) City share of Tacoma 2nd supply project is estimated at $28,000,000. Approximately $11,000,000 in cash presently exists in a city project fund and the $9,686,737 shown here would come out of the same fund. The balance (approximately $18,000,000) will be via a new debt obligation which is identified in Table 11-2.
TABLE 11-2

<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Revenue:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>5,812,231</td>
<td>7,405,688</td>
<td>7,553,781</td>
<td>7,704,857</td>
<td>7,858,954</td>
<td>8,016,133</td>
<td>8,176,456</td>
<td>8,339,133</td>
<td>8,519,345</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>72,047</td>
<td>73,688</td>
<td>74,958</td>
<td>76,457</td>
<td>77,986</td>
<td>79,546</td>
<td>81,137</td>
<td>82,761</td>
<td>84,384</td>
</tr>
<tr>
<td><strong>Total Operating Revenue</strong></td>
<td>5,884,278</td>
<td>7,479,168</td>
<td>7,622,739</td>
<td>7,781,314</td>
<td>7,936,940</td>
<td>8,095,679</td>
<td>8,257,593</td>
<td>8,422,745</td>
<td>8,594,729</td>
</tr>
<tr>
<td><strong>Operating Expenses (incl depreciation)</strong></td>
<td>4,545,650</td>
<td>6,576,867</td>
<td>6,926,621</td>
<td>7,457,804</td>
<td>7,939,400</td>
<td>8,071,422</td>
<td>8,171,257</td>
<td>8,421,812</td>
<td>8,632,075</td>
</tr>
<tr>
<td><strong>Total Operating Income</strong></td>
<td>1,338,628</td>
<td>7,902,301</td>
<td>7,696,118</td>
<td>7,323,510</td>
<td>6,997,540</td>
<td>8,024,257</td>
<td>8,086,336</td>
<td>7,990,933</td>
<td>7,962,654</td>
</tr>
</tbody>
</table>

**Other Financial Sources**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Income</td>
<td>1,000,000</td>
<td>1,000,000</td>
<td>500,000</td>
<td>175,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>System Development Fees</td>
<td>324,953</td>
<td>640,924</td>
<td>653,742</td>
<td>666,817</td>
<td>680,153</td>
<td>693,756</td>
<td>707,531</td>
<td>712,784</td>
<td>718,037</td>
</tr>
<tr>
<td>Connection Charges</td>
<td>40,000</td>
<td>40,800</td>
<td>41,616</td>
<td>42,448</td>
<td>43,297</td>
<td>44,163</td>
<td>45,046</td>
<td>45,947</td>
<td>46,858</td>
</tr>
<tr>
<td>Charge In Lieu of Assessment</td>
<td>15,000</td>
<td>15,300</td>
<td>15,806</td>
<td>16,326</td>
<td>16,561</td>
<td>16,892</td>
<td>17,230</td>
<td>17,500</td>
<td>17,770</td>
</tr>
<tr>
<td>Proceeds from Long-Term Debt</td>
<td>324,953</td>
<td>640,924</td>
<td>653,742</td>
<td>666,817</td>
<td>680,153</td>
<td>693,756</td>
<td>707,531</td>
<td>712,784</td>
<td>718,037</td>
</tr>
</tbody>
</table>

**Other Financial Uses**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SRF Loan 1986 &amp; 1989</td>
<td>26,873</td>
<td>26,223</td>
<td>25,573</td>
<td>24,923</td>
<td>24,272</td>
<td>23,622</td>
<td>22,972</td>
<td>22,322</td>
<td>21,672</td>
</tr>
<tr>
<td>Bond Issue</td>
<td>1,272,680</td>
<td>1,264,015</td>
<td>1,267,615</td>
<td>1,280,265</td>
<td>1,293,917</td>
<td>1,307,669</td>
<td>1,321,421</td>
<td>1,335,173</td>
<td>1,348,925</td>
</tr>
<tr>
<td>Tacoma Pipeline Debt</td>
<td>459,467</td>
<td>719,467</td>
<td>1,258,423</td>
<td>1,297,917</td>
<td>1,338,340</td>
<td>1,378,761</td>
<td>1,419,182</td>
<td>1,459,603</td>
<td>1,499,025</td>
</tr>
<tr>
<td>Capital Projects</td>
<td>2,537,000</td>
<td>2,961,000</td>
<td>2,970,000</td>
<td>2,980,000</td>
<td>2,990,000</td>
<td>3,000,000</td>
<td>3,010,000</td>
<td>3,020,000</td>
<td>3,030,000</td>
</tr>
<tr>
<td>Unreserved</td>
<td>4,094,523</td>
<td>2,517,725</td>
<td>2,476,096</td>
<td>3,955,236</td>
<td>3,514,193</td>
<td>1,671,149</td>
<td>1,404,972</td>
<td>836,582</td>
<td>503,468</td>
</tr>
<tr>
<td>Reserved</td>
<td>1,243,813</td>
<td>1,235,345</td>
<td>1,239,058</td>
<td>1,242,869</td>
<td>1,246,681</td>
<td>1,250,493</td>
<td>1,254,305</td>
<td>1,258,217</td>
<td>1,262,129</td>
</tr>
<tr>
<td>Total Ending Working Capital</td>
<td>5,338,336</td>
<td>3,753,070</td>
<td>3,715,156</td>
<td>5,166,095</td>
<td>3,768,332</td>
<td>2,172,314</td>
<td>1,542,372</td>
<td>1,019,782</td>
<td>732,468</td>
</tr>
</tbody>
</table>
### TABLE 11-3
EXISTING USER CHARGES

**EFFECTIVE DATE 12/31/00**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>EXISTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly service charge to all users</td>
<td></td>
</tr>
<tr>
<td>Meter size, inches (a,b)</td>
<td></td>
</tr>
<tr>
<td>5/8 and ¾</td>
<td>$2.20</td>
</tr>
<tr>
<td>1</td>
<td>$2.45</td>
</tr>
<tr>
<td>1 ½</td>
<td>$3.30</td>
</tr>
<tr>
<td>2</td>
<td>$4.00</td>
</tr>
<tr>
<td>3</td>
<td>$13.95</td>
</tr>
<tr>
<td>4</td>
<td>$16.80</td>
</tr>
<tr>
<td>6</td>
<td>$28.10</td>
</tr>
<tr>
<td>8</td>
<td>$37.59</td>
</tr>
</tbody>
</table>

**Commodity charge, $/ccf**

<table>
<thead>
<tr>
<th>City retail</th>
<th>Winter</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside (a)</td>
<td>$1.24 for 1st 7ccf</td>
<td>$1.64 for 1st 7ccf</td>
</tr>
<tr>
<td></td>
<td>Plus $1.69 thereafter</td>
<td>Plus $2.09 thereafter</td>
</tr>
<tr>
<td>Outside</td>
<td>$1.64 for 1st 7ccf</td>
<td>$2.00 for 1st 7ccf</td>
</tr>
<tr>
<td></td>
<td>Plus $2.09 thereafter</td>
<td>Plus $2.46 thereafter</td>
</tr>
</tbody>
</table>

(a) Does include utility tax of 4.8 percent for inside-city users
(b) Includes no water use
WATER FACILITIES INVENTORY (WFI)

Read Instructions on back before completing

<table>
<thead>
<tr>
<th>ITEM ID NO</th>
<th>2 COUNTY</th>
<th>GROUP</th>
<th>TYPE</th>
<th>WRIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 SYSTEM NAME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADDITIONAL ROUTING INFO

MAILING ADDRESS

CITY | STATE | ZIP CODE

OWNER'S NAME (LAST, FIRST) | OWNER NO

ADDITIONAL ROUTING INFO

MAILING ADDRESS

CITY | STATE | ZIP CODE

SYSTEM CONTACT PERSON | TITLE

DAY TELEPHONE | EVENING TELEPHONE

SYSTEMS SERVING ANY RESIDENTS (PEOPLE LIVING IN A DWELLING SERVED BY THE SYSTEM), COMPLETE THIS SECTION

9 NUMBER ACTIVE RESIDENTIAL CONNECTIONS | 16 NUMBER ACTIVE RESIDENTIAL POPULATION

SYSTEMS SERVING ANY NON-RESIDENTS (I.E., TRAVELERS, EMPLOYEES, STUDENTS, ETC.), COMPLETE THIS SECTION

11 NUMBER NON-RESIDENTIAL CONNECTIONS

12 ENTER AVERAGE DAILY NON-RESIDENTIAL POPULATION SERVED FOR EACH MONTH MAKE ENTRY FOR EACH MONTH

13 DOES THE SYSTEM SERVE AT LEAST 25 OF THE SAME NON-RESIDENTS FOR 4 OR MORE DAYS PER WEEK FOR AT LEAST 150 DAYS PER YEAR?

14 TOTAL NUMBER CONNECTIONS METERED | 15 DISTRIBUTION RESERVOIR(S) TOTAL CAPACITY

GALLONS

16. DOH SOURCE NUMBER | 17. SOURCE NAME


25. MINIMUM REQUIRED BACTERIOLOGICAL SAMPLING SCHEDULE

26. APPROVED SERVICES (PER PLANS) | DATE OF LAST SANITARY SURVEY

27. EFFECTIVE DATE RETRO CHANGES | SIGNATURE OF DOH REVIEWER

WATER SYSTEM
JOINT DECLARATION OF THE
THE CITY OF TACOMA
DEPARTMENT OF PUBLIC UTILITIES, WATER DIVISION
THE CITY OF KENT
COVINGTON WATER DISTRICT
LAKEHAVEN UTILITY DISTRICT
AND
THE CITY OF SEATTLE
SEATTLE PUBLIC UTILITIES

The undersigned parties have been engaged for some time in the negotiation of an agreement that would provide for the design, financing, construction and operation of the proposed Second Supply Project.

The undersigned parties have committed substantial resources to this effort because of the substantial environmental, conservation, recreational, fish, water supply and reliability benefits that the Second Supply Project will make available to areas of Pierce and King Counties, and the degree to which it will foster regional cooperation on a wide array of water related issues.

The undersigned utilities have, after careful examination and due consideration, concluded that the attached Project Agreement is a full and complete agreement and, with the exception of editorial corrections, is ready for submission to and consideration by their respective governing bodies substantially in the form as attached hereto.

Dated the 3rd day of November, 1999

City of Tacoma
Department of Public Utilities
Water Division

City of Kent
Lakehaven Utility District

City of Seattle
Seattle Public Utilities

Covington Water District

11-3-97
11:20 AM
DESIGN AGREEMENT BETWEEN THE CITY OF TACOMA, CITY OF KENT AND THE COVINGTON WATER DISTRICT

This Design Agreement (Agreement), dated this 28th day of June, 2000, by and between the City of Tacoma, Department of Public Utilities, Water Division, (Tacoma) a municipality, the City of Kent, (Kent) a municipality, and the Covington Water District (Covington or CWD), a special purpose district, all of which are organized under the laws of the State of Washington, sometimes referred to herein individually as "Party", and collectively as "Parties", to become effective on the Effective Date (as defined herein).

WHEREAS, Tacoma has an interest in seeing progress with the Second Supply Project to meet the water supply needs of those participating in the Second Supply Project, and

WHEREAS, Kent and Covington have a current and future need for additional water supply capacity to provide adequate and reliable service to its present and future water customers, and

WHEREAS, design and permitting of the facilities described in this Agreement, hereinafter defined as the Kent/Covington Section of the Second Supply Pipeline (Project), will expedite the additional water supply and capacity needed by Kent and Covington in a timely and cost-effective manner, and

WHEREAS, Tacoma, Kent and Covington are participants in the Second Supply Project, which project is intended to secure a long term water supply for the participants, and

WHEREAS, the Kent/Covington Section of the Second Supply Pipeline will be capable of being integrated into the Second Supply Project when the full project is constructed, and

WHEREAS, the possible "early design/build" of this section of the Second Supply Pipeline was contemplated in the Conceptual Agreement Between Participating South King County Regional Water Association Member Utilities and Tacoma Public Utilities, Water Division dated February 25, 1998, and

WHEREAS, design of the Kent Covington Section of the Second Supply Pipeline will address immediate water supply needs of Kent and Covington, while being complimentary to the long term water supply plans of both.
NOW, THEREFORE, in consideration of the mutual covenants and premises contained herein, and for other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the Parties hereto agree as follows.

1 Defined Terms

1.1 For purposes of this Agreement, when used with initial capitalization the terms set out below are defined as follows:

1.1.1 “Design Budget” means the budget for the design and permitting of the Project established pursuant to section 6.

1.1.2 “Due Date” means the date upon which payment of any invoice issued pursuant to section 9 is due.

1.1.3 “Effective Date” means the date upon which this Agreement becomes effective and shall be the date entered in the preamble to this Agreement after signatures to this Agreement are completed.

1.1.4 “First Diversion Water Right” means the legal right (claim) for Tacoma to divert, extract and use for water supply purposes water from the Green River currently supplying Pipeline No 1 (up to 113 cfs).

1.1.5 “Interest Payment” means the product of the payment due to a Party to resolve a payment dispute and one-twelfth of the Interest Rate for each month for which interest is to be calculated pursuant to section 9.7. Daily interest rate is the Interest Rate divided by 365.

1.1.6 “Interest Rate” means the prime interest rate as established from time to time by the Bank of America, stated as an annual percentage rate, which was 9% as of May 15, 2000.

1.1.7 “Kent/Covington Meter” means the meter installed as part of Project construction to measure the amounts of water delivered to Kent and Covington pursuant to this Agreement.

1.1.8 “Point(s) of Diversion” means the location(s) at which the water is delivered by Tacoma to Kent and Covington pursuant to this Agreement.

1.1.9 “Preliminary Budget” means the budget for the permitting and design of the Project as set forth in Exhibit D.
1110 "Preliminary Project Schedule" means the schedule for the permitting and design of the Project as set forth in Exhibit D

1111 "Project" or "Kent/Covington Section of the Second Supply Pipeline" or means approximately 9.2 miles of new 72 inch and 60 inch water supply pipeline, that will stretch from Tacoma’s Pipeline No. 1, approximately 9000 feet downstream of Tacoma’s Green River Headworks Control Building, to the intersection of SE 304th Street and 224th Avenue SE (Lake Sawyer Road).

1112 "Project Schedule" means the schedule for the construction of the Project established pursuant to section 7.

1113 "Prudent Utility Practice" means at any particular time, the generally accepted practices, methods and acts in the municipal water supply industry that would achieve the desired result consistent with reliability, safety and economy or if there are no such practices, methods or acts, then in that event the practices, methods and acts which, in the exercise of reasonable judgment in light of facts known at the time the decision was made, could have been reasonably expected to achieve the desired result consistent with reliability, safety and economy.

1114 "Second Diversion Water Right" means the legal right obtained in 1986 for Tacoma to divert, extract and use for water supply purposes water from the Green River (up to 100 cfs).

1115 "Second Supply Project" means a proposed water pipeline (Second Supply Pipeline) extending from the current Tacoma Headworks Control Building on the Green River to Pipeline No. 4 near Tacoma’s Portland Avenue reservoir and including the Second Diversion Water Right, a share of the improvements to Tacoma’s Headworks, the North Branch of the Second Supply Pipeline, certain Tacoma mitigation agreements, and the Howard Hanson Dam additional storage project.

1116 "Term" means the duration of this Agreement as established pursuant to section 3.

1117 "Uncontrollable Force" means an act or event beyond the control of a Party and which by the exercise of reasonable due diligence and reasonable foresight such Party could not have reasonably been expected to avoid or remove which renders the Party unable to
perform, including but not limited to flood, earthquake, storm, accident, fire, lightning and other natural catastrophes, epidemic war, strike or labor dispute, change in federal, state or local law, restraint by order of any court, regulatory authority which a good faith effort on the part of the appropriate Party is unable to remove or vacate, or any other cause reasonably beyond the control of the Party affected thereby.

1118 “Useful Life” means the period during which the Project can be safely, prudently and economically utilized for the purposes for which it was intended.

2 Exhibits

2.1 The following exhibits, which are attached hereto, are incorporated into this Agreement by reference as if fully set forth herein.

2.1.1 Exhibit A-Project Specifications

2.1.2 Exhibit B-Project Map

2.1.3 Exhibit C-Project Quality Assurance Reviews

2.1.4 Exhibit D-Preliminary Project Schedule

2.1.5 Exhibit E-Preliminary Budget

2.1.6 Exhibits F through P - intentionally left blank

2.1.7 Exhibit Q-Special Provisions for CWD and Kent

3 Term

3.1 This Agreement shall take effect on the Effective Date, and shall continue in full force and effect until the earlier of

3.1.1 The date the Project is integrated into and becomes a part of the Second Supply Project

3.1.2 The date the Parties agree that the Project has reached the end of its useful life

3.2 All obligations incurred during the Term shall survive the expiration or termination of this Agreement until they are satisfied.
Nature of the Project

By this Agreement, Kent and Covington are authorizing Tacoma to proceed with design and permitting of the Project.

It is anticipated that the full Second Supply Project will receive authorization to proceed in 2000. However, if the full project does not proceed, Kent and Covington may give written notice to proceed with construction of the Project in accordance with Exhibit Q.

The Project shall be designed so that it can be integrated into the Second Supply Project. To that end, the pipeline shall be designed in the right-of-way for and in the alignment of the Second Supply Project.

The Project shall be designed in a manner consistent with the Project specifications set forth in Exhibit A. As consideration for Kent and Covington's acquisition, pursuant to this Agreement, of water capacity rights to be provided by the facilities comprising the Project and the Second Supply Project, Kent and Covington shall be responsible for paying all of the costs incurred by Tacoma to design the Project pursuant to the terms and conditions of this Agreement. Ownership of the Project shall be vested in and remain with Tacoma. Kent and Covington shall own water capacity rights.

Tacoma hereby waives and agrees not to assess against Kent and Covington a system development charge in conjunction with the Project pursuant to this Agreement.

Tacoma shall be responsible for the design of the Project pursuant to the terms and conditions of this Agreement. Tacoma shall discharge such responsibilities in a professional and workmanlike manner, and consistent with Prudent Utility Practice for a project of this nature. In so doing, Tacoma may use members of its professional staff, employ contractors, and consultants as may be reasonably necessary.

Tacoma shall be responsible for obtaining, and for keeping in full force and effect during the Term, all permits, licenses, authorizations and regulatory approvals necessary to design, construct, operate and maintain the Project.

Quality Assurance and Quality Control

June 21, 2000
Tacoma shall undertake the design of the Project in accordance with the quality assurance and quality control program set forth in Exhibit C.

6 Initiation of Project Design

6.1 Upon the execution of this Agreement, Tacoma shall promptly initiate the design needed to commence construction of the Project. Such design shall be accomplished in a manner consistent with the terms and conditions of this Agreement.

6.2 Tacoma shall take all commercially reasonable actions to complete the permitting and design of the Project in an expeditious manner as defined by the Preliminary Project Schedule (Exhibit D) and Preliminary Budget (Exhibit E).

6.3 Upon the completion of Project design, Tacoma shall send written notification to Kent and Covington that Project design has been completed, and that the Project is ready to be bid and constructed.

7 Initiation of Project Construction

7.1 The Project construction will likely proceed as the first phase of work in 2001 under the full Second Supply Project authorization. An updated Budget and Schedule for the Second Supply Project will be developed when the project receives full approval by the project participants to proceed.

7.2 Construction of the Kent/Covington Section of the Second Supply Pipeline may proceed in accordance with Exhibit Q if the full Second Supply Project does not proceed. In such event, a separate Project Budget and Schedule will be developed for this section of pipeline.

8 Oversight of Project Design

8.1 During the course of the permitting and design activities described in section 6, members of the Tacoma Project team shall meet with the Kent and Covington personnel (including consultants, if needed) as frequently as necessary to keep Kent and Covington fully informed regarding the progress on the permitting and design of the Project, but in any event no less frequently than once every other month. At such meetings, Tacoma shall report to Kent and Covington all significant design activities completed since the prior meeting, all permitting and design activities expected to be completed by the next meeting, the percentage of the
relevant budget expended to date, the permitting and design activities completed to date relative to the relevant schedule, and any other developments that should be brought to the attention of Kent and Covington to keep them fully advised regarding the Project.

8.2 Tacoma shall make available to Kent and Covington any and all information, documents, plans and correspondence regarding the permitting and design of the Project that may be reasonably requested by Kent and Covington. Kent and Covington shall have access during normal business hours to any and all information, documents, plans and correspondence regarding the permitting and design of the Project, and to the Project site.

8.3 At all meetings held pursuant to subsection 8.1, Tacoma shall solicit from Kent and Covington advice regarding the permitting and design of the Project, and Kent and Covington shall provide Tacoma advice on such topics, which advice shall be consistent with the terms and conditions of this Agreement, and with the objective of completing the Project in a manner consistent with the Project Schedule and Design Budget.

8.4 Tacoma shall take into account and incorporate in the Project design the advice so provided by Kent and Covington, if and to the extent Tacoma determines that such action to be reasonable and appropriate.

8.5 Kent and Covington will have the right to approve the consultant's scope of work, schedule and budget under which Kent and Covington will be billed, and such approvals will not be unreasonably withheld.

8.6 The Project Schedule and Design Budget shall only be revised by the agreement of the Parties.

9 Billings and Payment for Project Design and Permitting

9.1 During any period when all or any portion of the Project is being permitted or designed or during any period when the costs of such permitting and design remain outstanding or in litigation, Tacoma shall cause all consultants who seek payment for activities or material related to the Project to forward to Kent and Covington and Tacoma on or before the first or third Thursday of each month an invoice. Such invoice shall set forth the amount of payment claimed, the activity, service or material provided, whether the payment is a change order and the contract under which payment is sought. In addition, Tacoma may forward to Kent and Covington a separate invoice for costs associated
with the Project, including but not limited to costs of Tacoma’s professional staff, associated overheads and any taxes, which Tacoma has incurred during the preceding calendar month or months for the permitting and design of the Project.

9.2 Kent and Covington may request from Tacoma, and Tacoma shall promptly provide to Kent and Covington, any documentation or other information that Kent and Covington may reasonably request to understand the nature of the costs contained on any invoice issued pursuant to subsection 9.1.

9.3 Tacoma shall review all invoices issued pursuant to section 9.1, and shall advise Kent and Covington by the first Monday after the invoice is received if, in Tacoma’s judgment, the invoice is properly due and payable.

9.4 Upon receipt of the notification from Tacoma pursuant to subsection 9.3, payment of invoices forwarded to Kent and Covington by any consultant, or by Tacoma shall be due and payable by Kent and Covington to the party issuing the invoice by check or by wire transfer to the bank and account designated by such party not later than the close of business on the second Monday after the invoice is received (Due Date).

9.5 If payment of any invoice is not received by the party that issued the invoice on or before the Due Date, such payment shall be considered past due, and the amount of such invoice shall accrue a late payment charge for each day that the invoice remains unpaid equal to the product of the amount of the invoice and the daily interest rate pursuant to section 11.6. Such charge shall continue to accumulate until the unpaid invoice and all late payment charges are paid in full to the party that issued the invoice.

9.6 If Kent and Covington dispute all or any portion of an invoice issued by Tacoma pursuant to this section 9, Kent and Covington shall pay such invoice in full pursuant to this section 9, and shall indicate in writing to Tacoma the portions of the invoice that Kent and Covington dispute and the reasons therefore. The Parties shall make a good faith effort to resolve such dispute. If such efforts are unsuccessful, either Party may seek resolution of the dispute pursuant to section 20.

9.7 If the resolution of any dispute over an invoice, whether through Agreement of the Parties or by dispute resolution pursuant to section 20, results in the payment of money from Tacoma to Kent and Covington, such payment shall include an Interest Payment for the period.
commencing with the date the disputed invoice was paid, and ending on
the date the payment resolving the dispute is made to Kent and
Covington

10 Audits of Design Invoices

10.1 Kent and Covington shall have the right to audit any invoices issued to
Kent and Covington pursuant to section 9, provided that such audit is
conducted not later than the third anniversary of the date the invoice
was issued.

10.2 During normal business hours, Tacoma shall make available to Kent and
Covington any and all documents and information related to any invoice
issued pursuant to this Agreement reasonably requested by Kent and
Covington in the course of conducting any audit.

10.3 Based upon the results of any audit conducted pursuant to this section
10, Kent and Covington may dispute amounts paid pursuant to any
invoice on or before the third anniversary of the date the invoice was
issued. Kent and Covington shall provide Tacoma a written report
setting forth the invoice or invoices that are disputed, the amount of
payment or payments disputed, and the reasons therefore. The parties
shall make a good faith effort to resolve such dispute. If such efforts are
unsuccessful, either party may seek resolution of the dispute pursuant to
section 20.

10.4 If resolution of any such dispute, whether by agreement of the Parties or
by dispute resolution pursuant to section 20, results in payment of money
from one Party to the other Party, such payment shall include an Interest
Payment for the period commencing with the date the payment was
made or should have been made, and ending on the date the payment
ending the dispute is made.

11 Construction or Termination of the Second Supply Project

11.1 The Parties anticipate that the Project will be integrated into the Second
Supply Project. If and when that occurs, the payments made by Kent
and Covington for the costs of permitting and designing the Project
pursuant to this Agreement shall be credited against the payment
obligation of Kent and Covington for the costs of permitting, designing
and constructing the Second Supply Project. Interest on such payments
made by Kent and Covington will only be included in the credit if and to
the extent that the credit for payments made by Tacoma on the Second
Supply Project include interest.
12 Notices

12.1 Any notice required or permitted to be given under or pursuant to this Agreement shall be in writing and shall be delivered to the other Party at its address set forth below either (i) in person, (ii) by overnight delivery service, (iii) by first class mail, postage prepaid, or (iv) by facsimile equipment providing confirmation of the completed transmission, if a copy of such facsimile transmission is immediately sent by one of the alternative means set forth in (i), (ii) or (iii) above. Notices shall be effective upon receipt.

If to Kent
Public Works Director
City of Kent
220 4th Avenue So.
Kent, WA 98032-5895

If to Covington
General Manager
Covington Water District
18631 S E 300th Place
Kent, WA 98042

If to Tacoma
Superintendent
Tacoma Water
P O. Box 11007
Tacoma, WA 98411
3628 South 35th Street
Tacoma, WA 98409

12.2 Either Party may change the address to which notices shall be sent by giving notice of such change in accordance with subsection 12.1

13 Uncontrollable Force

13.1 A Party shall not be in breach of this Agreement as a result of such Party’s failure to perform its obligations under this Agreement when such failure is due to an Uncontrollable Force, to the extent that such Party, despite the exercise of due diligence, is unable to remove such Uncontrollable Force. Nothing in this Agreement shall be construed to require either Party to prevent or settle any strike or labor dispute in order to obtain relief under this section 13

13.2 Each Party shall notify the other as soon as practicable of any Uncontrollable Force that may impair performance under this
Agreement. Neither Party shall be denied relief from its obligations under this section 13 because of a failure to give notice within a reasonable period except to the extent that such failure increases the losses of the other Party.

13.3 This section 13 shall not relieve any Party from the obligation to pay money when due under the terms of this Agreement.

14 Assignment

Neither Party may assign this Agreement, or all or any part of such Party’s rights or obligations under this Agreement, without the prior written consent of the other Party, which consent shall not be unreasonably withheld. This Agreement shall be binding upon and shall inure to the benefit of the Parties hereto, their successors and permitted assigns.

15 Waivers

Except as otherwise provided herein or as agreed to by the Parties, no provision of this Agreement may be waived except as documented or confirmed in writing. Any waiver at any time by a Party of its rights with respect to a default under this Agreement or with any other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter. Either Party may waive any notice or agree to accept a shorter notice than specified in this Agreement. Such waiver of notice or acceptance of shorter notice by a Party at any time regarding a notice shall not be considered a waiver with respect to any subsequent notice required under this Agreement.

16 Invalid Provision

The invalidity or unenforceability of any provision of this Agreement shall not affect the other provisions hereof, and this Agreement shall be construed in all respects as if such invalid or unenforceable provisions were omitted.

17 Amendment

No change, amendment or modification of any provision of this Agreement shall be valid unless set forth in a written amendment to this Agreement signed by the Parties.

18 Entire Agreement and Interpretation

June 27, 2000
18.1 This Agreement sets forth the entire agreement of the Parties, and supersedes any and all prior agreements with respect to the subject matter of this Agreement. The rights and obligations of the Parties hereunder shall be subject and governed by this Agreement. The headings used herein are for convenience of reference only and shall not affect the meaning or interpretation of this Agreement.

18.2 This Agreement has been jointly drafted by the Parties, and is not to be interpreted or construed against any Party as the drafter of this Agreement.

19 Independent Contractors

19.1 Except as expressly provided in this Agreement, no Party shall be obligated or liable for any obligation or liability of another Party, and no Party shall have, by virtue of this Agreement, any right, power or authority to incur any obligation or liability of, to act as the agent or representative of, or to otherwise bind another Party.

19.2 The Parties hereto are independent entities and shall not be deemed to be partners or joint-venturers or agents of each other for any purpose whatsoever.

20 Dispute Resolution

20.1 Except as otherwise provided in this Agreement, any and all disputes arising under this Agreement shall be resolved by binding arbitration pursuant to this section.

20.2 The Parties shall make good faith efforts to resolve by informal discussion any dispute arising under or in connection with this Agreement. If at any time a Party to a dispute determines that such informal discussions will not result in a resolution, such Party may initiate binding arbitration of any dispute arising under or in connection with this Agreement. Any such arbitration shall be conducted pursuant to the rules for commercial arbitration of the American Arbitration Association or the rules of such other non-judicial dispute resolution service as agreed to by the Parties to the dispute. In any such arbitration proceeding, the Parties to such dispute shall have the rights of discovery available to parties in civil litigation under the Federal Rules of Civil Procedure.

20.3 The award of the arbitrators shall be final, and may be enforced in any manner available under the laws of the jurisdiction in which such arbitration proceeding is held.
court having jurisdiction. In making any such award, the arbitrators shall have the authority to grant such relief as they deem appropriate, including without limitation the award of damages and the granting of specific performance.

20.4 Pending the decision in any binding arbitration process pursuant to this section 20, the Parties to such process shall continue to fulfill their respective duties under this Design Agreement.

21. Indemnification

Each Party hereto agrees to hold harmless, indemnify and defend the other respective Party, its officers, employees and agents from any and all claims for monetary damages due to physical injuries, including without limitation death and property damages, when such claim arises from or the damages is alleged to have been caused by or related to this Agreement, except that said indemnity shall not extend to the gross negligence or willful misconduct of a Party, or its officers, employees or agents.

22. Third Party Beneficiaries

22.1 Except as specifically provided in subsection 22.2, none of the provisions of this Agreement shall inure to the benefit of or be enforceable by any third party.

22.2 The Parties intend that the parties to the Second Supply Project Agreement shall have the same rights as those granted to Kent and Covington pursuant to section 8.

23. Duty of Good Faith

The Parties agree that in taking actions or making determinations required or provided for under this Agreement, each shall act with fairness and in good faith.

24. Execution in Counterparts

This Agreement may be executed in three counterparts, any of which shall be regarded for all purposes as one original. The Parties agree to execute any and all deeds, instruments, documents and resolutions necessary to give effect to the terms of this Agreement.

25. Signature Clause

June 17, 2000
Each of the undersigned signatories represents and warrants that he has all necessary and proper authorization to execute and deliver this Agreement on behalf of the Party on the behalf of which he is signing.
COVINGTON WATER DISTRICT

By Eys Hornsby, President Board of Commissioners

By David R. Knight, Secretary Board of Commissioners

By Judith L. Nelson General Manager

Approved as to Form

By K. C. Cayce General Counsel

CITY OF TACOMA

By Mark Crisson Director of Utilities

By Kenneth J. Merry Water Superintendent

Approved as to Form

By Mark Bubenik Chief Assistant City Attorney

CITY OF KENT

By Jim White Mayor

By Don Wickstrom Public Works Director

Approved as to Form

By Roger Lubovich City Attorney

June 27, 2000
Project Specifications

- **Pipeline Material Specifications:** The pipe and appurtenance materials will be as determined earlier in the preliminary design for the Second Supply Project. The pipe will be of spiral welded steel with coal tar enamel on the exterior and polyurethane lining in the interior. The pipeline involves approximately 4.2 miles of 60” diameter and 5.0 miles of 72” diameter pipe. The pipeline will be buried except for the bridged crossing over the Green River. The short connection from Pipeline No. 1 to this pipeline is expected to be 24” diameter. The pipe and appurtenances will be provided in accordance with AWWA Standards and Tacoma’s standard technical specifications. The design life of the pipeline is expected to be over 100 years.

- **Pipeline Route:** The pipeline connects to Tacoma’s Pipeline No. 1 approximately 9000 feet downstream of Tacoma’s Headworks Control Building. The pipeline continues westerly in the Second Supply Pipeline right of way consisting of an old railroad right of way, undeveloped land, crossings of private, City of Black Diamond and King County roads, along the John Henry Coal Mine, through a gravel mine and along acquired easements along Lake Sawyer Road. This section of the pipeline will end at the intersection of SE 304th Street and Lake Sawyer Road. See attached map- Exhibit B.

- **Metering and Telemetry:** A connection with meter and associated telemetry at the end of the pipeline will be designed later, if needed. If the full Second Supply Project proceeds, the metered connections will be at other designated locations.
KENT/COVINGTON SECTION OF
THE SECOND SUPPLY PIPELINE

EXHIBIT B
Project Quality Assurance Procedures

Conceptual design developed by Tacoma, other Project participants, and consultant design leads/experts

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<td>HDR Design/Tech Memos</td>
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<tr>
<td>MW Design/Tech Memos</td>
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<tr>
<td>CH2M QA/QC</td>
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<tr>
<td>HDR QA/QC</td>
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<tr>
<td>TRC Review</td>
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<td>Sr. CH2M, HDR, MW &amp; Tupac experts (4)</td>
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<td>ISSP Partner Workshop</td>
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<td>Review @ concept &amp; 20%</td>
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<td>CH2M Proj Mgr Review</td>
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<td>Tacoma/Partner Review</td>
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<tr>
<td>Contractor Review</td>
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4/17/00

Exhibit C
# Preliminary Budget

**Summary of Estimated Tacoma and Consultant Costs for Design and Permitting of the Kent/Covington Section of the Second Supply Pipeline**

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<thead>
<tr>
<th>Costs</th>
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<td>Consultant Costs</td>
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<td><strong>Total Estimate</strong></td>
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### Preliminary Budget

#### Tacoma Costs:

Estimated Tacoma Water (In-house) design/administration costs for the Kent/Covington Section* of the Second Supply Pipeline

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<td><strong>TOTAL</strong></td>
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*PL#1 to SE 304th St & Lake Sawyer Road with Tacoma designing the section from SR169 to SE 304th St

**Clearing by contractor sufficient for surveying (20' wide strip)
### Consultant Budget for Final Design-
#### Kent/Covington Section

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<tr>
<th>Task</th>
<th>Task Name</th>
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<th>Expenses</th>
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<th>Expenses</th>
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**TOTALS**

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<td>$1,609,000</td>
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*6/27/00*  
*Page 3 of 3*
The Covington Water District (Covington) and the City of Kent (Kent) have a mutual need to receive deliveries of firm water from the Second Supply Project (Project) at the earliest date possible. To achieve this objective, Covington and/or Kent desire to complete the design, permitting and construction of the upper portion of the Project pipeline without further delay. The upper portion is located beginning from a point approximately 9000 feet west of the Headworks Control Building to S.E. 304th Street.

Covington and/or Kent will enter into an agreement with Tacoma for the design and permitting of full Project capacity in this upper portion of the Project pipeline. It is expected that this agreement will be approved in June 2000, at which time the design team led by CH2M/Hill will immediately proceed with this work with an estimated completion date of March 2001. Covington and/or Kent will pay for the cost of this design work and contract management will be done by Tacoma. All costs associated with this work will be considered reimbursable costs to be shared by Project partners in accordance with the Second Supply Project Agreement.

During the remainder of the year 2000 and while the design work described above is proceeding, Tacoma expects to receive an Incidental Take Permit from the U.S. Fish & Wildlife Service and the National Marine Fisheries Service pursuant to its Green River Habitat Conservation Plan. Also, Tacoma plans to finalize and approve the Second Supply Project Agreement with Project partners, finalize the financing plan for the Project, and seek final approval from the Tacoma Public Utility Board and Tacoma City Council to proceed with completion of the Project. It is anticipated that the timing of these events will be such that transition from design to construction of the portion of the project most critical to Covington and Kent can proceed smoothly.

An assessment of progress on the Tacoma efforts described immediately above will be made periodically during the design period. If it becomes evident at some point that approval to proceed with the full Project will likely be delayed, Covington and/or Kent may initiate construction of the upper portion of the Project pipeline through a written request to Tacoma. The upper portion will be sized to provide full Project capacity. The costs of this construction will be paid by Covington and/or Kent with all funds expended to be credited to their obligation of the full Project costs.
If a decision is made by Covington and/or Kent prior to the end of 2002 to construct the upper portion of the Project pipeline, Tacoma will commit to provide water to Kent and/or Covington as described below. Upon completion of construction, Tacoma will provide firm supplies to Covington and Kent of up to 10 MGD (5 MGD each) during the summer months (June 15th to September 15th) until 2007 unless proportionately reduced by drought or emergency conditions. After 2007, the amount will reduce by 2 MGD (1 MGD each) each year as so:

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply</th>
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<tbody>
<tr>
<td>2007</td>
<td>10 MGD</td>
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<tr>
<td>2008</td>
<td>8 MGD</td>
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<td>2009</td>
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<tr>
<td>2010</td>
<td>4 MGD</td>
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<tr>
<td>2011</td>
<td>2 MGD</td>
</tr>
<tr>
<td>2012</td>
<td>0 MGD</td>
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Kent and Covington can receive additional water on an as available basis year around.

Tacoma will receive its published Constant Use Customer wholesale rate for the water delivered to Covington and Kent. In the event the design or construction of the upper portion of the Project pipeline were to initiate any mitigation concerns, Tacoma commits to work with the involved parties to assure that the applicable mitigation agreements will be implemented upon use of Second Diversion water rights.

If at some point after construction of the upper portion is completed, Kent and Covington desire to extend this pipeline to Tacoma’s Headworks Building, they may provide Tacoma written notice of that desire. Once the Project pipeline is extended to the Headworks, and mitigation and permitting issues with applicable agencies are resolved, Covington and/or Kent will each be entitled to 1/9 of the Second Diversion water in accordance with the intent of the provisions in the Second Supply Project Agreement. Other parties may share in the cost of this extension in accordance with the intent of the provisions in the Second Supply Project Agreement.
Second Supply Pipeline and Associated Components
Including Howard Hanson Storage

CONCEPTUAL AGREEMENT

Between

Participating South King County Regional
Water Association Member Utilities

And

Tacoma Public Utilities, Water Division

This Conceptual Agreement is a framework for updating the contract dated July 29, 1985 (1985 Contract) for participation in the Second Supply Pipeline Project (Project) between the City of Tacoma Department of Public Utilities (Tacoma) and the participating members of the South King County Regional Water Association. The participating member utilities of the South King County Regional Water Association are the City of Kent, Covington Water District, and Lakehaven Utility District (South King County Utilities, or SKCU). This Conceptual Agreement is necessary to reflect changes to the Project and specific elements of the Project not envisioned at the time of the 1985 Contract. It is the intent of Tacoma and SKCU that this Conceptual Agreement, in conjunction with the provisions of the 1985 Contract, will serve as the basis for a Project Agreement which will set forth in detail the specific terms and conditions under which the parties will participate in the Project. The parties
hereto acknowledge and agree that nothing in this Conceptual Agreement alters or affects the validity or enforceability of the 1985 Contract.

The Project Agreement will be a long-term agreement in which Tacoma provides contractual rights to the Project elements set out below in consideration of financial participation in the Project by the SKCU members. The term of the Project Agreement shall be for the life of the Project. Provisions to assure long term Project operational and financial viability will be included in the Project Agreement.

The following represents a conceptual agreement between the SKCU members and Tacoma regarding the participation in the Project as well as water storage at Howard Hanson Dam. For the purpose of this Conceptual Agreement, the Project is composed of the following elements:

° The Second Diversion Water Right (up to 65 MGD);
° The Second Supply Pipeline, from Tacoma's Headworks treatment building to Tacoma's Pipeline #4 near Portland Ave. Reservoir (approximately 33 miles with a nominal capacity of 72 MGD);
° A share of the improvements at Tacoma's Headworks diversion dam and intake (associated with the Second Diversion Water Right);
° The Seattle Intertie (approximately 8 miles);
° A share of the cost of the Tacoma mitigation agreements;
The Howard Hanson Dam Additional Storage Project (up to 20,000 acre-feet per year of municipal water supply storage in Phase I and options to participate in Phase II).

The foregoing elements are shown on Figure 1.

This Conceptual Agreement is predicated on the understanding that Seattle Public Utilities (Seattle) will participate in the Project. If Seattle fails to participate, then Tacoma and SKCU will take such actions as are necessary and appropriate under the circumstances to complete the Project, taking into account Seattle’s absence.

Each participant (Tacoma, Seattle, and each SKCU member) will contribute capital, in the case of Seattle and Tacoma equal to one-third of the capital costs of the Project and in the case of each SKCU member equal to one-ninth of the capital costs of the Project. Currently the capital costs of the Project are forecast at $195 million (in 1996 dollars).

In return for the capital investments, each participant will receive, except as otherwise set forth herein, the contractual right of access to and use of an undivided share of all Project facilities proportional to the capital investment made, either one-third or one-ninth as appropriate. Further, each participant will receive the contractual right to receive and use a proportionate share of the Second Diversion Water Right water supply, including water supplied by the Project (run of the river and stored water).
In the Project Agreement, Seattle will be granted the ability to utilize the full capacity of the Seattle Intertie, and each of the SKCU and Tacoma will be granted the ability to utilize a proportionate share of the capacity of Project facilities downstream of the Seattle Intertie, in the manner described in the following paragraph. All of the foregoing use shall be without charge. The rights described in this paragraph are considered an essential element of this Conceptual Agreement.

Tacoma and the SKCU utilities shall each have the right to use up to one-half of the one-third of the Project facilities capacity downstream of the Seattle Intertie which could have otherwise been utilized by Seattle. To the extent such capacity is not being used, Tacoma or the SKCU utilities may use without charge all of such unused capacity on a first come, first served basis, unless and until its use is requested by Tacoma or a SKCU utility. In such case, each utility's use of such capacity shall be limited to the amount of capacity it has a right to use.

Some Project participants may wish to retain their contractual rights of access to and control of their proportionate, undivided share of the Seattle Intertie. In that event, the Project Agreement will limit any such participant's contractual rights of access to and control of Project facilities downstream of the Seattle Intertie to such participant's proportionate share thereof.

Except as set out above, each participant shall have the contractual right to use for its own purposes its share of the
capacity of Project facilities, including without limitation storage at the Howard Hanson Dam. To the extent a participant wishes to make use of any unutilized capacity of Project facilities of any other participant, including without limitation storage at the Howard Hanson Dam, it may do so without charge. Should a participant wish to make use of the capacity of Project facilities of any other participant for which the owner of such Project facilities has a use, the participant wishing to use such Project facilities may not do so without the consent of the owning participant.

Under completion and execution of the Project Agreement, each participating member of SKCU will agree, as a signatory to the Project Agreement, to individually accept financial responsibility for their share of Project costs. It is the understanding of the parties that the Project Agreement will incorporate the "take or pay" provisions of the 1985 Contract which includes proportional sharing of Project costs and benefits (Section 6). The "take or pay" obligation to be incorporated into the Project Agreement means the obligation of the Project participants to pay their proportionate share of fixed capital and fixed operations and maintenance (O&M) costs without regard to the amount of Second Diversion Water Right water taken or not taken. The "take or pay" obligation will not apply to costs which vary with the amount of Second Diversion Water Right water taken, such as variable O&M.
In the event that increased levels of water treatment are required in the future, provisions similar to those in the 1985 Contract, Section 4, will be included in the Project Agreement. Capital cost and fixed O&M costs associated with water treatment will be allocated based on estimated peak flow requirements of each participant while variable O&M costs will be based on the volume of water used by each participant.

During Phase I operation of the Howard Hanson Dam Additional Storage Project (Storage Project), water available to participants can be stored at the dam in proportion to their share of the Project water between February 15 and June 30. In most years total stored water will equal 20,000 acre-feet if Project participants commit the full amount of their allocation of Second Diversion Water Right water to storage. Water consumed by any participant during the spring refill period which prevents 20,000 acre-feet per year of water from being placed in storage will be accounted for as a use of that participant's share of storage.

If the Storage Project proceeds to Phase II, the storage of additional water for flow management and municipal supply, then participants in the Project will be accorded the opportunity to participate before Phase II is offered to other potential parties. This participation in Phase II will be up to the same proportion as their participation in the Project. Each participant shall have a right of first refusal to a portion of the share of Phase II of any Project participant which has
decided to forego participation in Phase II. The share of Phase II foregone shall be made available to the remaining Project participants based upon their Project share, assuming that the sum of their Project shares equal one-hundred percent of the Project.

South King County Regional Water Association (SKCRWA) members may develop or may be invited to participate in artificial recharge projects that could operate conjunctively with the Project. In the event that a SKCU member develops such a recharge project and invites other SKCU members to participate in the recharge project, the SKCU member developing the recharge project agrees to invite Tacoma to participate in the recharge project. In the event that a SKCU member is invited to participate in such a recharge project developed by a SKCRWA member which is not a SKCU member, the SKCU member so invited agrees to request that the recharge project developer invite Tacoma to participate in the recharge project.

Construction is scheduled to complete all Project components as soon as possible, but in any event by 2004, concurrent with the completion of the Storage Project. Specific Project elements could be completed earlier, if the risk of earlier completion is considered to be acceptable to the participants.

The SKCU parties have a potential need for water which may require action be taken to secure a water supply in advance of the Project schedule. The following sections set out the provisions under which such actions would be taken.
Provisions For Supplying Water to Covington Water District and City of Kent Under Certain Circumstances.

The Covington Water District (Covington) and the City of Kent (Kent) have identified a need for water deliveries in the event that the Project, or certain portions of it, are delayed. This section sets forth the circumstances under which such water supply would be needed, and how the parties intend to supply it. The Contingencies set forth below permit the construction of facilities in Project right-of-way. If Kent/Covington should exercise any such Contingencies, any facilities constructed pursuant thereto can be constructed in the Project right-of-way.

First Contingency - In the event that Water Resources Development Act (WRDA) authorization and appropriation for initiating Storage Project design has not been passed into law on or before October 1, 2000, and completion of the Project is delayed thereby, Covington and/or Kent may require the commencement of design of that portion of the Project stretching from a point approximately 9,000 feet west of the Headworks Control Building to S.E. 304th Street (Kent/Covington Intertie) by providing Tacoma written notice of their desire to commence such design activity. Such design work shall be for the full Project capacity, and may be undertaken by either Tacoma or Kent/Covington, as specified in the Project Agreement, and such work shall be paid for by the party or parties which sent notice to Tacoma pursuant to this Conceptual Agreement. The right of
Kent and Covington to send notice to Tacoma pursuant to this First Contingency shall expire on the last day of 2001.

**Second Contingency** - In the event that Kent and/or Covington have given Tacoma notice pursuant to the First Contingency and WRDA authorization and appropriation for initiating Storage Project design has not been passed into law on or before October 1, 2002, and completion of the Project is delayed thereby, Kent and/or Covington may require the commencement of construction of the Kent/Covington Intertie by providing Tacoma written notice of their desire to begin such construction. Such construction work may be undertaken by either Tacoma or Kent/Covington, as specified in the Project Agreement. The Kent/Covington Intertie will be sized to provide capacity adequate to serve the needs of the parties participating in the construction of this Kent/Covington Intertie. The costs of constructing the Kent/Covington Intertie will be apportioned among participating parties based on the proportionate share of capacity in the Kent/Covington Intertie that will be available to each participating party. The right of Kent and Covington to send notice to Tacoma pursuant to this Second Contingency shall expire on the last day of 2003.

**Third Contingency** - In the event that Kent and/or Covington have given notice to Tacoma pursuant to the First and Second Contingencies, Kent and/or Covington may elect to extend the Kent/Covington Intertie to the Project headworks by providing written notice to Tacoma of such intention. Such construction
work may be undertaken by either Tacoma or Kent/Covington as specified in the Project Agreement. This extension will be sized to provide capacity adequate to serve the needs of the parties participating in the construction of this extension. The costs of constructing the extension will be apportioned among participating parties based on the proportionate share of capacity in the extension that will be available to each participating party. The right of Kent and Covington to send notice to Tacoma pursuant to this Third Contingency shall expire on the last day of 2011.

Fourth Contingency - In the event that Kent and/or Covington have given notice to Tacoma pursuant to the First and Second Contingencies, Kent and/or Covington may elect to extend the Kent/Covington Intertie to the vicinity of 124th Street by providing written notice to Tacoma of such intention. Such construction work may be undertaken by either Tacoma or Kent/Covington as specified in the Project Agreement. This extension will be sized to provide capacity adequate to serve the needs of the parties participating in the construction of this extension. The costs of constructing the extension will be apportioned among participating parties based on the proportionate share of capacity in the extension that will be available to each participating party. The right of Kent and Covington to send notice to Tacoma pursuant to this Fourth Contingency shall expire on the last day of 2016.
Contingency Participation

In the event that Kent and/or Covington exercise the First, Second, Third or Fourth Contingencies, upon such exercise Kent and/or Covington shall make a written offer of participation in the activities to be undertaken pursuant to any such Contingencies to Lakehaven and Tacoma. Upon receipt of such written notice, Lakehaven and Tacoma shall notify Kent and/or Covington whether they wish to so participate. Should Tacoma and/or Lakehaven elect to participate in any of the Contingencies, the party so electing shall pay their proportionate share of the costs of implementing any such Contingency.

Tacoma Option

Another party or parties may elect to construct facilities pursuant to the Second, Third or Fourth Contingencies with a capacity of less than the full Project capacity. In that event, and in addition to the right to participate in such activities, Tacoma may elect to require that the facilities to be constructed be sized to full Project capacity, and Tacoma shall be responsible for paying the additional costs associated with increasing the capacity from that planned by the participating parties to full Project capacity.

Water Supply

If Kent/Covington exercise their rights under the First and Second Contingency, Tacoma agrees to provide to Kent/Covington for the period commencing with the completion of the Kent/
Covington Intertie up to 10 MGD and up to a maximum of 3300 acre-feet per year of water from Tacoma's First Diversion Water Right. Any water committed to Kent/Covington may be recalled by Tacoma at any time after the year 2011, by Tacoma providing Kent/Covington written notice of such recall not less than three years prior to the effective date of such recall. In payment for such water supply, Kent/Covington agree to pay to Tacoma an amount equal to the O&M costs and the capital costs of wells operated and developed to support this water supply to Kent/Covington, as set forth in Figure 2.

If Kent/Covington exercise their rights under the First, Second and Third Contingencies, and if the extension of the Kent/Covington Intertie is built to the Project headworks, then in that event on and after the last day of 2011, Kent/Covington may elect to take their proportionate share (2/9) of the water available under the Second Diversion Water Right. In payment for such water supply, Kent/Covington agree to pay the costs of exercising the right to receive such water, including without limitation the costs of the MIT Agreement, if any.

Credit for Expenditures

In the event that Kent/Covington exercise their rights under the First, Second, Third or Fourth Contingencies, and the Project is completed, Kent/Covington and any other party participating in any such Contingency shall receive as a credit against their share of Project costs an amount equal to the monies paid by each
participant to implement those portions of the Contingencies which are incorporated into the Project.

In the event that Tacoma exercises the Tacoma Option to increase the capacity of the Kent/Covington Intertie and/or the extension to the headworks, and the Project is completed, Tacoma shall receive as a credit against its share of Project costs an amount equal to the monies paid by Tacoma to exercise the Tacoma Option.

O&M and Sunk Costs

If the Kent/Covington Intertie and/or the extension to the headworks are constructed pursuant to the Second and Third Contingencies, fixed O&M costs for operating such facilities will be apportioned among the participating parties on a basis proportionate to the capacity of such facilities which is available to each participating party, without regard to the amount of water taken or not taken. Variable O&M costs will be apportioned based on the amount of water used by each participating party.

If Kent/Covington, and other participating parties, construct facilities pursuant to any of the foregoing Contingencies, and such facilities are not incorporated into the completed Project, Kent/Covington and the participating parties shall make a payment to Tacoma to compensate for a share of the costs incurred by Tacoma to procure permits, rights of way, easements and the Second Diversion Water Right. Tacoma,
Kent/Covington and other participating parties shall enter into good faith negotiations to determine the amount of such payment.
Provisions For Supplying Water to Lakehaven Utility District
Under Certain Circumstances

Lakehaven Utility District may need water delivery prior to completion of the pipeline portion of the Project in 2001, and prior to completion of the Project in 2004. The section sets forth, among other matters, how the parties intend to supply it. The Options set forth below permit construction of facilities in the Project right-of-way. If Lakehaven should exercise such Options, any facilities constructed pursuant thereto can be constructed in the Project right-of-way.

Tacoma will provide written notification to Lakehaven as soon as practicable after determining: (1) that the pipeline portion of the Project will be completed after 2001; (2) that the entire Project will be completed after 2004.

Option 1

Upon receipt of the written notice or notices from Tacoma described in the proceeding paragraph, Lakehaven shall have the right to:

1. By written notification to Tacoma, have Tacoma initiate and complete engineering and design work necessary to construct the mutually agreed upon facilities required to provide early water delivery to Lakehaven.

2. Upon the completion of the design and engineering work described in subparagraph 1, by written notification to Tacoma, have Tacoma initiate and complete construction of the facilities required to provide early water
delivery to Lakehaven, and supply water in amounts up to 1,650 acre-feet per year, and at a rate up to 5 MGD.

The activities described in subparagraphs 1 and 2 above shall be paid for by Lakehaven. Tacoma will utilize reasonable efforts to expedite activities described in subparagraphs 1 and 2 above.

In the event that Tacoma and Lakehaven agree that the development of groundwater supply from Tacoma sources is necessary to meet the early delivery water requirements of Lakehaven, the following conditions will apply:

1. In payment for such groundwater supply from Tacoma sources, Lakehaven agrees to pay Tacoma an amount equal to the O&M costs and capital costs of wells operated and developed to support this groundwater supply to Lakenhaven, as set forth in Figure 2.

2. When Phase I of the Storage Project begins operation and Project water is available to Lakehaven, this supplemental groundwater supply will no longer be available to Lakehaven except on an as available basis.

3. Alternatively, a groundwater recharge project, such as Lakehaven's Oasis Project, could serve in place of the Storage Project. Implementation of such a groundwater recharge project coupled with the availability of Project water, would remove Tacoma's groundwater obligation except on an as available basis.
4. In any event, any groundwater committed to Lakehaven may be recalled by Tacoma at any time after the year 2011, by Tacoma providing Lakehaven written notice of such recall not less than three years prior to the effective date of such recall.

**Option 2**

If the Project has not been completed by the last day of 2010, on and after such date Lakehaven may elect to take its proportionate share (1/9) of the water available under the Second Diversion Water Right by way of diverting water from the Green River in the vicinity of Auburn. Lakehaven shall make such election by providing written notice of such election to Tacoma. In payment for such water supply, Lakehaven agrees to pay the costs of exercising the right to receive such water, including without limitation the costs of the MIT Agreement, if any.

Lakehaven shall make a written offer of participation in the activities to be undertaken by Lakehaven pursuant to this Option 2 to Tacoma, Kent and Covington. Upon receipt of such written notice, Tacoma, Kent and Covington shall notify Lakehaven whether they wish to so participate. Should Tacoma and/or Lakehaven elect to participate in any of the Contingencies, the party so electing shall pay their proportionate share of the costs of implementing any such Contingency.

In the event that Lakehaven exercises its rights under the this Option 2, and the Project is completed, Lakehaven and any other party participating in any such Option 2 activities shall
receive as a credit against its share of Project costs an amount equal to the monies paid by each participant to implement those portions of Option 2 which are incorporated into the Project.

If facilities are constructed pursuant to this Option 2, fixed O&M costs for operating such facilities will be apportioned among the participating parties on a basis proportionate to the capacity of such facilities which is available to each participating party, without regard to the amount of water taken or not taken. Variable O&M costs will be apportioned based on the amount of water used by each participating party.

If Lakehaven, and other participating parties, construct facilities pursuant to this Option 2, and such facilities are not incorporated into the completed Project, Lakehaven and the participating parties shall make a payment to Tacoma to compensate for a share of the costs incurred by Tacoma to procure permits, rights of way, easements and the Second Diversion Water Right. Tacoma, Lakehaven and other participating parties shall enter into good faith negotiations to determine the amount of such payment.

Tacoma Option

Another party or parties may elect to construct facilities pursuant to Option 1 or Option 2 with capacity less than the full Project capacity. In that event, and in addition to the right to participate in such activities, Tacoma may elect to require the facilities to be constructed be sized to full Project capacity, and Tacoma shall be responsible for paying the additional costs.
associated with increasing the capacity from that planned by the participating parties to full Project capacity.

**Other Matters**

In the event that Lakehaven pursues piloting of artificial recharge in the Mirror Lake or Redondo-Milton Channel aquifers, Tacoma agrees to extend the Interim Water Supply Agreement, dated June 8, 1995, for an additional four years (from June 8, 1999 until June 8, 2003), on the condition that Lakehaven pays any additional costs of water transmission or installation or operating costs of any pumping facilities which may be required.

**DATED this 25th day of February, 1998.**

Tacoma Public Utilities City of Kent

By: Mark Crisson Director By: Jim White Mayor

Lakehaven Utility District Covington Water District

By: President Board of Commissioners By: President Board of Commissioners

Lakehaven Utility District

By: President Board of Commissioners
SECOND SUPPLY
PROJECT
Examples of Groundwater Cost Calculation

Capital Cost to Produce 3300 Acre Feet From Groundwater in South Tacoma Aquifer

Assumptions
1) For estimating purposes each well produces 1500 gpm
2) Pumping period is 120 days
3) Drilled well casing and screen has a 40 year economic life
4) Pumps, motors, electrical equipment and telemetry equipment has a 25 year economic life
5) Well building has a 50 year economic life
6) Inflation is 3¾% per year
7) Discount rate is 6½% per year

Typical well construction costs (plant costs)
8B drilled in 1989 cost $93,020
3½ inflation 1990-1996 (7 years)
\[(1.03)^7 \times (93,020) = 114,403\]
Annual cost 40 year life @ 6½% 
\[0.06646 \times (114,403) = \$7,603\]

Pump, motor, electrical & telemetry equip. in 1990 cost $102,626
3½ inflation 1991-1996 (5 years)
\[(1.03)^5 \times (102,626) = 122,541\]
Annual cost 25 year life @ 6½% 
\[0.07823 \times (122,541) = \$9,586\]

Well building (UP) in 1987 cost $91,114
3½ inflation 1988-1996 (9 years)
\[(1.03)^9 \times (91,114) = 118,883\]
Annual cost 50 year life @ 6½% 
\[0.06344 \times (118,883) = \$7,542\]

* Total estimated annual capital cost per well 
\[\$24,731\]

(Does not include land or land rights, engineering costs, environmental and permitting costs or transmission piping from well to distribution system)

Production = 1500 gpm (60 min/hr) 24 hr/day (120 days)
\[325,851 \text{ gal/acre feet} \times 795.5 \text{ acre feet/well} = 795.5 \text{ acre feet/well}\]

Number of wells needed = 3300 acre feet
\[795.5 \text{ acre feet/well} \times 4.15 \text{ say 4 wells}\]

* Total estimated annual capital cost to produce 3300 acre feet/year = 4 ($24,731) 
\[= \$98,924\]
## O&M Cost Calculation

### Capital Cost to Produce 3300 Acre Feet From Groundwater in South Tacoma Aquifer

Include only costs directly related to groundwater supply.

### Taxes

0.1082 \( \frac{(7,573,029)}{2} = 409,701 \text{/yr} \)

### Source of Supply

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>Source of Supply General</td>
<td>( \frac{(237,339)}{2} = 12,840 \text{/yr} )</td>
</tr>
<tr>
<td>601 31</td>
<td>Source of Supply Wells</td>
<td>( \frac{(59,589 + 137,813)}{2} = 98,701 )</td>
</tr>
<tr>
<td>601 4</td>
<td>Water Supply Control</td>
<td>( \frac{(451,626)}{2} = 24,433 \text{/yr} )</td>
</tr>
<tr>
<td>601 7</td>
<td>Fleet Services</td>
<td>( \frac{(489,914)}{2} = 26,504 \text{/yr} )</td>
</tr>
<tr>
<td>603</td>
<td>Miscellaneous</td>
<td>( \frac{(139,292)}{2} = 7,049 \text{/yr} )</td>
</tr>
<tr>
<td>610</td>
<td>Maintenance Supervision &amp; Engineering</td>
<td>( \frac{(22,459)}{2} = 11,215 \text{/yr} )</td>
</tr>
<tr>
<td>611 4</td>
<td>Maintenance Wells &amp; Springs</td>
<td>185,213/2 = 92,607/yr</td>
</tr>
</tbody>
</table>
| 612 0 | Misc. Maintenance Water Supply Plan              | \( \frac{(2,311)}{2} = 125 \text{/yr} \)

### Water Treatment

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>640</td>
<td>Supervision &amp; Engineering Operation</td>
<td>( \frac{(182,924)}{2} = 9,896 \text{/yr} )</td>
</tr>
<tr>
<td>641</td>
<td>Chemicals</td>
<td>( \frac{(600,019)}{2} = 32,461 \text{/yr} )</td>
</tr>
<tr>
<td>642</td>
<td>Operating Expense Treatment</td>
<td>( \frac{(524,403)}{2} = 28,370 \text{/yr} )</td>
</tr>
<tr>
<td>642 5</td>
<td>Fleet (Treatment)</td>
<td>( \frac{(36,368)}{2} = 1,968 \text{/hr} )</td>
</tr>
<tr>
<td>642 7</td>
<td>Fluoride Application Plant</td>
<td>( \frac{(19,488)}{2} = 1,054 \text{/yr} )</td>
</tr>
<tr>
<td>643</td>
<td>Miscellaneous</td>
<td>( \frac{(60,890)}{2} = 3,294 \text{/yr} )</td>
</tr>
<tr>
<td>650</td>
<td>Supervision &amp; Engineering Maintenance</td>
<td>( \frac{(60,890)}{2} = 3,294 \text{/yr} )</td>
</tr>
</tbody>
</table>

\( \text{Total} = 263,474 \)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>652</td>
<td>Water Treatment Equipment Maintenance</td>
<td>$2,493/hr</td>
<td>$94,679/yr</td>
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<tr>
<td>652.14</td>
<td>Fluoride Plant Maintenance</td>
<td>$291/yr</td>
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<tr>
<td>653</td>
<td>Miscellaneous Maintenance</td>
<td>$891/yr</td>
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</table>

**Water Transmission & Storage**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>660</td>
<td>Supervision &amp; Engineering Operation</td>
<td>$17,348/yr</td>
<td></td>
</tr>
<tr>
<td>661</td>
<td>Operations</td>
<td>$12,716/yr</td>
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<tr>
<td>665</td>
<td>Miscellaneous Operations</td>
<td>$2,198/yr</td>
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<tr>
<td>670</td>
<td>Maintenance Supervision &amp; Engineering</td>
<td>$543/yr</td>
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<tr>
<td>671</td>
<td>Maintenance Transmission</td>
<td>$18,679/hr</td>
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<tr>
<td>672</td>
<td>Maintenance Storage</td>
<td>$1,110/yr</td>
<td></td>
</tr>
<tr>
<td>673</td>
<td>Miscellaneous Maintenance</td>
<td>$2,054/yr</td>
<td></td>
</tr>
<tr>
<td>681.3</td>
<td>Care of Grounds</td>
<td>$5,182/yr</td>
<td></td>
</tr>
<tr>
<td>685</td>
<td>Building Services</td>
<td>$75,271/yr</td>
<td></td>
</tr>
</tbody>
</table>

| Source of Supply | $263,474 |
| Water Treatment  | $94,679  |
| Trans & Storage  | $135,101 |
|                 | $493,272 |

Taxes $493,472
1,034,131 (409,701) = $195,424

Total Estimated O&M Demand Costs for 17 Wells $688,696/yr

Total for 4 wells 4 (688,696) = $162,046/yr
Total Estimated Annual O&M + Capital Costs for
4 wells to produce 3300 acre feet for Scenario No. 2 - $162,046 + $98,924 = $260,970/yr

* Note that this is an annual cost since capital costs and the majority of O&M costs are
annual whether or not wells are actually pumped in a given year.
CITY OF KENT and SOOS CREEK WATER AND SEWER DISTRICT
EMERGENCY USE INTER-TIE AGREEMENT

THIS AGREEMENT, made and entered into this ___ day of ___ , 2001, by and between the CITY OF KENT, a Washington municipal corporation (hereinafter referred to as "the City"), SOOS CREEK WATER AND SEWER DISTRICT, a Washington municipal corporation (hereinafter referred to as "the District"), and the CITY OF SEATTLE (hereinafter referred to as SPU), all entities being duly organized and existing under and by virtue of the laws of the State of Washington, is entered into for the purposes of planning, designing, constructing, maintaining and operating an emergency system inter-tie between the respective parties.

WITNESSETH:

WHEREAS, both the City and the District are public agencies authorized by law and qualified to provide domestic public water in accordance with federal, state and local laws and regulations, and

WHEREAS, emergency use inter-ties between public water agencies can assist them in performing their water supply duties during times of emergency and water shortage, and

WHEREAS, implementation of emergency intertie agreements between SPU purveyor and non-purveyor customers that involve SPU water supply are allowed subject to SPU approval, and

WHEREAS, it is in the public interest for the parties herein to establish an emergency use inter-tie to provide backup water supply in the event of an emergency, as defined herein.

NOW, THEREFORE

IT IS HEREBY AGREED by and between the parties hereto as follows

1. The inter-tie is intended to operate as a one way gravity flow from the District's system into the City's system, by an inter-tie facility to be located within a vault suitable for the purpose. The facilities for this purpose are schematically shown on Attachment 1 to this document. Final location and configuration of the facilities will be determined at the time of final design.

2. The District will act as the lead agency, and will be the design and contracting entity for the construction of the facilities contemplated hereby.

3. Upon completion of construction, the District and the City will own and operate the facilities respectively indicated on Attachment 1 to this agreement. The District will convey those facilities to be owned and operated by Kent by Bill of Sale.

4. The City shall reimburse the District for all actual costs associated with the planning, design, construction and permitting for this project. All reasonable
efforts have been made to develop cost projections for this project. The estimated total project cost is $85,000.

5 The City and the District will each have access to the vault via dual padlocks or ownership of keys to the vault.

6 The City will be provided a key to the vault's lock. Only the District will unlock and operate the vault, except as otherwise provided herein.

7 The inter-tie will be operated only in the event of an emergency. For purposes of this agreement, an emergency is defined to be as a infrastructure failure, contamination of water supply, fire flow demand failure, electrical supply failure, or drought condition as defined by the State Department of Ecology such that the City's water supply is unable to provide sufficient water supply to its inhabitants.

8 It is anticipated that the inter-tie will be capable of transporting approximately 500-750 gpm. Both parties recognize that the District's water system's ability to sustain this flow rate is limited by District physical system characteristics. The District may reduce the rate of flow for any period necessary to ensure that the inter-tie does not adversely impact its system operation.

9 The procedures for operating the inter-tie in the event of an emergency shall be as follows:

   a The City will make the determination that an emergency exists which warrants a request that the inter-tie be activated.

   b The City's Water Superintendent or designee shall provide a verbal request to the District Manager or designee and Seattle Public Utilities (SPU). Upon the District's and SPU's concurrence that such an emergency exists, the inter-tie will be activated in one of the two following manners:

1) If the emergency is one that does not require immediate water by the City, the District will open the inter-tie at 9:00 a.m. on the first business day following the determination of the emergency. The City's personnel shall also be on site for operation of the City's facilities. At the time of activation, District and City personnel shall concurrently confirm and note the standing reading on the flow meter totalizer of the inter-tie.

2) In the event of an emergency which requires immediate use of the inter-tie, the City shall verbally notify the District that the inter-tie's activation is required as soon as reasonably possible. If the District is unable to respond within thirty minutes of such verbal notification, the City's personnel will be permitted to unlock and activate the inter-tie valve, and to verify and to note the standing reading on the flow meter totalizer of the inter-tie.
c The City will provide the District with a written request confirmation not less than 24 hours after any verbal request, or during the first day of normal business after the verbal request, whichever is later. If the City requests that the inter-tie be activated prior to 9:00 a.m. on the first business day following the determination of an emergency, the City will provide backup data as necessary to allow the District to request a waiver of demand metering charges from SPU for the particular event, in accordance with the wholesale water contract between the District and SPU. If demand metering charges are not waived by SPU, the City shall pay such charges incurred by the District relative to the event.

d The District shall notify SPU in writing within 10 days after the use of the emergency inter-tie. This notification will include a description of the nature of the emergency, and the date, time and quantity of water used during the activation of the inter-tie.

e The inter-tie shall remain activated until the City has determined that the emergency causing need for the activation has ceased, but in no event for longer than two weeks unless mutually agreed to in writing by the District and SPU. The District shall close the inter-tie at the time of such determination, or at 9:00 a.m. on the following day. The City shall provide a written confirmation of its request that the inter-tie be closed.

f The District shall read the meter, and calculate and invoice the City for the water used during each activation of the inter-tie as follows:

i The District shall prepare an invoice by multiplying the number of ccf's (hundred cubic feet) of water used by either the new water wholesale rate or the demand metering charge the District is required to pay to SPU for the event, whichever is greater, plus the amount per ccf established by the District's Board of Commissioners as the District's wheeling charge. For calendar year 2001, the wheeling charge shall be $0.20 per ccf. Payment of invoices calculated in accordance herewith shall constitute complete payment for the water, labor, and activation of the inter-tie, and its administration while activated or while pending activation.

ii The City shall pay each invoice in full within thirty days of its issue. After 60 days, a late charge of 10% of the amount due shall be added, and thereafter the entire balance due shall bear interest at 12% per annum, until paid in full.

10 The implementation of this agreement is contingent upon receipt of the written approval of SPU, and it shall be subject to any amendments made to the District's wholesale water contract with SPU during the term hereof.

12 The inter-tie project is subject to approval by the Washington State Department of Health. The District will submit plans and specifications to the Department for review and approval concurrently with the project's construction. The City will pay the review fees directly to the Department. Any changes to the project...
required by the Department will be made by the District. Both parties recognize that these changes may result in additional costs to the City.

13 Each party hereto agrees to protect, defend and indemnify the other party, its officers, officials, employees and agents from any and all costs, claims, judgments and/or awards of damages, arising out of or in any way resulting from the party's default, failure of performance, or negligent conduct associated with this agreement, by the party, its employees, subcontractors or agents. Each party agrees that its obligations under this provision extend to any claim, demand, and/or cause of action brought by or on behalf of any of its employees, or agents. The foregoing indemnity is specifically and expressly intended to constitute a waiver of each party's immunity under Washington's industrial insurance act, RCW Title 51, as respects the other party only, and only to the extent necessary to provide each party with a full and complete indemnity of claims made by the other party's employees. The parties acknowledge that these provisions were specifically negotiated and agreed upon by them.

14 The City agrees to protect, defend and indemnify the District, its officers, officials, employees and agents from any and all costs, claims, judgments and/or awards of damages, arising out of or in any way related to pressure changes within the City's service area attributable to the activation and use of the inter-tie.

15 This agreement shall continue in effect until mutually cancelled by the parties.

16 Unless otherwise agreed to by the parties, this agreement is not intended to preclude, conflict with, or otherwise affect the terms of existing or future agreements executed between SPU and the City that may involve use of the inter-tie described herein.

THE CITY OF KENT

Date 7-26-01

SOOS CREEK WATER AND SEWER DISTRICT

Date 8/1/01

CITY OF SEATTLE

Date 7-7-01

Kent/Soos Creek Agreement
Emergency Inter-tie
AGREEMENT FOR THE EMERGENCY SALE OF WATER
BETWEEN
THE CITY OF RENTON AND THE CITY OF KENT

This AGREEMENT made and entered into this 17th day of May, 1995, by and
between the CITY OF RENTON, a municipal corporation of the State of Washington, hereinafter
called "RENTON" and the CITY OF KENT, a municipal corporation of the State of Washington,
acting through its Water Department, hereinafter called "KENT"

WHEREAS, RENTON and KENT may experience periodic water supply shortfall,
WHEREAS, RENTON and KENT recognize the public benefits of cooperation and
collaborative problem solving,
WHEREAS, RENTON and KENT are willing to sell water in an emergency at the existing
system interties,
WHEREAS, the parties desire to enter into an AGREEMENT providing for the emergency
sale of water

NOW THEREFORE, IT IS AGREED AS FOLLOWS

1) **Term of AGREEMENT** The effective date of this AGREEMENT shall be
__________ , 1995. The AGREEMENT shall be for a minimum of one (1)
year and shall continue in full force and effect in its present form or as amended until
terminated by either party in accordance with Section 15 of this AGREEMENT. The rates
and quantities of water sold are set forth in Sections (3) and (7).

2) **Sale.** Subject to the conditions set out in this agreement, either party may sell water to the
other in the event that the receiving City is experiencing an emergency. An emergency is
defined, for the purposes of this agreement, as a situation of relative short duration during
which the City can not meet water consumption needs of all or part of its distribution system.

3) **Rate.** For 1995 KENT shall pay to RENTON for all water delivered at the rate of $1.73 per
100 cubic feet, which is RENTON's retail rate for commercial customers for 1995. For 1995
RENTON shall pay to KENT for all water delivered at the rate of $1.64 per 100 cubic feet
during the period May 1st to September 30th, which is KENT's summer retail rate for
commercial customers for 1995 and at the rate of $1.24 per 100 cubic feet during the period
October 1st to April 30th, which is KENT's winter retail rate for commercial customers for
1995. The rates charged by the SELLER shall be adjusted each year on January 1st and shall
be the retail rates for the coming year for commercial customers of each respective City.

4) **Metering.** RENTON and KENT shall each provide, own and maintain, an appropriate
metering device to measure the water flowing through the intertie. An interlocal agreement
may be prepared to allow one party to operate and maintain the intertie and distribute the
costs equally between the both parties. Before allowing any water to flow through the intertie,
the party requesting the water shall provide a description and documentation of the emergency
condition to the other party.

5) **Priority and Continuity of Service.** The determination of whether water is available for
emergency sale shall be at the sole discretion of the party delivering (selling) the water. In the
event of a condition requiring restrictions on the delivery of water, the party delivering the
water shall have the right to restrict or interrupt service. The party providing water may
voluntarily interrupt or reduce deliveries of water if it determines that such interruption or
reduction is necessary or reasonable. Except in cases of emergency and in order that operations will not be unreasonably interfered with, the party providing water shall give the party buying water, reasonable notice of any such interruption or reduction, the reason therefor, and the probable duration thereof. The party buying water shall discontinue or reduce service from the intertie upon reasonable notice. Service shall be reactivated or increased again subject to the aforementioned conditions.

6) Water Quality. The quality of water delivered under this AGREEMENT shall be subject to applicable provisions of State and Federal law and rules and regulations of the appropriate State agency governing water quality, and subject also to applicable provisions of City ordinances relating thereto and not inconsistent herewith. Each party agrees to deliver water which shall be of no less quality than is delivered to its other retail customers throughout the service area.

7) Quantity of Water. Depending upon demand conditions, water availability (including conservation impacts), as well as aquifer behavior, in the RENTON system, RENTON may make available, for purchase by KENT, up to the approximate amount of three and a half million (3,500,000) gallons per day or more from the existing emergency intertie located at SW 43rd and Lund Avenue South. Depending upon demand conditions and water availability (including conservation impacts), KENT may make available, for purchase by RENTON, up to two million (2,000,000) gallons per day from the existing emergency intertie located at SW 43rd and Lund Avenue South.

8) Coordination and Project Management.

A) Operations.

For the purpose of operating the water system intertie between RENTON and KENT, coordination shall occur between representatives of the systems, who are:

- Water Maintenance Manager, City of RENTON
- Water Superintendent, City of KENT

(or their designated representatives)

The coordination shall consist of exchanging operational information such as the respective flow rates, pumping capacities, back-pressure sustaining valve setpoints, system pressure effects, water quality characteristics, and other operational information as necessary to accomplish the purposes of this AGREEMENT while maintaining safe operation of both systems.

B) Engineering.

For the purposes of coordinating engineering issues regarding the RENTON and KENT intertie, the following personnel shall be the designated representatives:

- Water Utility Supervisor, City of RENTON
- City Engineer, City of KENT

(or their designated representatives)

The engineering issues addressed shall include operational criteria as well as hydraulic.
behavior, water quality considerations, and other appropriate engineering issues

C Administration

For the purposes of AGREEMENT administration and AGREEMENT modifications or interpretations, the following personnel shall be the designated representatives:

Planning/Building/Public Works Administrator, City of RENTON

and

Public Works Director, City of KENT

(or their designated representatives)

9) Payment. The City providing the water shall read the meter once each month at approximately thirty (30) day intervals (when the intertie is being used). Payment shall be made by the City receiving water as soon as possible after receipt of statement and in any event, not later than the tenth (10) of the second month following the presentation of the bill.

In the event a meter shall fail to register or obviously register incorrectly, the amount of water considered delivered through said meter shall be the amount delivered the previous day or the last day that the meter was previously known to be properly functioning and the total amount registered shall be pro-rated based on the number of days multiplied times the reading used.

10) Penalties For Late Payment. The City selling water may assess a late charge on the City buying water for failure to comply with the provisions in Section (9). This charge shall be at the rate of twelve percent (12%) per year. In the event that the City buying water should fail to make any payment for a period of sixty (60) days after the same becomes due, the City selling water shall have the right to terminate further water service without further notice, until such delinquency is cured.

11) Breach of Contract. Either party may cancel this Agreement for material breach of its terms by written notice served upon the other party at least twenty (20) days prior to the proposed termination date. If the breaching party removes the breach and performs under terms of this agreement before the termination date, the Agreement shall remain in full force and effect. However, if the breach is not removed and continues, then the Agreement shall be null and void in all respects except for obligation to make payments as defined for water use prior to the termination date.

12) Procedure for Amending the Contract. Either party can request the other to consider an amendment of the AGREEMENT. Any proposed amendments shall be made in writing. Amendments may be made if they are mutually acceptable to RENTON and KENT and signed by both parties. Minor or operational amendments may be made by the Administrators.

13) Access to Facilities and Records. Each party shall be entitled to inspect the intertie facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records regarding the intertie as are at their disposal and as may be reasonably necessary to properly implement any section of this AGREEMENT.

14) Non-Assignability. Neither this AGREEMENT nor any interest therein shall be transferred.
or assigned by either City without prior written consent of both Cities

15) **Termination.** This AGREEMENT may be terminated in whole or in part by either party any time after one year from date of this AGREEMENT, upon ten (10) days written notice sent by certified mail to the other party. Send notices to the Water Utility Supervisor at the City of Renton and the City Engineer at the City of Kent.

IN WITNESS WHEREOF, the parties have hereunto set their hands this day and year above written.

**CITY OF RENTON**

By **Earl Clymer**, Mayor

ATTEST/AUTHENTICATED

**Marilyn J. Petersen**, City Clerk

APPROVED AS TO LEGAL FORM

**Larry Warren**, City Attorney

**CITY OF KENT**

By **Jim White**, Mayor

ATTEST/AUTHENTICATED

**Brenda Jacober**, City Clerk

APPROVED AS TO LEGAL FORM

**Roger Lubovich**, City Attorney
AGREEMENT FOR THE SALE OF WATER BY THE
CITY OF RENTON TO THE CITY OF KENT

This Agreement made and entered into this 9th day of _____June_____, 1980, by the CITY OF RENTON, a municipal corporation of the State of Washington, hereinafter called "RENTON", and the CITY OF KENT, a municipal corporation of the State of Washington, hereinafter called "KENT".

WITNESSETH:

WHEREAS, the parties desire to enter into a contract providing for the sale of water by RENTON to KENT, NOW, THEREFORE, IT IS AGREED AS FOLLOWS:

(1) Term of Contract. The effective date of this AGREEMENT shall be _____June 1____, 1980. The contract shall be for a two (2) year period with KENT having the option to renew for an additional one (1) year period under the same terms and conditions as set forth herein, EXCEPT that the rate which KENT pays for water supplied by RENTON shall be subject to renegotiation at the time of renewal.

(2) Rates. KENT shall pay to RENTON for all water delivered $0.27 cents per 100 cubic feet. Should RENTON raise the rate to its other municipal or industrial customers of the same class, the rate to KENT shall be increased by the same proportion.
(3) **Metering Equipment.** RENTON shall own and maintain an
appropriate metering device to measure the water flowing from
RETON's system to the system of KENT at the point of service
connection. RENTON agrees that at KENT's request it shall
install and maintain equipment selected by KENT and approved by
RENTON to transmit signals to KENT's and RENTON's recording
equipment located elsewhere of the total amount of water delivered
as shown by RENTON's meters, all at KENT's expense.

(4) **Meter Charge.** A monthly meter charge of fifty-one dollars
and eighty-five cents ($51.85) for the 12-inch meter shall be
paid by KENT.

(5) **Provision for Emergency Surcharge.** In the event, that for
any reason, RENTON is unable to supply its customers from its own
source, it may be necessary for RENTON to impose a surcharge in
order to pay for unexpected expenditures that would be required
to maintain a sufficient water supply. The charge to KENT for
such water purchased or supplied by RENTON shall be negotiated in
the event that RENTON must pay more than 90 percent of the
current cost which KENT is paying to RENTON pursuant to this
agreement.

(6) **Priority and Continuity of Service.** In the event of a
general emergency requiring restrictions on the delivery of
water, RENTON shall have the right to restrict or terminate
service to KENT.
RENTON may temporarily interrupt or reduce deliveries of water to KENT if RENTON determines that such interruption or reduction is necessary or reasonable in case of system emergencies or in order to install equipment and make repairs, replacements, investigations and inspections of, or perform other maintenance work on RENTON's water system or those parts of the system supplying KENT. Except in cases of emergency and in order that KENT's operations will not be unreasonably interfered with, RENTON shall give KENT reasonable notice of any such interruption or reduction, the reason therefore, and the probable duration thereof.

(7) Payment. RENTON shall read the meter once each month at approximately thirty (30) day intervals. Payment shall be made by KENT as soon as possible after receipt of statement from RENTON, and in any event, not later than the tenth (10th) of the second month following the presentation of the bill. In the event the meter shall fail to register, or obviously register incorrectly, the amount of water delivered through said meter shall be estimated on the basis of the meter readings for the same month, or months during the preceding year, when said meter was properly functioning.

In the event the meter shall fail to register, or obviously register incorrectly any time during the first twelve (12) months of use, the amount of water considered delivered through said
meter shall be that amount delivered the previous month or the latest month during which the meter was properly functioning.

(8) **Penalties for Late Payment.** RENTON may assess a late charge on KENT for failure to comply with the provisions in Section (7). This charge shall be twelve percent (12%) per year. In the event that KENT should fail to make any payment to RENTON for a period of sixty (60) days after the same becomes due, RENTON shall have the right to terminate further water services until such delinquency is cured.

(9) **Procedure for Amending the Contract.** Either party can request the other to consider an amendment of the contract. Any proposed amendments shall be made in writing. Amendments may be made if they are mutually acceptable to RENTON and KENT and signed by both parties.

(10) **Access to Facilities and Records.** Each party shall be entitled to inspect the facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records as are at their disposal and as may be reasonably necessary to properly implement any section of this contract.

(11) **Non-Assignability.** Neither this contract nor any interest therein shall be transferred or assigned by KENT without prior written consent of RENTON.
(12) **Water Quality.** The quality of water delivered under this agreement shall be subject to applicable provisions of State and Federal law and rules and regulations of the appropriate State agency governing water quality, and subject also to applicable provisions of RENTON ordinances relating thereto and not inconsistent herewith. RENTON agrees to deliver water which shall be of no less quality than is delivered to its customers throughout the RENTON service area.

(13) **Quantity of Water.** RENTON shall supply a quantity of water to KENT in the amount of zero to two and one-half million (2,500,000) gallons per day. The rate of delivery of water from RENTON's system to KENT's system shall not exceed two thousand (2,000) gallons per minute.

(14) **Miscellaneous Control Devices.** RENTON reserves the right to require KENT to install, as a condition of water service, a pressure reducing valve, backflow preventive device, pressure relief valve, flow limiting device or similar devices at any location where RENTON determines a need to protect its facilities. RENTON also reserves the right to require KENT to oversize the system in the Orilla Industrial Area should the required flows to said area be affected by the service to KENT.

(15) **Termination.** This agreement may be terminated in whole or in part by either party anytime upon thirty (30) days written notice sent by registered mail to the other party.
IN WITNESS WHEREOF the parties have hereunto set their hands the
day and year first above written.

CITY OF KENT
ATTEST:

By

Mayor

CITY OF RENTON
ATTEST:

By

Mayor
IT IS HEREBY AGREED on this 20th day of March, 1982 by and between Water District No. 111, King County, Washington, a municipal corporation existing under the laws of the State of Washington, hereinafter called the "District", by and through its duly elected qualified and acting commissioners, and the City of Kent, a municipal corporation of the third class of the State of Washington, hereinafter called the "City", by and through its duly elected qualified, acting and authorized officials as follows:

WHEREAS, the District has been formed by the electors in the vicinity of Lake Meridian for the purpose of providing water service, and

WHEREAS, the City operates a municipal water system and obtains its water from a source east of the City through a transmission line running generally parallel to the Kent-Kangley highway and from east to west through the District and

WHEREAS, the District and the City desire to enter into a contract providing for the sale of water by the City from its transmission line to the District for the needs of inhabitants of the District for domestic purposes,

NOW, THEREFORE, IT IS AGREED as follows:

Section 1. EFFECTIVE DATE. This contract shall take effect upon execution by the proper City and District officials; provided, however, that in the event no Utility Local Improvement District is formed within the District within two (2) years, the agreement would automatically terminate; and provided further, that no obligation to purchase water by the District or to sell water to the District by the City as hereinafter provided, shall become effective until the construction of the distribution system within the first U.L.I.D. has been completed and the District makes a written request for delivery of water; provided further, that in the event the construction within the first U.L.I.D. is not completed within four (4) years from the date of the agreement, then this agreement is terminated.

Section 2. TERM OF CONTRACT. Contract will be in full force and effect for fifteen (15) years from the date of execution and the District has the option to renew the contract for an additional fifteen (15) years.
Section 3. WATER AND PUMP STATEN. The District agrees to construct, install and pay for a master meter and pumping station to be located approximately at the intersection of the Hunt-Krailey Highway and 145th Avenue Southwest, as a part of the initial water system construction under the first U.L.L.D. provision, however, that all plans and specifications of the District relating to pumping stations, controls, and storage facilities, and appurtenances, shall first be submitted to the City for approval prior to any construction thereof. The point of delivery of water by the City to the District shall be in the Ritual to the master meter.

Section 4. SERVICE FOR CUSTOMERS WITHIN THE DISTRICT. It is agreed that upon completion of construction of a water distribution system within the District and upon written notification to the City by the District that they are ready to provide water service the City will discontinue water service to all customers within the District on the date, or as soon thereafter as is physically possible, that the District stipulates they will be prepared to commence water service, which can be served by the District's system; provided, however, that those customers served by the M.U.D. the District purges from the City's.

Section 5. "DMX" METER. The provisions of this agreement apply to customers within the District and are intended to the District in the future.

Section 6. RATES. The District agrees to pay the City for all water delivered at the delivery point the dollar (\$1.00) per million cubic feet of water delivered at the District to the District per month plus 15% for 100 cubic feet of water delivered to the District. The rate for water delivered to the District is subject to change at any time by the City provided that the change shall not exceed a direct proportion to the new rates are in residential water rates within the city. The rate shall be calculated by multiplying the new water rates by the average monthly residential water consumption for the most recent full calendar year, and dividing the total.
average annual revenue per residential City customer derived therefrom, by the average annual revenue per residential customer obtained by applying the old water rates within the City to the same average residential usage per month for the same period. The charge per 100 cubic feet of water shall be computed to the nearest one hundredth of a cent.

Section 7. METERS IN PLACE. It is agreed that because the meters, service lines and appurtenances in place in the District at the time the City commences water delivery to the District have been paid for by the customers using them, the City will deed to the District all such meters and service connections of all customers to be served by the District. The same provision shall apply to customers of the City to which the District would provide service in the future at such time as the District commences service.

Section 6. QUALITY OF WATER. The City makes no guarantee as to the quality of water except that it will be of like quality to that delivered to domestic water customers within the City.

Section 9. QUANTITY OF WATER. The District does not demand and the City does not guarantee to deliver any specified minimum quantity of water except that the City agrees to use reasonable diligence in providing a constant supply of water to the District consistent and in proportion to all water usage in the City. If the City finds it necessary to enforce sprinkling regulations the District agrees to put the same regulations into effect. All consumers in the District shall submit to and comply with all ordinances and regulations of the City governing the consumption of water in the District and the District agrees to adopt appropriate rules and regulations governing the use of water and agrees to maintain its water system free from unnecessary leaks.

Section 10. PAYMENTS. The City shall read the meter at periodic intervals of approximately thirty (30) days on or before the 20th day of each month. The charges herein provided for shall be paid by the District to the City quarterly. The City shall submit to the District an invoice containing statements of master meter readings as of the 20th day of the month for the preceding month and the District shall furnish to the City on the 20th day of the billing month a certified statement showing the total number of customers.
supplied by the District with water service for the monthly period immediately preceding the date of such statement. It is recognized that the District may make payment only upon claim processed through the County Treasurer and payment shall be made by the District as soon as possible after receipt of statement from the City, and in any event not later than the 10th of the second month following the date of water reading. In the event the water table is not to register, or obviously registers incorrectly, the amount of water delivered through said meter shall be estimated on the basis of the water reading for the same month or months, during the preceding year when said meter was last functioning.

Section 11. PRECUTTY. The City agrees that it will not by future contract with others, nor reduce its supply that the District could not be served adequately.

Section 12. ACCESS TO FACILITIES AND RECORDS. Either party shall be entitled to inspect the facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records as are at their disposal and as may be reasonably necessary, properly to implement any section of this contract.

Section 13. NON-ASSIGNABILITY. Neither this contract nor any interest therein shall be transferred or assigned by the District without the written consent of the City.

Section 14. FAILURE TO PAY. In the event that the District should fail to make any payment to the City for a period of sixty (60) days after the same becomes due, the City shall have the right to terminate further water services until such delinquency is cured.

IN WITNESS WHEREOF the parties have hereunto set their hands the day and year first above written.

KING COUNTY UTLA DISTRICT NO. 111

By: [Signature]

[Title]

[Name]

[Title]

[Name]

[Title]

[Name]

THE CITY OF LINDA

By: [Signature]

[Title]

[Name]

ANGUAGE LAWYER

[Title]

[Name]
SUPPLEMENTAL AGREEMENT FOR SALE OF WATER
BY CITY OF KENT TO
KING COUNTY WATER DISTRICT NO. 111

THIS AGREEMENT, made and entered into this ___ day of May, 1966, by and between THE CITY OF KENT, a municipal corporation of the third class of the State of Washington, hereinafter called "City," and KING COUNTY WATER DISTRICT NO. 111, a municipal corporation existing under the laws of the State of Washington, hereinafter called "District;"

W I T N E S S E T H:

THAT WHEREAS, these parties have heretofore entered into an Agreement for the sale of water by the City to the District, under date of March 20, 1962, and

WHEREAS, Section 1 said Contract Agreement specifies "That in the event that the construction within the first ULID is not completed within four (4) years from the date of the Agreement, then this Agreement is terminated." and

WHEREAS, construction on said ULID was commenced by the District prior to the expiration of said four (4) year terms, but has not been completed within said four (4) year period, and

WHEREAS, it is the mutual desire of these parties that said termination clause be voided and that said Agreement of March 20, 1962 be and remain in all its terms, conditions and covenants an effective Agreement between these parties,

NOW, THEREFORE, it is hereby covenanted and agreed by and between these parties as follows:

1. That in consideration of the fulfillment of the
terms and conditions of said Agreement for Sale of Water, dated March 20, 1962 and the efforts made by the District toward construction of its pipelines, improvements and appurtenances under the designation of ULID No. 2, presently in process of construction, it is hereby mutually agreed that provisions of Section 1 of said Agreement, dated March 20, 1962 by and between these parties to the effect that said Agreement should be terminated unless the first ULID of the District shall be completed within a four (4) year period after March 20, 1962, be and the same is hereby cancelled.

2. That in all other respects, the terms and conditions of March 20, 1962 shall be and remain in full force and effect between these parties.

IN WITNESS WHEREOF the parties have hereunto set their hands and seals the day and year first above written.

THE CITY OF KENT
BY. [Signature]

ALEX THORNTON, MAYOR

ATTEST.

[Signature]

MARTIN J. MASON, CTRY CLERK

[Signature]

PRESIDENT AND COMMISSIONER

SECRETARY AND COMMISSIONER

[Signature]

COMMISSIONER
AGREEMENT FOR THE SALE OF WATER BY CITY OF KENT TO

KING COUNTY WATER DISTRICT NO. 111

This AGREEMENT made and entered into this 17th day of December, 1973, by the CITY OF KENT, a municipal corporation of the State of Washington, hereinafter called "CITY", and KING COUNTY WATER DISTRICT NO. 111, a municipal corporation existing under the laws of the State of Washington, hereinafter called "DISTRICT".

WITNESSETH:

WHEREAS, the parties desire to enter into a contract providing for the sale of water by the CITY to the DISTRICT, NOW, THEREFORE

IT IS AGREED as follows:

(1) TERM OF CONTRACT. The effective date of this AGREEMENT shall be December 1, 1973. The CONTRACT shall be for a ten (10) year period with the DISTRICT having the option to renew for an additional ten (10) year period under the same terms and conditions as set forth herein, EXCEPT that the rate which the DISTRICT pays for water supplied by the CITY shall be subject to review at the time of renewal.

(2) RATES. The DISTRICT shall pay to the CITY for all water delivered 13.5 cents per 100 cubic feet. In the event, however, that for any reason the CITY is unable to supply its customers from its own source of water and must purchase water from another source, the charge to the DISTRICT for such water purchased by the CITY shall be negotiated in the event the CITY must pay more than 13.5 cents per 100 cubic feet for such water.

(3) METER CHARGE. A monthly meter charge of seventy (70) dollars for the existing 8 inch meter shall be paid by the DISTRICT. If any additional connections are made by the DISTRICT, the connection and meter charge will be
(4) **CONSERVANCY COUNSELING.** The CITY and DISTRICT will advise and counsel with each other concerning the development of water levels and storage.

(5) **MAINTENANCE AND OPERATION.** If at any time during the life of this CONTRACT the DISTRICT should decide to contract for maintenance and operation of its facilities, the DISTRICT will afford the CITY the first opportunity to contract for said services.

(6) **PAYMENTS.** The CITY shall read the meter or meters once each month at approximately thirty (30) day intervals. It is recognized that the DISTRICT can make payment only upon claim processed through the County Treasurer and payment shall be made by the DISTRICT as soon as possible after receipt of statement from the CITY, and in any event, not later than the tenth (10th) of the second month following the presentation of the bill. In the event the meter or meters shall fail to register, or obviously register incorrectly, the amount of water delivered through said meter or meters shall be estimated on the basis of the meter readings for the same month, or months during the preceding year, when said meter or meters were properly functioning.

(7) **ACCESS TO FACILITIES AND RECORDS.** Each party shall be entitled to inspect the facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records as are at their disposal and as may be reasonably necessary to properly implement any section of this CONTRACT.

(8) **NON-ASSIGNABILITY.** Neither this CONTRACT nor any interest therein shall be transferred or assigned by the DISTRICT
without prior written consent of the CITY.

(9) CANCELLATION OF PRIOR AGREEMENTS. Agreements previously entered into between the parties dated March 20, 1962 and July 13, 1966, be and same hereby are cancelled.

(10) ENTIRE AGREEMENT. This CONTRACT constitutes the entire agreement of the parties relative to the sale of water by the CITY to the DISTRICT. This CONTRACT can be changed or amended only by subsequent written agreement of the parties.

(11) FAILURE TO PAY. In the event that the DISTRICT should fail to make any payment to the CITY for a period of sixty (60) days after the same becomes due, the CITY shall have the right to terminate further water services until such delinquency is cured.

IN WITNESS WHEREOF the parties have hereunto set their hands the day and year first above written.

KING COUNTY WATER DISTRICT NO. 111

By ________________________________

President and Commissioner

By ________________________________

Commissioner

By ________________________________

Commissioner

ATTEST:

C. ________

Secretary, Board of Commissioners

CITY OF KENT

ATTEST:

Mayor

City Clerk
AGREEMENT ESTABLISHING USE AND SERVICE AREAS OF THE PARTIES

AGREEMENT between King County Water District No. 111, a special purpose district of the state of Washington, hereinafter called "District," and the City of Kent, a municipal corporation of the state of Washington, hereinafter called "City."

1. Purpose. The District and the City have previously informally agreed to the establishment of a boundary between the service areas of the two parties and are now desirous of confirming the previous understanding and agreement in writing.

2. Agreement. It is hereby agreed between the parties that the boundary between the areas served by each of the parties shall be as follows:

Beginning at the South one-quarter corner of Section 33, Township 22 North, Range 5 East, W.M.;

thence North along the West line of the East 1/2 of said Section 33 to the Southeast corner of the NW 1/4 of the NE 1/4 thereof;

thence East along the South line of said NW 1/4 of the NE 1/4 to a point 440 feet east of the Southeast corner thereof;

thence northerly and parallel with the east line of said NW 1/4 of the NE 1/4 to the South line of the North 1/2 of the North 1/2 of said NW 1/4 of the NE 1/4;

thence east along the south line of said North 1/2 of the North 1/2 to the Southeast corner thereof;

thence North along the East line of said NW 1/4 of the NE 1/4 to the Northeast corner thereof;

thence West along the North line of said Section 33 to the East line of the Big "K" Addition No. 2 according to the Plat thereof recorded in Vol 67 of Plats, page 66, records of King County, Washington;
thence North along said east line to the Northeasterly line thereof;

thence Northwesterly along said Northeasterly line to the Northeast corner of the Big "K" Addition, as recorded in Vol. 73 of Plats, Page 16, Records of King County, Washington;

thence continuing Northwesterly along the Northeasterly line of said Big "K" Addition, to its intersection with the east margin of 124th Ave. SE;

thence North along said East margin to its intersection with the Southwesterly margin of S.R. 516 (Kent-Kangley Road);

thence Northwesterly to the intersection of the West margin of 124th Avenue SE with the Southwesterly margin of S.R. 516;

thence Northerly to the intersection of the West margin of 124th Avenue SE with the Northeasterly margin of said S.R. 516;

thence Northwesterly along said Northeasterly margin to the Northeasterly line of the following described parcel.

Beginning at a point on the N line of the NE 1/4 of the SW 1/4 of Sec. 20, Township 22 North, Range 5 E.4.M., in King County, Washington, distant N 89°59' E 841.7' from the NW corner of the said NE 1/4 of the SW 1/4 and the true point of beginning;

thence continuing north 89°59'00" N 154.3', thence S 28°38'00" West 478.9' to the N line of the Kent-Black Diamond Highway; thence N 62°09'00" W along said N line of the said Highway 134 S' to a point which is S 58°38'00" W of the point of beginning; thence N 28°38'00" E 407.0' to said true point of beginning.

Thence Northeasterly along said Northwesterly line to the North line of said NE 1/4 of the SW 1/4,

thence West along said North line to its intersection with a line that is 495 feet West of and parallel with the NW 1/4 of Section 28, T 22 N, R 5 E, W.M.;

thence North along a line that is 495 feet West of and parallel with said NW 1/4, and the West 1/2 of Section 21, T 22 N, R 5 E, W.M., to the North line thereof.
District shall serve the area lying generally east of said boundary line and City shall serve the area lying generally west of said boundary line.


KING COUNTY WATER DISTRICT NO. 111

By ____________________

Charles E. Wilson, Commissioner

CITY OF KENT

By ____________________

Mayor, Isabel K. Hogan

By ____________________

Clerk, Marie Jensen

By ____________________

Robert R. Sparks, Commissioner
THIS AGREEMENT entered into this 12th day of August 1979, by and between the CITY OF KENT, hereinafter referred to as "Kent" and the CITY OF TUKWILA, hereinafter referred to as "Tukwila".

WHEREAS Municipal Corporations are given the power to contract under RCW 39.34 for cooperative services, and

WHEREAS it is necessary for Tukwila and Kent to enter into this Agreement to provide a water intertie system, and

WHEREAS it is mutually beneficial to both parties to enter into this Agreement to provide emergency water flow and water supply to meet Kent's needs during periods of peak demand and for emergency flow and fire protection in both cities,

NOW, THEREFORE, IN CONSIDERATION of the mutual benefits conveyed hereby do agree as follows:

1. Both parties agree to cooperate in the construction of a water flow intertie system uniting the water supplies of the City of Kent and the City of Tukwila at a point on the West Valley Highway.

2. The intertie system will be constructed by the City of Kent at the City of Kent's expense and ownership of said facility shall remain with the City of Kent. The City of Kent hereby agrees to operate and maintain said facility.

3. Both parties agree that the intertie system will not be operated except during periods when either party desires to obtain
water from the other party. Whenever either party wishes to operate the intertie, ten days notice shall be given to the other party, except that in the case of an emergency, such notice shall not be required. Whenever operated, the operating party agrees to notify the other party's Fire Department and Water Department immediately.

4. Both parties agree that the rate to be charged for water used under this Agreement will be at the rate of $0.33 per 100 cubic feet of water used. Billing for said charge shall be made in the normal course of business and paid by the other party promptly upon receipt of the invoice. Failure to pay for water utilized under this Agreement or for use for other than emergency purposes, unless otherwise agreed upon, shall be grounds for termination of this Agreement.

5. Either party may cancel this Agreement for material breach of its terms by written notice served upon the other party at least twenty (20) days prior to the proposed termination date. If the breaching party removes the breach and performs under terms of this Agreement before the termination date, the Agreement shall remain in full force and effect. However, if the breach is not removed and continues, then the Agreement shall be null and void in all respects except for the obligation to make payments as defined for water used prior to the termination date.

CITY OF TUKWILA

By Edgar W. Beach
Mayor

CITY OF KENT

By Joe E. Hase
Mayor
Attest:

By ________________________________
City Clerk

Approved as to Form:

____________________________________
City Attorney for
City of Tukwila

Attest:

By ________________________________
City Clerk

Approved as to Form:

____________________________________
City Attorney for
City of Kent
April 5, 1995

Mr. Don E. Wickstrom, P.E.
Director of Public Works
City of Kent
220 - 4th Avenue S.
Kent, WA 98032-5895

Re: Changes to Intertie Agreement and
No Protest LID Covenant

Dear Don:

Enclosed are three originals of each of the above-referenced documents which have been signed by our General Manager. These originals include the changes you requested in your April 4, 1995 letters.

Thanks for bringing these omissions/changes to my attention. I look forward to working with you.

Sincerely,

Keith A. Harris
Manager
Planning and Construction

Enclosures (3) originals
This Fire Protection and Intertie Agreement (the "Agreement" or "this Agreement") is made this 15th day of March 1995 (being the "anniversary date") between Highline Water District, King County (hereinafter sometimes referred to as "Highline") and the City of Kent, King County (hereinafter sometimes referred to as "Kent").

WHEREAS Highline and Kent are each municipal corporations organized and operating consistent with the laws of the State of Washington; and

WHEREAS the State of Washington, Department of Health encourages Water Service Agreements between adjacent water utilities; and

WHEREAS the connection operates via a pumping system to flow water to Kent and via gravity to flow water to Highline; and

WHEREAS Highline and Kent presently have an eight-inch (8") manually-operated connection between the District's connection between the districts located at S. 240th Street and 35th Avenue South, as governed by an Agreement to Provide Water Services dated October 6, 1982, and

WHEREAS the rate structure of Highline specifies the costs of providing water for certain classes of users; and

WHEREAS at least one boundary of Highline is parallel with and abuts at least one boundary of Kent; and

WHEREAS Highline and Kent wish to supersede the October 6, 1982 Agreement to Provide Water Service (the "Water Service Agreement"), and enter into a new Fire Protection and Emergency Intertie Agreement to serve the customers of Kent.

NOW THEREFORE, it is agreed as follows:

1. Location of Facilities: Highline and Kent agree to cooperate on the replacement and maintenance of an emergency fire protection intertie at the intersection of South 240th Street and 35th Avenue South. This intertie will be for two-way flow between Highline and Kent. The intertie shall be operational on a year-round basis.

2. Limitations on Use of Water From Intertie: Kent and Highline shall limit the use of the water obtained through the intertie for fire-fighting purposes, emergency use and special maintenance purposes.
Intertie Agreement

For purposes of this Agreement:

a. Firefighting Purposes means in the event Kent storage tank and well pumping capacities are inadequate to combat a conflagration from mains with Kent, water from the intertie may be used to extinguish the fire.

b. Emergency Use means in the event of a power outage, a pump system mechanical failure or a rupture in the distribution system which would impair the productivity of Kent wells to maintain the capacity of the storage tank for fire-fighting purposes and consumption by the public. This emergency use would terminate upon restoration of the electrical power and the repair to the pump(s) and damaged distribution system.

c. Special maintenance purposes are limited to:

1) Temporary removal from service of either the City’s 300,000 gal. reservoir at 264th St. & 34th Ave. and/or 1 million gal. site at Reith Rd. & 256th St. for the purpose of maintenance, painting or decontamination.

2) Scheduled preventive maintenance operation of the intertie pumping station whereupon the pumping station is operated once a month for no longer than a four hour duration.

4. Maintenance, Repair, Inspections and Costs for Same - Kent shall be responsible for inspecting and maintaining the intertie. Kent shall advise Highline of the qualifications of the firm which is proposed to do the inspection and maintenance. Highline shall reasonably approve the choice.

Kent or its representative shall inspect the intertie annually or more often as required, and shall advise Highline of the results of the inspections. Kent shall pay all costs to repair the intertie as necessary to insure its proper functioning and shall advise Highline of its maintenance and repair activities.

The parties agree that emergency repairs to the South 240th Street and 35th Avenue South Intertie may be performed by either party without notice, followed by notice to the other party as soon as reasonably possible. The costs of any emergency repairs undertaken by Kent shall be borne solely by Kent. The costs of any emergency repairs undertaken by Highline shall be promptly reimbursed by Kent.
Interht Agreement

5. Notice - Kent shall notify Highline within a ten (10) day period after use of the intertie for fire-fighting purposes or other emergency use stating the nature of the emergency use, the date and time of use and the quantity of water used in the intertie.

6. Costs of Water Supplied by Highline - Kent shall pay Highline for use of water through the intertie system based on Highline's published wholesale rate in effect on the date the water is used by Kent. Any time Kent uses water, whether for one day or an entire month, Kent shall pay the monthly meter charge for the month or months in which it is drawing water, plus pay the commodity charge. Thus, using the rates in effect at the present time, for any use of water within a single month, Kent will pay $2,305 plus $1.41 (October through May) and $1.87 (June through September) for each 100 cubic feet of water used. Kent understands that the wholesale rate may be revised by Highline from time to time. However, Kent will be allowed a scheduled maintenance period (up to four hours) each month to allow operation of the intertie pumping station for preventive maintenance purposes. This will not require payment of the monthly meter charge, only payment for water used.

7. City of Seattle Demand Charges - The parties reserve the right to negotiate with the City of Seattle to obtain an agreement with the City of Seattle to waive any City of Seattle demand charges incurred by Highline as a consequence of the South 240th Street and 35th Avenue South Intertie. Any agreement shall be in writing and shall become a part of this intertie Agreement. Highline will provide a signed copy of same to Kent.

If Highline is unable to obtain an agreement with the City of Seattle to reduce or waive demand charges to Highline caused by use of water in accordance with this Agreement, and shall any of the ten peak days used to calculate the demand charge be coincidental with a day in which water was taken through the South 240th Street and 35th Avenue South Intertie, then Kent shall calculate their portion, if any, of the demand charge.

8. Indemnification - The parties agree to indemnify and hold each other harmless from any claim arising under this Agreement. It is understood and agreed that Highline makes no warranties or assurances as to water availability, pressure or volume at any given time relating to the Intertie.

It is understood that if Highline's water service to the South 240th Street and 35th Avenue South Intertie is temporarily interrupted for repair for an emergency, or for any other reasons, it is not obligated to provide an alternative source of water supply. Highline does, however, warrant that it will not, except for reasons relating to emergencies or other necessary repairs, interrupt the water supply to the intertie.

8-A Costs of Water Supplied by Kent - Highline shall pay Kent for use of water through the intertie system based on Kent's published water rate in effect on the date the water is used by Highline.
Interim Agreement

9. **Term** - This Interim Agreement, except for the water rate, shall be reviewed annually, and shall continue indefinitely unless either party notifies the other of its intention not to continue or to renegotiate this Agreement by giving six months written notice prior to the end of each annual anniversary date.

10. **Dispute Resolution** - If a dispute arises out of or relates to this Agreement, or the breach of it, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to settle the dispute by mediation under the rules and regulations of the Washington State Water/Wastewater Association, or Washington Arbitration and Mediation Services, Inc. before resorting to arbitration, litigation or some other dispute resolution procedure.

11. **Termination** - The October 6, 1982 Agreement to Provide Water Service is superseded by this Agreement, subject to any accrued monetary charges which may be owing from Kent to Highline.

DATED this ___ DAY OF April ___, 1995.

HIGHLINE WATER DISTRICT

By ____________________________

Peggy S Bosley

Its GENERAL MANAGER

STATE OF WASHINGTON

COUNTY OF KING

I certify that I know or have satisfactory evidence that
Peggy S Bosley is the person who appeared before me
and said person acknowledged that he/she signed this
instrument on oath and stated that he/she was authorized
to execute the instrument and acknowledged it as the Fire
Protection & Emergency Interim Agreement of Highline
Water District, and she signed the document as the free
and voluntary act of such party for the uses and purposes
mentioned in the instrument.

I, POLLY DAIGLE, am a Notary Public in King County,
WA whose commission expires June 20, 1997 and resides
in Kent, WA. ____________________________

POLLY DAIGLE

DATED ____________________________ 1995

(seal or stamp)

CITY OF KENT

By ____________________________

Its

STATE OF WASHINGTON

COUNTY OF KING

I certify that I know or have satisfactory evidence that
_______________________ is the person who
appeared before me and said person acknowledged that
he/she signed this instrument on oath and stated that
he/she was authorized to execute the instrument and
acknowledged it as the Fire Protection & Emergency
Interim Agreement of Highline Water District, and that
he/she signed the document as the free and voluntary act
of such party for the uses and purposes mentioned in
the instrument.

I ____________________________ am a Notary Public in
King County, WA, whose commission expires
_______________________ and who resides in _________

_______________________


(seal or stamp)
RESOLUTION NO. 1341

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF AUBURN, WASHINGTON, AUTHORIZING THE MAYOR OF THE CITY OF AUBURN, TO EXECUTE AN AGREEMENT BETWEEN THE CITY OF AUBURN AND KING COUNTY WATER DISTRICT NO. 87 CONCERNING THE TRANSFER OF KING COUNTY WATER DISTRICT NO. 87'S WATER SYSTEM TO THE CITY OF AUBURN.

THE CITY COUNCIL OF THE CITY OF AUBURN, WASHINGTON, IN A REGULAR MEETING DULY ASSEMBLED, HERewith RESOLVES THAT.

THE Mayor of the City of Auburn, Washington, is here-with authorized and directed to execute an Agreement between the City of Auburn and King County Water District No. 87 concerning the transfer of King County Water District No. 87's water system. A copy of said Agreement is attached hereto, denominated as Exhibit "A" and made a part hereof as though set forth in full herein.

THE Mayor is hereby authorized to implement such administrative procedures as may be necessary to carry out the directions of this legislation.

DATED and SIGNED this 6th day of July, 1982.

\[Signature\]

MAYOR

ATTEST

\[Signature\]

City Clerk

Resolution No. 1341
7/6/82
Section 3. The City Clerk is hereby authorized and directed to transmit a certified copy of this ordinance to all of the parties to the agreement attached hereto.

Section 4. This ordinance shall take effect and be in force five (5) days from and after its passage, approval and publication as provided by law.

ATTEST:

[Signature]
ISABEL HOGAN, MAYOR

APPROVED AS TO FORM.

[Signature]
P. STEPHEN DIJULIO, CITY ATTORNEY

PASSED the 16th day of August, 1982.
APPROVED the 17th day of August, 1982.
PUBLISHED the 21st day of August, 1982.

I hereby certify that this is a true copy of Ordinance No. 7361, passed by the City Council of the City of Kent, Washington, and approved by the Mayor of the City of Kent as herein indicated.

[Signature]
BETTY GRAY, DEPUTY CITY CLERK

Duplicate
Original

4-2
IT IS AGREED by and between WATER DISTRICT 87, King County, a Washington Municipal Corporation ("WD 87"), and the Cities of AUBURN ("Auburn") and KENT, ("Kent") Washington, (collectively, "the cities") as follows:

1. Authority

This agreement is entered into pursuant to RCW 35.13A.070, which authorizes one or more cities and water districts to contract regarding ownership of property, providing of water service, and operation of facilities.

2. Transfer of Water System

The ownership of WD 87's entire "water system" shall, as of the above date, be transferred and conveyed to Auburn and Kent, in the manner provided below.

The term "water system" shall include, but not be limited to, all WD 87 water mains and appurtenances, hydrants, easements; licenses, franchises, permits and facilities, rights and assets of any kind or nature whatsoever.

Said transfer is subject to the cities' performance of all of the terms and conditions of this agreement.

The cities hereby accept their respective portions of the water system on the terms of this agreement.

3. Division of System

The entire WD 87 water system lying southerly of the following described line will become the property of Auburn and the remaining portion of the water system (lying northerly of the following described line) shall become the property of Kent:

Starting at a point of intersection on the westerly boundary line of WD #87 which is the easterly margin of the Chicago Milwaukee and St Paul Railroad right-of-way with the southerly right-of-way line of S. 277th street and projecting easterly therefrom along said southerly right-of-way line to an intersection point with the easterly margin of the Burlington Northern Railroad right-of-way thence northerly therefrom along said easterly line to an intersection point with the northerly right-of-way line of S. 277th street thence projecting easterly therefrom along said northerly right-of-way line to the easterly boundary line of WD #87 which is the westerly line of S S. Highway #5 (aka) East Valley Highway.

WD 87's customer records will be divided between the cities, according to the above division of the water system and any temporary services.

The limited hand tools and miscellaneous personal property owned by WD 87 will be transferred to Auburn.

4 Connection to Auburn System

The cost of inter-connecting the WD 87 water system to Auburn's water system shall be paid for from monies presently in the WD 87 maintenance fund.

The City of Kent is presently connected to the WD 87 water system, and no further connections are presently needed.
5. Costs and Expenses/WD 87 Money

The following shall be paid from WD 87 money, in the following order of priority:

WD 87 routine debts and expenses.
WD 87's attorney's fees for drafting of this agreement, and related work.
Any attorney's fees and/or costs in obtaining boundary review board or other governmental approvals (per paragraph 10 hereof).
Cost of inter-connecting the WD 87 system to Auburn's water system (per paragraph 4 hereof).

To the extent that any WD 87 money remains after payment of the above, the same shall be divided evenly between the cities proportionate to the number of WD 87 customers to be served permanently by the cities.

To the extent that the WD 87 funds are inadequate to pay all of the above, then the City of Auburn shall bear any remaining cost of inter-connecting the water systems. If there is insufficient WD 87 money to pay all of the other above-listed items in full (other than WD debts), then any amount remaining due shall be borne by the cities according to the same permanent customer ratio as above.

6. Service Interruptions

The cities each agree that transfer of the water system will not result in any interruption of water service to any WD 87 customer other than that normally experienced in the day-to-day operation of the respective water systems.

7. Water Rates

The cities each agree that former WD 87 customers shall, following transfer and in the future, be charged for water service, and pay the same connection and other charges, as the cities charge in each case, its other customers in the same class of service. Service shall also be of the same quality as that received by other customers in the same class.

8. Temporary Service

Auburn and Kent recognize, and agree, that until their respective water systems are readily available within the present WD 87 service area, each will have to extend temporary water service to existing customers on the opposite side from them on the above described boundary line. During such temporary service, the customers shall pay the serving city's rates and charges, and the serving city will maintain the water mains, hydrants and meters serving those temporary customers.

The city temporarily serving such customers will turn over the customers to the other city on request. Both cities agree to cooperate in the transition of these customers from one city to the other and agree that water service to the customers will not be interrupted unnecessarily during the transition.

No property temporarily served by one of the cities shall be assessed, or otherwise required to pay, for new water mains or facilities in order to transfer their services over to the other city unless said property is specifically benefited beyond the availability of the existing service.

No new water services including fire hydrants and fire service lines will be connected to a water main owned by one city but temporarily being utilized to serve the above said customers (property), without the written consent of the other city.

2/11/82
9. Preferential Employment

The full-time employees of WD 87 shall be entitled to offers of comparable full-time employment from both Auburn and Kent, in accordance with RCW 35.13A.090.

10. Governmental Approvals

If, in the opinion of either city, it is necessary to obtain approval of this agreement by the King County Boundary Review Board, King County Council, and/or any other governmental body, then that city shall so notify the other parties to this agreement prior to transfer of WD 87's remaining monies to the cities.

The cities shall determine, between themselves, which city (or WD 87) shall obtain such approval(s). Regardless of who obtains the approval(s), the cost thereof shall be paid from WD 87 funds to the extent available.

11. Financial Records

WD 87's financial and other records are available on request, for inspection and copying by either of the cities.

12. WD 87 Indebtedness

WD 87 shall, as above, pay all of its debts from its present funds. WD 87 warrants that on the effective date of this agreement it will have no debts. Further WD 87 has no bonds, warrants or similar obligations outstanding, and will not issue any in the future. WD 87 also warrants that it does not have any UIID or other assessments receivable, and will not form any improvement districts in the future.

WD 87 warrants that, to the best of its knowledge and the knowledge of its Water Commissioners, there are no pending, asserted or threatened claims, suits or liens against it or any of its water system, monies or other assets. IF WD 87 or any its commissioners should receive notice or knowledge of any such claim, suit or lien prior to the effective date of this agreement, WD 87 will immediately notify other cities. The Water Commissioners of WD 87 shall not be personally liable for the foregoing warranties, and shall not be personally liable for performance of any of the terms of this agreement unless they shall, by Board of Water Commissioners's action, vote or otherwise cause the breach of this agreement.

13. WD 87 Continuing Authority.

Following the effective date of this agreement, WD 87 shall remain a municipal corporation, and its commissioners shall remain in office for at least their present terms of office, unless WD 87 is sooner dissolved as set forth below. During the continued existence of WD 87, its commissioners shall not exercise any rights, privileges, powers or functions provided by law to WD 87, except at the request of one or both of the cities. If such request is made by only one of the parties, then such actions shall be taken only with respect to that city's portion of the WD 87 water system. The WD 87 Commissioners shall not be obliged to undertake any action unless it is necessary to implement, clarify or carry out this agreement and, in such case, the other city(ies) requesting the action shall thereby agree to save the WD 87 Commissioners harmless from any liability in respect to the same.

14. Dissolution of WD 87

Any one or more of the parties to this agreement, or anyone else having standing to do so, may petition and/or take such steps as are necessary to dissolve WD 87 under any available statutory authority and procedure. In the event that WD 87 has not been dissolved within five (5) years of the effective date of this agreement, then the cities agree that they will immediately thereafter petition for the dissolution of WD 87 pursuant of RCW 57.90 governing the disincorporation of special districts that have not actively carried out any of the district's purposes or functions for a period of five (5) years, or any similar or other statutes then in effect. The cost of such disincorporation shall be borne by the cities in the same proportion as other expenses are provided for in this agreement.

2/11/82
15. Approval by Parties

This agreement shall be submitted to the governing bodies of each of the parties and approved by City Ordinance and Water District Resolution. Certified copies of said ordinances and resolution shall be furnished each of the parties to this agreement. Adoption of said ordinances and resolution shall serve in lieu of signature to this agreement. Notwithstanding the effective date set forth as the beginning of this agreement, this agreement shall be effective 45 days after it is approved by all three (3) parties.

DATED as of the date set forth hereinafore.

CITY OF AUBURN

CITY OF KENT

WATER DISTRICT NO. 87, KING COUNTY

2/11/82
THIS AGREEMENT, made and entered into this [Insert Date] day of January, 19[99]
by and between King County Water District No. 87, a municipal corporation
duly organized and existing under the laws of the State of Washington,
hereinafter called the "district," by and through its duly elected,
qualified and acting commissioners, and the City of Kent, a municipal
corporation of the third class of the State of Washington, hereinafter called
the "city," by and through its duly elected, qualified, acting and authorized
officials,

WITNESSETH:

Section 1. SCOPE OF CONTRACT. Subject to the terms and conditions
hereinafter set forth, the City agrees to sell and deliver to the district
and the district agrees to purchase and receive from the city, surplus
water for the needs of inhabitants of the district for domestic purposes.

Section 2. EFFECTIVE DATE OF CONTRACT. This contract shall take effect
upon the execution thereof by the proper officials of the district and
the city, provided, however, that in the event a proposed utility local
improvement district #1 of the district should not be formed by the district
the agreement shall automatically terminate; and provided further that no
obligation to purchase water by the district or to sell water to the district
by the city or to perform maintenance and installation services at
hereinafter provided, shall become effective until the construction of
the distribution system proposed under utility local improvement district
#1 of the district has been completed and the district requests delivery
of water.

Section 3. TERM OF CONTRACT. Except as provided in Section 2
above, this contract shall be in effect for a term of twenty (20) years
from the date hereof, except that provisions for the maintenance of the
district's lines by the city and the installation of water connections
by the city for the district may be terminated as hereinafter provided.

Section 4. OBLIGATION OF CITY TO EXTEND AND/OR INCREASE SIZE OF NAIL:
It is understood and agreed that the city presently has installed a 10 inch
main upon First Avenue South to a point 400 feet north of South 236th St.
(River Road) and has installed a 6 inch main along Third Avenue South in

EMERSON R. THATCHER
ATTY.
KENT, WASHINGTON
sent to the "T" Bridge, over the Green River, and a 4 inch main across a 3/4
bridge into the territory of the district a distance of approximately 1100
feet on 56th Avenue South, and thence westerly through the territory of the
district to its boundaries and further west to serve the customers of
the city. The city shall, upon notification to it by the district that
utility local improvement district has been formed, and that construction
of the distribution lines therein will be done, proceed to install from the
city's 6 inch main hereinabove described, across the "T" Bridge, and for an
approximate distance of 1100 feet, an 8 inch water main. Furthermore, the
city shall, at such time during the life of this contract as the district
may install a complete system of fire protection within the district, extend
the said 10 inch line from its present or then end to the "T" Bridge and a
junction with the 8 inch line to be installed by the city hereunder. All
of such installation shall be at the sole cost and expense of the city.

Section 5 SURVEY TO DETERMINE CUSTOMERS WITHIN DISTRICT. It is

further understood and agreed that presently there reside within the
water district seven (7) customers who are presently receiving water
from the city of a 4 inch line which extends south from the "T" Bridge
1100 feet and then west beyond the west boundaries of the district. It is
understood and agreed that when and if the utility local improvement dis-
trict #1 of the district is completed, all of said Kent customers being

"customers of the Kent line" shall be given the choice of continuing to purchase
water directly from the city or of purchasing water from the district and
that upon such choice made, the city or the district will serve, at such
rates as may be established by them respectively, the customers choosing the
city or the district respectively. The customers being northerly of the
Kent line shall continue to be served by the city. It is further recognized
that there shall be a new development of housing in the district and it
is agreed that all new customers lying south of that portion of the City of
Kent line running west from the point 1100 feet south of the "T" Bridge,
shall be served by the district only and that all new customers north of the
said line shall be served by the city.

Section 6 INTH. The district agrees to pay the city for all
water delivered to the district, at the delivery point, as follows:

SCERSON N. THATCHER
EN Director
KENT WASHINGTON
The charge of $1.00 per connection herein provided for shall remain constant during the life of this agreement, but it is understood and agreed that the charge of $1.00 per 100 cubic feet of water delivered to the district shall be subject to change by the City of Kent from time to time during the life of this contract, as the City may change its rates for similar types of service.

Section 7. PAYMENTS. The charges herein provided for shall be paid by the district to the city monthly. The city shall submit invoices containing statements of meter meter readings as of the 20th of the month and the district shall furnish to the city, on the 20th of each month, a certified statement showing the total number of consumers supplied by the district with water service for the month immediately preceding the date of such certified statement. The city shall have the right to make payment only upon claims processed through the County Treasurer and payments shall be made by the district as soon as possible after receipt of statement from the city and, in any event, not later than the 10th of the second month following the date of meter readings.

Section 8. PRIORITIES. The city agrees that it will not, by contract with others, for surplus water, so reduce its supply that the district could not be served adequately.

Section 9. FACILITIES. (a) The city agrees to furnish, install, erect and maintain all facilities required to furnish service to the point of delivery, specified hereinafter and title to all such facilities shall be and remain vested in the city.

(b) The city agrees to deliver surplus water from its water supply and reservoirs but no higher standard of purity shall be required by the city than that in effect for residential consumers of the city.

Section 10. POINT OF DELIVERY. The surplus water to be supplied by the city under the provisions hereof shall be delivered to the district at a point approximately 1 mile south of the "T" bridge hereinabove described, at whatever pressure may be available with the existing mains, or main to be installed under the terms hereunder, reservoirs and other...
Section 11. MEASUREMENT. (a) All water delivered by the city to the district shall be measured by a suitable master metering device of standard manufacture, to be furnished, installed, maintained and calibrated by the city, at the expense of the district. In the event the meter fails to register, or obviously registers incorrectly, the water furnished there through the city shall estimate the amount of water delivered for the period during which such meter failed to register. In making such estimate, the city shall take 50% of the total deliveries of water through such meter for the two months immediately preceding the failure of such meter to properly register deliveries.

(b) The city shall read its meters at periodical intervals of approximately thirty (30) days, or on or about the 20th day of each month.

Section 12. CONTINUITY OF SERVICE. The city is obligated hereunder to supply the district with surplus water only, and shall not be liable for damages for breach of contract or otherwise to the district for failure, suspension, or diminution of its water supply, or variations in pressure occasioned by or in consequence of demands made upon its water system by the inhabitants of the city, or of any cause beyond the control of the city.

Section 13. CITY ORDINANCES AND REGULATIONS. All consumers and inhabitants of the district shall submit to and comply with all ordinances, rules and regulations of the city pertaining to consumption and use of water and the district agrees to adopt appropriate rules and regulations governing the consumption of water in the area comprising the district, to give full force and effect to the provisions of this section. The district agrees to maintain its pipelines free from unnecessary leaks.

Section 14. ACCESS TO FACILITIES AND RECORDS. Either party will be entitled to inspect the facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records as are at their disposal and as may be reasonably necessary, properly to implement any section of this contract.

Section 15. MAINTENANCE. It is understood and agreed that the city has, and that the district has not, facilities for maintenance of water systems, and that the city shall upon request of the district
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Cost of labor at the rate of $2.25 per hr., or at such other high rate as the city may be from time to time required to pay, plus 10% overhead, plus cost of materials, plus 14% per mile for each item of equipment used in said maintenance.

The city shall invoice for such maintenance at the same time that invoice for water purchased is made, and payments shall be made by the district to the city within the same time as is required for payment for water purchased.

The provisions of this paragraph may be cancelled by either party upon ninety (90) days written notice to the other.

Section 16. CONNECTION. The city agrees that after the original individual meter installations are made by the district, on the installation of its facilities under the utility local improvement district #1 of the district, it will, on request of the district, make additional customer connections to the lines of the district, at a cost and terms of payment as set out hereinafore for maintenance of the district's facilities.

The provisions of this paragraph may be cancelled by either party upon ninety (90) days written notice to the other.

Section 17. It shall be the duty of the city to furnish, install, maintain, and collect upon a meter meter at the point of delivery as heretofore described, at a cost and on the payment terms as hereinafore provided for, for maintenance and connection costs.

Section 18. CONDEMNATION. In the event the facilities of the water district are acquired through condemnation by any other authorized body, and in the further event that at that time Kent has not received $6,000.00 from the 1.50 per customer per month charge authorized to be provided for, the water district shall, in the proceeds of the amount paid on such condemnation, pay to the City of Kent for with the difference between the sum of $6,000.00 and the amount theretofore received by the City through said 1.50 charges.

Section 19. FAILURE TO PAY. In the event that the district should fail to make any payment to the city for a period of sixty (60) days after the same becomes due, the city shall have the right to terminate further water connection until such delinquency is cured.
Section 20 - NON-ASSIGNABILITY. Neither this contract nor any interest therein shall be transferred or assigned by the district without prior written consent of the city.

IN WITNESS WHEREOF the parties have heretounto set their hands the day and year first above written.

KING COUNTY WATER DISTRICT NO. 8

By: [Signature]
President and Commissioner

By: [Signature]
Commissioner

By: [Signature]
Commissioner

Attest: [Signature]
Secretary, Board of Commissioners.

THE CITY OF KENT

By: [Signature]
Mayor

Attest: [Signature]
City Clerk

EMERSON & THATCHER
CITY OF KENT, WASHINGTON
This Agreement made and entered into this _21st_ day of _December_ 1981, by the CITY OF KENT, a municipal corporation of the State of Washington, hereinafter called "THE CITY", and KING COUNTY WATER DISTRICT NO. 87, a municipal corporation of the State of Washington, hereinafter called "THE DISTRICT.

WITNESSETH.

WHEREAS, the parties desire to enter into a contract providing for the sale of water by The CITY to THE DISTRICT, NOW, THEREFORE, IT IS AGREED AS follows:

1. Term of Contract. The effective date of this AGREEMENT shall be _December_, 1981. The contract shall be for a ten (10) year period.

2. Rates. THE DISTRICT shall pay to THE CITY for all water delivered at a rate of $0.77 cents per 100 cubic feet. It is understood and agreed that during the life of this contract said rate shall be subject to change from time to time by THE CITY as THE CITY changes its rate to other customers.

3. Metering Equipment. THE CITY shall own and maintain an appropriate metering device to measure the water flowing from THE CITY's system to THE DISTRICT's system at the point of service connection.
(4) **Meter Charge.** A monthly demand charge of nineteen dollars and thirty-five cents ($19.35) for the 6-inch meter shall be paid by THE DISTRICT. It is understood and agreed that during the life of the contract said monthly charge shall be subject to change from time to time by THE CITY as THE CITY changes its charge to other customers.

(5) **Point of Delivery.** The water to be supplied by THE CITY under the provisions hereof shall be delivered to the district at a point approximately 1190 feet south of the 3rd Avenue Bridge over the Green River at whatever pressure may be available with the existing mains, reservoirs and other facilities.

(6) **Priority and Continuity of Service.** Continuity of service to THE DISTRICT shall be maintained by THE CITY to the maximum extent feasible in the same manner as service to THE CITY's own residences and other consumers served directly by it. In the event of a general emergency or water shortage requiring restrictions on the delivery of water, no greater restrictions shall be placed upon deliveries to THE DISTRICT than are placed upon deliveries to similar classes of consumers served directly by THE CITY.

THE CITY may temporarily interrupt or reduce deliveries of water to THE DISTRICT if THE CITY determines that such interruption or reduction is necessary or reasonable in case of system breakdowns or in order to install equipment and make repairs, replacements, investigations and inspections of, or perform other maintenance work on THE CITY's water system or those parts of their system supplying THE DISTRICT. Except in cases of emergency and in order that THE DISTRICT's operations will not be unreasonably interfered with,
THE CITY shall give THE DISTRICT reasonable notice of any such interruption or reduction, the reason therefore, and the probable duration thereof.

(7) Payment. THE CITY shall read the meter once each month at approximately thirty (30) day intervals or in accordance with its billing practices. Payment shall be made by THE DISTRICT as soon as possible after receipt of statement from THE CITY, and in any event, not later than the sixteenth (16th) of the second month following the presentation of the bill. In the event the meter shall fail to register, or obviously register incorrectly, the amount of water delivered through said meter shall be estimated on the basis of the meter readings for the same month, or months during the preceding year, when said meter was properly functioning.

In the event the meter shall fail to register, or obviously register incorrectly any time during the first twelve (12) months of use, the amount of water considered delivered through said meter shall be that amount delivered the previous month or the latest month during which the meter was properly functioning.

(8) Penalties for Late Payment. THE CITY may assess a late charge on THE DISTRICT for failure to comply with the provisions in Section (7). This charge shall be twelve percent (12%) per year or the maximum amount permissible by law. In the event that THE DISTRICT should fail to make any payment to THE CITY for a period of sixty (60) days after the same becomes due, THE CITY shall have the right to terminate further water services until such delinquency is cured.
(9) **Procedure for Amending the Contract.** Either party can request the other to consider an amendment of the contract. Any proposed amendments shall be made in writing. Amendments may be made if they are mutually acceptable to THE CITY and THE DISTRICT and signed by both parties.

(10) **Access to Facilities and Records.** Each party shall be entitled to inspect the facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records as are at their disposal and as may be reasonably necessary to properly implement any section of this contract.

(11) **Non-Assignability.** Neither this contract nor any interest therein shall be transferred or assigned by THE DISTRICT without prior written consent of THE CITY.

(12) **Water Quality.** The quality of water delivered under this AGREEMENT shall be subject to applicable provisions of State and Federal law and rules and regulations of the appropriate State agency governing water quality, and subject also to applicable provisions of THE CITY ordinances relating thereto and not inconsistent herewith. THE CITY agrees to deliver water which shall be of no less quality than is delivered to its customers throughout THE CITY service area.

(13) **Maintenance.** It is understood and agreed that THE CITY has, and that THE DISTRICT has not, facilities for maintenance of water systems, and that THE CITY shall upon request of THE DISTRICT perform at its convenience such
maintenance work as may be required upon the facilities of THE DISTRICT, within utility local improvement district No. 1 of THE DISTRICT, at a cost equal to 15% above all costs incurred by THE CITY to do said work. Included in said costs but not limited to shall be direct and indirect labor costs, overhead costs, material costs, equipment costs and contractor services costs.

THE CITY shall invoice for such maintenance costs at the same time that invoice for water purchased is made, and payments shall be made by THE DISTRICT to THE CITY within the same time as is required for payment for water purchased.

The provisions of this paragraph may be cancelled by either party upon ninety (90) days written notice to the other.

(14) Connection. THE CITY agrees it will, on request of THE DISTRICT, make additional customer connections to the lines of THE DISTRICT, at a cost and terms of payment as set out hereinabove for maintenance of THE DISTRICT's facilities.

The provisions of this paragraph may be cancellable by either party upon ninety (90) days written notice to the other.

(15) City Ordinances and Regulations. All consumers and inhabitants of THE DISTRICT shall submit to and comply with all ordinances, rules and regulations of THE CITY pertaining to consumption and use of water and THE DISTRICT agrees to adopt appropriate rules and regulations governing the consumption of water in the area comprising THE DISTRICT, to give full force and effect to the provisions of this section. THE DISTRICT agrees to maintain its pipelines free from unnecessary leaks.
(16). **Termination.** Except where specified otherwise in this document, this agreement may be terminated in whole or in part by either party anytime upon one (1) year written notice sent by registered mail to the other party.

IN WITNESS WHEREOF the parties have hereunto set their hands the day and year first above written.

WATER DISTRICT NO. 87

BY: [Signature]

CITY OF KENT

BY: [Signature] Mayor

Attest. [Signature] City Clerk
Chapter 15.07

LANDSCAPING REGULATIONS*

Sections
15.07.010 Purpose
15.07.020 Landscape plan approval
15.07.030 Failure to complete required landscaping - Inspection
15.07.040 General landscape requirements for all zones
15.07.050 Types of landscaping
15.07.060 Regulations for specific districts
15.07.070 Maintenance of landscaping

*Cross reference(s) – Street trees, ch 6 10, building code, ch 14 02

15.07.010 Purpose.
A. The provisions of this chapter are to provide minimum standards for landscaping in order to maintain and protect property values and enhance the general appearance of the city
B. The planning director shall have the authority to waive specific requirements or impose additional requirements in unique or special circumstances to ensure the fulfillment of the stated purpose of this chapter and to allow for flexibility and innovation of design. Special circumstances or unique conditions shall be reviewed with the planning director prior to submittal of a landscape plan. Examples of special conditions might include
1. Preservation of unique wildlife habitat
2. Preservation of natural or native areas
3. Compliance with special easements
4. Renovation of existing landscaping
5. Unique site uses

15.07.020 Landscape plan approval.
A. A building permit shall not be issued until the landscaping plan has been approved
B. At the time of development plan review, the planning department shall review specific landscape requirements with the owner or his representative

15.07.030 Failure to complete required landscaping - Inspection.
A. Failure to complete all of the required landscaping or any part of it within six (6) months of the building occupancy, issuance of the certificate of occupancy or the planning department final inspection shall constitute a zoning violation
B. It shall be the responsibility of the project manager or business owner to contact the planning department upon completion of the landscaping work and request an inspection
C. The planning department may inspect the landscaping upon request of the project manager or business owner or at any time after the six (6) month expiration date.

15.07.040 General landscape requirements for all zones.
A. All parking areas of over twenty thousand (20,000) square feet shall have a minimum of ten (10) percent of the parking area, maneuvering area and loading space landscaped as a means to reduce the barren appearance of the lot and to reduce the amount of stormwater runoff. Perimeter landscaping, required adjacent to property lines, shall not be calculated as part of the ten (10) percent figure
B. All ingress or egress easements which provide corridors to the subject lot, not adjacent to a public right-of-way, shall be considered the same as a public right-of-way. Landscape requirements for easement corridors shall be the same as those required adjacent to public rights-of-way
C. All outside storage areas shall be screened by fencing and landscaping a minimum of five (5) feet in depth unless it is determined by development plan review that such screening is not necessary because stored materials are not visually obtrusive. The five (5) foot deep landscaped area can occur within the street right-of-way abutting the property line
D. All portions of a lot not devoted to building, future building, parking, storage or accessory uses shall be landscaped in a manner appropriate to the stated purpose of this chapter.
E. All required landscaping areas shall extend to the curbline or the street edge. A crushed rock path in lieu of landscaping shall be required where appropriate as determined by the planning department.
F Required landscape areas which are inappropriate to landscape due to the existence of rail lines or other features shall be relocated, first, to another lot line, or second, to an equal-sized area in another portion of the lot, to be determined by the planning department upon review with the owner or developer.

G. Bark mulch, gravel or other nonvegetative material shall only be used in conjunction with landscaping to assist vegetative growth and maintenance or to visually complement plant material. Nonvegetative material is not a substitute for plant material.

H. Required landscape areas shall be provided with adequate drainage.

I. Slopes shall not exceed a three (3) to one (1) ratio (width to height), in order to decrease erosion potential and assist in ease of maintenance.

J. The perimeter of all parking areas which abut residential zones or uses shall be landscaped to a minimum depth of three (3) feet with type II landscaping unless otherwise provided by this chapter. A six (6) foot high solid wood or equivalent fence is also required. Substitute fencing, including but not limited to chainlink fence with slats, may be approved by the planning director upon application of the developer and adjacent residential property owners when such fencing shall provide buffering consistent with the purpose and intent of this chapter. The term "adjacent residential property," for purposes of this section, shall mean abutting property, and lots immediately adjacent to abutting property.

K. Landscaping shall not conflict with the safety of those using adjacent sidewalks or with traffic safety. Safety features of landscaping shall be discussed at the time of development plan review, if necessary.

L. Quantity, arrangement and types of plants installed shall be appropriate to the size of the required landscape area and purpose of planting area as noted in KCC 15 07.050 pertaining to types of landscaping.

M. All trash containers shall be screened from abutting properties and streets by a one hundred (100) percent sight-obscuring fence or wall and appropriate landscaping.

N. Landscaping shall be placed outside of sight-obscuring or one hundred (100) percent sight-obscuring fences unless it is determined by the planning department that such arrangement would be detrimental to the stated purpose of this chapter.

O. All property abutting Highway 167 or Interstate 5 shall be landscaped to a minimum depth of ten (10) feet unless a larger area is required elsewhere in this chapter.

P. All property abutting East Valley Highway between South 180th Street on the north to the SR167 overpass on the south shall be landscaped to a minimum depth of fifteen (15) feet unless a larger area is required elsewhere in this chapter.

Q. The use of native and drought tolerant, low water use plants shall be incorporated into landscape design plans.

R. Landscape plans shall include where feasible a diversity of native plant species which promote native wildlife habitat.

S. When irrigation systems are incorporated into a landscaping area, the applicant shall prepare a water use and conservation plan for review and approval by the public works department.

T. Landscaping adjacent to required biofiltration systems may be considered part of any required landscaping areas, subject to approval by the planning director and the public works department. Landscaping shall not be permitted within the treatment area of a biofiltration system. The chosen vegetation shall not result in any disruption of bioswale functions at any time.

U. Landscaping buffers shall be required adjacent to any above ground storm water facilities, as required in the city's construction standards, subject to the approval of the public works department.

V. The configuration and plant species of landscape areas on a site shall be designed so as to not disrupt the functions of storm water systems. (Ord. No. 2786, § 5, 6-21-88; Ord. No. 3409, § 44, 7-7-98)
### Types of landscaping.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Type I Solid Screen</th>
<th>Type II Visual Screen</th>
<th>Type III Visual Buffer</th>
<th>Type IV Low Cover</th>
<th>Type V Open Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Type I landscaping is intended to provide a solid sight barrier to totally separate incompatible uses</td>
<td>Type II landscaping is intended to create a visual separation that is not necessarily one hundred (100) percent sight-obscuring between incompatible uses</td>
<td>Type III landscaping is intended to provide visual separation of uses from streets and main arterials and between compatible uses so as to soften the appearance of streets, parking lots and building facades</td>
<td>Type IV landscaping is intended to provide visual relief where clear sight is desired or as a complement to larger, more predominant planting materials</td>
<td>Type V landscaping is primarily intended to visually interrupt large open spaces of parking areas</td>
</tr>
</tbody>
</table>

| Description | Type I landscaping shall consist of evergreen trees or tall shrubs with a minimum height of six (6) feet at planting, which will provide a one hundred (100) percent sight-obscuring screen within two (2) years from the time of planting, or a combination of evergreen and deciduous trees and shrubs backed by one hundred (100) percent sight-obscuring fence | Type II landscaping shall be evergreen or a mixture of evergreen and deciduous trees with large shrubs and ground cover interspersed with the trees. A sight-obscuring fence will be required unless it is determined by development plan review that such a fence is not necessary (See also A, B, and C below) | Type III landscaping shall be evergreen and deciduous trees planted not more than thirty (30) feet on center interspersed with large shrubs and ground cover. Where used to separate parking from streets, plantings must create a visual barrier of at least forty-two (42) inches in height at time of planting and form a solid screen two (2) years after planting. (See also A, B, and C below) | Type IV landscaping shall consist of a mixture of evergreen and deciduous shrubs and ground cover, to provide solid covering of the entire landscaping area within two (2) years of planting and to be held to a maximum height of three and one-half (3 1/2) feet (see definition of ground cover) | Type V landscaping shall consist of trees planted with supporting shrubs or ground cover. Each landscape area shall be of sufficient size to promote and protect growth of plantings, with a one hundred (100) square foot minimum (see KCC 15.07 040(A)) (See also A and B below) |

Additional requirements for Types II, III, and V are as follows:

(A) Evergreen trees shall be an average height of six (6) feet at planting. Deciduous trees shall be the following sizes based on their spacing

1. One (1) inch caliper Ten (10) feet on center
2. Two (2) inch caliper Twenty (20) feet on center
3. Three (3) inch caliper Thirty (30) feet on center
4. Three and one-half (3 1/2) to five (5) inch caliper Forty (40) feet on center

(B) Ground cover shall be of sufficient size and spacing to form a solid cover within two (2) years from the time of planting

(C) The plantings and fence must not violate the sight area safety requirements at street intersections

(Ord No 3409, § 45, 7-7-98)
15.07.060 Regulations for specific districts.

Landscaping regulations for specific zoning districts are as follows:

A Residential agricultural, SR-1 None
B Single-family residential, SR-2 through SR-8 None
C Duplex multifamily residential, MR-D None
D Low density multifamily residential, MR-G
   Multifamily residential townhouse, MR-T
   Medium density multifamily residential, MR-M
   High density multifamily residential, MR-H
   1 A minimum of ten (10) feet of landscaping shall be provided abutting a public right-of-way
   2 Open green area shall occupy no less than twenty-five (25) percent of the area of the lot
   3. The side and rear perimeters of properties shall be landscaped to a minimum depth of ten (10) feet
   4 A minimum of five (5) feet of foundation landscaping shall be placed along the perimeter of any multifamily structure. Foundation landscaping consists of shrubbery or some other combination of landscape materials that helps to reduce the visual bulk of structures and buffer dwelling units from light, glare and other environmental intrusions.
E Mobile home park combining district, MHP
   Requirements shall be per the mobile home park code
F Neighborhood convenience commercial, NCC
   Community commercial, CC
   Commercial manufacturing, CM
   General commercial, GC
   Professional and office district, O
   1 The perimeter of property abutting a residential district shall be landscaped to a minimum depth of ten (10) feet
   2 A planting strip not less than five (5) feet in depth shall be provided along all property lines abutting public rights-of-way
G Downtown commercial, DC
   1 A minimum of three (3) feet of landscaping to screen off-street parking areas, placement of which shall be determined through the downtown design review process outlined in KCC 15 09 046
   2 Street trees in accordance with the official tree plan shall be planted
H Downtown commercial enterprise, DCE
   Downtown limited manufacturing, DLM
   1 The perimeter of properties abutting a residential district shall be landscaped to a minimum depth of ten (10) feet
   2 A minimum of three (3) feet of landscaping to screen off-street parking areas, placement of which shall be determined through the downtown design review process outlined in KCC 15 09 046
   3 Street trees in accordance with the official tree plan shall be planted
I Industrial agricultural, MA (industrial uses)
   Industrial park district, MI
   1 Front yard The front twenty (20) feet shall be improved with appropriate permanently maintained landscaping
   2 Side yard At least fifteen (15) feet of the side yard shall be landscaped as provided in subsection (I)(1) of this section
J Limited industrial district, M2
   1 Front yard The front fifteen (15) feet shall be improved with appropriate permanently maintained landscaping
   2 Side yard At least ten (10) feet of the side yard shall be landscaped as provided in subsection (J)(1) of this section
K General industrial district, M3
   1 Front yard The front ten (10) feet shall be improved with appropriate permanently maintained landscaping
   2. Side yard At least five (5) feet of the side yard shall be landscaped as provided in subsection (K)(1) of this section
L Gateway commercial district, GWC
   1 Additional landscaping requirements
   Landscaping requirements shall include the following
   a Where buildings abut the required front yard, a landscape strip at least fifteen (15) feet in depth shall be provided Where vehicular parking areas abut the required front yard, a landscape strip at least twenty (20) feet in depth, with an earth berm at least thirty-six (36) inches in height, shall be provided
   b A landscape strip at least five (5) feet in depth shall be provided along the side property lines of all independent development sites. No landscaping along the side property lines shall be required between adjacent properties where a common, shared driveway with a perpetual cross-
A landscape easement is provided to serve the adjoining properties. Where the side property line of a commercial use abuts a residential district, a landscape strip at least ten (10) feet in depth shall be provided.

c A landscape strip of at least fifteen (15) feet in depth shall be provided along side property lines flanking the street of a corner lot where vehicular parking areas abut the required side yard, an earth berm at least twenty-four (24) inches in height shall be provided.

d A landscape strip of at least five (5) feet in depth shall be provided along all rear property lines. Where the rear property line of a commercial use abuts a residential use, a landscape strip of at least ten (10) feet in depth shall be provided.

(Ord No 3050, §§ 8, 9, 7-7-92, Ord No 3409, § 46, 7-7-98, Ord No 3439, § 5, 2-2-99, Ord No 3470, § 13, 8-17-99)

15.07.070 Maintenance of landscaping.

A Required Whenever landscaping is or has been required in accordance with the provisions of this title or any addition or amendments to this title, or in accordance with the provisions of any previous code or ordinance of the city, the landscaping shall be permanently maintained in such a manner as to accomplish the purpose for which it was initially required.

B Notice of violation The planning director or his designated representative is hereby authorized and empowered to notify the owner of any property required to be landscaped, or the agent, tenant, lessee or assignee of any such owner, that the landscaping is not being adequately maintained and the specific nature of such failure to maintain. The notice shall specify the date by which the maintenance must be accomplished, and shall be sent by certified mail, addressed to the owner at his last known address.

C Action upon noncompliance

1 Upon the failure, neglect or refusal of any owner or agent so notified to perform the required maintenance within the time specified in the written notice, or within fifteen (15) days after the date of such notice if the notice is returned to the city by the post office department because of inability to make delivery thereof, provided the notice was properly addressed to the last known address of the owner or agent, the planning director or his designated representative is hereby authorized and empowered to cause the required maintenance to be done and provide for payment of the cost thereof, with the cost to be collected or taxed against the property affected as provided in this section.

2 Nothing in this section shall prevent the planning director or a designated representative from taking action as provided in KCC 15 09 090.

D Charge for maintenance by city to be included in tax bill When the city has performed landscape maintenance or has paid for such maintenance, the actual cost thereof, plus accrued interest at the rate of eight (8) percent per annum from the date of the completion of work, if not paid by such owner prior thereto, may be charged to the owner of such property on the next regular tax bill forwarded to such owner by the city, and if so charged shall be due and payable by the owner at the time of payment of such bill.

E Lien for payment of charges If the full amount due the city is not paid by such owner within thirty (30) days after performance of the maintenance as provided for in subsection (C) of this section, then, in that case, the planning director or his designated representative may cause to be recorded in the office of the supervisor of treasury accounting a sworn statement showing the cost and expense incurred for the work, the date the work was done, and the legal description of the property on which the work was done. The recording of such sworn statement shall constitute a lien and privilege on the property, and shall remain in full force and effect for the amount due in principal and interest, plus court costs if any, until final payment has been made. The costs and expenses shall be collected in the manner fixed by law for the collection of taxes and further shall be subject to a delinquent penalty of eight (8) percent per annum if the costs and expenses are not paid in full on or before the date the tax bill upon which the charge appears becomes delinquent. Sworn statements recorded in accordance with the provisions of this subsection shall be prima facie evidence that all legal formalities have been complied with and that the work has been done properly and satisfactorily, and shall be full notice to every person concerned that the amount of the statement plus interest constitutes a charge against the property designated or described.
in the statement and that the charge is due and collectible as provided by law.

F Alternative methods of collection of charges
In addition to or in lieu of the provisions of subsections (D) and (E) of this section, the city may, at its option, commence a civil action in any court of competent jurisdiction to collect for any charges incurred by the city for performance of maintenance as provided in subsection (C) of this section.
15.08.010 Applicability.

The provisions of this chapter are of general application to several or all zoning districts unless otherwise noted.

15.08.020 Special permit uses.

The following uses are permitted in the several districts in which they are listed as special permit uses provided that they conform to the development standards listed in this section in addition to conforming to the development standards of the zoning district in which the use is located.

A Churches (excluding drive-in churches, which are conditional uses)

1 Minimum lot area Minimum lot area is one (1) acre in SR zones, in other zoning districts it shall be the minimum lot area of the underlying district.

2 Front yard There shall be a front yard of at least twenty (20) feet in depth.

3 Side yard Each side yard shall be a minimum of fifteen (15) feet in width.

4 Rear yard There shall be a rear yard of at least twenty (20) feet in depth.

5 Ingress and egress A separate entrance and exit shall be provided. Loading and unloading areas shall be provided and shall be located off public streets.

6 Landscaping All yard areas must be landscaped.

7 Day-care centers Day-care centers in churches must also provide the required play area as provided in subsection (B) of this section.

8 Parking, signs Off-street parking and sign regulations shall be observed.

B Gasoline service stations (with or without retail convenience grocery sales) The provision of gasoline pumps shall not be considered incidental or secondary to a permitted use, and must conform to the requirements of this section.

1 Minimum lot area Minimum lot area is fifteen thousand (15,000) square feet.

2 Lot frontage There shall be at least one hundred twenty (120) feet of frontage on a public street.

3 Pump setbacks The pump island shall be set back fifteen (15) feet from the public right-of-way and any property lines.

4 Lubrication facilities Lubrication shall be done within an enclosed building.

5 Buffering of adjacent property A solid or woven fence, free of advertising, shall be maintained along property lines which flank residential districts.

6 Lighting Lighting devices shall be shaded so as not to glare into residential districts.

7 Hours Gasoline service stations providing automobile repair services abutting residential districts shall limit their hours of operation from 6:00 a.m. to 9:00 p.m. Signs shall not be lit when the service station is closed.

8 Ingress and egress Driveway widths and separation shall be reviewed and approved by the public works department. There shall be not more than two (2) driveways per public right-of-way.

9 Parking Off-street parking shall be provided in compliance with Ch. 15 05 KCC.

10 Signs The sign regulations of Ch. 15 06 KCC shall apply.

11 Grocery sales facilities Convenience grocery sales facilities shall be limited to a maximum size of three thousand (3,000) square feet of gross floor area in zones which do not allow retail grocery sales as a principally permitted use.

12 General development standards Development standards and criteria of the underlying zoning district shall apply unless otherwise noted in this section.

13 Storage of motor fuels Quantity limitations on hazardous substance land uses, including onsite hazardous waste treatment or storage facilities, shall not apply to motor fuels that may be stored on the site for the permitted use.

C Drive-in restaurants

1 Minimum lot area Minimum lot area is fifteen thousand (15,000) square feet.
Chapter 7.02

WATER

Sections
7.02.010 Water to be metered
7.02.020 Rates for water connection
7.02.030 Using water in excess of meter capacity
7.02.040 Maintenance of water system
7.02.050 Cross-connection restrictions – Purpose
7.02.060 Same – Definitions
7.02.070 Same – Service connection
7.02.080 Same – Administration
7.02.090 Same – Inspection – Right of entry.
7.02.100 Same – Administrative code adopted
7.02.110 Right of entry, shutting off water
7.02.120 Separate meters required – Exceptions
7.02.130 Existing service to more than one (1) building
7.02.140 Connection with other water supply
7.02.150 Connections outside of city limits
7.02.160 Installation and connection charges inside city limits
7.02.170 Installation and connection charges outside city
7.02.180 Temporary water meters
7.02.190 Stop cocks
7.02.200 Turn on and off service by water utility employees
7.02.210 Special stop and waste cock
7.02.220 Replacement – Permit credit
7.02.230 Connections from stop cock at owner’s expense and care
7.02.240 Plumber’s permit for turn on and off
7.02.250 Water turned on by owner or tenant prohibited
7.02.260 Vacant premises – Water supply
7.02.270 Size of water main
7.02.280 Turning off-turning on charges
7.02.290 Prohibited uses
7.02.300 Water rates within the city
7.02.310 Water rates outside city
7.02.320 Billing for service
7.02.330 Charges when meter is out of order
7.02.340 Request for meter check
7.02.350 Fire protection service

7.02.360 Emergency shutoff without notice
7.02.370 Penalty for violation

*Cross reference(s) – Department of public works, ch 2 28, utility tax levied on telephone, gas, electric, garbage, water, sewer and drainage utilities, ch 3 18, utilities cleaning fund, § 3 40 1000, street occupation permit, ch 6 08, water shortage regulations, ch 7 13, environmental policy, ch 11 03, requirements and standards for subdivisions, § 12 04 430, fire hydrants, ch 13 04, plumbing code, ch 14 04

State law reference(s) – Public water supply systems, RCW 70 119A 010 et seq

7.02.010 Water to be metered.

All water of the water utility of the city shall be sold by use of a water meter that measures the amount of water used by a consumer (Ord No 2370, § 1 Formerly Code 1986, § 7.06 040)

7.02.020 Rates for water connection.

The city council shall fix rates to be paid by a consumer for water procured from the water utility of the city, and for the amount of cost to be charged to and paid by the applicant for a water connection to a water main including the water meters. Water connection shall be of various sizes as specified in this chapter. All water connections and water meters shall be installed by the water utility of the city or by a contractor approved by the director of public works. All connections shall be made under the supervision of the director of public works or his authorized representative and shall meet or exceed the standards and specifications approved by the director of public works (Ord No 2370, § 1 Formerly Code 1986, § 7.06 080)

7.02.030 Using water in excess of meter capacity.

The water utility will not install a water meter on a service which demands water in excess of the rated capacity of the meter. The water utility of the city shall have the right to discontinue water service to any consumer when the demand of the service exceeds the following meter capacities

<table>
<thead>
<tr>
<th>Meter size (inches)</th>
<th>Gallons per minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 x 3/4</td>
<td>20</td>
</tr>
<tr>
<td>3/4</td>
<td>30</td>
</tr>
</tbody>
</table>
7 02 040 Maintenance of water system.

All tanks, reservoirs, water meters, water mains, pipes, couplings, shutoff valves, stop cocks and every other kind of equipment or material in use or in place as a part of the water system of the city and located in any street, alley, city park, city property, or in any easement or franchise belonging to the city, or located upon private property from a water main of the water system to and including the water meter, are the property of the city and are subject to the exclusive control and regulations of the city. All pipes and connections from the water meter to the premises or building served by the city water are the property and the sole responsibility of the owner or lessee of the premises or building.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 120)

7 02 050 Cross-connection restrictions – Purpose.

It is the purpose of KCC 7 02 050 through 7 02 100 to protect the health of consumers receiving water from the city by protecting the public water system of the city from actual or potential contamination.

(Ord No. 2394, § 1 Formerly Code 1986, § 7 06 180)

7 02 060 Same – Definitions.

The following are established as definitions for purposes of KCC 7 02 050 through 7 02 100:

Cross-connection shall mean any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewer, or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply system of this district as a result of backflow.

Backflow shall mean the flow, other than the intended direction of flow, of any foreign liquids, gases or substances into the city public water supply or distribution system.

Backflow prevention device shall mean a device to counteract back pressure or to prevent back siphonage.

Director shall mean the director of public works of the department of public works.

All definitions contained in WAC 248-54-830, as now or hereafter amended, shall by this reference be considered definitions within this section.

(Ord No. 2394, § 1 Formerly Code 1986, § 7 06 181)

Cross reference(s) – Definitions and rules of construction generally, § 1 01 030

7 02 070 Same – Service connection.

A. No water service connection from the city water system to any premises shall be installed or maintained unless the city water supply is protected by backflow prevention devices as required by the director or his designee and the rules and regulations of the state board of health and this code. The installation or maintenance of a cross-connection which will endanger the water quality of the city water supply is prohibited. Any such cross-connection is hereby declared a nuisance and shall be abated. The control and/or elimination of cross-connections within the city systems shall be in accordance with WAC 248-54-820 through 248-54-850, as amended.

B. Service to any property, landowner or water user receiving its water supply from the city water supply system shall be contingent upon compliance with all requirements of the rules and regulations of the State Board of Health and of this code pertaining to cross-connections. Service shall be discontinued to any premises, water user or property owner for failure to comply with such regulations of the State Board of Health and of this code pertaining to cross-connections, and any discontinued service will not be re-established until the department of public works has approved compliance with such requirement of the rules and regulations of the State Board of Health and of this code pertaining to cross-connection.

(Ord No 2394, § 1. Formerly Code 1986, § 7 06 182)
Kent City Code

7.02.080 Same - Administration.

The department of public works shall be responsible for administering KCC 7 02.050 through 7.02.100 including the development of the necessary procedures and practices to accomplish same, consistent with the standards in this code and Chapter 248-54 WAC
(Ord No 2394, § 1 Formerly Code 1986, § 706 183)

7.02.090 Same - Inspection - Right of entry.

The director and other duly authorized employees of the department of public works bearing proper credentials and identification shall be permitted to enter upon all properties receiving water service from the city water supply system for the purposes of inspection, observation and testing in accordance with the provisions of this code
(Ord No 2394, § 1 Formerly Code 1986, § 706 184)

7.02.100 Same - Administrative code adopted.

The provisions of WAC 248-54-820 through 248-54-850, as now or hereafter amended relating to cross-connection control and elimination and the use of backflow prevention devices when such are considered to be advisable are upon the filing of are hereby adopted and made a part hereof. All provisions of the Washington Administrative Code may be executed and applied by the department of public works in determining when cross-connections are prohibited and when backflow prevention devices shall be required. A copy of such provisions is on file in the city clerk's office
(Ord No 2394, § 1 Formerly Code 1986, § 706 185)

7.02.110 Right of entry, shutting off water.

Employees of the water utility or finance department when in the course of their employment shall have the right to go upon private property to read, inspect, repair, install or remove a water meter or to inspect, repair or remove any connection between the water main to and including the water meter, or to shut off a water service. A water meter may be removed from the premises for purpose of inspection or repair, or when a bill for consumed water or sewer service is not paid
(Ord No 2370, § 1 Formerly Code 1986, § 706 200)

7.02.120 Separate meters required - Exceptions.

Except as provided in this chapter, each separate building occupied as a dwelling or as a place of business must have a separate water service and water meter. Where the applicant desires to have two (2) or more service pipes on the same premises, he shall state in his application for a water connection, and separate service pipes shall be run with individual stop cocks to each water meter. Each mobile home park and each condominium may be served by one (1) water meter. The city council may enter into agreements with commercial and industrial users to allow more than one (1) building to be served by a single meter.
(Ord No 2370, § 1 Formerly Code 1986, § 706 240)

7.02.130 Existing service to more than one (1) building.

At the time of the adoption of this chapter where more than one (1) building is served through one (1) meter, the consumption of water for each billing period shall be divided by the number of buildings served and the charge will then be calculated as if each building were a separate account
(Ord No 2370, § 1 Formerly Code 1986, § 706 280)

7.02.140 Connection with other water supply.

A No service connection shall be allowed from the city mains to any premises supplied by water from any other source, unless special permission is given by the director of public works, which special permission may be terminated at any time if in the judgment of the director of public works the public interest requires it
B No cross-connection shall be made or maintained between any city service connection and pipe supplying water from any other source unless the water supplied from the other source, by tests by the State Board of Health, is shown to conform with the United States bacteriological standard for
7.02.150 Connections outside of city limits.

A Whenever any person outside the limits of the city, not already furnished with water by the city, shall desire the system to be extended, such person shall apply to the city council to have such water service extended. Such application shall designate the premises to be supplied and the number of services desired. If a permit is granted by the city council, the applicants shall, at their own expense, install all necessary mains or pipes in accordance with the requirements of the city engineer and the comprehensive water plan of the city which is on file in the office of the director of public works. All regulations concerning the size of service and meter shall apply.

B Whenever any water district desires to purchase water from the city, it shall make application to the city council and if accepted, install all mains and services in accordance with the rules and regulations of the city. An individual contract will be negotiated for the purchase of water. Whenever any portion of a water district is annexed to the city, the ownership of the mains, meters, and services shall become the property of the city in accordance with RCW 35 13A 020.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 360)

7.02.160 Installation and connection charges inside city limits

A Any property owner within the city limits applying for water service shall pay in full a tap charge plus a system development charge prior to issuance of the water service permit. The tap charge will include the cost of connection and laying the pipe from the city water main to the property line of the property to which service is desired, or at a distance of sixty (60) feet from the main toward such property line, whichever is shorter. The minimum tap charge so established for service installed by the water utility is as follows:

1 Two hundred seventy-five dollars ($275) for each five-eighth (5/8) inch by three-quarter (3/4) inch connection
2 Three hundred twenty-five dollars ($325) for each three-quarter (3/4) inch connection
3 Three hundred fifty dollars ($350) for each one (1) inch connection
4 Six hundred dollars ($600) for each one and one-half (1 1/2) inch connection
5 Eight hundred dollars ($800) for each two (2) inch connection

On any connection over two (2) inches, the minimum tap charge shall be the actual cost of the meter and installation, plus twenty-five (25) percent.

B If the workload of the water utility as determined by the director of public works is such that the installation of the water connection would interfere with the proper operation and maintenance of the water system, the director of public works may require that the property owner employ a licensed contractor to make the connection and install the necessary line and materials except the water meter. All such water services shall meet or exceed the standards and specifications approved by the director of public works. The minimum tap charge is as follows:

1 One hundred dollars ($100) for each five-eighth (5/8) inch by three-quarter (3/4) inch connection
2 One hundred twenty-five dollars ($125) for each three-quarter (3/4) inch connection
3 One hundred seventy-five dollars ($175) for each one (1) inch connection
4 Three hundred sixty dollars ($360) for each one and one-half (1 1/2) inch connection
5 Five hundred dollars ($500) for each two (2) inch connection

All such contractor-installed connections shall be guaranteed by the contractor for a period of one (1) year.

C The system development charge is as follows:

1 One thousand one hundred dollars ($1,100) for each meter less than one (1) inch in size
2 One thousand nine hundred fifty-eight dollars ($1,958) for each one (1) inch meter
3 Four thousand four hundred dollars ($4,400) for each one and one-half (1 1/2) inch meter
4 Seven thousand eight hundred twenty-two dollars ($7,822) for each two (2) inch meter

(Revised 2/00)
5 Seventeen thousand six hundred dollars ($17,600) for each three (3) inch meter
6 Thirty-one thousand two hundred eighty-four dollars ($31,284) for each four (4) inch meter
7 Forty-eight thousand eight hundred eighty-four dollars ($48,884) for each five (5) inch meter
8 Seventy thousand four hundred dollars ($70,400) for each six (6) inch meter
9 One hundred twenty-five thousand one hundred fifty-eight dollars ($125,158) for each eight (8) inch meter
10 One hundred ninety-five thousand five hundred fifty-eight dollars ($195,558) for each ten (10) inch meter

D If an undersized meter is installed, a deduction will be allowed from the above charges, including system development charges, which will reflect the difference in cost between the undersized meter and the regular size meter. All service material (including water meter) will remain the property of the city.

E If the tap is changed to one of a larger size, the cost and expense of such charge must be paid before the larger size tap is installed.

F If it becomes necessary during the installation of such connection on a time and material basis to break and replace either concrete or blacktop paving, then in each instance an additional charge shall be made to cover the cost of such repair.

Ord No 2370, § 1, Ord No 3486, § 1, 11-16-99
Formerly Code 1986, § 7 06 400)

7.02.170 Installation and connection charges outside city.

Any property owner outside the city limits applying for water service shall pay in full the tap charge plus a system development charge prior to the issuance of a water service permit. The minimum charge established shall be the cost as established for inside the city limits plus fifty (50) percent, except the system development charge. The system development charge shall be the same as for inside city limits.

Ord No 2370, § 1 Formerly Code 1986, § 7 06 440)

7.02.180 Temporary water meters.

A When water service is required for a specific short-term duration, upon approval of the director of public works, a temporary water meter may be obtained from the water utility.

B Such meters shall only be used for a designated project and shall be promptly returned to the water utility upon completion of the project or at the end of sixty (60) days, whichever comes first. The meters are to be returned in the same condition as when rented, and the user shall be held responsible for any damage thereto including paying all repair or replacement costs. While in the user's possession, the user shall be solely responsible for the meter and as such, should it be lost or stolen, the user shall pay the water utility the cost of its replacement.

C The director of public works shall require that a cash bond be deposited with the city prior to receipt of a temporary meter. The amount of the bond shall equal the replacement cost of the respective meter. Upon return of the meter, the payment of all outstanding charges including any meter repair or replacement costs, the cash bond shall be released back to the user.

D Temporary meters may be moved from one hydrant to another within the same project, provided, the water utility is notified in advance of the proposed relocation and that hydrant wrenches are used to make all connections and disconnections.

E The charge for water used through the temporary meter shall be at a rate of one dollar and thirty-three cents ($1.33) per one hundred (100) cubic feet, plus a meter charge as established in subsections (E)(1) and (E)(2) of this section. Effective December 31, 1999, the charge for water used through the temporary meter shall be at a rate of two dollars and thirty cents ($2.30) per one hundred (100) cubic feet, plus a meter charge as established in subsections (E)(1) and (E)(2) of this section.

1 Up to one and one-half (1 1/2) inch meter, fifty dollars ($50),
2 Two (2) inch and larger meter, one hundred dollars ($100).

Payment shall be made in full upon return of the meter. If a meter is lost or stolen, payment for water used shall be based on an estimate made by the director of public works.

Ord No 2370, § 1, Ord No 3486, § 2, 11-16-99
Formerly Code 1986, § 7 06 460)

(Revised 2/00)
02.190 Stop cocks.
All service pipes must come directly from the street main and shall be laid at such depth and at such point as the water utility shall designate. All stop cocks and connections thereto shall be maintained by and under the control of the water utility (Ord No 2370, § 1 Formerly Code 1986, § 7 06 480).

7.02.200 Turn on and off service by water utility employees.
No person except employees of the water utility or the finance department will be allowed to turn the water on or off at the city’s stop cock after the plumbing has been completed and the water turned on by the water utility, except to repair the special stop and waste cock or the pipe between it and the city’s stop cock. (Ord No 2370, § 1 Formerly Code 1986, § 7 06 520)

7.02.210 Special stop and waste cock.
A special stop and waste cock with a key attached thereto shall be placed on the pipe leading from the city's stop cock outside of the building or inside if basement is available. No branch pipe, bbbie or fixture of any kind shall be placed between this stop cock and the city’s main. If this stop cock does not thoroughly drain all pipes throughout the premises, additional ones shall be placed in all sags, bends and traps that cannot otherwise be drained. If the service is to a business building adjacent to a city sidewalk, a valve type stop and waste cock in a cast iron valve box, with traffic type lid shall be installed near the outside wall of the building. (Ord No 2370, § 1 Formerly Code 1986, § 7 06 560)

7.02.220 Replacement – Permit credit.
If a property owner, lessee or occupant requests a change in meter size and/or water line size, an application shall be made to the city engineer. The city engineer shall review the application for compliance with KCC 7 02 030. If the request results in an increase flow capability to the property, the charge for this service shall include the respective system development charge, otherwise, the charge shall be limited to a time and material basis. In all cases a credit on this charge will be made for the meter removed. This credit will be based on a depreciation schedule of twenty (20) percent per year for the number of years the meter has been in service, with a minimum credit of two dollars and fifty cents ($2.50). No credit will be allowed for the valves, meter box, or pipe originally installed. Where a system development charge is included, a credit will also be given for that previously paid system development charge. (Ord No 2370, § 1 Formerly Code 1986, § 7 06 600)

7.02.230 Connections from stop cock at owner's expense and care.
All pipes and connections from the city’s adapter or coupling located on or near the property line or near the meter box shall be put in at the expense of the property owner, who shall be responsible for all damages resulting from leaks and breaks. (Ord No 2370, § 1 Formerly Code 1986, § 7 06 640)

7.02.240 Plumber’s permit for turn on and off.
No plumber or other person will be allowed to make connection with the city mains or make alterations in conduit, pipe or other fixture connecting therewith, or to connect pipes when they have been disconnected, or to turn water off or on, upon any premises at the city’s stop cock without a permit from the director of public works. (Ord No 2370, § 1 Formerly Code 1986, § 7 06 680)

7.02.250 Water turned on by owner or tenant prohibited.
If the water is turned on to the premises by anyone other than an employee of the water utility or the finance department after it has been turned off at city stop cock, it will be turned off again at the city stop cock and locked, and will not be turned on again until the charges as prescribed in this chapter have been paid. Such charges will consist of the actual cost per hour, including overhead, of sending water utility employees to return service to the account, plus a turn on charge of fifteen dollars ($15). In no case will the charge be less than fifteen dollars ($15). (Ord No 2370, § 1 Formerly Code 1986, § 7 06 720)
Kent City Code

7.02.260 Vacant premises - Water supply.
If it is decided to discontinue the use of water supply to vacant premises for a period of not less than thirty (30) days, notice in writing must be given to the finance department. The water will be turned off and will be turned on again upon written application at a charge of fifteen dollars ($15) for such turn on. No remission of charges will be made for a lesser period than thirty (30) days or without receipt of notice by the finance department.
(Ord. No. 2370, § 1 Formerly Code 1986, § 7 06 760)

7.02.270 Size of water main.
No water main shall be installed unless it is at least six (6) inches in diameter and is the size indicated in the comprehensive water plan.
(Ord. No. 2370, § 1 Formerly Code 1986, § 7 06 800)

7.02.280 Turning off-turning on charges.
A. For the purpose of paying the expense to the water utility or finance department, a charge as set forth in this chapter is hereby fixed and made to turn off or turn on the water service to any building for the making within the building of any inspection, repair, maintenance, enlargement, replacement, addition, or change in or to the water line or lines, or plumbing, or plumbing fixtures, or for the purpose of connection any kind of machine, appliance, toilet or bath facilities, or any kind of plumbing in or to the water system located within the building when the building does not have stop and waste cock as required in KCC 7 02 210.
B. The charge shall be twenty-five dollars ($25) if the turn-off or turn-on is done within a period of forty-eight (48) hours, which charge shall be paid to the finance director before any water service is turned off or turned on for any of the purposes set forth in this section.
C. If the turn-off and turn-on is not done within a period of forty-eight (48) hours, the charge is fifteen dollars ($15) to turn off the water service and fifteen dollars ($15) to turn on the service. The charge shall be paid to the finance director before any water service is turned off or turned on for any of the purposes set forth in this section.
(Ord. No. 2370, § 1 Formerly Code 1986, § 7 06 820)

7.02.290 Prohibited uses.
No person shall
1. Use water from the city water system for sprinkling or irrigating when requested by a police officer or firefighter of the city to cease such use during a fire which the fire department is seeking to control or when use of water for sprinkling or irrigation is forbidden by the city council,
2. Bathe in, fish in, or throw any substance into any reservoir or water tank or standpipe or into any pipe or connection to the city water system, or upon the premises where any reservoir, water tank or standpipe is located,
3. Obstruct the access to any fire hydrant or place lumber, dirt, rubbish or other material upon public right-of-way or city owned property within twenty (20) feet of a fire hydrant or to open or operate a fire hydrant except a member of a fire department or employee of the city in pursuance of his employment or duty,
4. Break or deface the seal of a water meter or tamper with, damage, obstruct or alter a water meter in service,
5. Make any connection with a water main, water pipe or fire hydrant for delivery of water from the city water system to a consumer without a permit from the water utility and a means of measuring the quantity of water taken prior to consumption,
6. Turn on or turn off a water service at the water box or any place between the water meter and the water main of the city water system other than by an employee of the water utility or finance department who is authorized to either turn on or turn off a water service,
7. Interfere with, obstruct or prevent free or safe access to any water meter or water service for purpose of reading, inspection, repair, removal or installation by any employee of the water utility or finance department in pursuit of his employment,
8. Tamper with, destroy, break or interfere with any part of the water system, or
9. Make, construct, buy, sell or in any way dispose of to any person any curb cock key or hydrant wrench that fits or may be used on any part of the city water system without permission of the director of public works of the city.
(Ord. No. 2370, § 1 Formerly Code 1986, § 7 06 840)
02.300 Water rates within the city.

A The monthly rate from October 1 to April 30 is one dollar and twenty-four cents ($1.24) per one hundred (100) cubic feet plus a monthly demand charge for service and meter, and from May 1 to September 30 the monthly rate is one dollar and sixty-four cents ($1.64) per one hundred (100) cubic feet plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from October 1 to April 30 is one dollar and twenty-four cents ($1.24) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus one dollar and sixty-nine cents ($1.69) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from May 1 to September 30 is one dollar and sixty-four cents ($1.64) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and ninety cents ($2.90) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. The monthly demand charge for service and meter is as follows:

<table>
<thead>
<tr>
<th>Meter size (inches)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 x 3/4</td>
<td>$2.20</td>
</tr>
<tr>
<td>1</td>
<td>2.45</td>
</tr>
<tr>
<td>1 1/2</td>
<td>3.30</td>
</tr>
<tr>
<td>2</td>
<td>4.00</td>
</tr>
<tr>
<td>3</td>
<td>13.95</td>
</tr>
<tr>
<td>4</td>
<td>16.80</td>
</tr>
<tr>
<td>6</td>
<td>28.10</td>
</tr>
<tr>
<td>8</td>
<td>37.59</td>
</tr>
<tr>
<td>10</td>
<td>48.46</td>
</tr>
</tbody>
</table>

B For lifeline-qualified water service customers, the monthly rate is forty-five cents ($0.45) per one hundred (100) cubic feet plus a monthly demand charge for service and meter as set forth in subsection (A) of this section.

C Eligibility criteria for lifeline rate shall be as established by city council.

D Subject to the right of access and inspection by a representative of the city, water service customers of the city may apply for a one-time rate adjustment for any single billing period under the following circumstances:

a An accidental water leak has been discovered on the subject property, or

b A water line failure has occurred on the subject property, or

c An unexplained, abnormal water meter reading has occurred on the subject property even though subsequent city inspection of the water meter indicates that the meter is functioning properly.

This rate adjustment shall not exceed fifty (50) percent of the difference between the total amount of the billing period sought for adjustment minus the customer’s average water usage. For the purposes of this subsection, the “average water usage” shall be computed by determining the total volume of water consumed, under normal use conditions, during the preceding twelve (12) months and dividing that total volume by the number of times the city would typically read the customer’s water meter in a twelve (12) month period.

2 This rate adjustment is permitted on a one-time basis only and can only be applied to one (1) billing period. To be eligible for this rate adjustment, the affected water system must be owned by or subject to the exclusive control of the customer and be located between the city’s water meter and owner’s residence or structure. The bill sought for adjustment must exceed two (2) times the customer’s highest usage in any single billing period during the twelve (12) months prior to the billing period sought for adjustment.

3 Following a request for rate adjustment provided under this subsection, the city’s finance director, or his/her designee, shall review the request and determine whether or not to adjust the customer’s monthly billing. In order to make a proper determination, city staff shall be entitled to access, inspect, and approve the customer’s water system repair prior to granting a rate adjustment.

4 If approved, the city shall make this rate adjustment by issuing a credit to the customer’s account after verification of leakage or water system failure, inspection of water meter and water system, where applicable, and verification of corrective repairs. All repairs shall occur within thirty (30) days of application to the city.

5 The owner may request reconsideration of the decision of the finance director, or his/her des-
Kent City Code

7.02.310 Water rates outside city.

A The monthly rate from October 1 to April 30 is one dollar and sixty-four cents ($1.64) per one hundred (100) cubic feet plus a monthly demand charge for service and meter, and from May 1 to September 30 the monthly charge is two dollars ($2) per one hundred (100) cubic feet plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from October 1 to April 30 is one dollar and sixty-four cents ($1.64) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and nine cents ($2.09) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from May 1 to September 30 is two dollars ($2) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and forty-six cents ($2.46) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. The monthly demand charge for service and meter is as follows:

<table>
<thead>
<tr>
<th>Meter size (inches)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 x 3/4</td>
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<td>8</td>
<td>37.59</td>
</tr>
<tr>
<td>10</td>
<td>48.46</td>
</tr>
</tbody>
</table>

B For lifeline-qualified water service customers, the monthly rate is forty-eight cents ($0.48) per one hundred (100) cubic feet plus a monthly demand charge for service and meter as set forth in subsection (A) of this section.

C Eligibility criteria for lifeline rate shall be as established by city council.

D Subject to the right of access and inspection by a representative of the city, water service customers of the city may apply for a one-time rate adjustment for any single billing period under the following circumstances:

- An accidental water leak has been discovered on the subject property,
- A water line failure has occurred on the subject property,
- An unexplained, abnormal water meter reading has occurred on the subject property.

This rate adjustment shall not exceed fifty (50) percent of the difference between the total amount of the billing period sought for adjustment minus the customer's average water usage. For the purposes of this subsection, the "average water usage" shall be computed by determining the total volume of water consumed, under normal use conditions, during the preceding twelve (12) months and dividing that total volume by the number of times the city would typically read the customer's water meter in a twelve (12) month period.

2 This rate adjustment is permitted on a one-time basis only and can only be applied to one (1) billing period. To be eligible for this rate adjustment, the affected water system must be owned by or subject to the exclusive control of the customer and be located between the city's water meter and owner's residence or structure. The bill sought for adjustment must exceed two (2) times the customer's highest usage in any single billing period during the twelve (12) months prior to the billing period sought for adjustment.

3 Following a request for rate adjustment provided under this subsection, the city's finance director, or his/her designee, shall review the request and determine whether or not to adjust the customer's monthly billing. In order to make a proper determination, city staff shall be entitled to access, inspect and approve the customer's water system repair prior to granting a rate adjustment.

4 If approved, the city shall make this rate adjustment by issuing a credit to the customer's
count after verification of leakage or water system failure, inspection of water meter and water system, where applicable, and verification of corrective repairs. All repairs shall occur within thirty (30) days of application to the city.

5 The owner may request reconsideration of the decision of the finance director, or his/her designee, by the city council through the city council’s operation committee.

(Ord No 2732, § 3, Ord No 2495, § 2, Ord No 3043, § 2, 5-5-92, Ord No 3143, § 3, 11-16-93, Ord No 3486, § 4, 11-16-99 Formerly Code 1986, § 7 06 880)

7.02.320 Billing for service.

All billing for water shall be made to the nearest five cents ($0.05).

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 900)

7.02.330 Charges when meter is out of order.

If a meter fails to register the amount of water used, the customer will be charged at the average rate of monthly consumption as shown by the meter when the meter was in working order.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 920)

7.02.340 Request for meter check.

A customer may request a meter check. If it is found that the meter is registering less than or more than the requirements of the state for meter accuracy, no charge will be made. If it is found that the meter is registering in accordance with state regulations, a charge which is on file in the city clerk’s office will be made. This charge will be added to the next water billing.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 930)

7.02.350 Fire protection service.

A Pipes for fire protection purposes must be fitted with such fixtures as are needed for fire protection and such fixtures shall be sealed by the water utility. In no case shall such seal be broken, except in case of fire or by the fire chief for the purpose of testing the pipes, fixtures or hose.

B When seals are broken in case of fire, it shall be the duty of the owner or tenant of the premises to notify the water utility within twenty-four (24) hours after its occurrence, and the seal will be replaced by the water utility.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 940)

7.02 360 Emergency shutoff without notice.

A The water may at any time be shut off from the mains without notice for repairs, extensions or other necessary purposes and persons having boilers supplied by direct pressure from the mains are cautioned against danger of explosion or collapse. Where meters are in use, a safety valve shall be placed between the boiler on such service and the meter at the owner’s expense, and the owner shall be held responsible to the city for any and all damages to meters caused by hot water.

B The city will not be responsible for the safety of boilers or other fixtures on the premises of any water consumer.

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 960)

7.02.370 Penalty for violation.

Any person found guilty of violating this chapter or any part thereof shall be guilty of a misdemeanor, and, upon conviction thereof, shall be subject to a fine not exceeding three hundred dollars ($300).

(Ord No 2370, § 1 Formerly Code 1986, § 7 06 950)

(Revised 2/00)
7.12.460 Interpretation.
A franchisee shall comply with all pertinent rules, regulations and requirements of the FCC, or any other federal or state body or agency having jurisdiction in regard to cable television systems.
(Ord No 3107, § 2, 5-4-93)

7.12.470 Effect on prior franchises.
Nothing contained in this chapter shall abridge, impair, alter, modify or in any way affect any right, privilege or immunity of either a franchisee or the city conferred by or arising under any cable franchise granted prior to and remaining in effect on the effective date of the ordinance, provided, that the acceptance of a franchise granted under this chapter for any cable service area shall be deemed to constitute the surrender by a franchisee of the right to operate a cable television system in that cable service area under any prior franchise.
(Ord. No 3107, § 2, 5-4-93)

7.12.480 Incorporation by reference into each franchise.
The Cable Communications Ordinance shall be incorporated in its entirety by reference into and become a part of each and every cable television franchise granted by the city.
(Ord. No 3107, § 2, 5-4-93)

Chapter 7.13
WATER SHORTAGE EMERGENCY REGULATIONS*

Sections
7.13.010 Purpose
7.13.020 Intent
7.13.030 Definitions
7.13.040 Application
7.13.050 Mandatory regulations.
7.13.060 Large water users.
7.13.070 Site design review.
7.13.080 Director may prohibit irrigation
7.13.090 Fines and penalties
7.13.100 Enforcement

*Cross reference(s) – Department of public works, ch 2 28, water, ch 7 02
State law reference(s) – Water shortage, RCW 43 83B 400 et seq., water use efficiency and conservation programs and practices, RCW 90 54 180

7.13.010 Purpose.
A The provisions of this chapter shall be in full force and effect only upon adoption by the city council of the declaration that a water emergency condition prevails.
B The provisions of this chapter shall be of no further force or effect after October 15 or any year in which a water shortage emergency is declared or when the city council may extend the effective date of the chapter in any year by adopting a resolution to that effect.
(Ord. No 2227, § 10 Formerly Code 1986, § 9 24 40)

7.13.020 Intent.
If the city council has and does declare that a water shortage emergency condition prevails in the area served by the city water division due to a lack of supply and transmission capabilities, this chapter is intended to allocate equitably the water available to the city water division during such emergency to the end that sufficient water will be available for human consumption, sanitation and fire protection.
(Ord No 2227, § 1. Formerly Code 1986, § 9 24 04)
Kent City Code

7.13.030 Definitions.

For the purpose of this chapter, the following terms, phrases, words, and their derivations shall have the meaning given in this section.

Customer shall mean any person using water supplied by the city.

Director shall mean the director of public works of the city.

East side of Kent is all that portion of the city east of SR 167.

Water shall mean water from the water division of the city public works department.

West side of Kent shall mean all that portion of the city west of SR 167.

(Ord No 2227, § 2 Formerly Code 1986, § 9.24.08)

Cross reference(s) - Definitions and rules of construction generally, § 1 01 030

7.13.040 Application.

The provisions of this chapter shall apply to all customers using water both in and outside the city, regardless of whether any customer using water shall have a contract for water service with the city.

(Ord No 2227, § 3 Formerly Code 1986, § 9.24.12)

7.13.050 Mandatory regulations.

From and after the fifteenth day of May in each year in which this chapter is effective, no person or customer shall sprinkle, water or irrigate any shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation or wash any sidewalk, driveway, porch or other outdoor surfaces except as follows:

1. Such irrigation, sprinkling, watering and washing shall be permitted on the west side of the city on even-numbered days of the calendar.

2. Such irrigation, sprinkling, watering and washing shall be permitted on the east side of the city on odd-numbered days of the calendar.

(Ord No 2227, § 4 Formerly Code 1986, § 9.24.16)

7.13.060 Large water users.

The requirements of KCC 7 13 050 to the contrary notwithstanding, no person or customer whose historic monthly average water use for the period from May 15 through August 31 exceeds one hundred thirty-three thousand six hundred ninety (133,690) cubic feet per month, hereinafter called “large water users”, shall irrigate, sprinkle, or water any shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation except on days assigned in each week during which this chapter is in effect. The days shall be assigned by the director after consultation with the individual large water users.

(Ord No. 2227, § 5. Formerly Code 1986, § 9.24.20)

7.13.070 Site design review.

While this chapter is in effect, no planting or landscaping required by the site design review process or other city action shall be implemented unless the city determines that the health, safety or welfare of the public might be endangered.


7.13.080 Director may prohibit irrigation.

Whenever the director determines that the water available to the city’s water utility division is insufficient to permit any irrigation, watering or sprinkling and that all water then available should be used solely for human consumption, sanitation and fire protection, he may order and direct that irrigation, watering, or sprinkling shall not be permitted by any person or customer. While such order is in effect, no person or customer shall irrigate, sprinkle or water any shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation. Violations shall be punished as provided in KCC 7 13.090. The director shall use every available means to advise customers that such order is in effect.

(Ord No 2227, § 7 Formerly Code 1986, § 9.24.28)

7.13.090 Fines and penalties.

Except as otherwise provided in this chapter, violations of any provision of this chapter shall be punishable as follows:

<table>
<thead>
<tr>
<th>Violation within a twelve (12) month period</th>
<th>Classification</th>
<th>Fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  First violation</td>
<td>Warning</td>
<td>None</td>
</tr>
<tr>
<td>2  Second violation</td>
<td>Infraction</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

7-71
7.13.100 Enforcement.

A. Each police officer of the city shall, in connection with his duties imposed by law, diligently enforce the provisions of this chapter.

B. The director and all employees of the city water utility division, public works department and fire department are authorized to enforce the provisions of this chapter including the power to issue written notice to appear.

A RESOLUTION of the City Council of the City of Kent, Washington, adopting a Water Conservation Program as an additional element of the City's Water Comprehensive Plan.

WHEREAS, South King County, including the City of Kent, has been designated a critical water supply service area pursuant to Chapter 70.116 RCW, the Public Water System Coordination Act; and

WHEREAS, the King County Water Utility Coordinating Committee has developed a South King County Coordinated Water System Plan ("CWSP") that imposes certain obligations upon all public water system purveyors in South King County, including the City of Kent; and

WHEREAS, a water conservation program is an integral element of the South King County CWSP; and

WHEREAS, in accordance with King County Ordinance No. 9461, all purveyors subject to the South King County CWSP must adopt a water conservation program. NOW, THEREFORE,

The City Council of the City of Kent, Washington, does hereby resolve as follows:

Section 1. The "City of Kent Water Conservation Plan" attached as Exhibit "A" and incorporated herein by this reference
shall be incorporated as an additional element of the City's Water Comprehensive Plan in accordance with the South King County Coordinated Water System Plan and King County Ordinance No. 9461.

Passed at a regular meeting of the City Council of the City of Kent, Washington, this _1_ day of _June_, 1993.

Concurred in by the Mayor of the City of Kent, this _2_ day of _June_, 1993.

DAN KELLEHER, MAYOR

ATTEST:

BRENDA JACOBER, CITY CLERK

APPROVED AS-TO FORM:

ROGER A. LUBOVICH, CITY ATTORNEY

I hereby certify that this is a true and correct copy of Resolution No. _1361_, passed by the City Council of the City of Kent, Washington, on the _1_ day of _June_, 1993.

BRENDA JACOBER (SEAL)
CITY CLERK
PRODUCT: SODIUM THIOSULFATE

ORDER NO:  
PROD NO: 

MANUFACTURER: MAY WATERS & ROGERS INC

A PENTAL PACKED COMPANY (425) 888-2400
708 TIBBON POINT, WIRKLAND, WA 98073

MATERIAL SAFETY DATA SHEET

FRAME UPLOAD DATE: 09/18/92
VERSION: 001

EMERGENCY ASSISTANCE

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMBERT
(800) 422-6300

PRODUCT NAME:  
SODIUM THIOSULFATE

WHEN IN CONJUNCTION WITH:

GENERAL INFORMATION

NAME: SODIUM THIOSULFATE, ANHYDROUS

SYNONYM: Sodium hyposulfite; "hypos" 
SODIUM THIOSULFATE, CRYSTAL
SODIUM THIOSULFATE, SOLUTION

CHEMICAL NAME OR STRENGTH:

Sodium Thiosulfate

FORMULA: Na2S2O3 (anhydrous)

MOLECULAR WEIGHT: 158.11 (anhydrous), 248.19 (pentahydrate)

ADDRESS: GENERAL CHEMICAL CORPORATION
90 East Halsey Road
Parsons, NJ 07054-0298

CONTACT: Manager of Product Safety

PHONE NUMBER: (201) 516-1840

CURRENT ISSUE DATE: January 1991
NIOSH-approved breathing apparatus to protect against any release of toxic and/or irritating fumes. Skin and eye protection should also be provided. Use water spray to keep fire-exposed containers cool and to knock down fumes.

VENTILATION: Provide LOCAL EXHAUST if dusty or misty conditions prevail, and if there should be a release of sulfur dioxide gas (see Section G). Keep incompatible materials out of hands, dusts, etc.

NORMAL HANDLING: Avoid contact with eyes, skin, clothing. Do not breathe dust or mist. Use with adequate ventilation. Wash thoroughly after handling.

STORAGE: Store in a cool dry area, away from acids or oxidizers. Keep container closed when not in use and protect from physical damage.

SPILL OR LEAK (ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT - SECTION E): Promptly shovel or sweep up the dry chemical into an empty container with a minimum of dusting. Cover and store as above. Cautiously spray residue with plenty of water to complete clean-up. Contact appropriate regulatory authorities for approved method of disposal, if necessary.

PRECAUTIONS/PROcedures LABEL INSTRUCTIONS: SIGNAL WORD - CAUTION contact with acids releases irritating sulfur dioxide gas. When dissolving and making solutions, add water cautiously and with stirring as solutions can get hot and dry.

PERSONAL PROTECTIVE EQUIPMENT:

RESPIRATORY PROTECTION: If dusty or misty conditions prevail, use dust or mist respirator approved by NIOSH. If sulfur dioxide should be released (see Section G), use a supplied-air respirator or self-contained breathing apparatus, or other alternative choice approved by NIOSH as recommended for this gas (see PPE table).

SKIN AND HAIR: If probable exposure to dust or mist or solution exists, wear chemical safety goggles and hard hat (or other head covering). Do not wear contact lenses. Eyes must be protected as above if dissolving this material in water.

HANDS, ARMS, AND BODY: For routine product-handling or use, wear full work clothing, including long-sleeved shirt and trousers. Cotton gloves are usually adequate when handling dry product. For solutions, wear impermeable gloves and apron. If contact is prolonged or repeated, wear impermeable clothing.

FIRST CLOTHING AND EQUIPMENT: Provide eyewash facilities convenient to area of use or handling.

PHYSICAL DATA

STATE IS (AT NORMAL CONDITIONS): SOLID

RANGE AND ODOR: White granules with no odor (anhydrous).

Clear to white crystals or granules with no odor (hydrate).

Clear colorless liquid with no odor (solution).

BOILING POINT: ** 100 Degrees C
PRODUCT: SODIUM THIOSULFATE

** hydrate loses its water @ 100 Degrees C; anhydrous decomposes above 100 Degrees C.

MELTING POINT: (transition) 48 Degrees C

SPECIFIC GRAVITY (420=1): Anhydrous: 1.667

** Hydrate: 1.685

Solution: NA

VAPOUR DENSITY (AIR=1): NA

SOLUBILITY IN WATER (% by Weight): 47 @ 0 Degrees C (hydrate)

33 @ 0 Degrees C (anhydrous)

H: 7.5% solution***, pH = 8.6 (approx.)

*** anhydrous basis.

VAPOR PRESSURE (at 20 Degrees C): NA

EVAPORATION RATE (Et->er=1): NA (Butyl Acetate = 1): N/A

% VOLATILE BY VOLUME (at 70 Degrees C): NA

C. REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: High temperatures (above 100 Degrees C) yield sulfur di-oxide gas and hazardous residue (details below).

INCOMPATIBILITY (MATERIALS TO AVOID):

STONG OXIDIZERS: cause vigorous exothermic reactions.

ACIDS: release sulfur dioxide gas (details below).

WATER-REACTION MATERIALS such as sodium: cause strong exothermic reaction with the hydrate.

Volatile reaction with sodium nitrates when water of crystallization has been driven off by heating.

HAZARDOUS DECOMPOSITION PRODUCTS: SULFUR DIOXIDE GAS: toxic, corrosive, and an oxidizer. SODIUM SULFIDE RESIDUE: flammable, dangerous fire risk, strong irritant to skin and tissue; incompatible with acids.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: None known.

D. HAZARDOUS INGREDIENTS (Mixtures Only)

MATERIAL OR COMPONENT/C.A.S. #: Not Applicable.

I. ENVIRONMENTAL

DEGRADABILITY/AQUATIC TOXICITY:

Degradability: NA (inorganic).

Aquatic Toxicity: no data found.

TANOL/WATER PARTITION COEFFICIENT: Unknown.

HAZARDOUS SUBSTANCES (CLEAN WATER ACT SEC. 311): NO

IF SO REPORTABLE QUANTITY: -- (40 CFR 116-117)

Waste Disposal Method: (Disposer MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS): Flush to sewer with plenty of water, if permitted by applicable disposal regulations. Otherwise, waste Sodium
PRODUCT: SODIUM THIOSULFATE

Thiosulfate might have to be disposed of by an approved contractor.

RCRA STATUS OF UNUSED MATERIAL IF DISCARDED: Not a "hazardous waste", if discarded, unused.

HAZARDOUS WASTE NUMBER: (IF APPLICABLE): NA (40 CFR 261)

REFERENCES

PERMISSIBLE CONCENTRATION REFERENCES:
None established for Sodium Thiosulfate.

REGULATORY STANDARDS: Not applicable.

DOT CLASSIFICATION: Not Regulated (49 CFR 173)

GENERAL


b. NIOSH Registry (PTECS), 1981-87, Accession No. WH6476-000.


e. MERCK INDEX, 10th ed., 1983, Monograph 9452.

ADDITIONAL INFORMATION

This product is not for food or drug use.

FOOTNOTE: NR = NOT DETERMINED NA = NOT APPLICABLE

* = PROPRIETARY - TRADE SECRET
PRODUCT: SODIUM THIOSULFATE

---------- FOR ADDITIONAL INFORMATION ----------

CONTACT: MSDS COORDINATOR
VAN WATERS & ROGERS INC.
DURING BUSINESS HOURS, PACIFIC TIME  (425) 989-3400

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ARE RESPONSIBLE TO VERIFY THIS DATA UNDER THEIR OWN OPERATING CONDITIONS TO

DETERMINE WHETHER THE PRODUCT IS SUITABLE FOR THEIR PARTICULAR PURPOSES AND THEY

ASSUME ALL RISKS OF THEIR USE, HANDLING, AND DISPOSAL OF THE PRODUCT, OR FROM

THE PUBLICATION OF USE OF, OR RELIANCE UPON, INFORMATION CONTAINED HEREIN.

THIS INFORMATION RELATES ONLY TO THE PRODUCT DESIGNATED HEREIN AND DOES NOT

RELATE TO ITS USE IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY OTHER
SECTION I
PRODUCT IDENTIFICATION

PRODUCT NAME OR NUMBER (as it appears on label)
SC-200

MANUFACTURER'S NAME
Spartan Chemical Co., Inc.

ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE)
110 N. Westwood Ave., Toledo, OH 43607

HAZARDOUS MATERIAL DESCRIPTION, PROPER SHIPPING NAME, HAZARD CLASS, HAZARD ID NO. (49 CFR 172.101)
Unrestricted

ADDITIONAL HAZARD CLASSES (AS APPLICABLE)
r/a

SECTION II
HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>CAS REGISTRY NO.</th>
<th>%W</th>
<th>CHEMICAL NAME(S)</th>
<th>TWA</th>
<th>STEL</th>
<th>Ceiling</th>
<th>CARCINOGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>111-76-2</td>
<td>9</td>
<td>2-Butoxyethanol</td>
<td></td>
<td></td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>1310-73-2</td>
<td>4</td>
<td>Sodium hydroxide</td>
<td></td>
<td></td>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>

*This substance is subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (SARA) and of 49 CFR 172.101.

SECTION III
PHYSICAL DATA

BOILING POINT
210 °F

SPECIFIC GRAVITY (H₂O = 1)
1.063

PERCENT SOLID BY WEIGHT (%)
14-15

VAPOR PRESSURE
18

VAPOR DENSITY (AIR = 1)
<1

SOLUBILITY IN WATER
Complete

PH
Concentrate - 13.0-13.5

SECTION IV
FIRE AND EXPLOSION HAZARD DATA

FLASH POINT - None

METHOD USED - ASTM - D92

FLAMMABLE LIMITS - n/a

EXTINGUISHING MEDIA
n/a

SPECIAL FIRE FIGHTING PROCEDURES
n/a

UNUSUAL FIRE AND EXPLOSION HAZARDS
n/a
SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE - CONDITIONS TO AVOID
Threshold limit value - Not established
May cause skin and eye irritation. Avoid prolonged skin contact and inhalation of vapors or mist. Butoxyethanol is absorbed through the skin which may affect the liver, kidneys, lymph and blood systems; inhalation may irritate throat and respiratory system.

REMEDIES FOR EXPOSURE - In case of contact immediately flush eyes with plenty of water for at least 15 minutes; call a physician. Flush skin with water. Wash clothing before reuse. If swallowed do not induce vomiting. Give large quantities of water. Call a physician immediately. Never give anything by mouth to an unconscious person.

EMERGENCY AND FIRST AID PROCEDURES - In case of contact immediately flush eyes with plenty of water for at least 15 minutes; call a physician. Flush skin with water. Wash clothing before reuse. If swallowed do not induce vomiting. Give large quantities of water. Call a physician immediately. Never give anything by mouth to an unconscious person.

SECTION VI - REACTIVITY DATA

STABILITY: UNSTABLE
STABLE

INCOMPATIBILITY (MATERIALS TO AVOID)
Strong acids and strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
None known

HAZARDOUS MAY OCCUR
POLYMERIZATION WILL NOT OCCUR

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Small quantities can be flushed with water into sanitary sewer; large quantities should be absorbed or contained.

WASTE DISPOSAL METHOD
Same as above.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE) - Not required

VENTILATION - Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

PROTECTIVE GLOVES (SPECIFY TYPE)
Solvent resistant

EYE PROTECTION (SPECIFY TYPE)
Approved safety glasses with side shield

OTHER PROTECTIVE EQUIPMENT - Under certain conditions alkali resistant aprons and boots are suggested.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Do not freeze, do not store above 120°F.

OTHER PRECAUTIONS
None

Spartan Chemical Co., Inc.

NAME Thomas J. Mitchell
TITLE Director of Research
DATE February 13, 1989
SUPERCEDES January 15, 1987
CHLORINE

SECTION 1 - PRODUCT IDENTIFICATION

<table>
<thead>
<tr>
<th>Product Name and Synonyms</th>
<th>Manufacturer's Name and Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>GEORGIA-PACIFIC CORPORATION</td>
</tr>
<tr>
<td>CAS Name and Number</td>
<td>300 W. Laurel Street (98225)</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 1236</td>
</tr>
<tr>
<td></td>
<td>Bellingham, WA 98227</td>
</tr>
<tr>
<td></td>
<td>Telephone: 206-733-4410</td>
</tr>
<tr>
<td>Chemical Family</td>
<td>Emergency Telephone Number</td>
</tr>
<tr>
<td>Halogen</td>
<td>1-800-424-9300 CHEMTREC</td>
</tr>
<tr>
<td>Chemical Formula</td>
<td></td>
</tr>
<tr>
<td>Cl₂</td>
<td></td>
</tr>
</tbody>
</table>

SECTION 2 - HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>% WEIGHT</th>
<th>ACGIH TLV®</th>
<th>ACGIH STEL</th>
<th>OSHA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>99.5</td>
<td>0.5 ppm</td>
<td>1 ppm</td>
<td>0.5 ppm (ceiling)</td>
</tr>
<tr>
<td>Inert Ingredients</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION 3 - PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance and Odor</td>
<td>A greenish-yellow gas or an amber liquid with a suffocating, pungent, irritating odor</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>70.9</td>
</tr>
<tr>
<td>Boiling Point (Degrees Fahrenheit)</td>
<td>-29.3</td>
</tr>
<tr>
<td>Melting Point (Degrees Fahrenheit)</td>
<td>-149.6</td>
</tr>
<tr>
<td>Vapor Pressure (MM of Mercury)</td>
<td>4350 @ 70°F</td>
</tr>
<tr>
<td>Specific Gravity (Water = 1)</td>
<td>1.41</td>
</tr>
<tr>
<td>Vapor Density (Air = 1)</td>
<td>2.5</td>
</tr>
<tr>
<td>Percent Volatile (By Weight)</td>
<td>100%</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>0.7g/100g water @ 68°F</td>
</tr>
<tr>
<td>Evaporation Rate (Butyl Acetate = 1)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

SECTION 4 - FIRE AND EXPLOSION DATA

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>None</td>
</tr>
<tr>
<td>Fire Extinguishing Media</td>
<td>Use media appropriate for the surrounding fire.</td>
</tr>
<tr>
<td>Flammable Limits (Percent by Volume): Lower</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Special Firefighting Procedures &amp; Equipment</td>
<td>Use water spray to cool intact, fire-exposed containers (one-ton tanks and cylinders will release chlorine when a fusible metal safety plug melts at 158-165°F). If possible, have specially trained personnel remove intact cylinders from fire area. Firefighters must use MSHA- or NIOSH-approved self-contained breathing apparatus with a full facepiece, and full protective clothing.</td>
</tr>
<tr>
<td>Unusual Fire and Explosion Hazards: Chlorine will support the burning of most combustible materials, just as oxygen does. Flammable gases and vapors can form explosive mixtures with chlorine.</td>
<td></td>
</tr>
<tr>
<td>Hazardous Combustion Products</td>
<td>Toxic products are generated when combustibles burn in the presence of chlorine</td>
</tr>
</tbody>
</table>
SECTION 5 - REACTIVITY DATA

Stability

Unstable _X_  Stable

**Conditions to Avoid**

Intense local heat (above 419°F), elevated temperatures may cause cylinders to burst

**Incompatibility (Materials to Avoid)**

Reducing agents, combustible substances, i.e., gasoline and petroleum products, turpentine, acetylene, alcohols, hydrogen, ammonia, ether and sulfur, finely divided metals. Chlorine reacts with hydrogen sulfide and water to form hydrochloric acid; it also combines with carbon monoxide and sulfur dioxide to form phosgene and sulfuryl chloride (toxic and corrosive materials)

Chlorine will react exothermically with iron and steel at temperatures in excess of 453°F

**Hazardous Decomposition Products**

None

**Hazardous Polymerization**

Will Occur __  Will Not Occur _X_

**Conditions to Avoid**

Not applicable

SECTION 6 - HEALTH HAZARD INFORMATION

**Exposure from Routine Use**

Chlorine inhalation may cause irritation if inhaled or allowed to contact the skin or eyes

**Effects of Overexposure**

Chlorine gas may cause severe irritation of the eyes, nose, and respiratory tract with tearing, runny nose, sneezing, coughing, choking, and chest pain. Severe breathing difficulties may occur which may be delayed in onset. Pneumonia may result. In high concentrations chlorine may irritate the skin and cause sensations of burning and pricking, inflammation, and blister formation. Any contact with liquid chlorine may cause burns, blistering, and tissue destruction. Severe exposures may be fatal. Corrosion of the teeth, skin irritation, and reduced respiratory capacity may result from repeated or prolonged exposure.

**Probable Routes of Exposure**

Inhalation, skin absorption

**Emergency First Aid Procedures**

Call physician IMMEDIATELY for any person overexposed to chlorine.

- **Eye Contact**
  - If liquid chlorine or high concentrations of chlorine gas get into eyes, wash eyes with large amounts of water, occasionally lifting the upper and lower lids.

- **Skin Contact**
  - Treat for inhalation exposure first. If liquid chlorine or high concentrations of chlorine gas get on the skin, immediately flush the contaminated skin with water. If clothing is contaminated, remove and immediately flush skin with water. If irritation is present after washing, get medical attention.

- **Inhalation**
  - Move person to fresh air at once. Restore breathing when required. If breathing is difficult, administer oxygen. Keep warm and at rest. In mild cases, give milk to relieve throat irritation. Get immediate medical attention.

- **Ingestion**
  - Not applicable

SECTION 7 - TOXICITY DATA

**Oral**

Not available

**Dermal**

Not available

**Inhalation**

LC₅₀ (human) - 873 ppm for 30 min. produced toxic effects in lungs and thorax on respiration

IDLH (Immediately Dangerous to Life or Health) - 25 ppm

**Carcinogenicity**

Not listed as a carcinogen by IARC, NTP, OSHA or ACGIH

**Other Pertinent Data**

Aquatic toxicity: 0.08 ppm/168 hours (trout, fresh water)

10 ppm/1 hr /unicate/killed/salt water
SECTION 8 - SPECIAL PROTECTION INFORMATION

Personal Protective Equipment

Protective Gloves  Impervious

Eye Protection: Splashproof safety goggles.

Respiratory Protection (Specify Type) Only NIOSH- or MSHA-approved equipment should be used. Any self-contained breathing apparatus with a full facepiece or supplied-air respirator with a full facepiece, helmet, or hood.

Other Protective Equipment  Face shields (eight-inch minimum), appropriate impervious clothing necessary to prevent any possibility of skin contact.

Ventilation

Local Exhaust  If required to maintain PEL.

Mechanical (General)  If required to maintain PEL.

Special  Not applicable

Other  Use enclosed, isolated processing and handling whenever possible

SECTION 9 - SPILL, LEAK, AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

1. Notify safety personnel
2. Ventilate area of leak to disperse gas
3. Exclude from area all except specially trained, assigned personnel with approved self-contained breathing equipment and appropriate protective clothing
4. Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air and repair the leak or allow the cylinder to empty through a reducing agent, such as sodium bisulfide and sodium bicarbonate.

A spill or release of this material may trigger the emergency release reporting requirements under SARA, Title III (40 CFR Part 355) and/or CERCLA (40 CFR, Part 300) State or local reporting requirements may differ from federal requirements. Consult counsel for further guidance on your responsibilities under these laws.

Waste Disposal Methods  Allow gas to disperse at a safe location or bubble through a large volume of 15% sodium hydroxide solution or other alkali. Suitably dispose of resulting solution.

Clean Water Act Requirements  Chlorine, Total Residual is listed in Table IV as a "Pollutant Required to be Tested by Existing Dischargers if Expected to be Present."

Resource Conversation and Recovery Act (RCRA) Requirements  Information unknown at time of publication.

SECTION 10 - REGULATORY INFORMATION

FDA  Aqueous chlorine solution is "Generally Recognized as Safe" (GRAS). Chlorine is approved as a bleaching ingredient under §137.105(a) and §137 200(a)

USDA  USDA self-certification (9 CFR 317 20); is FDA approved

CPSC  Not listed in Hazardous Substances Labeling Guide

NSF  Maximum allowable usage for water treatment is 30 mg/L.
TSCA  CAS# 7782-50-5, Chlorine

DOT  Regulated

Proper Shipping Name  Chlorine
Hazard Class  2.3 (Poison Gas)
Label Required  "Chlorine" Placard

Identification No.  UN 1017
Other Pertinent Information  No named Packing Grp
RQ is 10 lbs

EPA  EPA Reg No.:  57265-1; EPA Est. No.:  57265-WA-1

Superfund Amendments and Reauthorization Act (SARA) Title III  Section 313, Supplier Notification
This product is known to contain the following chemicals, which are listed in 40 CFR 372 65 as toxic chemicals requiring supplier notification

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Chemical Abstract Service Registry No.</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>7782-50-5</td>
<td>100</td>
</tr>
</tbody>
</table>

This information must be included in all MSDSs that are copied and distributed for this material

SECTION 11 - SPECIAL PRECAUTIONS AND COMMENTS

Precautions to be Taken in Handling and Storing
Store chlorine containers in well-ventilated areas of low fire potential, away from incompatible materials (see Sec V) and away from sources of heat and ignition. Protect containers from weather and physical damage, follow standard safety procedures for containers of compressed, corrosive gases. Regularly inspect (and test) piping and containment used for chlorine service. Liquid levels should be less than 85% of tank or cylinder capacity. Provide special training to workers handling chlorine. Contact lenses should not be worn when working with chlorine.

Other Precautions
Use preplacement medical exams, preclude from workplace exposure to chlorine those with cardiac, pulmonary or chronic respiratory problems.

Registrations / Certifications  None

Effective Date:  8/24/94  Supersedes:  7/18/94.

The symbol "*" indicates revision from previous issue.

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MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

Manufacturer's Name: Canadian Oxy Industrial Chemicals Limited Partnership
Supplier's Name: Canadian Oxy Industrial Chemicals Limited Partnership

Street Address: 100 Amherst Avenue

City: North Vancouver
Province: British Columbia
Postal Code: V7H 1S4
Emergency Tel: (604) 929-3441

Chemical Name: Chlorine
Chemical Family: Halogen
Chemical Formula: Cl₂

Product Use: Pulp bleaching, water treatment, manufacture of plastics, organic and inorganic chlorides, refrigerants, pharmaceuticals.

SECTION 2 - HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>Hazardous Ingredient</th>
<th>% w/w</th>
<th>CAS Number</th>
<th>PINumber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>99.5</td>
<td>7782-50-5</td>
<td>1017</td>
</tr>
</tbody>
</table>

SECTION 3 - PHYSICAL DATA

Physical State:
- Gas at room temperature: amber liquid or greenish-yellow gas, penetrating odour
- Vapour Pressure: 4800 mmHg at 20°C
- Melting Point: -34°C
- Freezing Point: -101°C
- pH: not applicable
- Specific Gravity: 1.41 (liq. at 20°C)
- Solubility in Water: 0.7% at 20°C
- Coeff of Water/Oil Distr: not available

Odour & Appearance:
- Odour Threshold: 0.2-0.4 ppm
- Evaporation Rate: not available
- Critical Temperature: 144°C

SECTION 4 - FIRE AND EXPLOSION DATA

Flammability:
- Yes [ ] No [ X ] Chlorine will support the burning of most combustible materials

Means of Extension:
- Use extinguishing media appropriate for surrounding fire.
- Use water to keep fire-exposed containers cool. Do not spray water directly on a chlorine leak.
- Flashpoint and Method: not applicable
- Upper Explosion Limit (% by volume): not applicable
- Lower Explosion Limit (% by volume): not applicable
- Auto Ignition Temp: not applicable
- Hazardous Combustion Products: Toxic substances are formed when combustibles burn in chlorine
- Sensitivity to Impact: not applicable
- Sensitivity to Static Discharge: not applicable

SECTION 5 - REACTIVITY DATA

Chemical Stability:
- Yes [ X ] No [ ] Dry chlorine is stable in steel containers at ambient conditions.
- Incompatibility with other substances:
  - (If yes, which ones)
  - Chlorine may react violently or explosively with ammonia, acetylene, ether, turpentine and other hydrocarbons, hydrogen, titanium and other metals.

Hazardous Decomposition Products:
- Wet chlorine (>150 ppm H₂O) corrosively attacks most common metals Chlorine reacts with CO to form toxic phosgene; SO₂ to form toxic sulfuryl chloride; water to form hydrochloric and hypochlorous acid
- None
Product Identifier: CHLORINE

SECTION 6: TOXICOLOGICAL PROPERTIES

<table>
<thead>
<tr>
<th>Contact</th>
<th>Skin Absorption</th>
<th>Eye Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation Acute</td>
<td>Inhalation Chronic</td>
<td>Ingestion</td>
</tr>
</tbody>
</table>

- Effects of Acute Exposure to Material
  - **LIQUID:** Burns skin, eyes, mucous membranes.
  - **GAS:** Eye and respiratory irritation, dyspnea, retching, vomiting, pulmonary edema. A few deep breaths at 1000 ppm Cl₂ may cause death.

- Effects of Chronic Exposure to Material
  - Prolonged or repeated exposures above 5 ppm may cause damage to respiratory tract.

<table>
<thead>
<tr>
<th>(Specify Species and Route)</th>
<th>LD₅₀ not available</th>
<th>LC₅₀293 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rat - 1 hr. inhalation</td>
<td>Severe skin, eye respiratory</td>
<td></td>
</tr>
</tbody>
</table>

- Sensitizing capability: Not a sensitizer
- Carcinogenicity: No evidence
- Reproductive Effects: Insufficient data
- Synergistic Materials: Not available

SECTION 7: PREVENTIVE MEASURES

- **Personal Protective Equipment**
  - Eye wash stations and chemical safety showers must be immediately available. If routine respiratory protection is required, institute a complete respiratory protection program. Emergency or planned entry into unknown or IDLH concentration requires positive pressure self-contained or air-supplied respirator with full facepiece.

- **Engineering Controls (e.g., Ventilation, Enclosed Processes, Specify)**
  - Provide general and local exhaust ventilation to meet TLV.

- **Spill Procedures**
  - Establish written emergency plans and special training of personnel. Large leaks may require evacuation of surrounding area.

- **Waste Disposal**
  - Chlorine gas may be absorbed in alkaline solution (caustic soda, soda ash, hydrated lime); control pH > 10. Dispose of residue in accordance with Environmental Regulations.

- **Handling Procedures and Equipment**
  - Regularly inspect and test piping and containment for chlorine service. Consult Chlorine Institute guidelines.

- **Storage Requirements**
  - Store in ventilated areas of low fire potential, away from incompatible materials. Protect containers from weather and physical damage.

- **Special Shipping Information**
  - Must meet Transport Canada Dangerous Goods Regulation (SOR/85-77)
  - Class 2.3 - Poison gas

SECTION 8: FIRST AID MEASURES

- **Emergency** for all exposures except minor inhalation or minor skin contact.

  - **INHALATION**
    - Remove victim to fresh air. Restore or support breathing as required. Trained person may administer oxygen until breathing is eased. Keep victim warm and at rest.

  - **SKIN:**
    - Remove contaminated clothing under safety shower. Flush skin thoroughly with water (20 minutes). Do not attempt to neutralize with chemicals. Use cold packs to reduce pain.

  - **EYES:**
    - Flush with copious amounts of water (30 minutes). Do not attempt to neutralize with chemicals. Use cold packs to reduce pain.

SECTION 9: PREPARATION DATA

- **Prepared By**
  - Canadian Oxy Industrial Chemicals Limited Partnership
  - WHMIS COMMITTEE

- **Date Issued**
  - 92/12/16

- **Phone Number**
  - (604) 929-3441
SUPPLIER NOTIFICATION REQUIREMENT

SARA TITLE III

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 ("SARA") of 1986 and 40 CFR Part 372.

Because Jones Chemicals, Inc. is in Standard Industrial Classification codes 20 through 39, manufactures or processes this toxic chemical, and sells or otherwise distributes this mixture or trade name product containing a toxic chemical to you, we are required to give you this notification under SARA Title III.

This notification is required to be made each year with at least the first shipment of each mixture or trade name product to each recipient beginning January 1, 1989.

This notification must not be detached from this Material Safety Data Sheet ("MSDS"). Any copying and redistribution of this MSDS shall include copying and redistribution of this notification attached to copies of the MSDS subsequently redistributed.

This mixture or trade name product contains the following Section 313 Toxic Chemicals:

<table>
<thead>
<tr>
<th>SARA TITLE III TOXIC CHEMICAL</th>
<th>CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER (CAS #)</th>
<th>PERCENT BY WEIGHT OF TOXIC CHEMICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>7782-50-5</td>
<td>99.5%</td>
</tr>
</tbody>
</table>
Sodium fluoride (NaF) 2.5 mg of F/m³ LEL 14 g

Melting Point 992 °C
Evaporation Rate (Buiw Accurate = 1)

Solubility in Water 15 °C 4.0 g/100g 25 °C 4.3 g/100g

Appearance and Odor White crystalline powder, no odor

Fire and Explosion Hazard Data

Flash Point (Method Used) n.a.
Ignitability Limits n.a.

Extinguishing Media n.a.

Special Fire Fighting Procedures: Although this product itself is not inflammable, IF/WHEN this product is heated at high temperature, HF gas escurs from this product. Therefore, it is necessary to avoid heating and to protect persons against HF gas.

Unusual Fire and Explosion Hazards
Section V - Reactivity Data

<table>
<thead>
<tr>
<th>Property</th>
<th>Unstable</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions to Avoid</td>
<td></td>
<td>To avoid heating.</td>
</tr>
</tbody>
</table>

Incompatibility (Materials to Avoid)

To avoid contact with mineral acid.

Hazardous Decomposition or Byproducts

Fluoric Acid gas (HF gas)

Hazardous Polymerization

May Occur

Will Not Occur

Section VI - Health Hazard Data

Route(s) of Entry

Inhalation? as dust

Swallow handled as solution ingestion taken by accident

Health Hazards (Acute and Chronic)

Acute: vomit, diarrhea, pain in stomach, tremble

Chronic: fluorosis

Cardiography: NTP? IARC Monographs? OSHA Requested?

Signs and Symptoms of Exposure

Medical Conditions

Generally aggravated by Exposure: vomit, diarrhea, respiration trouble

Emergency and First Aid Procedures

Drink calcium solution of 10g/250cc water concentration.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled

Avoid dispersion and keep general persons at a distance.

Waste Disposal Method

Put enough water to dissolve the product and put excess slaked lime
to change the product into calcium fluoride.

Precautions to be Taken in Handling and Storing

General

Other Precautions

Information given herein is offered in good faith as accurate, but without
guarantee. Conditions of use and suitability of the product for particular users
are beyond our control. Thus all risks of use of the product are therefore
assumed by the user.

Section VIII - Control Measures

Respiratory Protection (Special Type)

Wear dust prevention mask of 99.9% efficiency.

Ventilation

Local Exhaust

Mechanical (General)

bag filter

Protective Glasses

rubber gloves

Eye Protection: goggles

Other Protective Clothing or Equipment

Wear/Personal Protective Equipment

Page 2
**MATERIAL SAFETY DATA SHEET**

**PRODUCT IDENTIFICATION**

**PRODUCT NAME:** CAUSTIC SODA 25%, STANDARD GRADE

**SYNONYMS:**
- SODIUM HYDROXIDE SOLUTION, 25%

**CHEMICAL NAME:** SODIUM HYDROXIDE, AQUEOUS SOLUTION

**MOLECULAR FORMULA:** NaOH

**CHEMICAL FAMILY:** ALKALI

**INGREDIENTS——HAZARD CLASSIFICATIONS**

<table>
<thead>
<tr>
<th>INGREDIENTS—HAZARDOUS</th>
<th>CAS NO.</th>
<th>%</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROXIDE</td>
<td>01310-73-2</td>
<td>25</td>
<td>TWA 2 mg/m³ (C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NFFA RATING: 3-0-1</td>
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</tbody>
</table>

**COMPONENTS—OTHER**

<table>
<thead>
<tr>
<th>COMPONENTS—OTHER</th>
<th>CAS NO.</th>
<th>%</th>
<th>COMMENTS</th>
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</thead>
<tbody>
<tr>
<td>ITER</td>
<td>7782-18-5</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

**SHIPPING INFORMATION**

- TANK TRUCKS: RQ SODIUM HYDROXIDE SOLUTION; CORROSIVE MATERIAL; UN 1824
- TANK CARS: RQ SODIUM HYDROXIDE SOLUTION; CORROSIVE MATERIAL; UN 1824
- DOT REPORTABLE QUANTITY (RQ) IS 1000 LBS ON DRY BASIS.

**PHYSICAL PROPERTIES**

- **BOILING POINT/RANGE:** 111 °C (232 °F)
- **MELTING POINT:** NA
- **FREEZING POINT:** -14 °C (7 °F)
- **MOLECULAR WEIGHT:** 40.01 (DRY BASIS)
- **SPECIFIC GRAVITY (H₂O=1):** 1.274 @ 20 °C
- **VAPOR PRESSURE (MM Hg):** 10.5 @ 20 °C
- **VAPOR DENSITY (AIR=1):** 75
- **SOLUBILITY IN H₂O:** COMPLETE
- **PARED AND COLOR:** 1 WHITE, CLEAR TO SLIGHTLY TURBID LIQUID. ESSENTIALLY COLORLESS.

**FIRE AND EXPLOSION DATA**

- **FLASH POINT:** NONE
- **FLAMMABLE LIMITS:** LOWER: NA   UPPER: NA
- **AUTOIGNITION TEMP.:** NA
[Text content as per the image]
TOXICITY COMMENTS:
INGESTION CAUSES SEVERE BURNS OF THE MUCOUS MEMBRANES OF THE MOUTH, THROAT, ESOPHAGUS AND STOMACH.
INHALATION OF MIST MAY CAUSE DAMAGE TO UPPER RESPIRATORY TRACT AND EVEN TO THE LUNG TISSUE.
CHRONIC: CONTACT WITH EVEN DILUTE SOLUTION MAY RESULT IN MULTIPLE AREAS OF SUPERFICIAL DESTRUCTION OF THE SKIN OR PRIMARY IRRITANT DERMATITIS. SIMILARLY, INHALATION OF THE MIST MAY RESULT IN VARYING DEGREES OF IRRITATION OF THE RESPIRATORY TRACT TISSUES. MAY VARY FROM MILD IRRITATION OF NASAL MUCOUS MEMBRANES TO SEVERE INFLAMMATION OF THE LUNGS.

--------------------------------------------------------------------------------

HEALTH HAZARD INFORMATION

PERMISSIBLE EXPOSURE LIMITS
PERMISSIBLE EXPOSURE LIMITS ARE LISTED IN THE 'INGREDIENTS' SECTION.

--------------------------------------------------------------------------------

EMERGENCY FIRST AID

INGESTION
DO NOT GIVE PLiENTY GET MEDICAL
INDUCE VOMITING OF WATER ATTENTION
DRINK LARGE QUANTITIES OF WATER OR MILK. IF VOMITING OCCURS, GIVE MORE WATER. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

GET MEDICAL  CONTAMINATED CONTAMINATED
ATTENTION CLOTHING SHOES - DESTROY
REMOVE & LAUNDER
IMMEDIATELY FLUSE WITH PLENTY OF WATER FOR AT LEAST 30 MINUTES OR UNTIL MEDICAL TREATMENT IS RECEIVED.

INHALATION
REMOl', TO FRESH AIR IF NOT BREATHING GIVE OXYGEN GET MEDICAL
GET ARTIFICIAL RESPIRATION ATTENTION

--------------------------------------------------------------------------------

SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS:
USE WITH ADEQUATE VENTILATION
FOR PROPER TANK ENTRY PROCEDURES, SEE ANSI Z117.1-1977. MONITOR CARBON MONOXIDE AND OXYGEN LEVELS IN TANKS AND ENCLOURED SPACES.

FACE SHIELD GOGGLES

NA - NOT APPLICABLE
NE - NOT ESTABLISHED
(R) - INDICATES REGISTERED TRADEMARK OF ASCHEM NORTH AMERICA
FACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

GLOVE TYPE: SYNTHETIC RUBBER

MATING TYPE: MIST

USE ONLY MIOSH APPROVED EQUIPMENT.

PROTECTIVE EQUIPMENT:
RUBBER BOOTS, COTTON WORK CLOTHES, RUBBER SUIT OR APRON.

SPECIAL HANDLING AND STORAGE CONDITIONS

ASH THOROUGHLY DO NOT GET IN EYES, DO NOT BREATHE

FER HANDLING ON SKIN OR CLOTHING DUST, VAPOR, MIST, GAS

EPT CONTAINER STORE IN TIGHTLY

LOSED CLOSED CONTAINERS

CONTAINER MAY

CONTAIN HAZARDOUS RESIDUES

IN MAKING WATER SOLUTION, AVOID RAPID TEMPERATURE RISE, VIOLENT SPATTERING OR EXPLOSIVE ERUPTIONS BY ALWAYS ADDING CAUSTIC SODA TO WATER. ADD WATER TO CAUSTIC SODA. HEAT WATER TO 80-100 DEG F BEFORE ADDING CAUSTIC SODA. ADD SMALL AMOUNTS OF PRODUCT SLOWLY AND EVENLY OVER SURFACE OF WATER WITH CONSTANT STIRRING. NEVER INCREASE THE CONCENTRATION OF PRODUCT IN SOLUTION BY MORE THAN 5% WITH ANY SINGLE ADDITION. WATER SHOULD NOT EXCEED 150 DEG F DURING ADDITION.

SPILL MANAGEMENT

WASH WITH NEUTRALIZE

WASH WITH WATER AND 'NEUTRALIZE' ARE APPLICABLE TO SMALL SPILLS (UP TO 10 GALLONS) ONLY. LARGE SPILLS SHOULD BE CONTAINED AND REMOVED WITH VACUUM TRUCK. KEEP THE PRODUCT OUT OF WATER SOURCES AND SEWERS.

DISPOSAL PROCEDURES

DILUTE WITH WATER AND NEUTRALIZE WITH DILUTE ACID.

ADDITIONAL INFORMATION

WARNING! THIS PRODUCT MAY CONTAIN EXTREMELY SMALL (TRACE) AMOUNT(S) OF CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER OR BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM (PER PROPOSITION 65).

INDICATES REGISTERED TRADEMARK OF ATTOCHEM NORTH AMERICA

NOT APPLICABLE NE - NOT ESTABLISHED
PRESENT, ARE IDENTIFIED IN THE 'INGREDIENTS-HAZARD CLASSIFICATION' SECTION OF THIS MSDS.

MSDS PREPARED BY TECHNICAL SERVICE

THE ABOVE INFORMATION IS ACCURATE TO THE BEST OF OUR KNOWLEDGE. HOWEVER, SINCE DATA, SAFETY STANDARDS, AND GOVERNMENT REGULATIONS ARE SUBJECT TO CHANGE AND THE CONDITIONS OF HANDLING AND USE, OR MISUSE ARE BEYOND OUR CONTROL, ATOCHEM MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN AND DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON. USER SHOULD SATISFY HIMSELF THAT HE HAS ALL CURRENT DATA RELEVANT TO HIS PARTICULAR USE.

NA - NOT APPLICABLE
NE - NOT ESTABLISHED
1) - INDICATES REGISTERED TRADEMARK OF ATOCHEM NORTH AMERICA
MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

TRADE NAME (as labeled): LIQUID BLEACH

MANUFACTURERS NAME: T C. Products
ADDRESS: 2001 Thorne Rd, Tacoma, WA, 98421
PHONE NUMBER: (206) 272-9376
DATE REVISED: 4/12/96

ANSI / NSF Certified to standard 60, EPA Registered, certified for AWWA and USDA use.

II. HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS NUMBERS</th>
<th>PERCENT</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>OTHER</th>
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</thead>
<tbody>
<tr>
<td>Sodium Hypochlorite</td>
<td>7681-52-9</td>
<td>5.25%</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td>N/A</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>7681-52-9</td>
<td>6.0%</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td>N/A</td>
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<tr>
<td>Sodium Hypochlorite</td>
<td>7681-52-9</td>
<td>10.0%</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td>N/A</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>7681-52-9</td>
<td>11.0%</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td>N/A</td>
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<tr>
<td>Sodium Hypochlorite</td>
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<td>12.5%</td>
<td>1 ppm</td>
<td>1 ppm</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(Response to all strengths is identical.)

III. PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>VAPOR DENSITY (air=1):</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAPOR PRESSURE mm Hg @20°C:</td>
<td>N/A</td>
</tr>
<tr>
<td>EVAPORATION RATE (butyl acetate=1):</td>
<td>N/A</td>
</tr>
<tr>
<td>MELTING POINT OR RANGE:</td>
<td>N/A</td>
</tr>
<tr>
<td>BOILING POINT OR RANGE:</td>
<td>N/A</td>
</tr>
<tr>
<td>SOLUBILITY IN WATER:</td>
<td>100%</td>
</tr>
<tr>
<td>STRENGTH:</td>
<td>5.25% 6.0% 10.0% 11.0% 12.5%</td>
</tr>
<tr>
<td>SPECIFIC GRAVITY @ 60°F:</td>
<td>1.0825 1.09 1.150 1.175 1.206</td>
</tr>
<tr>
<td>FREEZING POINT in F(R):</td>
<td>+20 +19 +6 0 -12</td>
</tr>
<tr>
<td>APPEARANCE AND ODOR:</td>
<td>Yellow-green liquid with slight chlorine smell</td>
</tr>
</tbody>
</table>

IV. FIRE AND EXPLOSION

| FLASH POINT in F (give method): | N/A |
| FLAMMABLE LIMITS IN AIR, volume %: | Non-Flammable |
| FIRE EXTINGUISHING MATERIALS: | Use water in flooding quantities as fog |
| WATER SPRAY: | X |
| CARBON DIOXIDE: | | |
| FOAM: |  |
| DRY CHEMICAL: |  |
| OTHER: |  |
| SPECIAL FIREFIGHTING PROCEDURES: | Wear NIOSH approved self-contained breathing apparatus for chlorine gas vapors |
| | Cool containers exposed to fire with water |
| UNUSUAL FIRE AND EXPLOSION HAZARDS: | Bleach decomposes when heated to high temperatures causing container to rupture |
| NFPA 704 HAZARD CLASSIFICATIONS: | Health. 2 Flammability 0 |
| | Reactivity 1 Specific COR |
V HEALTH HAZARD INFORMATION

TOXIC EFFECTS / ROUTES OF ENTRY

EYE CONTACT: CORROSIVE
Exposure to liquid may produce mild irritation to burns. Exposure to vapor may produce mild to severe irritation

SKIN CONTACT: CORROSIVE
Exposure to liquid may produce mild irritation to burns. Exposure to vapor may produce mild to severe irritation

INGESTION: CORROSIVE
May cause burns to mucous membranes. May cause esophageal or gastric perforation, laryngeal edema, vomiting and nausea

EFFECTS OF OVEREXPOSURE

ACUTE: Material may be corrosive to skin, mucous membranes and eyes
Vapors may cause respiratory irritation

CHRONIC: No known chronic effects

This product is not listed as a carcinogen by OSHA, NTP or IARC

FIRST AID AND EMERGENCY PROCEDURES

EYE CONTACT: Flush eyes thoroughly with running water for at least fifteen minutes. Get prompt medical attention

SKIN CONTACT: Rinse thoroughly with running water. If irritation persists contact physician or local poison control center

SWALLOWED: Immediately give large quantities of water or milk to dilute. Do not induce vomiting. Do not give vinegar or other acidic material. Get prompt medical attention

INHALED: If symptoms occur, remove victim to fresh air. Provide support respiration and get prompt medical attention if necessary

VI REACTIVITY DATA

STABILITY: STABLE: __ UNSTABLE: X - Avoid Heat

INCOMPATIBILITY: Avoid acids, ammonia, organic compounds, oxidizing compounds, reducing compounds, heavy metals and salts thereof

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine, chlorine dioxide, chloramines.
If decomposition occurs, it may cause container to rupture

HAZARDOUS POLYMERIZATION: WILL OCCUR: __ WILL NOT OCCUR: X
VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL RESPONSE PROCEDURES: Dilute with copious amounts of water and then mop up
Avoid splashing into eyes, prolonged exposure to skin and inhalation of fumes

PREPARING WASTE FOR DISPOSAL: Neutralize and dispose in accordance with federal,
state and local regulations

VIII. SPECIAL HANDLING AND STORAGE INFORMATION

VENTILATION: Provide adequate ventilation

GLOVES: Wear chemical resistant gloves

RESPIRATORY: Wear Niosh approved respiratory protection

EYE PROTECTION: Wear splash proof chemical resistant safety goggles

OTHER PROTECTION: Wear a faceshield and chemical resistant clothing if splashing
of material may occur

HYGIENIC PRACTICES: Provide eye wash and emergency showers Launder clothing
when soiled

STORAGE REQUIREMENTS: Store in a cool, dark place away from heat, light and
combustible sources Store below 90F Keep containers
closed and provide adequate ventilation

The information contained herein is provided in good faith and is believed to be correct as of
the date hereof However, T C Products Inc Makes no representation as to the
comprehensives or accuracy of the information. It is expected that individuals receiving this
information will exercise their independent judgment in determining its appropriateness for a
particular purpose Accordingly, T.C. Products Inc will not be responsible for damages of
any kind resulting from the use of or reliance upon such information. No representations or
warranties, either expressed or implied of merchantability Fitness for a particular purpose or
of any other nature are made hereunder with respect to the information set forth herein or to
the product to which the information refers
Section I — Material and Company Identification

Material Name: POTASSIUM PERMANGANATE
CAS #: 7722-64-7

Section II — Hazardous Ingredients/Identity Information

Not applicable since product is a single compound

(Potassium Permanganate) 98% TLV Units by Wt.

Section III — Physical/Chemical Characteristics

Melting Point: 302 F
Specific Gravity (H₂O = 1): 2.7
Decomposes with evolution

Section IV — Fire and Explosion Hazard Data

Flash Point: Not Flammable
Flammable Limits: N/A
Explosion Limits: LEL N/A, UEL N/A

Extinguishing Media:
WATER

Special Fire Fighting Procedures: USE PLENTY OF WATER. WATCH FOR RAPID BURNING AND BE PREPARED TO RETREAT TO SAFE DISTANCE. IF YELLOW OR BRONZE FUMES ARE PRESENT, WEAR A POSITIVE PRESSURE, SELF-CONTAINED BREATHING APPARATUS.
Section IV - Reactivity Data

<table>
<thead>
<tr>
<th>Stability</th>
<th>Unstable</th>
<th>Conditions to Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>X</td>
<td>EXPOSURE TO INCOMPATIBLE MATERIALS OR HEAT.</td>
</tr>
</tbody>
</table>

**Hazardous Decomposition**

Combustible Decomposition in Damp Atmosphere

**Material to Avoid**

ARSENIC, ALCOHOLS, IODIDES, ACIDS, CHARCOAL, ORGANIC

**Hazards Generally Exposed**

FUMES OR MERCURY SULFIDES, HYDROGEN, HYDRAZINES,

**Hazardous Polymerization**

**Exposure to Incompatible Materials or Heat.**

with HYDROCHLORIC ACID, CHLORINE, PEROXIDES, OXALATES.

**Section V - Health Hazard Data**

**Route(s) of Entry:**

Inhalation? YES

**Health Hazards (Acute and Chronic):**

**Threshold Limit Value - Manganese and Its Inorganic Compounds as MnCl₂/m³**

(C = ceiling value)

**Carcinogenicity:**

NTP? YES

**OSHA Regulator?**

**Section VI - Control Measures**

**Respiratory Protection (Specify Type):**

MECHANICAL (GENERAL)

**Ventilation:**

Local Exhaust

Mechanical (General)

**Protective Gloves:**

RUBBER OR PLASTIC GLOVES

**Other Protective Clothing or Equipment:**

NOT ESSENTIAL

**Decontamination Practices:**

NONE
POTASSIUM PERSYLVANATE

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>99.3% min.</td>
</tr>
<tr>
<td>Sulfate</td>
<td>0.05% max.</td>
</tr>
<tr>
<td>Chloride</td>
<td>0.01% max.</td>
</tr>
<tr>
<td>Insoluble matter in water</td>
<td>0.20% max.</td>
</tr>
<tr>
<td>#</td>
<td>Make/Model</td>
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<tr>
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<tr>
<td>ER 1</td>
<td>Bosch 0611302034</td>
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<tr>
<td>ER 3</td>
<td>Stanley BR-87</td>
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<td>Stanley SM-22</td>
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<tr>
<td>ER 3 b</td>
<td>Stanley HP-1</td>
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<tr>
<td>ER 3 c</td>
<td>Stanley IW/08</td>
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<tr>
<td>ER 3 d</td>
<td>Stanley TP-03</td>
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<tr>
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<td>Homelite 610 S-12D</td>
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<td>ER 15</td>
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<td>6607 Trk5309</td>
<td>1995</td>
<td>795 00</td>
<td>Water/Whse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER 157</td>
<td>Redmax BC261DL</td>
<td>Line Trimmer</td>
<td>377085 Whse</td>
<td>1996</td>
<td>399.99</td>
<td></td>
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<tr>
<td>ER 158</td>
<td>Stihl FS99</td>
<td>Line Trimmer</td>
<td>29270682 Whse</td>
<td>1996</td>
<td>399.99</td>
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<tr>
<td>ER 159</td>
<td>Stihl TS 350</td>
<td>Cut-Off Saw</td>
<td>122600377 Whse</td>
<td>1996</td>
<td>671.46</td>
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<tr>
<td>ER 160</td>
<td>Stihl 038</td>
<td>Chainsaw</td>
<td>333516794 Whse</td>
<td>1996</td>
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<tr>
<td>ER 161</td>
<td>X90-251 1hp QSP</td>
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<td>None Whse</td>
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<td>Neutronics Mini-gas</td>
<td>Gas Detector</td>
<td>017MA03803 Whse</td>
<td>1997</td>
<td>2,395.00</td>
<td>Sewer</td>
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<td>ER 163</td>
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<td>Gas Detector</td>
<td>017MA03804 Whse</td>
<td>1997</td>
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<tr>
<td>ER 164</td>
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<td>Gas detector</td>
<td>017MA03805 Whse</td>
<td>1997</td>
<td>2,395.00</td>
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<td>ER 165</td>
<td>Neutronics Mini-Gas</td>
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<td>017MA03806 Whse</td>
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<td>2,395.00</td>
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<td>ER 166</td>
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<td>017MA03807 Whse</td>
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<td>2,395.00</td>
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<td>235590743 Whse</td>
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<tr>
<td>ER 168</td>
<td>Tanaka TBC2510</td>
<td>Weedeater</td>
<td>R288158 Whse</td>
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<tr>
<td>ER 169</td>
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<tr>
<td>ER 171</td>
<td>Echo PB-60HT</td>
<td>Blower</td>
<td>1407 Whse</td>
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<td>359.99</td>
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<tr>
<td>ER 172</td>
<td>Bomag BT-58</td>
<td>Tamper</td>
<td>101540505604 Trk5304</td>
<td>1997</td>
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<td>ER 173</td>
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<td>235699651 Whse</td>
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<td>10115 Whse</td>
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<td>Wheeler 85</td>
<td>Camper</td>
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<td>162.90</td>
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<td>Echo HC-1600</td>
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<td>504333 Whse</td>
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CITY OF KENT
PUBLIC WORKS OPERATIONS
DISASTER RESPONSE PROCEDURE

"DUTY TO REPORT" PROCEDURE

Positions Affected: All staff in the Operations and Maintenance Divisions

GENERAL GUIDANCE

When and How to Report:

When first responding to a disaster, it is better to be on the side of having too many resources than to have too few. Therefore, it is the O & M Division's policy to respond in force and as soon as possible even when the full extent of damage and resource need is not known. Additionally, a disaster could happen outside of work hours and employees could be scattered throughout the region. Precious time could be wasted trying to track employees down. It is far more effective for employees to call in to a limited set of central numbers.

With the above in mind, the attached procedures have been written to provide employees with some general guidance about when and how to report. A procedure such as this cannot be designed to cover all circumstances. Consequently, the overriding concepts are:

(1) Employees are expected to take the initiative to report to the Public Works Operations Department

(2) Overreaction is preferred to under-reaction.

Where to Report:

Employees may be tempted to report to that part of the service area closest to their home and "start work" even if they are in their own vehicle and do not have any way by which to communicate with Public Works Operations. That approach is unacceptable for reasons of safety and control of response. We cannot afford not to know who is working where and what they are doing. During the initial mobilization, staff who cannot communicate with Public Works Operations should report directly to Public Works Operations to check in and receive orders. If someone is "coming in" and can call in by telephone or radio, they should do so and receive orders. Lacking that, the default action is to report directly to Public Works Operations.
City Support to Employees and their Families:

This topic is to be addressed on a Public Works Operations Department basis.

Non-Work Hours

"All Public Works Operations employees are encouraged to insure the safety and welfare of their families and homes, then make every reasonable effort to contact their worksite or supervisor. All employees should make every reasonable effort to report to their worksite unless to do so would jeopardize their personal safety or that of their family. If an employee is unable to report to work after making a reasonable attempt to do so, he/she must find a way to notify his/her supervisor as soon as possible, pursuant to department policies and procedures."

The following flow charts describe the Public Works Operations' specific procedures for reporting in disaster conditions during non-work hours.
WEATHER EVENTS
(Floods/Snow Storms/Wind Storms)

Generally these events build over time and we have warning.

"Triggers" for following flow chart below:

If you hear a warning of heavy rain/wind/snow/ice coming soon.
If you see or hear about heavy floods/rain/wind/snow/ice or widespread power outage which lasts more than one hour.

- Call 859-3394 P.W.O.
  - If You Get A Recording
    - Leave message with name, time & where you can be reached.
  - Call Control Center 859-3398
    - If no contact.
      - Call standby #’s on cellular or pager
        - 859-3315
          - No Contact
            - Police will contact field crew via radio
              - Sit tight and try again.
            - Refer to standby
ALL OTHER EVENTS

Employees will be called out as for "regular" emergencies.

WORKING HOURS

In the event of a widespread disaster during work hours, the Department will make every reasonable effort to allow employees to promptly check on the status of their families and homes as soon as possible without compromising emergency response functions as defined in the City's Emergency Operations Plan.

The City Public Works Director or his/her designee will decide on a case by case basis the instances when an allowance for time off for unusual circumstances will be made for employees.
CITY OF KENT
PUBLIC WORKS OPERATIONS
DISASTER RESPONSE PROCEDURE

CONTENTS

Duty to Report Procedure .................................................. Page 3
General Operating Guidelines .............................................. Page 7
  Guidance to Field Crews
  Initial Damage Assessment
  Detailed Damage Assessment
  Field Safety Notes
  Vehicle Minimum Materials & Equipment
Public Works Operations Disaster Response Procedures .......... Page 11
  PWO O&M, EOC Representative
  PWO O&M, EOC Representative Checklist
Public Works Operations Manager ........................................ Page 14
  Manager’s Checklist
Administrative Support Supervisor ........................................ Page 17
  Administrative Support Supervisor Checklist
Water Superintendent ......................................................... Page 22
  Water Superintendent Checklist
Utilities Superintendent ..................................................... Page 42
  Utilities Superintendent Checklist
Street Superintendent ....................................................... Page 70
  Street Superintendent Checklist
Fleet Superintendent ......................................................... Page 94
  Fleet Superintendent Checklist
  Emergency Vendor List
  Warehouse Vendor List
Logistics ............................................................................. Page 102
  Food, Water, Bedding
  Emergency Contractors List
Revision 06/06/97
EMERGENCY RESPONSE MODE OF OPERATION
SNOW / ICE / FLOODING / WIND STORM

<table>
<thead>
<tr>
<th>ISSUES:</th>
<th>LEVEL I (MODERATE)</th>
<th>LEVEL II (SEVERE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(To be determined by Public Works Operations Manager)</td>
<td></td>
</tr>
<tr>
<td>RADIOS:</td>
<td>Personnel cover during 7:30 - 4:00 shift - (by Water dept)</td>
<td>Personnel in Control Center at all times -</td>
</tr>
<tr>
<td></td>
<td>(1) One person cover during evening after hours</td>
<td>(1) One Radio (Water dept)</td>
</tr>
<tr>
<td></td>
<td>(1) One Supervisor as determined by need (day shift only)</td>
<td>(1) One Phones (Water dept)</td>
</tr>
<tr>
<td></td>
<td>Control Center will inform when to switch to Tac 2, via radio</td>
<td>(1) One Supervisor stationed in Control Center, to dispatch</td>
</tr>
<tr>
<td></td>
<td>Control Center on Tac 1 &amp; 2</td>
<td>Control Center on Tac 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>Field personnel on Tac 2</td>
<td>Field personnel on Tac 2</td>
</tr>
<tr>
<td></td>
<td>All others on Tac 1</td>
<td>All others on Tac 1</td>
</tr>
<tr>
<td></td>
<td>Front Office will stay off radio traffic</td>
<td></td>
</tr>
<tr>
<td>PHONES:</td>
<td>Pre-recorded message (when available)</td>
<td>Pre-recorded message (when available)</td>
</tr>
<tr>
<td></td>
<td>Manager will designate 2nd person to standby</td>
<td>(1) One Office person stationed in Control Center with 2nd Person active and other standby available</td>
</tr>
<tr>
<td></td>
<td>Front desk answers all calls w/assistance as needed</td>
<td></td>
</tr>
<tr>
<td>REPORTS:</td>
<td>Road Closures</td>
<td>Road Closures</td>
</tr>
<tr>
<td></td>
<td>File in (3) three ring binder located in Control Center at all times</td>
<td>File in (3) three ring binder located in Control Center at all times</td>
</tr>
<tr>
<td></td>
<td>Service Requests/Complaints</td>
<td>Service Requests/Complaints</td>
</tr>
<tr>
<td></td>
<td>File in (3) three ring binder located in Admin office</td>
<td>File in (3) three ring binder located in Admin office</td>
</tr>
<tr>
<td></td>
<td>Complaints taken by phone will be distributed directly to Superintendent</td>
<td>Complaints taken by phone will be distributed directly to Superintendent</td>
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</table>
# EMERGENCY RESPONSE MODE OF OPERATION
## SNOW / ICE / FLOODING / WIND STORM

<table>
<thead>
<tr>
<th>ISSUES:</th>
<th>LEVEL I (MODERATE)</th>
<th>LEVEL II (SEVERE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(To be determined by Public Works Operations Manager)</td>
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<tr>
<td><strong>PERSONNEL:</strong></td>
<td></td>
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</tr>
<tr>
<td>With Manager's approval, Superintendent will:</td>
<td>With Manager's approval, Superintendent will:</td>
<td></td>
</tr>
<tr>
<td>Request assistance from other departments</td>
<td>Request assistance from other departments</td>
<td></td>
</tr>
<tr>
<td>Authorize Managers/Supervisors to take home fully equipped City vehicles</td>
<td>Authorize Managers/Supervisors to take home fully equipped City vehicles</td>
<td></td>
</tr>
<tr>
<td>Make pagers available for crew members</td>
<td>Make pagers available for crew members</td>
<td></td>
</tr>
<tr>
<td>Assign equipment and supplies to individual units</td>
<td>Assign equipment and supplies to individual units</td>
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<tr>
<td>Standby duty to remain the same</td>
<td>Standby duty to remain the same</td>
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<tr>
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<tr>
<td><strong>EQUIPMENT:</strong></td>
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</tr>
<tr>
<td>With Manager's approval, Superintendent will:</td>
<td>With Manager's approval, Superintendent will:</td>
<td></td>
</tr>
<tr>
<td>Assign equipment and supplies to individual units</td>
<td>Assign equipment and supplies to individual units</td>
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</tr>
<tr>
<td>Authorize personnel to take home fully equipped City vehicle</td>
<td>Authorize personnel to take home fully equipped City vehicle</td>
<td></td>
</tr>
<tr>
<td>Make pagers available for crew members</td>
<td>Make pagers available for crew members</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUPPLIES:</strong></td>
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<td></td>
</tr>
<tr>
<td>Sandbags will be provided for immediate danger only at the discretion of the Superintendent</td>
<td>Sandbags will be provided for immediate danger only at the discretion of the Superintendent</td>
<td></td>
</tr>
</tbody>
</table>
ICE/SNOW/FLOOD/WIND STORM
Street Closure Procedure

Call In:
Control Center
Operations Superintendent

daylight:
Superintendent
dispatch
crew-field
verify

Off-Hour
Control Center
or Supt

dispatch field crews
to verify

Approval by:
day - manager
off-hour - manager/supt

Control Center:
dispatch crew thru superintendent
(day) or direct (off-hour) to
implement road closure

Signed Authorization
slip @ Control

Control Center
Notify
Valley Comm
Schools
Metro
Front Office

Front Office:
Notify: Mayor
Customer Services/Utility Billing
Engineering

Control Center
Notify
Valley Comm
School
Metro

C/map
fw
Operation Emergency Response Mode:

- Normal
- Phase I
- Phase II

Date: 
Time: 

Road Closure Authorization Order

Date: 
Requested by: 

Street Affected: 

Between 

Reason: 

Today's Weather 

Air Temp 

River Stage (if known): 

Est. duration for closure: 

Approval/Action: 

Recommended by: 
(Date) 
(Supervisor) 

Approved by: 
(Date) 
(Manager) 

Closed by: 
(Date) 
(Street Dept) 

Notices posted by: 
(Date) 
(Control Center) 

Road Re-Open Authorization Order

Due to the reduced level of risk, I hereby authorize the re-opening of the roadway to normal traffic.

Date 
(time) 
(Manager's Approval) 

Date 
(time) 
(Re-Opened by) 

Date 
(time) 
(Notice Posted by)
POSITION TITLE: WATER SUPERINTENDENT

Mission: To provide tactical direction to Water Operations and Maintenance Personnel

Responsibilities: See Water Superintendent Checklist

Location: City of Kent, Public Works Operations, 5821 S 240th Street, Kent, Washington

Position Order of Succession:

- Water Superintendent (Primary)
- Control Center Technician (Alt 1)*
- Water Facility Field Supervisor (Alt 2)
- Water Quality Field Supervisor (Alt 3)
- Water Mains/Services Field Supervisor (Alt 4)
- Water Hydrants Field Supervisor (Alt 5)

*Reports to Public Works Operations Manager (or representative) during initial damage assessment.

Takes over as Water Superintendent Alternate 1 only after release by PWO Manager.

Primary Organizational Responsibility Area: Water Utility restoration
## WATER DIVISION

<table>
<thead>
<tr>
<th>Water Treatment</th>
<th>Facilities</th>
<th>Control Center</th>
<th>Hyds/Meters/Locates</th>
<th>Mains/Services/Valves</th>
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<tbody>
<tr>
<td>Lid Cihak</td>
<td>William Hall</td>
<td>George Jett</td>
<td>Brad Dupleich</td>
<td>Phil McConnell</td>
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<tr>
<td>Field Supervisor</td>
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<td>Control Center Technician</td>
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<tr>
<td>Phone #1-253-863-7208</td>
<td>Phone #253-852-1019</td>
<td>Phone #253-630-0530</td>
<td>Phone #253-854-0714</td>
<td>Phone #1-253-537-2423</td>
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<td>Pager #621-8095</td>
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<tr>
<td>Utility Specialist II</td>
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/used 06/06/97

23
WATER SUPERINTENDENT CHECKLIST

Mission: To provide tactical operations and direction to Water Operations and Maintenance personnel.

- Upon first alert, call out Water section staff, as appropriate, and provide them with preliminary briefing.
- Report to Public Works Control Center
- Obtain situation briefing from Public Works Manager
- READ ENTIRE CHECKLIST/REPEAT ITEMS AS NECESSARY
- Begin a timed activity log and maintain for the duration of the emergency
- ASSESS STATUS OF WATER DIVISION RESOURCES
  - Account for section personnel (roll call)
  - Report serious staff injuries to Public Works Operations Manager immediately
  - Assess damages to Division facilities at Public Works Operations
  - Assess damages to vehicles, equipment, and supplies, (including fuel)
  - Assess damages to Control Center (computers, etc.)
  - Check Division communications equipment (telephone/radios/telemetry/pagers)
- Report status of Water Division resources to Public Works Operations Manager
- ASSIGN PERSONNEL AND ASSESS DAMAGE (refer to facility maps of water system)
  - Call out additional staff as appropriate (see callout procedures)
  - With approval of Public Works Manager, release personnel as necessary to check on their family's safety
- Field staff will initially be considered multi-purpose and will be assigned by the Public Works Operations Manager or Public Works Director at EOC to areas to perform initial damage assessment of division-wide facilities. After water division personnel are released by the Public Works Operations Manager to the Water Superintendent, make new assignments to staff as appropriate.
- Establish and maintain tactical liaison with affiliated utilities
  - Other water purveyors (see Utility Interlocal Agreement Manual - Water Superintendents office or Control Center
  - Others

24
DEVELOP RESPONSE PLAN

- Exchange all available status information with Public Works Manager
  - Update Division resources status (see list above)
  - Status of key Water facilities
  - Status of affiliated utilities
  - Other utility disruption (electrical/gas/phone) affecting key Water facilities
  - Systems and structures not directly damaged but at risk

- In concert with Public Works Manager, prioritize items for emergency/temporary repair or response

- Determine immediate and anticipated needs for:
  - Personnel (provide for relief and rotation)
  - Equipment
  - Supplies
  - Outside services

- Communicate needs not met with available resources to Public Works Manager

- Leave Public Works Operations only if approved by Public Works Manager (if leaving, establish "no later than" time for next communication with Public Works Manager)

- Maintain a timed entry log of all key activities
CONTROL CENTER TECHNICIAN

Mission: 1. To assess and monitor the condition of the Water, Sewer and Storm Systems via Telemetry.
          2. Provide communication support for Public Works Operations Field crews and coordinate responsibilities  
             (see Control Center Technician checklist)

Responsibilities: See Control Center Technician Checklist

Duty Location: City of Kent, Public Works Operations Control Center, 5821 South 240th, Kent, Washington 98032.

Position Order of Succession:
   Control Center Technician - Primary
   Water Quality Field Supervisor - (Alt 1)
   Water Treatment Plant Operator - (Alt 2)

Reports to: Public Works Operations Manager

Primary organization responsible area - provide telemetry information on utilities and communication/coordination support for field crews.
CONTROL CENTER TECHNICIAN CHECKLIST

Mission: To provide telemetry information on utilities and communication/coordination support for field crews.

- Upon First Alert, respond to the Control Center
- Begin timed entry log of all activities
- Assess damage to Telemetry System
- Assess damage to Control Center Generator
- Assess damage to radio, telephone systems
- Report status to Public Works Operations Manager
- Determine Telemetry status of Water/Sewer/Storm Systems in the prioritized sequence.
  - Use attached checklist #1
  - Provide copy/copies to Water Superintendent and Utility Superintendent
  - Identify problem areas with incoming data from Telemetry and crew reports. Pass information on to Public Works Operations Manager.

NOTE: This information will be passed to the Public Works Operations Manager and the Control Center will be under his control until after the initial damage assessment. Then it will come under the Water Superintendent's control at the direction of the Public Works Operations Manager.

- Mark prioritized damaged locations on wall maps for Water, Sewer, Storm, Street, including bridges, with colored pins.

  Red - High Priority - Immediate
  Yellow - Medium Priority - 24 hours or less for response
  Blue - Low Priority - more than 24 hours for response
  Green - No damage found
<table>
<thead>
<tr>
<th>Reservoirs &amp; Tanks</th>
<th>Pump Stations</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>[] 6M #1 Reservoir</td>
<td>[] Pump Station #5</td>
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<tr>
<td>[] Guiberson Reservoir</td>
<td>[] Pump Station #4</td>
<td>[] East Hill Well</td>
</tr>
<tr>
<td>[] Blue Boy Tank</td>
<td></td>
<td>[] 212th Plant/208th Well</td>
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<tr>
<td>[] 3.5 MG Tank</td>
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<td>[] Armstrong Springs Well</td>
</tr>
<tr>
<td>[] 125,000 Tank</td>
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<td>[] Reith Road Tank</td>
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<td>[] Seven Oaks</td>
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<td>[] Horseshoe Acres</td>
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<tr>
<td>[] Victoria Ridge</td>
</tr>
<tr>
<td>[] Air Injector Station</td>
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WATER DISTRIBUTION FIELD SUPERVISOR

Valley Floor and West Hill

Mission: 1. To maintain water systems capable of providing adequate fire protection
          2. To restore the Water Distribution system to full operation as quickly as possible

Responsibilities: See Water Distribution Field Supervisor Checklist

Position Order of Succession:

   Water Distribution Field Supervisor, Hydrants and Meters (Primary)
   Water Distribution Field Supervisor, Mains and Services (Alt 1)
   Water Distribution Maintenance Worker III, Hydrants (Alt 2)

Reports to: Water Superintendent

Primary Organizational Responsibility Area: To assess the damage to the City of Kent’s Water Distribution system in the entire area west of (and including) Central Avenue which includes most of Kent’s Valley floor as well as the Kent West Hill. Responsibility for maintaining fire protection and water service wherever possible while restoring damaged systems to full use.
WATER DISTRIBUTION FIELD SUPERVISORS CHECKLIST

Valley Floor and West Hill

Mission: 1. To restore Water Mains and Services to full operation.
2. To maintain the integrity of the Water Transmission and Distribution Systems.

☐ Report to Public Works Control Room (or Water Operations Room)
☐ Obtain situation briefing from Public Works Manager or Water Superintendent.
☐ Begin and maintain a timed entry log of activities
☐ Read Checklist
☐ Assess status of Resources
   ☐ account for personnel checklist
   ☐ Assess condition of vehicles and equipment
☐ Report status to Water Superintendent
☐ Assign crews to prioritized areas by checklist
   ☐ Route #2 - Central/212th/West Valley Highway checklist
   ☐ Route #4 - Meeker/Reith/Military Road/West Hill
   ☐ Route #5 -
   ☐ Route #6 -
☐ Isolate areas as necessary to prevent extreme damage. Inform the Control Center for coordination with the Fire Department.
☐ Provide assessment reports and updates to the Water Superintendent along with priority level for response.

Suggestions: Spare valve keys at Shop and keys for locking valves (2 types); bright colored ID or tags for valves closed in emergency. Visible on drive-by 24" x 1" nylon strip fluorescent orange/reflective.

☐ Assign personnel to begin priority repairs.
☐ Develop Water Distribution Response Plan.
WATER DISTRIBUTION FIELD SUPERVISOR

East Hill and Transmission Mains

Mission: 1. To maintain water systems capable of providing adequate fire protection
        2. To restore the Water Distribution system to full operation as quickly as possible

Responsibilities: See Water Distribution Field Supervisor Checklist

Position Order of Succession:
- Water Distribution Field Supervisor, Mains and Services (Primary)
- Water Distribution Field Supervisor, Hydrants and Meters (Alt 1)
- Senior Water Distribution Maintenance Worker III, Mains (Alt 2)

Reports to: Water Superintendent

Primary Organizational Responsibility Area: To assess the damage to the City of Kent's Water distribution system in the entire area East of Central Avenue which includes all of the East Hill area and the three (3) large Transmission mains supplying the three (3) major reservoirs. Responsibility for maintaining fire protection and water service wherever possible while restoring damaged systems to full use.
WATER DISTRIBUTION FIELD SUPERVISORS CHECKLIST

East Hill and Transmission Mains

Mission: 1. To restore Water Mains and Services to full operation.
2. To maintain the integrity of the Water Transmission and Distribution Systems.

☐ Report to Public Works Control Room (or Water Operations Room)
☐ Obtain situation briefing from Public Works Manager or Water Superintendent.
☐ Begin and maintain a timed entry log of activities
☐ Read Checklist
☐ Assess status of Resources
   ☐ account for personnel checklist
   ☐ Assess condition of vehicles and equipment
☐ Report status to Water Superintendent
☐ Assign crews to prioritized areas by checklist
   ☐ Route #1 - James Street/93rd/Benson checklist
   ☐ Route #3 - Meeker/Guiberson/Woodland Way checklist
   ☐ Route #5 -
   ☐ Route #6 -
☐ Isolate areas as necessary to prevent extreme damage. Inform the Control Center for coordination with the Fire Department.
☐ Provide assessment reports and updates to the Water Superintendent along with priority level for response.

Suggestions: Spare valve keys at Shop and keys for locking valves (2 types); bright colored ID or tags for valves closed in emergency. Visible on drive-by 24" x 1" nylon strip fluorescent orange/reflective.

☐ Assign personnel to begin priority repairs.
☐ Develop Water Distribution Response Plan.
WATER FACILITIES FIELD SUPERVISOR

Mission: To maintain or restore the full use of all Water Facilities beginning with:
1) Water Reservoirs and Tanks
2) Water Pump Stations
3) Water Sources

Responsibilities: See Water Facilities Field Supervisor Checklist

Location: City of Kent, Public Works Operations, 5821 South 240th Street, Kent, Washington

Position Order of Succession:

Water Facilities Field Supervisor (Primary)
Water Quality Field Supervisor (Alt 1)
Senior Water Facilities Maintenance Worker III (Alt 2)

Reports To: Water Superintendent or Representative

Primary Organizational Responsibility Area(s): To determine the integrity of each Water Facility, assess the degree of damage, if any, then prioritize and coordinate the response necessary to return to full operational status.
WATER FACILITIES FIELD SUPERVISOR CHECKLIST

Mission: 1. To provide damage assessment and operation/direction to the Facilities field crews.
2. To provide tactical operations and direction to Water Operations and Maintenance personnel.

[] Upon first alert, call out Water Facilities staff, as appropriate, and provide them with preliminary briefing
[] Report to Public Works Control Center or Water Operations office
[] Obtain situation briefing from Water Superintendent
[] READ ENTIRE CHECKLIST/REPEAT ITEMS AS NECESSARY
[] Begin a timed activity log and maintain for the duration of the emergency

[] ASSESS STATUS OF WATER DIVISION RESOURCES
[] Account for section personnel (roll call)
[] Report serious staff injuries to Water Superintendent immediately
[] Assess damages to Water Division facilities at Public Works Operations
[] Assess damages to vehicles, equipment, and supplies, (including fuel)

[] Report status of Water Facilities resources to Water Superintendent
[] ASSIGN PERSONNEL AND ASSESS DAMAGE (refer to facility maps of water system).
[] Call out additional staff as appropriate (see call out procedures)
[] With approval of Public Works Manager, release personnel as necessary to check on their family’s safety
[] Field staff will initially be considered multi-purpose and will be assigned by the Public Works Operations Manager or Public Works Director at EOC to areas to perform initial damage assessment of division-wide facilities. After water division personnel are released by the Public Works Operations Manager to the Water Superintendent, make new assignments to staff as appropriate.

* Upon first alert, respond to Public Works Operations office
* Begin a timed activity log and maintain it throughout the emergency
* Assign crews to physically check all primary Water Facility sites for structural damage and equipment function
WATER FACILITIES FIELD SUPERVISOR CHECKLIST

(continued)

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<tr>
<td>Cambridge Tank</td>
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Priority Order

1) Inspect all reservoirs for structural damage, as well as related valves and piping
2) Inspect all buildings for structural damage as well as related valves and piping
3) Inspect and test run all pumps/motors and essential equipment
4) Inspect and test all generators and engines with their fuel tanks and supply lines
5) Inspect all sump pumps and drainage systems

- Monitor assessments and relay information to the Water Superintendent along with priority level for response
- Assign personnel to begin priority repairs or emergency action to prevent further damage
- Develop a Water Facilities Response Plan

DEVELOP RESPONSE PLAN

- Exchange all available status information with Water Superintendent
- Update Division resources status (see list above)
- Status of Water key facilities
- Status of affiliated utilities
- Other utility disruption (electrical/gas/phone) affecting key Water facilities.
- Systems and structures not directly damaged but at risk
In concert with Water Superintendent, prioritize items for emergency/temporary repair or response

Determine immediate and anticipated needs for:

- Personnel (Provide for relief and rotation)
- Equipment
- Supplies
- Outside Services

Communicate needs not met with available resources to Water Superintendent

Leave Public Works Operations only if approved by Water Superintendent (if leaving, establish "no later than" time for next communication with Water Superintendent)

Maintain a timed entry log of all key activities
WATER QUALITY FIELD SUPERVISOR

Mission: To assess damage to all chemical feed systems as well as any impacts upon water quality/potability (existing or anticipated)

Responsibilities: See Water Quality Field Supervisor Checklist

Position Order of Succession:
- Water Quality Field Supervisor (Primary)
- Treatment Plant Operator (Alt 1)
- Water Facilities Field Supervisor (Alt 2)

Reports to: Water Superintendent or Representative

Primary Organizational Responsibility Area: Check and report on all chemical feed systems as well as potability of the water system. Responsible for emergency water supplies for emergency personnel immediately, as well as citizens (as available).
WATER QUALITY FIELD SUPERVISOR CHECKLIST

Mission: To provide tactical operations and direction to Water Operations and Maintenance

- Upon First Alert, respond to Water Quality staff, as appropriate, and provide them with preliminary briefing.
- Report to Public Works Control Center or Operations office
- Obtain situation briefing from Water Superintendent
- READ ENTIRE CHECKLIST/REPEAT ITEMS AS NECESSARY
- Begin a timed activity log and maintain it for the duration of the emergency
- ASSESS STATUS OF WATER DIVISION RESOURCES
  - Account for section personnel (roll call)
  - Report serious staff injuries to Water Superintendent immediately
  - Assess damages to Water Division facilities at Public Works Operations (lab, office, etc.)
  - Assess damages to vehicles, equipment, and supplies, (including fuel)
- Report status of Water Quality resources to Water Superintendent
- ASSIGN PERSONNEL AND ASSESS DAMAGE (refer to facility maps of water system)
  - Call out additional staff as appropriate (see callout procedures)
  - With approval of Public Works Manager, release personnel as necessary to check on their family's safety
- Field staff will initially be considered multi-purpose and will be assigned by the Public Works Operations Manager or Public Works Director at EOC to areas to perform initial damage assessment of division-wide facilities. After Water Division personnel are released by the Public Works Operations Manager to the Water Superintendent, make new assignments to staff as appropriate.
  (see Utility Interlocal Agreement Manual - Water Superintendents Office or Control Center)
DEVELOP RESPONSE PLAN

- Exchange all available status information with Water Superintendent
  - Update Division resources status (see list above)
  - Status of Water key facilities for Treatment and Water Quality
  - Status of affiliated utilities
  - Other utility disruption (electrical/gas/phone) affecting key Water Facilities
  - Systems and structures not directly damaged but at risk

- In concert with Water Superintendent, prioritize items for emergency/temporary repair or response

- Determine immediate and anticipated needs for:
  - Personnel (Provide for relief and rotation)
  - Equipment
  - Supplies
  - Outside Services

- Communicate needs not met with available resources to Water Superintendent

- Leave Public Works Operations only if approved by Water Superintendent. (If leaving, establish "no later than" time for next communication with Water Superintendent)

- Maintain a timed entry log of all key activities

- Physically check all chemical feed systems
  1) Chlorine systems at sources
  2) Treatment Plant at sources
  3) Fluoride systems

- Check and test run all chlorinators, saturators, and associated equipment.

- Assess damage to Treatment Plant

- Identify and report chemical systems that are operational and those not operational

- Report status to the Water Superintendent
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<td>E350 Service Van</td>
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<td>140</td>
<td>1400B Backhoe</td>
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<tr>
<td>227</td>
<td>D150 Pickup</td>
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<td>231</td>
<td>Ram Pickup</td>
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<td>Cargo Van</td>
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<td>234</td>
<td>E150 Wind Van</td>
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<td>Flatbed Trailer</td>
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<td>874</td>
<td>Utility Trailer</td>
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</table>
WATER DIVISION

Equipment in Vehicle #_____
[] First Aid Kit (ten-package)
[] Fire Extinguisher
[] Radio with Outside Speaker plus hand held radio
[] Overhead Light Bar

[] Two (2) pair of Rubber Gloves in serviceable condition
[] One pair of Safety Rubber Knee Boots for each person in vehicle
[] One pair of Safety Rubber Hip Boots for each person in vehicle
[] One set of Rain gear for each person in vehicle

[] One pair of Coveralls for each person in vehicle
[] One Hardhat for each person in vehicle
[] One Safety Vest for each person in vehicle
[] Each person in vehicle will wear a City issued uniform i.e., shirt, pants, coat, safety boots
[] Two (2) Flashlights, waterproof, 12 volt and a light w/cigarette lighter adaptor
[] Floodlights with stand
[] Tape measure, 16 feet and 100 feet
[] Two (2) Round Point Shovels, two (2) Square Point Shovels
[] Manhole Hook, CB Hook
[] Gas Monitor Detector
[] Blower
[] Two (2) pair Safety Goggles
[] One (1) diaphragm (or centrifugal pump - Facilities) with suction hose and discharge hose
[] Two (2) lb. Brass Sledge Hammer
[] Probe Bar/pry bar
[] Applicable Repair Parts
[] Miscellaneous Hand Tools, Claw Hammer, Screwdrivers, Pliers
[] Shop Towels

[] Hydrant diffuser
[] Two (2) Negative Pressure Respirators
[] Extension Cord(s)
[] Valve Keys (one (1) 5 foot and one (1) 8 foot)
[] Hex Wrench for removing Bolt-down Lids and Valve Box Lids
[] Tire chains
[] Maps of Water Facilities and Water System
[] Tow chains w/hooks
[] Polaroid Camera w/spare film (two (2) packs)
CITY OF KENT WATER DEPARTMENT
Anticipated Emergency Needs
January 23, 1996

Equipment

Backhoe(s) - Trackhoes
Dump Truck(s) - 5 yard & 10 yard

Excavation Shoring
Roadway plating (to cover excavations)
Dewatering pumps - centrifugal and diaphragm (2" to 6") with suction and discharge hoses
Generator(s) 2500 watt to 250 KW (portable)
Emergency lights & power cords
Chlorine injection pumps - liquid (for field use)
*Articulating crane for under-bridge repairs to water mains
Air compressors/jackhammers
Service vehicles w/tools for water system repairs

Personnel

Trained water personnel
Administrative staff

Materials

Ductile Iron Pipe
1) Bell & spigot w/gaskets - 4" to 36" (with associated MJ tees/crosses)
2) Restrained joint w/bolts and gaskets - 4" to 36" (with associated MJ tees/crosses)
3) Flanged w/bolts and gaskets - 4" to 36" with associated tees/crosses
Long Pattern Ductile Iron Sleeves - 4" to 36" - (Mechanical joint and restrained joint w/followers)
Romac type couplings - 4" to 36" transition from ductile iron to asbestos, cast iron, and concrete-cylinder pipe
Full circle repair bands Stainless steel size - 4" to 36" diameter
Flanged valves - resilient wedge gate valve, 4 to 16" Butterfly valves, 4 to 36"
Fl x MJ Adapters 4 to 36"
Saddles - double strap - 4 to 16" with 2" NPT tap
Water service repair parts - 1 to 2" poly and copper
Cement mix and temporary blocking materials
Crushed rock - 5/8 minus
Cold mix asphalt
Food and personal supplies for emergency crews
Potable water and tankers for emergency drinking water throughout the water system
Chlorine - sodium hypochlorite 10-15%, liquid
Calcium hypochlorite, granular
150 lbs & 1 Ton gas/liquid chlorine cylinders
Sodium Thiosulfate (or other dechlorination material)
Schedule 80 PVC pipe & fittings (1/2" to 2").

BL/map

WTR301
<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit Cost</th>
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<td>HOSE ADAPTERS</td>
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<td>18.00</td>
<td>126.00</td>
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<tr>
<td>ER PLATES 9&quot;</td>
<td>999</td>
<td>0.10</td>
<td>99.90</td>
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<td>DRINK CUPS 60Z</td>
<td>850</td>
<td>0.08</td>
<td>68.00</td>
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<tr>
<td>ER BOWLS (LARGE 16OZ)</td>
<td>36</td>
<td>1.00</td>
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<tr>
<td>[12 COUNT 16 OZ]</td>
<td>24</td>
<td>2.00</td>
<td>48.00</td>
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<td>CARE HAND DEGERMER</td>
<td>7</td>
<td>5.00</td>
<td>35.00</td>
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<tr>
<td>[55 PACKS IN INSTANT]</td>
<td>55</td>
<td>2.00</td>
<td>110.00</td>
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<tr>
<td>IVORY BARS-HAND SOAP</td>
<td>400</td>
<td>0.35</td>
<td>140.00</td>
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<td>IPOO (2 OZ BOTTLES)</td>
<td>104</td>
<td>3.00</td>
<td>312.00</td>
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<td>HOL GEL ISOPROPYL 4 OZ</td>
<td>72</td>
<td>2.50</td>
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</table>

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Subtotal</th>
<th>Vendor Address</th>
</tr>
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<tbody>
<tr>
<td>KING POTS (MISC SIZE)</td>
<td>15</td>
<td>20.00</td>
<td>300.00</td>
<td>SPORTCO - FIFE, WA. 4602 40TH ST E TACOMA, WA 206-922-2222</td>
</tr>
<tr>
<td>MATTRESS</td>
<td>70</td>
<td>15.00</td>
<td>1,050.00</td>
<td>SPORTCO - FIFE, WA. 4602 40TH AVE E, TACOMA, WA 206-922-2222</td>
</tr>
<tr>
<td>STICK FORKS/KNIVES/SPoons</td>
<td>200</td>
<td>0.15</td>
<td>30.00</td>
<td>SPORTCO - FIFE, WA. 4602 40TH ST E TACOMA, WA 206-922-2222</td>
</tr>
<tr>
<td>DET WIPES KITS</td>
<td>20</td>
<td>3.00</td>
<td>60.00</td>
<td>SPORTCO - FIFE, WA. 4602 40TH ST E TACOMA, WA 206-922-2222</td>
</tr>
<tr>
<td>VES (MISC. COOKING)</td>
<td>10</td>
<td>3.00</td>
<td>30.00</td>
<td>SPORTCO - FIFE, WA. 4602 40TH ST E TACOMA, WA 206-922-2222</td>
</tr>
<tr>
<td>PADS</td>
<td>150</td>
<td>0.17</td>
<td>25.50</td>
<td>MURTOUGH SUPPLY - FIFE, WA. 2001 48TH AVE E SUITE A FIFE, WA 98424 206-922-5544</td>
</tr>
</tbody>
</table>

**EST. COST** 4,400.40
**TAX** 360.83
**TOTAL** 4,761.23
**1ST YEAR** 2,380.62
**2ND YEAR** 2,380.62
Our One Day Food System provides the essentials for short-term emergency situations. This system offers satisfying and familiar foods with nutritional quality. All products are packed in a #10 can with an oxygen absorber added and nitrogen flushed to ensure long shelf life. Items are prepared by "Just-Adding-Water," or are "Ready To Eat." Select the entree on the left and add it to the rest of the system to build a complete one day food system. Approximate calories: 2,100 per day.

**SELECT YOUR OWN ENTREE**

- MENU #1 Beef Stew w/Noodles
  - # 93201
- MENU #2 Turkey w/Rice
  - # 93202
- MENU #3 Spaghetti w/Tomato and Cheese Sauce
  - # 93203
- MENU #4 Chili Entree
  - # 93204

And add it to the following for a ONE DAY FOOD SYSTEM:

- 1 Granola w/Dates and Milk
- 2 Peanut Butter Pouches
- 3 Pilot Bread Crackers
- 2 Honey Packets
- 1 Emergen-C (vitamin/mineral drink)
- 1 Herb Tea
- 1 Sugarless Hard Candy

**THREE DAY FOOD SYSTEM**

Three days w/water:

- 1 Menu #1
- 1 Menu #2
- 1 Menu #3
- 5 Aqua Blox® Literz® 33.8 oz ea

CODE NUMBER 93205

With a cookset: CODE NUMBER 93206

**SEVEN DAY FOOD SYSTEM**

Seven days w/water:

- 2 Menu #1
- 1 Menu #2
- 2 Menu #3
- 2 Menu #4
- 11 Aqua Blox® Literz® 33.8 oz ea

CODE NUMBER 93207

With a cookset: CODE NUMBER 93208

**COOKSET DESCRIPTION:**

Cookset includes: one 2 quart pot with lid and handle, stove, fuel (three-seven days), waterproof matches (50), one rigid plastic cup with handle and measurement levels, four spoons, and water purification tablets (50).
3 DAY FOOD PACK™

ineAire's "3 Day Food Pack™" offers nine great meals anytime/anywhere just add water and prepare each meal directly in the #2½ can (with pull-top lid). This product can be used for outdoor adventure, emergency situations, or convenience in the kitchen. Up to ten years shelf stability available with proper storage.*

**Breakfasts**
- Blueberry Honey Granola & Milk
- 5-Grain Fruit-Nut Instant Cereal
- Apple Honey Granola & Milk

**Lunches**
- Alpine Minestrone Soup
- Garden Vegetable Rice Pilaf
- Multi bean Soup

**Dinners**
- Mountain Chili
- Spaghetti Marinara w/Mushrooms
- Country Black Beans and Rice

*Proper storage requires conditions that are cool. Extended periods of exposure to heat will decrease shelf-life.

**SPECIFIC USES FOR THE 3 DAY FOOD PACK**

<table>
<thead>
<tr>
<th>Outdoor Adventure</th>
<th>In the Kitchen</th>
<th>Emergency Situations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family camping</td>
<td>Cabins (storage for just-in-case)</td>
<td>Corporate contingency planning</td>
</tr>
<tr>
<td>Fishing / hunting</td>
<td>RVs</td>
<td>Family contingency planning</td>
</tr>
<tr>
<td>Expeditions</td>
<td>Homes</td>
<td>(hurricanes/earthquakes/snowed in)</td>
</tr>
<tr>
<td>Marine (boating/cruising)</td>
<td>Colleges</td>
<td>Travel (just-in-case)</td>
</tr>
</tbody>
</table>

**WATER**

Aqua Blox® Purified Drinking Water

Coast Guard Certified for five year storage life. This product is purified water packaged in aseptic (drink box) containers. "Purified" water means that the water contains less than ten parts per million of total dissolved solids, i.e., minerals.

**Individual Servings**

<table>
<thead>
<tr>
<th>Count Per Case</th>
<th>Net Weight</th>
<th>Shelf Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>8.45 Fluid oz ea</td>
<td>5 years</td>
</tr>
<tr>
<td></td>
<td>1.78 Gallons per case</td>
<td></td>
</tr>
</tbody>
</table>

**CODE NUMBER**: 95284

**Count Per Case**

<table>
<thead>
<tr>
<th>Count Per Case</th>
<th>Net Weight</th>
<th>Shelf Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>1 Liter (33.8 Fluid oz.) ea</td>
<td>5 years</td>
</tr>
<tr>
<td></td>
<td>3.17 Gallons per case</td>
<td></td>
</tr>
</tbody>
</table>

**CODE NUMBER**: 95285
## WATER DEPARTMENT
### EMERGENCY PHONE NUMBERS/CONTRACTORS

**Electrical**
- Lucas Industrial Electric
  - P O 1378
  - Auburn, WA 98071
  - Contact Person: Eric Johnson
  - Home Phone: 1-360-829-2709
  - Office (253)833-5884

- Puget Sound Energy
  - Main Phone: 1-800-321-4123
  - After-Hours: 1-800-772-5509

**Controls/Telemetry**
- Systems Interface
  - 22125 17th Avenue SE, Suite #111
  - Bothell, WA 98021
  - Contact Person: Thor Bussinger
  - Office: (425)481-1225
  - Home Phone: (425)481-4462
  - Pager: (206)587-9647
  - Contact Person: Larry Johnson
  - Fax: (425)481-2115

- Vintumar, Inc
  - P O Box 1419
  - Issaquah, WA 98027-1419
  - Contact Person: Tim Ooyman
  - Office: (206)718-2700
  - Fax: (206)718-2700 (same as phone)

- Trnka Engineers Co
  - P O Box 3845
  - Bellevue, WA 98009
  - Contact Person: Dan Thwing
  - Office: (425)746-4478
  - Fax: (425)746-4183
  - Home Phone: (206)542-5017
  - Pager: (206)626-8183

- Casne Engineering
  - 355 118th Avenue SE
  - Bellevue, WA 98005-3554
  - Contact Person: Robert Casne
  - Office: (425)454-3555
  - Fax: (425)454-8922

- Ratelco (Field Telemetry)
  - 23454 30th Avenue
  - Kent, WA 98032
  - Contact Person: Larkina Som, Sales Rep
  - Contact Person: Scott Johnson, Sales Mgr
  - Office: (206)878-3750
  - Fax: (206)878-1926

- Seattle Office
  - 439 Dexter Avenue N
  - Seattle, WA 98109
  - Office: (206)624-6332
  - Fax: (206)682-0211
  - Contact Person: Dale Cochran
  - Cellular: (206)919-3561

- (Control Telemetry (CGCII)
  - Scada Pro (Phoenix)
  - Contact Person: Stan Wendle
  - Office: (602)968-7776
  - Fax: (602)966-8627

- Cascade Controls (Siemens PLC's)
  - 540 S Front Street
  - Seattle, WA 98108
  - Contact Person: John Fleming, President
  - Contact Person: Pat Denny, Tech Designer
  - Office: 1-800-228-0350 and (206)767-7300
  - Fax: (206)767-1680

**Pumps/Motors**
- Pump Tech (Wells also)
  - 13251 Northup Way
  - Bellevue, WA 98005
  - Office: (425)644-8501
  - Fax: (425)562-9213
  - Contact Person: Wayne Olson
  - Cellular Phone: (206)972-0987
  - Contact Person: Doug Davidson
  - Cellular Phone: (206)390-5672
  - Contact Persons: Tom Long, Tom Izyk
Beckwith and Keuffel  
5930 1st Avenue S  
Seattle, WA 98108  
Office (206)767-6701  
Fax (206)243-9615  
Contact Person Chuck Parsh  
Home Office (206)243-0335

Omega Contractors  
P O Box 430  
Duvall, WA 98019  
Contact Person Gordon Wagster  
Office (425)881-1697  
After Hours (425)788-2836  
Pager (206)996-4788

Northwest Industrial Repair  
21850 88th Place S  
Kent, WA 98031  
Contact Person Pat Henderson  
Office (253)872-2000  
Fax (253)872-7033

Aquaflo (Wells and Goulds Pumps)  
Aardvark Corp  
Machining Division  
1413 M endian East  
Edgewood, WA 98371  
Contact Person Mike Craig  
Office (253)952-6505  
Home (253)922-8316  
Fax (253)927-3478

Valves/Fittings/Pipe  
(Auma Actuators) J Bozeat and Associates  
17320 44th Avenue SW  
Seattle, WA 98136  
Office (206)937-5719  
Fax (206)937-6793

Designed Automation  
(Auma Actuators) (Basic Controls)  
14945 SW 72nd Avenue  
Portland, Oregon 97224  
Contact Person Frank Eiring  
Office (503)620-6060  
Fax (503)639-9468

H D Fowler  
1417 Thornton Avenue SW  
Pacific, WA 98047  
Office Bellevue (206)623-5030  
Sumner (253)863-8600  
Contact Person Joe Morrow  
Home Phone (425)488-0111  
Mobile Phone (206)954-5462  
Pager (206)699-2571  
Contact Person Steve Bricker  
Home Phone (253)863-8312  
Pager (206)997-2362

Pacific Waterworks  
602 Valley Ave NE  
Puyallup, WA 98372  
Contact Person Marv Weese  
Office 1-800-422-2038  
Fax (253)840-1141  
Home Phone (253)863-0941  
Contact Person Joe Kissel  
Home Phone (253)946-2311

Watermain Welding  
Commercial Welding  
711 S Myrtle  
Seattle, WA 98108  
Contact Person Kenny  
Office (206)767-4211  
Home Phone (253)631-2585  
Contact Person Randy  
Home Phone (253)630-3383  
Fax (206)767-7594

Fuel/Propane Supply  
Don Small & Sons Oil Co  
Office (253)854-0132  
Fax Contact Person Steve Small  
Home Phone (253)833-5656  
Contact Person Dan Small  
Home Phone (253)862-1619

Suburban Propane  
12642 Interurban Ave S  
Seattle, WA 98168  
Office (206)244-1530  
Fax (206)244-9681  
After hours, call office for standby pager  
number of person on call
Laboratory
Water Management Lab
1515 80th Street E
Tacoma, WA 98404
Contact Person Chris Mueller (owner)
Microbiologist Mike Knight
Microbiologist Diane Dumond
Office (253)531-3121
Fax (253)531-5287
Emergency (253)841-0732
Cellular (253)312-1650 and (253)312-1650

Lauks Testing Lab
940 S Harney Street
Seattle, 98108
Contact Person Diana Spence
Office (206)767-5060
Fax (206)767-5063

Chemical Feed Systems
TMG Services (1 mile north of 4 corners)
24919 Maple Valley Hwy SE - PO Box 1189
Maple Valley, WA 98038
Contact Person Brian Yarnell
Contact Person Tom Gazdik
Office 1-800-562-2310
Fax (425)432-5012

Whitney Equipment
14636 NE 95th Street
Redmond, WA 98052
Contact Person Kelly Reese
Office (206)556-1750
Fax (425)556-1746

T C Products (Hypochlorite only)
2001 Thorne Road
Tacoma, WA 98421
Office (253)272-9376
Fax (253)572-4145

Jones Chemical
Pacific Avenue
Suite #1101
Tacoma, WA 98402
Office (253)838-0644
Office 1-800-562-7920 (24 hr ans)
Fax (253)274-0733

Other Utilities
City of Auburn (253)931-3066
WD #111 (253)631-3770
Covington (253)631-0565
Cedar River (425)255-6370
City of Renton (425)235-2646
Highline Water (206)824-0375
Lakehaven Utility Dist (253)941-1516
City of Tukwila (206)433-1860
Soos Creek (253)630-9900
ENVIRONMENTAL CHECKLIST APPLICATION FORM

TO BE COMPLETED BY STAFF:

APPLICATION #: __________________ KIVA #: __________________

RECEIVED BY: __________ DATE: __________ PROCESSING FEE: __________

A. STAFF REVIEW DETERMINED THAT PROJECT:

[ ] Meets the categorically exempt criteria.
[ ] Has no probable significant adverse environmental impact(s) and application should be processed without further consideration of environmental effects
[ ] Has probable, significant impact(s) that can be mitigated through conditions. EIS not necessary.
[ ] Has probable, significant adverse environmental impact(s). An Environmental Impact Statement will be prepared.
[ ] An Environmental Impact Statement for this project has already been prepared.

Signature of Responsible Official: __________________ Date: ________

B. COMMENTS: __________________________________________________________

[ ]

C. TYPE OF PERMIT OR ACTION REQUESTED: _____________________________

[ ]

D. ZONING DISTRICT: ____________________________
TO BE COMPLETED BY APPLICANT:

A. BACKGROUND INFORMATION:

1. Name of Project  City of Kent Water System Plan - 2002

2. Name of Applicant  City of Kent Water Department

   Mailing Address  220 4th Avenue South

   Kent, WA 98032

   Contact Person  Don Wickstrom  Telephone 253-856-5500

   (Note that all correspondence will be mailed to the applicant listed above)

3. Applicant is (owner, agent, other)  Public Works Director

4. Name of Legal Owner  City of Kent  Telephone 253-856-5500

   Mailing Address  Same as above

5. Location  Give general location of proposed project (street address, nearest intersection of streets and section, township and range)

   The Kent Water System service area is located within the incorporated City of Kent, plus some additional unincorporated areas within the jurisdiction of King County. The boundaries were established under the adopted Critical Water Supply Plan for South King County and cover approximately 27 square miles, approximately 23.5 of which are within the incorporated City of Kent. By Ordinance No 1315 on October 23, 1973, King County granted the City of Kent franchise rights for water main installation, maintenance, and operation in the area. Since October 1973, there have been no changes regarding the boundaries of the service area, and no changes are planned during the present planning period.

6. Legal description and tax identification number
   a. Legal description (if lengthy, attach as separate sheet)

      The Kent Water System service area is comprised of all or some portions of Sections 35 and 36 of Township 23 North, Range 4 East, Section 31 of Township 23 North, Range 5 East, Sections 6, 7, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32, and 33 of Township 22 North, Range 5 East, Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 35, and 36 of Township 22 North, Range 4 East. Figure 1-3 within the Water System Plan (herein after WSP) is a map that reflects the service area boundaries.

   b. Tax identification number

      91-6001254
7 Existing conditions. Give a general description of the property and existing improvements, size, topography, vegetation, soil, drainage, natural features, etc. (if necessary, attach a separate sheet)

The Kent Water System service area covers approximately 27 square miles, of which, approximately 23.5 square miles are within the City of Kent. Residential, commercial, and industrial uses of land are interspersed in the service area.

The principle topographic features are the Green River Valley and the upland plateaus rising from both sides of the valley. The valley itself extends from the adjoining City of Auburn on the South through Kent to the cities of Tukwila and Renton to the North. It is about 2.5 miles wide with an elevation ranging from 30 to 40 feet above sea level on the valley floor. The West hill rises abruptly to about 400 feet, while the East Hill rises to a similar elevation with a more gentle slope. The topography of the service is shown on Figure 1-1 located within the WSP.

The geologic structure of the East and West hills are comprised almost entirely of glacial till and other glacial deposits overlying bedrock principally consisting of Tertiary sedimentary rocks. The floor of the Green River valley is underlain by post-glacial alluvial deposits generally derived from erosion of the glacial deposits in the surrounding hillsides.

There are few faults with surface expression in the Green River valley. Mapped faults generally consist of northeast trending features of limited length. The Seattle fault is located approximately 15 miles north of Kent, and is considered the most significant fault which could affect the City. Kent is located above the subsurface projection of the Cascadia Subduction Zone, where the Juan de Fuca tectonic plate is being forced under the North American continental plate.

The Kent Water System distribution system consists of over 250 miles of mains, 8 reservoirs with a total capacity of approximately 20.9 MG, and six pump stations. There are five main pressure zones/elevations, which have in some zones been divided into one or more smaller sub-areas. A schematic of the water system is shown on Figure 1-3 within the WSP.

8 Site Area. Approximately 27 square miles. Site Dimensions. See Figure 1-3.

9 Project description. Give a brief, complete description of the intended use of the property or project including all proposed uses, days and hours of operation and the size of the project and site. (Attach site plans as described in the instructions)

The 2002 WSP is a compilation of planning and engineering analysis conducted to determine the adequacy of the Kent Water System to meet the existing and projected requirements for provisions of domestic and fire protection service within the water system's established water service area. This plan supersedes the City's previous Water System Plan and serves as a guideline for future development and maintenance of the water system.

The WSP documents proposed improvement projects. The said projects may require, depending on the scope of the project, their own environmental checklist and determinations.
unless categorically exempt. The checklists and determinations would be accomplished at the time the individual projects are accomplished. This applies to private development as well as public development.

The planning area for this plan is the existing water service area for the Kent Water System. The Kent Water System service area covers approximately 27 square miles, of which, approximately 23.5 square miles are within the City of Kent. Please refer to Figure 1-3 within the WSP.

10 Schedule. Describe the timing or schedule (include phasing and construction dates, if possible).

The WSP identifies improvements to the City’s water system through saturation development, estimated to occur in 2043. These improvements are described in chapters 10 and 11 within the WSP.

11 Future Plans. Do you have any plans for future additions, expansion or further activity related to or connected with this proposal? If yes, explain.

Yes. The WSP discusses additions and improvements to the water system. Further, the WSP must be updated every 6 years.

12 Permits/Approvals. List all permits or approvals for this project from local, state, federal, or other agencies for which you have applied or will apply as required for your proposal.

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>PERMIT TYPE</th>
<th>DATE SUBMITTED*</th>
<th>NUMBER</th>
<th>STATUS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOH</td>
<td>Approval</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>King County</td>
<td>Adoption</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Leave blank if not submitted
**Approved, denied or pending

The WSP documents proposed improvement projects. The said projects may require, depending on the scope of the project, their own environmental checklists and determinations unless categorically exempt. Project permitting requirements and corresponding permit agencies will be identified at the time the individual projects are accomplished. This applies to private development as well as public development.

13 Environmental Information. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
The WSP documents proposed improvement projects. The said projects may require, depending on the scope of the project, their own environmental checklists and determinations unless categorically exempt. The checklists and determinations would be accomplished at the time the individual projects are accomplished. This applies to private development as well as public development.

14. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Do not know
ENVIROMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one) Flat, rolling, hilly, steep slopes, mountainous, other

The Kent Water System service area is comprised of a relatively flat valley floor bounded by sharply rising hillsides to relatively flat plateaus on the East and West. A topography map (Figure 1-1) is located within the WSP.

b. What is the steepest slope on the site (approximate percent slope)?

Within the Kent Water System service area there are areas with severe slopes. A topography map (Figure 1-1) is located within the WSP.

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.

The Green River valley is an erosional trough of glacial origin which is partially filled by more than 400 feet of post-glacial alluvial deposits in the Kent area. Three main depositional units have been identified in the subsurface: younger alluvium, the Osceola mudflow, and older alluvium. Silty sand and gravel deposited along the margin of the Vashon stade glacier are present along the western valley margin.

The East and West hills are comprised almost entirely of glacial till and other glacial deposits overlying bedrock principally consisting of Tertiary sedimentary rocks.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Within the service area there are areas with severe slopes. Slope stability would be reviewed during the environmental assessment of individual projects.

e. Describe the purpose, type and approximate quantities of any filling or grading proposed. Indicate source of fill.

Implementing portions of the capital projects described in the WSP may require importing of fill and grading, and such projects would be subject to appropriate state and federal permit processes. For such projects, fill would primarily be used for structural purposes. In certain areas, native soils may not be adequate for foundations or loading. In such cases, a limited amount of structural backfill may be imported from local gravel pits. Fill may also be required in some cases to construct berms or visual buffers around certain facilities. This fill would be obtained from a
local gravel pit As a design is developed for each project, approximate quantities of filling and grading would be estimated and discussed in project specific environmental documents.

f Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion has the potential to occur whenever soils are exposed. All construction projects would be reviewed and be supervised by the City of Kent Public Works Engineering Division to assure compliance with the City’s erosion control requirements, in addition to other appropriate state and federal laws and regulations.

Implementation of the WSP would not result in erosion.

g About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Implementation of the WSP would not change the amount of impervious surfaces.

h Proposed measures to reduce or control erosion, or other impacts to the earth, if any.

Any construction would comply with the City of Kent’s erosion control requirements. Individual projects would generate specific environmental documents to address earth impacts.

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.

Implementation of the WSP will not result in any emissions of dust. Minor amounts of dust may be produced during construction of some of the proposed projects. Air preventing measures, if any, would be evaluated for each individual projects’ environmental documents.

b Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known at this time.

c Proposed measures to reduce or control emissions or other impacts to air, if any.

Dust control measures, such as watering exposed soils, would be utilized when determined necessary. Individual projects would generate
specific environmental documents to address air impacts, if any

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, salt water, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

   The Kent Water System service area falls within both the Green River and Cedar River basins. Within these basins, there are numerous small streams including Soos Creek and Rock Creek, that discharges into the Green River and Cedar River, respectively. Several wetlands and small lakes also exist in the service area.

2) Will the project require any work over, in or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

   The WSP assumes construction of the Tacoma Second Supply pipeline (P-5) and related connections to Kent's water supply system. All aspects of the P-5 project affecting surface waters and/or listed species have been, or will be subject to federal and state permit review, including CWA 404 permit (and related Section 7 consultations with NMFS/USFWS), SEPA/NEPA, state shoreline permits, and state hydraulic permits. The WSP also discusses construction of a potential reservoir facility. While property has been acquired for siting the reservoir, no permitting or construction action has occurred. Any development of the site would be subject to a project-specific SEPA, as well as CWA 404 permit, ESA Section 7 consultations, and other appropriate state, local, and federal laws and regulations.

   It should also be noted that in January, 2001, the City authorized preparation of a Habitat Conservation Plan (HCP), pursuant to Section 10 of the Endangered Species Act, for the City's Clark Springs/Rock Creek water supply facilities and related activities. Since that time, the City has commenced negotiations with the Services (NMFS/USFWS) and begun the process of preparing appropriate technical studies. Any work on Clark Springs facilities in the vicinity of Rock Creek that results from the HCP will occur subject to appropriate, and project-specific, local, state, and federal permits and processes.

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
The WSP is a non-project SEPA action. Potential impacts from the proposed reservoir project are currently unknown and will require substantial study and be subject to project-specific SEPA regulatory review as noted above. Potential impacts relating to the P-5 project are addressed in the Tacoma Habitat Conservation Plan, Project EIS, and related environmental documents and studies. Specific project actions and the potential related effects of other potential capital projects will be addressed in project-specific SEPAAs, and may also include related Section 7 consultations, shoreline permits, and other measures. In addition, the City intends for future activities involving Clark Springs/Rock Creek facilities to be addressed within the HCP now underway.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities, if known.

The proposed non-project action consists of adoption of the WSP, not project-specific actions relating to water withdrawals. The WSP’s programs and operations may result in surface water diversions as authorized under existing state water rights. Kent’s Rock Creek Resource Protection Plan (RCRPP), as referenced in the WSP, provides for the necessary protection of aquatic species. The RCRPP is expected to be superseded by the HCP as cited earlier, which will be more comprehensive in nature. Under any circumstance, any new projects affecting surface waters that are subject to project-specific SEPA, Clean Water Act permitting, or other appropriate state/federal permits, will be addressed for potential impacts, and proceed through the necessary permit and/or consultation processes.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Areas of the water system service area are within the 100-year floodplain, however, no change in the floodplain capacity is expected.

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.

No waste discharges are proposed in the WSP.

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

The WSP recommends repair and improvement of existing water supply facilities. Project-specific SEPA analysis and/or other appropriate regulatory review will be undertaken relative to said projects to assess and address environmental impacts prior to development and use. Groundwater is withdrawn from aquifers in the upland areas east of Kent and the Kent Valley. A more detailed discussion can be found in Chapter 5 of the WSP. Groundwater withdrawn in relationship to Kent's Clark Springs facilities (Rock Creek) will be addressed within HCP now under development.

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.

No ground discharges are considered within the WSP.

Water Runoff (including storm water):

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.

Some of the projects discussed in the WSP would create additional impervious surfaces that would create stormwater runoff. In those projects, the water would be retained or detained consistent with the City of Kent Stormwater Construction Standards and other appropriate state/federal permit requirements.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Runoff water would be discharged to local collections systems that eventually discharge into surface waters. Water runoff would be evaluated during individual project environmental review.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Minimum amounts of new impervious surfaces would be created. Any stormwater would be controlled consistent with the City of Kent.
Stormwater Construction Standards and other appropriate state/federal permit requirements

4. Plants
a Check or circle types of vegetation found on the site
   - Deciduous tree: alder, maple aspen, other
   - Evergreen tree: fir, cedar, pine, other
   - Shrubs
   - Grass
   - Pasture
   - Crop or grain
   - Wet soil plants: cattail, buttercup, bulrush, 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?
   Implementation of the WSP will not result in any loss of vegetation. The specific types and amounts of vegetation that may be disturbed will be evaluated during the individual project review.
c List threatened or endangered species known to be on or near the site
   The WSP is a non-action item project. There are no known species in the area covered by the WSP.
d Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any
   Landscaping for individual projects would be determined during project review.

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
   Birds: hawk, heron, eagle, songbirds, other...
Mammals: deer, bear, elk, beaver, other: deer, bear, elk, beaver.

Fish: bass, salmon, trout, herring, shellfish, other: salmon, trout, bass.

b List any threatened or endangered species known to be on or near the site.

Chinook, coho, and bald eagles are known to be present in the area covered by the WSP.

c Is the site part of a migration route? If so, explain.

The area is considered a part of the Pacific Flyway.

d Proposed measures to preserve or enhance wildlife, if any.

Not applicable.

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.

Significant amounts of electricity are used by the Kent Water System to operate pumps that move water around the system to meet domestic and fire demands.

b Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Solar access would not be affected by implementation of the WSP.

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.

The Water Conservation Plan, chapter 4 of the WSP, is designed to conserve water resources and thereby reduce energy usage.

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.

The Kent Water System both chlorinates and fluoridates its water supply. The operation of the 212th Manganese Treatment Facility uses potassium permanganate, sodium hypochlorite, sodium hydroxide,
sodium fluoride, and polymer. The proposed corrosion control treatment facilities at Pump Station #5 and East Hill Well will use sodium hydroxide.

1) Describe special emergency services that might be required

No special emergency services would be required as part of this WSP. Emergency service requirements would be evaluated during the individual project reviews.

2) Proposed measures to reduce or control environmental health hazards, if any

Environmental health hazards and measures to reduce such hazards would be evaluated during the individual project review.

b Noise

1) What types of noise exist in the area which may affect your project (for example traffic, equipment operation, other)?

Operation of the water system is not affected by noise.

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.

Implementation of the WSP would not generate any noise. Pumps, emergency generators, and exhaust fans create noise.

3) Proposed measures to reduce or control noise impacts, if any.

Individual projects would generate specific environmental documents to address noise impacts, if any.

8. Land and Shoreline Use

a What is the current use of the site and adjacent properties?

Residential, commercial, industrial, agricultural, parks, and right-of-ways are the predominant land uses within the water service area.

b Has the site been used for agriculture? If so, describe.

Historically, areas within the Kent valley have been used for agricultural. The City of Kent's zoning map (Figure 2-1 within the WSP) indicates areas zoned agricultural.

Describe any structures on the site.
Individual structures should not be affected by implementation of the WSP.

d. Will any structures be demolished? If so, what?

No structures will be demolished as a result of implementing the WSP.

e. What is the current zoning classification of the site?

A variety of zoning exists throughout the water service area. The zones are defined in the Kent City Code.

f. What is the current comprehensive plan designation of the site?

Please refer to the City of Kent Comprehensive Plan for a detailed description of land use designations.

g. If applicable, what is the current shoreline master program designation of the site?

The City of Kent Shoreline Master Program includes Lake Mendian, Green River, and a small portion of Soos Creek as significant Shorelines of the State. No impacts to shorelines will result from this WSP.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Critical areas are protected by City regulations. Critical areas would not be impacted as a result of the WSP.

i. Approximately how many people would reside or work in the completed project?

The WSP is not a proposal that would create jobs or housing.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any

None necessary.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any

The intent of the WSP is to implement the land use plans and policies of the City. The WSP addresses water supply, storage, transmission, distribution, and treatment necessary to support the land use goals and policies of the City of Kent.
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
   
   None necessary

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?
   
   The WSP includes the addition of a 5 MG storage reservoir located on the East Hill. The height of the reservoir would depend on its location. The maximum water surface of the reservoir is anticipated to be 590 feet above sea level. The reservoir would most likely be construction of steel or concrete.

   b. What views in the immediate vicinity would be altered or obstructed?
   
   Effects on views and aesthetics would be described in project specific environmental documents.

   c. Proposed measures to reduce or control aesthetic impacts, if any.
   
   Measures to reduce or control aesthetic impacts would be evaluated in project specific environmental documents.

11. **Light and Glare**

   a. What type of light or glare will the proposals produce? What time of day would it mainly occur?
   
   Implementation of the WSP is not anticipated to create any facility that generates light or glare.

   b. Could light or glare from the finished project be a safety hazard or interfere with views?
   
   No
c What existing off-site sources of light or glare may affect your proposal?

Sources of off-site light or glare are not anticipated to affect the WSP

d Proposed measures to reduce or control light and glare impacts, if any

None

Individual projects would generate specific environmental documents to address light and glare impacts, if any

12. Recreation

a What designated and informal recreational opportunities are in the immediate vicinity?

The City of Kent has several parks located throughout the City that provide recreational opportunities

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

None proposed

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

Implementation of the WSP is not anticipated to affect historic sites or areas identified for cultural preservation

b Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site

Individual projects would generate specific environmental documents to identify and address impacts on historic resource, if any

c Proposed measures to reduce or control impacts, if any

Individual projects would generate specific environmental documents to identify and address impacts on historic resource, if any

14. Transportation

Identify public streets and highways serving the site, and describe
City of Kent Planning Services
Environmental Checklist – Page 17

1. Proposed access to the existing street system. Show on site plans, if any

Figure 1-2 within the WSP identifies the street network within the City of Kent and surrounding area

b Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Several METRO bus routes serve the City of Kent in addition to Sound Transit

c How many parking spaces would the completed project have? How many would the project eliminate?

Creation or elimination of parking is not a part of this proposal

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)

Many of the projects proposed within the WSP would be placed in City streets. Restoration of those streets would be an important part of the individual project

Implementation of the WSP would not require any new roads or streets

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe

Projects may be constructed in the vicinity of railroad tracks or sensitive areas. Environmental assessments would be conducted for each individual project

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

None

g. Proposed measures to reduce or control transportation impacts, if any

Transportation impacts would be evaluated for each individual project

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

Individual projects would be evaluated to determine their respective impacts to public services

16. **Utilities**

a Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. Storm sewer.

b Describe the utilities that are proposed for the project, the utilities providing the service and the general construction activities on the site or in the immediate vicinity, which might be needed.

The WSP addresses water supply, storage, transmission and distribution needs for the City of Kent planning area. The major purpose of the plan is to identify source, storage, transmission, and distribution systems necessary to serve the estimated population until saturation development (2043). The WSP addresses water supply, water conservation, aquifer protection, water quality, operation and maintenance, financing issues, and construction standards.

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 ________________________________

Date 8/6/02
DO NOT USE THIS SHEET FOR PROJECT ACTIONS

D. SUPPLEMENTAL SHEET FOR NONPROJECT 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, emission to air, production, storage, or release of toxic or hazardous substances, or production of noise?

   The WSP is a 40-year plan that identifies water system needs and improvements to meet domestic and fire flow demands. The two corrosion control treatment facilities previously stated would require the storage of large amount of sodium hydroxide, however, Conditional Use Permits (CUP's) have already been obtained for these facilities. The WSP itself would not directly result in any discharge to water, or in the production, storage, or release of toxic or hazardous substances or noise.

   Proposed measures to avoid or reduce such increases are:

   Does not apply.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

   Please see attached environmental checklist, section B 5 Animals, for additional information.

   Proposed measures to protect or conserve plants, animals, fish, or marine life?

   Does not apply.

3. How would the proposal be likely to deplete energy or natural resources?

   The WSP projects an increase in the consumption of water due to projected population growth.

   Proposed measures to protect or conserve energy and natural resources are:

   Continuation of the City’s Conservation Policies during peak usage periods.
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?

The WSP will not affect environmentally sensitive areas. Please see attached environmental checklist for additional information.

Proposed measures to protect such resources or to avoid or reduce impacts are

Not applicable.

5 How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The availability of water will allow development to occur consistent to goals and policies set forth in the City of Kent Comprehensive Land Use Plan. Uses incompatible with existing zoning and land-use plans would be subject to the City of Kent development review process.

Proposed measures to avoid or reduce shoreline and land use impacts are

Continued review of development projects during the permitting, design, and construction processes.

6 How would the proposal be likely to increase demands on transportation or public services and utilities?

Projected population increase would increase the needs for public services.

Proposed measures to reduce or respond to such demand(s) are

Continued conservation activities as noted within the Water Conservation Plan, Chapter 4 of the WSP.

7 Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The WSP will be reviewed by various agencies for approval.