# WASTEWATER SYSTEM FACILITIES PLAN, PHILOMATH, OREGON

July 2004

Prepared for:

**CITY OF PHILOMATH, OREGON**
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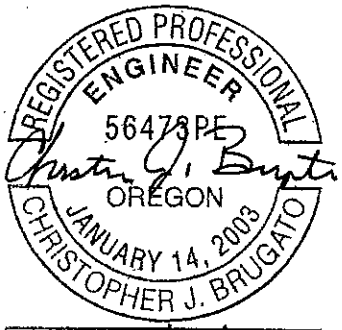
Exp 6/30/2006




EXPIRES: 12/31/2005

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August 23, 2004

Mr. Beau Vencill, Public Works Director
City of Philomath
P.O. Box 400
Philomath, OR 97370

RE: Philomath Wastewater System Facilities Plan Approval
File No. 103463
Benton County

Dear Mr. Vencill:

We have received the revised Philomath Wastewater System Facilities Plan (FP) prepared by Westech Engineering, Inc. and received in our office on July 29, 2004.

The revisions to the FP address all our comments. Therefore, we are approving the revised document. For the record, the City has chosen not to address environmental issues as required if state or federal funds are sought for this project at this time.

The next step is to start pre-design work. To avoid extra work and cost overruns, the County should not authorize final design until a pre-design report is reviewed and agreed by City staff and DEQ.

Should the implementation of this FP lapse over five years, we strongly recommend that you consult with DEQ staff to ensure that the proposed plan and issues are still relevant. It is sometimes possible that preparation of a new FP may be warranted after five years.

Please feel free to call me at [541] 686-7838 ext.233 should you have any questions or comments.

Sincerely,

Jaime Isaza, Project Officer

cc: John Yarnall - Westech
Keith Andersen, Mark Hamlin, Tim McFetridge - DEQ

ji: Philomath FP app.doc

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# CITY OF PHILOMATH
# WASTEWATER SYSTEM FACILITIES PLAN,
# PHILOMATH, OREGON

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MAO
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# FOREWORD

## USING THIS REPORT

Because this report will be used by many people whose needs for detailed information will differ widely, an Executive Summary has been included at the beginning of this report. This executive summary contains a summary and overview that briefly describes the content and main conclusions of the report. Thus, readers may gain a good general understanding of the direction of the report and its contents by reading the Executive Summary. If a reader wishes to explore the subject in greater detail, the appropriate section in the text can be consulted. Each section has also been generally organized so as to move from the general to the specific.

CITY OF PHILOMATH
Wastewater System Facilities Plan,
Philomath, Oregon

# Executive Summary
# July 2004

## PURPOSE OF FACILITIES PLAN

This Wastewater Facilities Plan was completed to achieve the following objectives;

- **Evaluate Current and Future Needs** – Evaluate the City's sanitary sewerage facilities with respect to existing and future needs, identify improvements and associated costs necessary to meet those needs, and provide the City with a guide for future development of the City's sanitary sewerage system.

- **Satisfy Funding Agency Requirements** – As with most small cities, Philomath may have some difficulty accumulating sufficient resources to construct the required improvements. Therefore, outside funding may need to be acquired. The federal and state funding agencies that distribute funds for public wastewater projects have published guidelines for the preparation of Facilities Plans. This plan is intended to conform to those guidelines.

## BACKGROUND INFORMATION

Philomath's original sewer system was built in 1952. It served most of the area within the present City limits west of Newton Creek. Concrete, mortar joint pipe was used for the sewer construction. Two sewage lift stations were built at that time. One was located at the sewage treatment plant and was intended to lift all sewage into the treatment plant. This was known as Pump Station A. At that time the sewage treatment plant was located at the City shops facility near the south end of 16th Street. A second lift station was constructed near the High School on Applegate Street. This lift station, known as Pump Station B, originally served the portion of the City east of 16th Street on the north side of Main Street and all of the area east of 19th Street on the south side of Main Street. Pump Station B discharged through a force main into Manhole #117 on Applegate Street where sewage flowed by gravity to Pump Station A. Pump Stations A and B essentially divided the City into two distinct drainage basins. This configuration remained until the mid 1980's, when large-scale sewer improvements were constructed.

In 1985, the capacity of Pump Station A was increased. In 1986 the City constructed large-scale sewerage system improvements that changed the overall configuration of the collection and treatment system. As part of this project, Pump Station B was abandoned. Flows from the collection system that originally drained to Pump Station B were rerouted to a new pump station on Chapel drive. This new pump station is known as the Newton Creek Pump Station, and remains in service essentially unaltered from the original 1986 project. The 1986 project also included the construction of a new treatment plant south of the Marys River. New force mains from Pump Station A and the Newton Creek Pump Station were constructed to convey flows to the new treatment plant. The new treatment plant was designed as a summer-holding winter-discharge facility with a headworks, two facultative lagoons, and disinfection facilities. A new

single-port outfall into the Marys River was also constructed. In 2003 an expanded chlorine contact chamber was constructed and dechlorination facilities were added at the WWTP. With the exception of this work, the treatment plant operates largely as originally designed.

## NEED FOR FACILITIES PLAN

The existing Sewerage System Facilities Plan was prepared by Westech Engineering and was adopted by the City in 1985. This document included a list of recommended improvements for the wastewater utility and helped enable the City to obtain an EPA construction grant for construction of improvements including the existing treatment lagoons. The 1985 plan was based on a 20 year planning horizon. Portions of the City's existing sanitary sewer facilities are nearing the end of their design life, and will need to be upgraded within the next planning period. The City of Philomath has chosen to address such problems in a proactive manner to avoid crisis situations. As such, the City believes a new facilities plan is necessary to identify guidelines for the development of the sanitary sewer system over the next planning horizon.

## BASIS FOR FACILITIES PLANNING

As previously mentioned, some of the City's existing wastewater facilities are nearing the end of their design life. As such, improvements will be necessary. Though improvements are required, haphazard improvements that do not adequately consider all of the issues that impact the system may end up costing the City more in the long run than well thought-out, carefully-applied solutions. For example, if a particular sewer pipe can not convey the volume of wastewater that flows into it, a logical solution is to replace the pipe with a larger pipe. However, if the larger pipe is sized only to accommodate the existing flow volumes and future growth upstream of the pipe occurs, the pipe size may need to be increased a second time to accommodate the flow increases. Instead of replacing the pipe twice, a more cost-effective solution is to replace the pipe once with a pipe sized to accommodate the existing flows plus the anticipated future growth. As this example illustrates, most wastewater facilities cannot be expanded incrementally to accommodate growth. More often that not, the most cost effective solution is to initially size the facilities to accommodate anticipated growth within the planning period. Therefore, this Facilities Plan not only considers the existing deficiencies, but also considers what improvements are going to be required during the planning period as the City grows and develops. The intent of the recommendations proposed in the plan is to provide the City with reliable wastewater facilities that not only meet current demands, but that will also adequately serve the City well into the future.

The DEQ recommends a minimum 20-year planning period for facilities planning. This planning period begins once the construction of the required improvements is completed. The intent of this approach is to construct improvements that have minimum design life of 20-years. Based on the project schedule outlined in **Section 8**, the construction of the first phase of the recommended improvements should be completed during the 2007 calendar year. Based on a 20-year planning period, the recommended improvements are expected to serve the City's needs until 2027. In order to assess the City's needs in the year 2027, population growth projections must be made to determine future wastewater flows and loads. The DEQ mandates the use of

County coordinated growth rates and population projections. Therefore, the growth rates and population projections used in the Facilities Plan are based on figures adopted by Benton County for the City of Philomath. Using the County's adopted growth rate, the projected population of Philomath in the year 2027 is expected to be approximately 5259 (see **Section 2**). Projected wastewater flows and loads are based, in part, on this population. Wastewater flow and load projections are detailed in **Section 5**.

The DEQ mandates that the planning area for facilities planning be limited to the land within the present UGB of the City. Therefore, the improvements recommended in this plan are based on development of land within the UGB in its present location, as well as the existing land use zoning for these areas. It is assumed that no significant development will occur within the study area that will require major changes to the existing zoning, and that there will be no significant expansions of the UGB within the study period. Changes in any of these assumptions could change the recommendations contained in this facilities plan. Should significant changes in any of the above occur, the facilities plan should be updated accordingly.

## COLLECTION SYSTEM DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

The collection system collects large amounts of infiltration and inflow. As previously stated, much of the collection system was constructed in 1952 and is nearing the end of its useful life. In addition to this, several sewer mains lack the capacity to convey existing peak flows. Pump Station A also lacks the capacity to convey peak flows. Surcharging in the Pump Station A collection basin is common. The primary purpose of the recommended collection system improvements is to reduce the amount of I/I and increase the capacity of the undersized facilities. The recommended improvements consist of implementing a large-scale, ongoing I/I reduction program, sewer main capacity increases, and replacing Pump Station A.

Funds generated from the I/I reduction program should be used to replace or rehabilitate the portions of the 1952 collection system that contribute the greatest amount of I/I. New sewers are typically constructed using PVC rather than concrete pipe. PVC pipe is more durable and leak resistant than concrete pipe. Modern construction techniques are also geared toward providing a relatively leak free system. Therefore, replacing those portions of the collection system that contribute the most I/I will reduce the amount of wastewater that must be treated at the WWTP.

Large portions of the collection system lack capacity to convey existing sanitary sewer flows. Therefore, the recommended improvements include upsizing the undersized trunk sewers. Pump Station A lacks capacity to convey existing peak flows and is nearing the end of its useful life and should be upgraded early in the planning period. The recommended improvements for the collection system are listed in **Table 6-4**.

## TREATMENT AND DISPOSAL SYSTEM DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

The existing treatment facilities are in relatively good working order and have the capacity to treat and dispose of the existing flows and loads. The primary shortcoming associated with the

existing facilities is that they lack capacity to treat and dispose of the projected flows and loadings resulting from growth during the planning period. As such, treatment plant improvements are likely to be required as the City's population increases. The hydraulic storage and organic loading capacity of the lagoons must be increased to treat projected flows associated with growth. In addition, a disposal method other than discharge to the Marys River will likely be required. Several alternatives for addressing these deficiencies were identified and evaluated. These are explained in greater detail in **Section 7** of the Facilities plan. The evaluation presented in **Section 7** showed that the most cost-effective approach to increase the capacity of the treatment facilities is to construct a new Facultative Lagoon and new summer effluent reuse facilities. The recommended treatment and disposal system improvements are listed in **Table 7-10**. A schematic representation of the recommended improvements is provided in **Figure 7-1**.

## COST PROJECTIONS

The project cost projections listed in the following table reflect costs in 2003 dollars and are planning level estimates intended to be in the range of +35% to –25% of the actual projects costs. The projected costs include legal, administration, permitting, engineering, and contingency as well as construction costs.

| Recommended Improvements | |
|---|---|
| Project | Estimated Project Budget |
| I/I Reduction Program (Priority 1A) | $220,000/year |
| Pump Station A Replacement (Priority 1A) | $1,125,000 |
| Priority 1A Trunk Sewer Improvements | $1,459,000 |
| Priority 1B WWTP Improvements | $2,058,000 |
| Priority 2 Trunk Sewer Improvements | $1,037,000 |
| Priority 2 WWTP Improvements | $435,000 |
| Timber Estates Pump Station Improvements (Priority 2) | $113,000 |
| Newton Creek Pump Station Improvements (Priority 2) | $1,132,000 |
| **Total Estimated Project Budget** (excluding annual I/I budget) | **$6,924,000** |

This expenditure is expected to build the basic improvements needed to provide the capacity to meet existing and projected flows and loadings through the planning period (i.e., 2027).

## FINANCING

Philomath does not currently have the resources nor is the City's existing user fee structure sufficient to fund the recommended improvements. Therefore, alternative funding sources must be pursued. Several potential funding sources are identified and discussed in **Section 8** of the Facilities Plan. All likely funding options will require the City to increase user rate and SDC's. We recommend that the City perform a user fee study and implement new user rates and SDC's as soon as possible.

## IMPLEMENTATION PLAN

A three-phase implementation plan is recommended. This is discussed in greater detail in **Section 8** of the Facilities Plan. The first phase includes the development of a funding plan for the recommended improvements. This should include an evaluation of the current user rates and SDC fees. The rates and fees should be increased as required. The second and third phases include the implementation (i.e., construction) of the priority 1A and 1B improvements respectively. A fourth and final phase of the implementation plan also exists. This includes the construction of the priority 2 improvements. These improvements are heavily dependent upon growth and may or may not be required during the planning period. Nonetheless, the City should plan for these improvements to avoid future crisis situations. The City should periodically evaluate the demands placed on the utility to determine how actual growth compares to the projections presented herein. If growth occurs faster than anticipated, the priority 2 improvements may be needed sooner. Should growth occur slower than anticipated, the priority 2 improvements may be delayed. The following table lists milestones and recommended completion dates for the first three phases of the implementation plan.

| Recommended Implementation Schedule (Priority 1A & 1B) | |
|---|---|
| Milestone | Date |
| PHASE I | |
| Submit Draft Facilities Plan to DEQ & City | 8/30/03 |
| Receive Comments from DEQ & City | 1/31/04 |
| Submit Final Facilities Plan to DEQ | 7/31/04 |
| DEQ Approval of Final Facilities Plan | 8/31/04 |
| City adopts Final Facilities Plan | 9/30/04 |
| Perform Rate Study & Implement New User Rates & SDCs | 12/31/04 |
| Update CIP | 12/31/04 |
| Conduct Funding Meeting With OECDD and RUS | 2/15/05 |
| Submit Funding Applications | 5/31/05 |
| Finalize Funding Package | 12/31/05 |
| | |
| PHASE II – Priority 1A Improvements | |
| Select Design Consultant | 1/31/06 |
| Complete Predesign Report | 3/31/06 |
| DEQ Approval of Predesign Report | 4/30/06 |
| Start Detailed Design of Improvements | 5/31/06 |
| Complete Design of Improvements | 1/31/07 |
| DEQ Approval of Plans & Specifications | 3/15/07 |
| Advertise for Construction Bids | 4/15/07 |
| Receive Construction Bids | 5/15/07 |
| Award Contracts | 6/15/07 |
| Start Construction | 7/15/07 |
| Complete Construction of Priority 1A improvements | 12/31/07 |
| | |
| PHASE III – Priority 1B Improvements | |
| Select Design Consultant, Prepare Predesign Report | 1/31/09 |
| Start Detailed Design of Improvements | 6/1/09 |
| Complete Design of Improvements | 12/1/09 |
| DEQ Approval of Plans & Specifications | 2/1/10 |
| Advertise for Construction Bids | 4/1/10 |
| Receive Construction Bids | 5/1/10 |
| Award Contracts | 6/1/10 |
| Start Construction | 7/1/10 |
| Complete Construction of Priority 1B improvements | 11/1/10 |
| | |

Section 1

# INTRODUCTION

# SECTION 1 INTRODUCTION

## 1.1. Background & Need

The City of Philomath is located on Highway 20 approximately five miles west of Corvallis in Benton County, Oregon. The current population of Philomath is approximately 4100. The City was founded in 1882. The past economic activity in Philomath has centered around the forest products industries. With the decline of the forest products industries in western Oregon future prosperity of Philomath appears to be tied to diversified light industries together with a growing residential community. Many of the residents of Philomath work in Corvallis and other nearby communities.

The City is bisected east to west by the Corvallis-Newport Highway 22/34, while the Marys River is located just south of town. Philomath's original sewerage facilities were constructed in 1952 and served most of the area within the present City limits west of Newton Creek. The existing wastewater treatment lagoons are located south of the Marys River outside of the City. The collection system is a conventional gravity collection system with three pump stations. The treatment lagoons are designed for summer holding and winter discharge to the Marys River.

The City's current development standards require findings that adequate capacity is available in the utility systems prior to development occurring. The implementation of this standard is difficult without a current sanitary sewer system master plan that identifies the required basin-wide improvements. An understanding of how the collection system works and how development within the basin impacts its performance allows one to determine what improvements to the sanitary sewer system are required by new development.

The existing Sewerage System Facilities Plan was prepared by Westech Engineering and was adopted by the City in 1985. This document included a list of recommended improvements for the wastewater utility and helped enable the City to obtain an EPA construction grant for construction of improvements including the existing treatment lagoons. The Sewerage System Facilities Plan recommended improvements under what EPA termed a 10 year staged construction plan, even though the improvements were thought to have a life greater than 10 years. This approach was used because the facilities plan had to conform to the City's adopted Comprehensive Plan population value of 9,000 people in the year 2000. As a result, the improved facilities were designed and constructed for a projected 1996 design year population of 4,500 people. Hindsight has confirmed that the City's Comprehensive Plan Population value of 9,000 people in the year 2000 was overoptimistic. In fact, the design year population of 4,500 has turned out to be reasonably close to the typical 20-year projection.

In 1993, Westech prepared the North Philomath Water and Sewer Study Update under the direction of Benton County. This document examined the water and sewer utilities with particular emphasis on the City potentially serving a large area on the north side of the City,

including an area outside of the City's Urban Growth Boundary (UGB) but within the Newton Creek drainage basin. This document has been used to a limited degree in sizing selected sanitary sewer system additions and for general planning purposes.

Since 1986 when the new WWTP and the Newton Creek Pump Station were constructed, environmental rules have changed and in general have become more stringent. A good example of this relates to the discharge of disinfected wastewater from the WWTP to the receiving stream. When constructed, the industry norm was a single port outfall to the river with no limits regarding chlorine toxicity to aquatic life in the stream. Subsequent to 1986, the State of Oregon implemented rules that were approved by the EPA regarding chlorine toxicity. The City of Philomath's single port outfall, like most other communities, did not satisfy the new chlorine toxicity requirements. After water quality modeling of the stream at different flow rates, the City determined that the best alternative was to dechlorinate the effluent prior to discharge. The City entered into a Mutual Agreement Order (MAO) with the DEQ. The MAO was adopted by the DEQ in July of 2001 (see **Appendix B**). This document gave the City until September 30, 2003 to complete the construction of the dechlorination improvements. The improvements have since been completed in accordance with the MAO.

Portions of the City's existing sanitary sewer facilities are nearing the end of their design life, and will need to be upgraded within the next planning period. The City of Philomath has chosen to address such problems in a proactive manner to avoid crisis situations. As such, the City believes a new facilities plan is necessary to identify guidelines for the development of the sanitary sewer system over the next planning horizon.

## 1.2. Project Objectives

The purpose of this study is to evaluate the City's sanitary sewerage system with respect to its existing and future needs, identify improvements and associated costs necessary to meet those needs, and provide the City with a guide for future growth of the City's sanitary sewerage system. The information contained herein is intended to assist the City in the planning and implementation of capital improvements to the sanitary sewerage system, as well as ongoing system maintenance.

This Wastewater Facilities Plan accomplishes the following specific objectives.

- Protect the public health within the planning area.
- Protect the water quality in the Marys River.
- Verify the previous delineation of the boundaries of the major sewer drainage basins and subbasins within the Planning Area.
- Update the maps of the existing sanitary sewer system based on field data collection and as-built drawings.

- Identify current and future sewer collection system deficiencies on a prioritized basis, particularly in the following areas:
  - Surcharging, bypasses, flow routing capacity
  - Pump station(s) capacity, reliability, auxiliary power
  - I/I concerns
  - Maintenance considerations

- Identify current and future treatment and disposal system deficiencies on a prioritized basis, particularly in the following areas:

  - WWTP capacity — Organic treatment capacity; Hydraulic capacity (flow routing and storage)
  - Effluent disposal — Total Maximum Daily Loads (TMDL); Mixing zone concerns

- Provide an evaluation of the options for correcting these deficiencies with preliminary construction cost estimates for recommended alternatives.

- Provide the City with a Wastewater Facility Plan that addresses concerns of both the City and regulating authorities.

- Provide specific recommendations to the community and City Council for action.

This report does not include a wetland inventory or delineation(s), topographic or aerial surveys, on-site environmental investigations or geotechnical investigations.

## 1.3. Prior Studies and Work

The following is a summary of some of the studies, reports and documents utilized in the preparation of this facilities plan.

- Construction Drawings, Sanitary Sewer System (original sewer system), Philomath, Oregon by Cornell, Howland, Hayes & Merryfield, April, 1951.

- Sewer System Facilities Plan, Philomath, Oregon by Westech Engineering, Inc., April 1985.

- Contract Documents, Sewer System Improvements (Newton Creek trunk sewer & pump station, force main & outfall, treatment lagoons), Philomath, Oregon by Westech Engineering, Inc., August 1985.

- N. Philomath Water & Sewer Study Update, Philomath, Oregon by Westech Engineering, Inc., August 1993.

- Engineer's Report, Hartz Industrial Site Public Infrastructure Improvements, Philomath, Oregon by Westech Engineering, Inc., December 1996.

- Storm Drainage System Master Plan, Philomath, Oregon by Westech Engineering, Inc., March 1998.

- Engineer's Report, Sanitary Sewer Pump Station Evaluation, Pump Station A-Interim Pump Improvements, Newton Creek PS-Pump Retrieval Options, City of Philomath, Oregon by Westech Engineering, Inc., February 1999.

- Preliminary Mixing Zone Study per condition C2 of NPDES permit, City of Philomath, Oregon by Westech Engineering, Inc., March 1999.

- Mutual Agreement and Order (MAO) WQ/M-WR-00-144, between the Oregon Environmental Quality Commission and the City of Philomath, Oregon, executed January 2001.

- Final Mixing Zone Study & Improvement Recommendations per MAO condition 8A(2), City of Philomath, Oregon by Westech Engineering, Inc., August 2001.

- Contract Documents, Wastewater Treatment Plant Dechlorination Improvements per MAO condition 8A(4), City of Philomath, Oregon by Westech Engineering, Inc., April 2002.

- Local Wetlands Inventory for the City of Philomath, for City of Philomath, Oregon by SRI/Shapiro, Inc., August 1996 (Draft).

- Mill Site Conversion Project, Conceptual Development Plan for Willamette Industries Mill Site, for Rural Development Initiatives, Inc. by KCM, Inc., November 1995.

- Topographic Aerial Maps, City of Philomath, Oregon. Panels 332/1256, 332/1259 & 330/1259, April 1989, 330/1256, April 1975.

- Flood Insurance Study, City of Philomath, Benton County, Oregon, by Federal Emergency Management Agency, December 1981.

- Flood Insurance Study, Benton County, Oregon, Unincorporated Areas, by Federal Emergency Management Agency, August 1986.

- Philomath Comprehensive Plan. Adopted March 30, 1983.

- Soil Survey of Benton County Area, Oregon, by USDA Soil Conservation Service, July 1987.

- Geologic Hazards of Eastern Benton County, Oregon, by State of Oregon Department of Geology and Mineral Industries, 1979.

- Precipitation-Frequency Atlas of the Western United States (NOAA Atlas 2), Volume X- Oregon, by US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.

## 1.4. Scope of Study

The scope of the Wastewater Facilities Plan is intended to comply with the applicable requirements of DEQ and the City. Study area characteristics were identified and included both physical and socioeconomic conditions. Existing population and land use were examined and projected into the future.

The existing wastewater system was investigated. Data was collected on the existing wastewater collection and treatment systems from operating records, conversations with City staff, on-site investigations, maps, as-built records, and other pertinent documentation. Existing facilities were evaluated in terms of location, sizing, capacity, condition, limitations, and performance. Consideration was given to the manner in which existing and proposed facilities could be used in the future as the study area develops to City zone densities.

Typical wastewater characteristics were identified in terms of loads, flows, strength and I/I allowances throughout the year. Future characteristics were projected to establish capacity requirements. Flows were addressed for both dry period and wet period conditions, and unit design values were established. Future wastewater characteristics were projected.

The basis for planning was established. Applicable regulatory requirements were identified and addressed, including current and future treatment criteria and discharge standards. The design capacity of the City's collection piping, pump stations and treatment plants was examined to determine impacts to present and future operation of wastewater facilities. Alternatives were identified for collection, treatment, and effluent disposal/reuse. Alternatives for system administration were identified and evaluated.

Nonviable options were screened out, and a limited number of selected alternatives were established and evaluated in detail. Finally, a recommended plan was identified that will enable the City to provide wastewater collection and treatment within the study area. This plan includes preliminary design data, capital improvement and operational costs, recommended staging of improvements, a project schedule, and a potential financing plan.

## 1.5. Authorization

In June of 2002, the City of Philomath authorized Westech Engineering to prepare a Wastewater Facilities Plan.

## 1.6. Wastewater Terms and Definitions

An understanding of key wastewater terms and definitions is necessary for an understanding of the discussions in this and subsequent sections. The following does not include all terms used in this report, but will provide a useful glossary for those readers not familiar with wastewater terminology. The different sewage flow classifications are defined in Section 4.

- Aerobic - Microorganisms living in the presence of free oxygen, or biological treatment processes that occur in the presence of oxygen.

- Anaerobic - Microorganisms capable of living without the presence of free oxygen, or biological treatment processes that occur in the absence of oxygen.

- Anoxic Denitrification - The process by which nitrate nitrogen is converted biologically to nitrogen gas in the absence of oxygen. This process is also known as anaerobic denitrification.

- Attached Growth Process - A biological treatment process in which the microorganisms responsible for the conversion of the organic matter or other constituents in the wastewater to gases and cell tissue are attached to some inert medium such as rocks, slag, ceramic or plastic materials. Attached growth treatment processes are also known as fixed film processes.

- Biological Treatment Processes - Treatment processes by which the stabilization and decomposition of organic material in sewage is accomplished by living microorganisms. The organic matter is used as a food source for microorganisms, and converted to forms which can either be removed from the waste stream (soluble organics) or are sufficiently stabilized to allow disposal without negatively affecting the environment (insoluble organics).

- Biological Nutrient Removal - The removal of nitrogen and/or phosphorus with biological treatment processes.

- BOD (Biochemical Oxygen Demand) - The amount of oxygen required to biologically stabilize the organic material in sewage by aerobic treatment processes. All references to BOD in this report are to 5-day BOD at 20°C ($BOD_5$).

- Biosolids - Solid and semisolid residuals resulting from wastewater treatment operations. Sludge, a biosolid, must periodically be removed from treatment systems.

- Chlorine Residual - The measured residual of chlorine used in disinfecting wastewater. Chlorine residual can exist in two forms; combined or free. The specific form is dependent on the rate of formation, which is controlled by the pH and temperature. A free chlorine residual is the most effective in achieving disinfection.

- Facultative Processes - Biological treatment processes in which the organisms can function in the presence or absence of molecular oxygen.

- Fecal Coliform - Bacteria which are used as an indicator of fecal pollution.

- Industrial Wastes - Wastes produced as a result of manufacturing or processing operations.

- Infiltration/Inflow (I/I) - Groundwater and stormwater which enters the sanitary sewer system.

  - Excessive I/I - Portion of infiltration or inflow which can be removed from the sewerage system through rehabilitation at less cost than continuing to transport or treat that portion of I/I.

  - Infiltration - Water that enters the sewage system from the surrounding soil. Common points of entry include broken pipe and defective joints in pipe and manhole walls. Although generally limited to sewers laid below the normal groundwater level, infiltration also occurs as a result of rain or irrigation water soaking into the ground and entering mains, manholes, or shallow house sewer laterals with defective joints or other faults.

  - Base Infiltration - Water that enters the sanitary sewer system from the surrounding soil during periods of low groundwater levels.

  - Rainfall Induced Infiltration - Additional infiltration which enters the sewerage system during and for several days after a period of rainfall. Rainfall often percolates into sewer ditches, especially ditches with granular backfill, and establishes a perched water table. This water then infiltrates into faulty sewers and manholes.

  - Inflow - Stormwater runoff which enters the sewerage system only during or immediately after rainfall. Points of entry may include connections with roof and area drains, storm drain connections, holes in manhole covers in flooded streets, and manhole cones located in ditch lines and that do not have watertight joints.

- Lagoon (Stabilization Pond) - A shallow basin constructed by excavating the ground and diking, for the purpose of treating raw sewage by storage under conditions that favor natural biological treatment and accompanying bacterial reduction.

- Nitrification - The biological process by which ammonia nitrogen is converted first to nitrite, then to nitrate.

- Denitrification - The biological process by which nitrate is converted to nitrogen and other gaseous end products.

- NPDES - National Pollutant Discharge Elimination System.

- pH - The degree of acidity or alkalinity of waste water, 7.0 being neutral, a lower number being acidic, and a higher number being basic.

- Sanitary Sewage - Waterborne wastes principally derived from the sanitary conveniences of residences, business establishments, and institutions.

- Suspended Growth Process - A biological treatment process in which the microorganisms responsible for the conversion of the organic matter or other constituents in the wastewater to gases and cell tissue are maintained in suspension within the liquid.

- TSS (Total Suspended Solids) - All of the solids in sewage that can be removed by settling or filtration. The quantity of TSS removed during treatment impacts the sizing of sludge handling and disposal processes, as well as the effectiveness of disinfection.

- Wastewater - The total fluid flow in a sewerage system. Wastewater may include sanitary sewage, industrial wastes, and infiltration and inflow (I&I).

Section 2

# Study Area & Planning Considerations

# SECTION 2
# STUDY AREA & PLANNING CONSIDERATIONS

## 2.1. Study Area

Philomath is situated north of the Marys River near the center of Benton County. The City is located on Highway 20/34 approximately five miles west of Corvallis. The Corvallis-Newport Highway 20/34 bisects Philomath east to west and provides the major road transportation into and through the City. Within the City, highway 20/34 is designated as Main Street. Other major roads include Green Road and West Hills Road entering the City from the north, and Fern Road and Bellfountain Road entering the City from the south. The Union Pacific Railroad (formerly Southern Pacific Railroad Co.) also has a rail line passing through the City.

The City's Comprehensive Plan was developed in 1983 and updated in 2003. The Comprehensive plan established a large urban growth boundary (UGB) which encompasses 2,560 acres, approximately 1,753 of which are outside the present City Limits. Eventually the entire area will be part of Philomath and will be served by the City's utility systems.

This report is based on the assumption that there will be no significant changes to the Urban Growth Boundary or zoning. The planning area of this report is limited to the land within the present UGB of the City. The improvements recommended in this plan are based on development of land within the UGB in its present location, as well as the existing land use zoning for these areas. It is assumed that no significant development will occur within the study area that will require major changes to the existing zoning, and that there will be no significant expansions of the UGB within the study period. Changes in any of these assumptions could change the recommendations contained in this facilities plan. Should significant changes in any of the above occur, the facilities and master plan should be updated accordingly.

## 2.2. Physical Environment

### 2.2.1 Climate and Rainfall Patterns

The study area is located in the Willamette Valley along the eastern foothill of the coast range. The climate in Philomath is relatively mild throughout the year, characterized by cool, wet winters and warm, dry summers. Growing seasons in the Willamette Valley are long, and moisture is abundant during most of the year (although summer irrigation is common).

The study area has a predominant winter rainfall climate. Typical distribution of precipitation includes about 50 percent of the annual total from December through

February, lesser amounts in the spring and fall, and very little during summer. Rainfall tends to vary inversely with temperatures -- the cooler months are the wettest, the warm summer months the driest.

Extreme temperatures in the study area are rare. Days with maximum temperature above 90°F occur only 5-15 times per year on average, and below 0°F temperatures occur only about once every 25 years. Mean high temperatures range from the low 80s in the summer to about 40°F in the coldest months, while average lows are generally in the low 50s in summer and low 30s in winter.

Although snow falls nearly every year, amounts are generally quite low. Willamette Valley floor locations average 5-10 inches per year, mostly during December through February. High winds occur several times per year in association with major weather systems.

Relative humidity is highest during early morning hours, and is generally 80-100 percent throughout the year. During the afternoon, humidities are generally lowest, ranging from 70-80 percent during January to 30-50 percent during summer. Annual evaporation is about 35 inches, mostly occurring during the period April through October.

Winters are likely to be cloudy. Average cloud cover during the coldest months exceeds 80 percent, with an average of about 26 cloudy days in January (in addition to 3 partly cloudy and 2 clear days). During summer, however, sunshine is much more abundant, with average cloud cover less than 40 percent; more than half of the days in July are clear.

There are extensive weather records for Hyslop Field between Corvallis and Albany. While the data from this weather station is not specifically for the City of Philomath, these values are generally believed to be representative for the immediate area around Philomath. Although there may be daily and weekly variations, the annual average climate is approximately the same. The climate data from Hyslop Field is used throughout the remainder of this document.

The study area receives an average of approximately 43.5 inches of precipitation annually, with the majority of the rainfall occurring during the winter months. The wettest year (since 1910) was 1996 when approximately 73 inches of rainfall was measured. The second wettest year was 1998, with approximately 60 inches of rainfall. Approximately 78% percent of the annual precipitation occurs between November 1 and April 30.

Based on the isopluvials of 24-hour precipitation from the NOAA Atlas 2, Volume X (Oregon), Figure 26, the 5-year 24-hour rainfall for the study area is approximately 3.8 inches. The other two rainfall statistics applicable to the facilities plan are the monthly precipitation amount from May with a 10% probability of exceedence

(3.49") and the monthly precipitation amount for January with an 20% probability of exceedence (11.01").

### 2.2.2 Topography

Philomath is located on the western edge of the Willamette Valley, near the point the where Marys River leaves the Coast Range. The City center is located on the second bench north of the Marys River. The natural surface drainage across the study area flows to the south, and the existing storm drainage system intercepts and routes flow into the Marys River.

The topography within the study area ranges from relatively flat south of Main Street and along Newton Creek, to steeper slopes and hills to the north, east and west of the City. Generally, the topography is gently sloping and undulating. Slopes over most of the area are between 0 and 3 percent. The northwest part of Philomath has steeper slopes ranging to 14 percent. The elevation within the study area ranges from approximately 260 feet along the Marys River to a high point of 450 feet at the northwestern corner of the UGB.

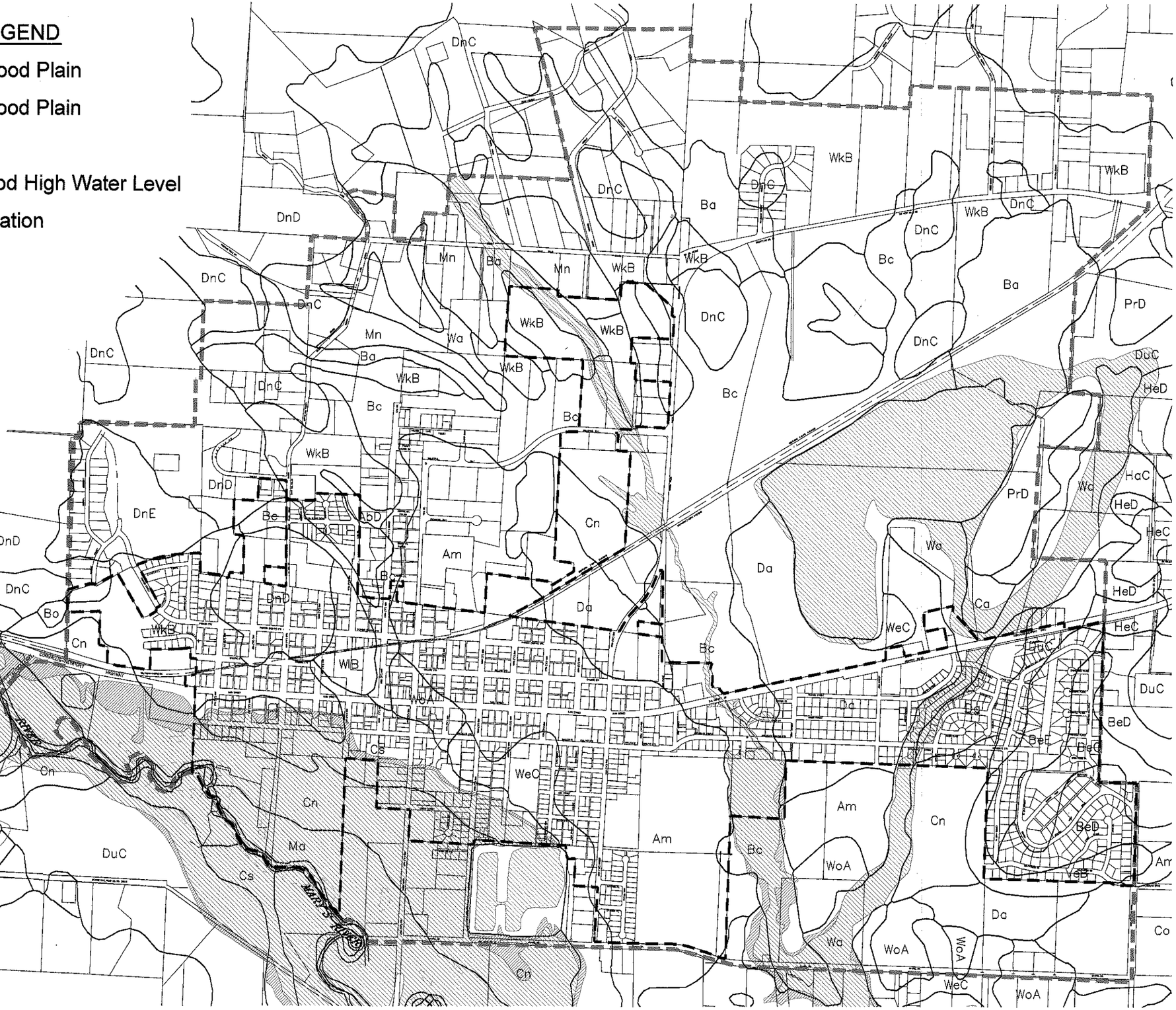
### 2.2.3 Soils

The 1985 Sewer Systems Facilities Plan and the 1996 Local Wetlands Inventory contain detailed discussions of the soils and geology within the UGB. These discussions on soil types are based from reports and maps prepared by the Soil Conservation Service (now the Natural Resource Conservation Service) showing the approximate locations of the Benton County soil types. The soil types found in the study area are shown in **Figure 2-1**. The reader is referred to the Benton County Soil Survey for detailed definitions and descriptions of the individual soil designations shown in **Figure 2-1**.

Although a detailed analysis of the soils and geology is outside the scope of this report, one soil characteristic evaluated by the Soil Conservation Service and these later reports was the surface drainage capacity. Two the five major soil associations within the study area possess poor surface drainage characteristics. These soils occur in much of the eastern part of Philomath, (between and on either side of both channels of Newton Creek) and along Hwy 20. Although poorly drained soils occur in a significant portion of the City within the planning area, including most of the industrial zoned areas, the undeveloped areas north of the City generally consist of moderately well drained soils. The importance of this to this report is to emphasize that the soil infiltration capacity within the developable portions of the study area is limited at best, particularly during the late winter months after the ground has become saturated. These poor drainage characteristics result in high groundwater tables and form the basis for the I/I values used in this study and in the City's adopted design standards.

## FLOOD & SOIL LEGEND

- FEMA 100 Year Flood Plain
- FEMA 500 Year Flood Plain
- February 1996 Flood High Water Level
- XyZ — Soil Survey Designation
- CITY LIMITS
- URBAN GROWTH BOUNDARY

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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

# SOILS, FLOODWAY & FLOODPLAIN

FIGURE
2-1

JOB NUMBER
960.3130.0

### 2.2.4 Geologic Hazards

Known geologic hazards within the study area include steep slopes, high seasonal groundwater, flooding, and seismic concerns.

#### 2.2.4.1 Steep/Unstable Slopes.

The only areas of potential slope stability concerns within the study area are on Neabeack Hill in the southeast corner of town. Steep slopes can have the potential for either mass movement or slope erosion. Mass movement results from shifting of rock or soil material in response to gravity, such as landslides and rock slides. These mass movements are often precipitated or aggravated by excessive groundwater. Slope erosion is the removal of soils or rock that occurs as a result of sheet flow, resulting in surface erosion or gully erosion. This is primarily caused by private land use practices (mainly land clearing and road construction) that can exacerbate slope erosion.

The 1979 "Engineering Hazard Map of the Corvallis Quadrangle" identifies no steep slope or mass movement hazards within the study area. However, the geologic hazard maps generally do not identify these types of hazards for areas less than 5 to 10 acres. Therefore, although this area shows no signs of recent movement, it is considered a geologically sensitive area for siting critical facilities, such as pump stations or treatment plants.

#### 2.2.4.2 High Groundwater.

As previously discussed, seasonal high groundwater is a common occurrence within the study area, and is a primary cause for the observed high levels of infiltration and inflow. The high groundwater problems are caused primarily by perched water tables due to soil saturation and lack of local drainage.

#### 2.2.4.3 Flooding.

The Marys River is the primary stream within the study area, with Newton Creek being the only major tributary within the study area. The Marys River extends approximately 40 miles from its confluence with the Willamette River to its headwaters northwest of Philomath. Newton Creek, the only major tributary in the study area, enters the Marys River at river mile 10.0. The Marys River has a streamflow pattern similar to other Willamette Valley streams. It is typified by high flows during the winter and low flows during the summer months.

The Federal Emergency Management Agency (FEMA) has established a 100-year floodplain designation and insurance ratings for the study area. While sometimes referred to as the "100 year flood", it is more accurate to consider

it the flood having a 1 percent chance of occurrence in any year, or a 10 percent chance of occurrence during any 10 year period.
During a 100-year flood (as defined by the Federal Emergency Management Association, FEMA), the Marys River and Newton Creek rise out of their normal channels creating a large floodplain. The limits of the 100 and 500 year floodplains as well as the high-water level observed during the February 1996 flood are shown previously on **Figure 2-1**. Flood profiles and maps for those portions of the Marys River adjacent to the study area are included in the Flood Insurance Study prepared for the City of Philomath as follows.

- Inside City Limits
  - Floodway panel 410011-0001, June 15, 1982.
  - FIRM panel 410011-0001 B, June 15, 1982.

- Outside City Limits
  - Floodway panel 410008-0067 (panel 67 of 250), August 5, 1986.
  - Floodway panel 410008-0090 (panel 90 of 250), August 5, 1986.
  - FIRM panel 410008-0067C (panel 67 of 250), August 5, 1986.
  - FIRM panel 410008-0086C (panel 86 of 250), August 5, 1986.
  - FIRM panel 410008-0090C (panel 90 of 250), August 5, 1986.

It should be noted that the Floodplain and Floodway boundaries shown on the FEMA flood maps and the maps enclosed in this report are based on flood elevations, and as such the actual boundaries may vary slightly from the location shown. Final determinations of whether property is within the floodway or floodplain must be determined based on a topographic survey of the property in question.

#### 2.2.4.4 Seismic.

Based on the current building code (Oregon Structural Specialty Code), the study area is classified as Seismic Zone 3 for purposes of structural design. If the wastewater alternative selected by the City includes the construction of buildings or other significant structures, a detailed geotechnical report will be required prior to design. Therefore, a more detailed review of local geology and faulting, as well as seismic and settlement considerations specific to the site selected, will be deferred until the predesign report.

#### 2.2.4.5 Stream Erosion

As is common with most valley bottom streams, the Marys River chanel is continuously eroding and depositing bank material. This is especially prevalent on the outer bends of the river where undercutting and caving of the banks is common within the study area. The potential for streambank erosion is an important design issue that must be carefully considered for facilities sited near the Marys River.

### 2.2.5 Public Health Hazards

Discussions with City staff have not revealed any known or documented chronic public health hazards within the study area.

### 2.2.6 Energy Production and Consumption

The proposed wastewater system will not produce any electricity or other energy sources. With regards to energy consumption, the major energy consumers in a wastewater collection and treatment system are the electric motors required to drive pumps, and other equipment. It is recommended that these components be specified as having high or premium efficiency motors, which will reduce the operating costs over the life of the project. Depending on the current programs in place with the electric utility providing service, there may be rebates available if high/premium efficiency electrical motors are specified that will tend to offset the slightly higher capital construction cost.

### 2.2.7 Water Resources

There are two classes of water resources within the study area, namely surface water and ground water.

#### 2.2.7.1 Surface Water.

Surface water includes all drainage channels that convey storm and surface runoff, up to and including the Marys River. Surface water quality protection is subject to extensive regulation by the State of Oregon. Water quality regulations related to the treatment and disposal of wastewater are summarized in **Section 3** of this report.

#### 2.2.7.2 Groundwater.

Groundwater protection is also important from the standpoint of both natural resource protection and public health protection. The primary groundwater concern relating to wastewater collection and septic systems is the potential for contamination of drinking water wells from sewage or treated effluent. This is the basis for the minimum separation distances between wastewater facilities and groundwater wells.

### 2.2.8 Flora and Fauna

#### 2.2.8.1 Flora.

The natural vegetation within the study area has been largely replaced by rural residential or agricultural (pasture or seed grass) uses. The area is capable of supporting lowland meadows or forests but to a large extent these have been replaced. Typical native vegetation along lowland foothill areas include such

tree species as Douglas fir, Western Red Cedar, big leaf maple, Vine Maple, California black cottonwood, Pacific yew, ash, Oregon oak, and Hawthorn. Shrubs that can be found are snowberry, indian plum and western hazel. Willows and various grasses are also found in this habitat.

#### 2.2.8.2 Fauna.

A variety of wildlife species are found within the study area. Big game species include black-tailed deer and Roosevelt elk. Several species of birds and small animals are found in and around the study area. Included in this group are ring-necked pheasant, turkeys, grouse, quail, waterfowl, doves, pigeons, and several varieties of song birds.

Forest Cover and riparian areas provide the habitat necessary for most big-game, bird, and small animal species. The agricultural areas within the study area provide feeding and cover for a variety of waterfowl and song birds.

The Marys river and many of its tributaries are important habitat for a variety of fish. Common fish species found include large mouth bass, rainbow trout, coastal cutthroat trout, dace and sculpin as well as anadromous salmonids, including coho salmon, chinook salmon and steelhead.

### 2.2.9 Air Quality and Noise

#### 2.2.9.1 Air Quality.

The existing air quality in the study area is generally good. Agricultural, slash and field burning can be significant intermittent air pollution sources, primarily during July and August. During cold periods with stagnant air, residential wood heating may impact local air quality. There are no known air quality monitoring stations located within the study area.

#### 2.2.9.2 Noise.

There are no significant generators or sources of noise in the Philomath study area. Noise levels are low and do not exceed DEQ standards. Noise sources within the study area are largely limited to vehicular traffic. None of the alternatives evaluated herein are expected to generate significant noise.

### 2.2.10 Environmentally Sensitive Areas

#### 2.2.10.1 Riparian Zone.

Riparian zones include the riparian zone adjacent to the Marys River, as well as incidental riparian zones that are a part of the intermittent drainage channels found throughout the study area. Riparian zones are considered

sensitive due to the variety of vegetative and wildlife species that utilize these areas as habitat. Riparian zones provide erosion control, drainage and runoff water quality management, wildlife habitat, and shading for surface waters.

### 2.2.10.2 Wetlands.

Wetlands are considered to be one of the most biologically productive components of the environment. Their functions and value include primary production, fish and wildlife habitat, flood control, water quality improvement and erosion control and point of entry for groundwater recharge. Detailed wetland surveys or delineations are not included in the scope of this Facilities Plan. However, a cursory overview of previous wetland surveys and related information is presented below.

The methodology for determining wetland areas is based on the Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987), used by the U.S. Army Corps of Engineers and the Oregon Division of State Lands (DSL). The regulatory definition of wetlands in the 1987 Manual requires that, under normal circumstances, positive indicators of wetland hydrology, hydric soil, and hydrophytic vegetation be present. Wetlands are defined as areas that are inundated or saturated by surface or ground 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. Wetlands generally include swamps, marshes, bogs, and similar areas, but also include seasonal wet meadows, farmed wetlands and other areas that may not appear "wet" all the time. Wetland determinations consist of documenting three criteria: hydrophytic (water-tolerant) vegetation, hydric (wet) soils, and wetland hydrology.

The Oregon Division of State Lands (DSL) is responsible for developing and maintaining the Statewide Wetlands Inventory (SWI). The inventory consists of two types of inventories - the National Wetlands Inventory (NWI) developed by the U.S. Fish and Wildlife Service and Local Wetlands Inventories (LWI) developed by cities according to standards set by the DSL.

The National Wetlands Inventory (NWI) was developed by the U.S. Fish and Wildlife Service (FWS) and is available statewide. Wetlands and deepwater habitats (streams, lakes, estuaries, etc.) are mapped on a USGS quad map base; most are at a scale of 1:24,000. Only those wetlands and other waters that are visible on high altitude aerial photographs are mapped, and most maps date to the mid-1980s. There are 1,865 maps for Oregon. These maps are available from the Oregon Division of State Lands (DSL).

The relevant National Wetlands Inventory Map for the study area is the Corvallis Quadrangle. This map includes the area south of the Marys River where the treatment plant is located. A copy of this map is included in

**Appendix G**. These maps show jurisdictional wetlands along and within the study area that had been identified as of that date, including along stream corridors and drainage channels.

Local Wetlands Inventories (LWIs) are comprehensive maps and information about wetlands throughout a city. They supplement the National Wetlands Inventory in urban areas. In 1990, DSL adopted guidelines and rules for conducting LWIs within urban growth boundaries. The LWI rules were updated in February 2001. LWIs are conducted by wetlands consultants for cities completing wetlands planning under Statewide Goals 5 (Natural Resources) or 17 (Coastal Shorelands). The City of Philomath completed a LWI in 1996. The LWI is shown in **Figure 2-2**.

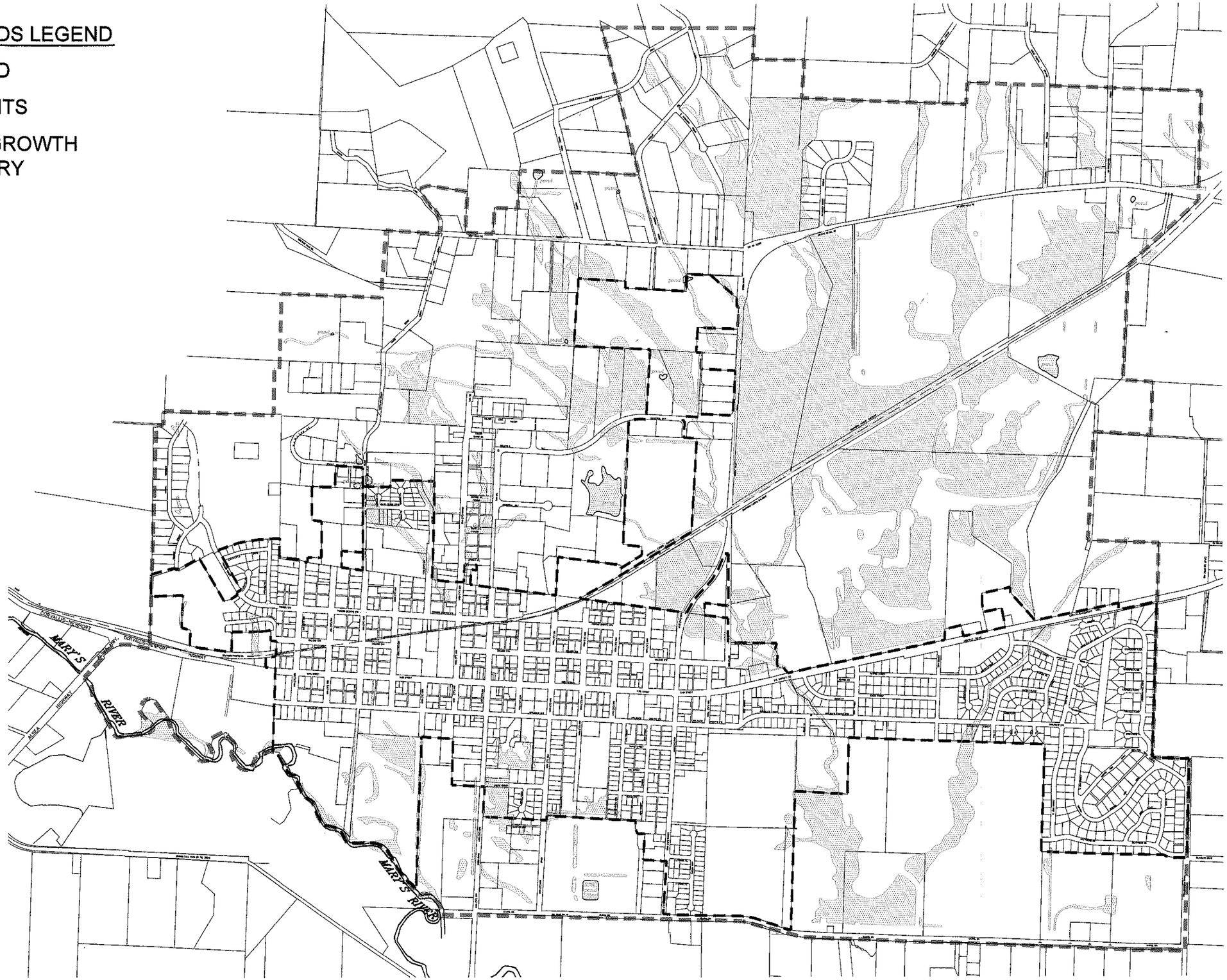
Wetlands affect the facilities planning effort in two ways. First, wetlands decrease the developable land within the UGB. This decreases the density of development at buildout conditions. The second impact involves the construction of sanitary sewer facilities in wetland areas. Construction work that impacts wetland areas is subject to additional permit requirements, and can be prohibited by the magnitude and nature of the impacts.

As discussed in **Section 6**, the projected collection system needs are based on estimate of wastewater flows associated with the complete development of land within the UGB. Clearly, as can be seen in **Figure 2-2**, much of the land within the UGB is wetland. Therefore, not all of the land within the UGB can be developed at the zoned densities. Current regulations allow for the development of wetland areas under the condition that developers undertake approved compensatory mitigation efforts. Therefore, wetland areas are not precluded from development outright. Nonetheless, current regulations are designed to preserve and enhance existing wetlands. As such, the complete development of wetland areas within the UGB will very likely never be realized. The projected wastewater flows throughout the study area at buildout conditions are based on the assumption that 50% of the wetland areas will ultimately be developed.

Of the improvements recommended herein, only the treatment plant expansion is likely to be affected by wetlands. The recommended alternative includes the construction of a new lagoon cell on the west side of the existing lagoons at the wastewater treatment plant. There are a few isolated wetland areas shown on the NWI map in the vicinity of the proposed lagoon. However, it appears that the lagoon can be cited to avoid these areas. As such, wetlands do not appear to pose a problem for the construction of the recommended improvements. Nonetheless, the site selection process should include a detailed wetland inventory and delineation of prospective sites. This work should precede the formal predesign effort for the proposed improvements.

## WETLANDS LEGEND

- WETLAND
- CITY LIMITS
- URBAN GROWTH BOUNDARY

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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

# LOCAL WETLANDS INVENTORY

FIGURE
2-2

JOB NUMBER
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### 2.2.10.3 Historical and Archaeological Sites.

Incorporated in 1882, Philomath has a rich history as one of the early settlements in the Willamette Valley. Several buildings and structures throughout town are included on the National Register of Historic Places. The selected alternative will likely not have any impact on these historical sites.

The mid Willamette valley was inhabited with the Calapooia people when the first western settlers arrived in the mid 1840's. It is also likely that prehistoric people inhabited the study area at one time. Remains of these cultures will likely be located adjacent to the Marys River. Therefore, a archaeological assessment may be required during the predesign phase, especially in areas adjacent to the river.

## 2.2.11 Threatened or Endangered Species.

A comprehensive inventory for threatened or endangered species in the study area has not been completed. Significant discussion and interest in anadromous salmonids exists in the Willamette Basin including the Marys River. The National Marine Fisheries Service (NMFS) is responsible for evaluating the "health" of different species and individual runs under the terms of the Endangered Species Act (ESA). The NMFS has defined the Upper Willamette Evolutionarily Significant Unit (ESU) as the Willamette basin upstream of Willamette Falls (Oregon City). This unit includes the Marys River.

On March 24, 1999, the NMFS listed as threatened all naturally spawned populations of spring chinook salmon in the Upper Willamette ESU. This listing impacts that reach of the Marys River adjacent to the study area which has been classified by the Oregon Department of Fish and Wildlife (ODFW) as providing rearing and migration habitat for spring chinook.

On March 25, 1999, the NMFS listed as threatened all naturally spawned populations of winter run steelhead in the Upper Willamette ESU. This listing also impacts that reach of the Marys River adjacent to the study area which has been classified by the ODFW as providing rearing and migration habitat for winter steelhead.

The NMFS issued the proposed 4(d) rules in December 1999 and the final rules in June 2000. The 4(d) rules are the mechanism under the ESA for protecting threatened as opposed to endangered species. A copy of the plain language Citizen's Guide to the 4(d) Rule for Threatened Salmon and Steelhead on the West Coast is included in **Appendix F**.

How the listings of steelhead and salmon will impact projects, including public wastewater projects, is not fully known at this time. A general consensus is that work that impacts riparian vegetation or work within the stream channels proper will come

under increasing scrutiny. To the extent feasible, alternatives that either do not impact or minimize impacts to riparian zones should be considered.

No other threatened or endangered species are known to reside in the study area. However, a biological inventory has not been completed. If the actual alternative constructed differs from the proposed alternative and results in construction at land sites not considered under this report, it will be necessary to perform both historical/archaeological and biological surveys to assure that impacts to threatened or endangered species do not occur.

## 2.3. Socio-Economic Environment

Growth within the study area will depend on socio-economic conditions within the City of Philomath. The following section contains a general discussion of economic conditions, trends, population, land use, and public facilities relating to both the study area and the City of Philomath.

### 2.3.1 Economic Conditions and Trends

Population growth and the resultant wastewater flows within the study area are linked to the economic conditions and trends of the City of Philomath and the greater Corvallis-Philomath metropolitan area. Growth in the City of Corvallis has to some extent met resistance from local residents. This has displaced some of the growth that may have occurred in Corvallis to Philomath. Philomath is an attractive town with a rural atmosphere that offers more affordable housing options than Corvallis. Philomath is to some extent evolving into a bedroom community for persons employed in Corvallis. With little significant industrial or commercial growth expected in the near future, this characterization is likely to remain valid throughout the planning period.

Philomath has experienced rapid levels of development during the past decade. This rapid level of development is anticipated to continue for the immediate future. Currently, the City believes most of the future development will occur in the northwest portion of town. The City is currently aware of plans for an 80 lot subdivision, a 30 lot subdivision, and a 50-60 lot subdivision in the northwest portion of town.

### 2.3.2 Historical Population & Growth Projections

#### 2.3.2.1 Historic Population.

Population histories provide a tool for determining the future growth of the wastewater system. Much of the challenge in projecting wastewater flows and loading within the study area relates to the difficulty in accurately tracking or projecting actual populations. **Figure 2-3** shows the population trends for the City of Philomath from 1940 to the present.

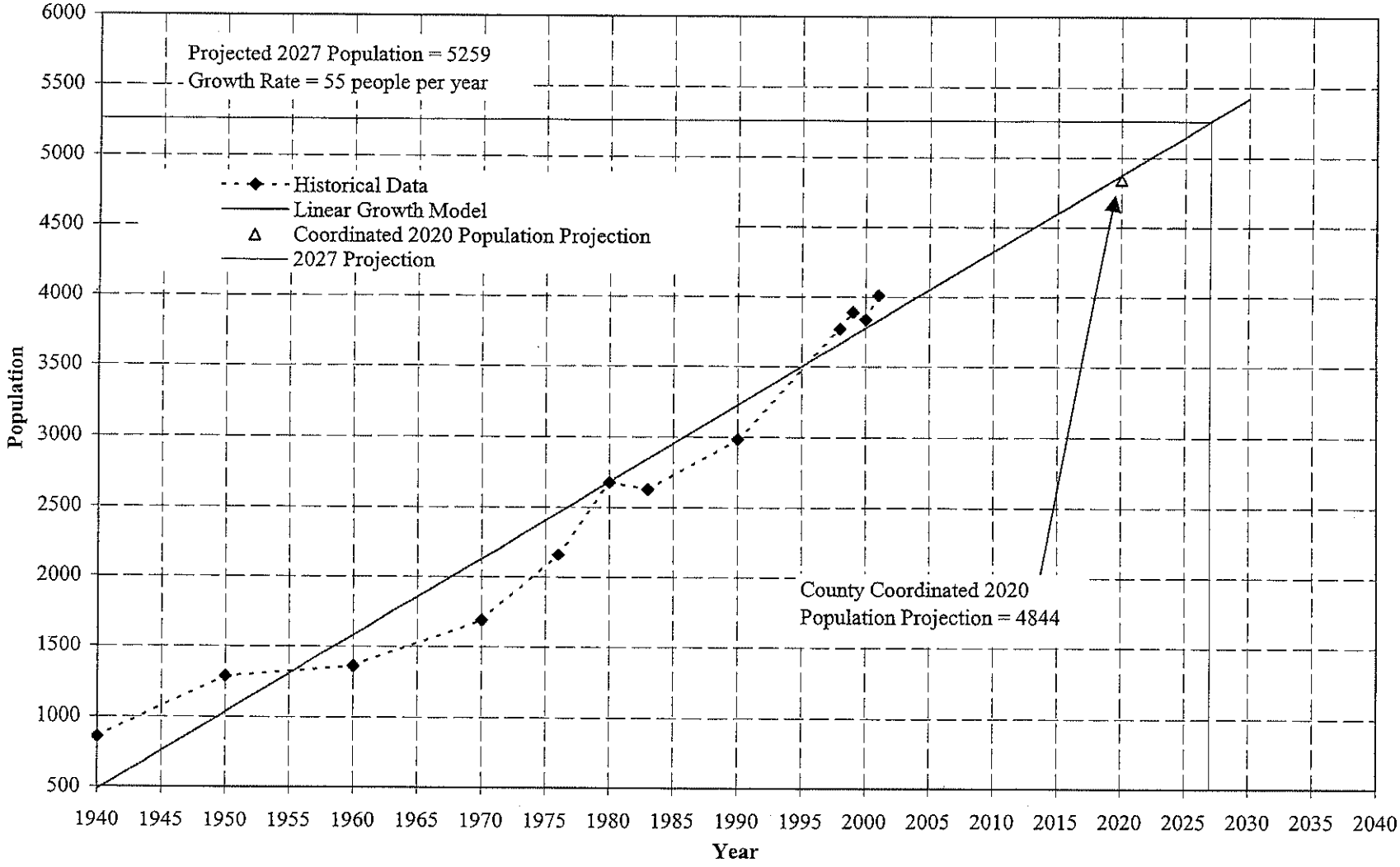
The population in Philomath has steadily increased from approximately 850 people in 1940 to over 4,000 people in 2002. The rate of growth has also increased as evidenced by the increasing slope of the line in **Figure 2-3**. Growth was particularly rapid during the 1970's when the residential areas east of Newton Creek were developed. During the 1960's and 1970's the lumber and logging businesses thrived, jobs were relatively plentiful in and around Philomath, and residential growth boomed. Another rapid growth spurt occurred in the 1990's when the area around Neabeack Hill was developed. The current population of Philomath is approximately 4,100 people.

#### 2.3.2.2 Future Population.

In the review of Facilities Plans, the DEQ relies on the County population allocations as the 'coordinated number' for evaluating population projections. This number has been agreed to by the Department of Land Conservation and Development (DLCD), the Office of the State Economist, and Benton County and is based on documented population trends. DEQ has indicated that the City is obligated under ORS 195.036 to conform to the County population allocation in order for the Department to approve the Facilities Plan. Therefore, the Benton County population projections for Philomath will be used for facilities planning purposes through the year 2020.

In 1998 Benton County made population projections through 2020. The 2020 population allocation for Philomath was projected at 4,844. As described below, the planning period for wastewater treatment facilities is 20 years from the completion of the facilities. Based on past experience, the treatment plant improvements recommended in this plan will likely not be completed until approximately 2007. Therefore, the current planning period will end 20 years later in the year 2027. As such, population projections must be extended to 2027.

**Figure 2-3**
**Philomath Population Projections**



In order to project to the year 2027, a linear growth model was fit to a historical population data set. The model parameters were determined using a least squares regression method. These parameters were used to project the population out to year 2027. The linear growth model is shown in **Figure 2-3**. As shown in **Figure 2-3**, the populations passes through the county coordinated population projection for the year 2020. Based on this growth model the projected population for 2027 is 5260.

#### 2.3.2.3 Anticipated Future Development.

Even with the loss of a substantial portion of the lumber industry, Philomath is likely to experience modest growth as a suburb of Corvallis. Corvallis is not only the home of Oregon State University but also is developing into a center for high technology businesses. Both the university and the growing high technology businesses offer new employment opportunities, and spin-off businesses may choose to locate in Philomath. With large tracts of industrial land available, Philomath seems poised to attract some of the spin-off high tech businesses.

As previously described, the City is currently aware of three subdivision projects that may create up to 170 new homes within the study area. These subdivisions are located in the northwest portion of town. During the planning period, the City anticipates future development to continue to be focused in this area.

## 2.4. Land Use Regulations

### 2.4.1 Comprehensive Plan

All of the land within the planning area is within the Philomath UGB. The City's Comprehensive Plan was adopted in 1983 and has been revised in 1990, 1993, and most recently in 2003.

### 2.4.2 Land Use Zoning

The planning area is made up of land in two general categories, namely land inside of City limits and land outside of the City limits but inside of the Urban Growth Boundary.

Land use zoning in the City of Philomath is comprised primarily of residential uses, although the Comprehensive Plan sets aside large areas for industrial development (approximately 800 acres), of which about 500 acres is presently undeveloped. Lesser amounts of land are designated for commercial, office, and public/open space uses.

The location of the UGB, City limits and land use zoning designations within the City of Philomath are shown in **Figure 2-4**.

The total areas contained under each zoning designation are listed in **Table 2-1**.

**TABLE 2-1**
**Approximate Areas By Land Use Zone**

| Land Use Category | Area (Acres) |
|---|---|
| Low Density Residential (R1) | 1,094 |
| Medium Density Residential (R2) | 228 |
| High Density Residential (R3) | 80 |
| Commercial (C) | 108 |
| Light Industrial (LI) | 124 |
| Heavy Industrial (HI) | 142 |
| Industrial Park (IP) | 628 |
| Public (P) | 154 |
| **TOTAL** | ± 2,558 |

a. Land Use within City Limits

The majority of the land within the City Limits is currently developed or partially developed. Much of the ongoing and anticipated development within the City is occurring outside the City Limits under deferred or delayed annexation agreements.

b. Land Use outside City Limits but within UGB

The majority of the land inside the UGB but outside the City Limits is undeveloped or underdeveloped. Of the undeveloped land inside the planning area and outside the City Limits, about 35 to 40% appears to be zoned for industrial use and the remainder for residential use. The majority of the industrial zoned land is either undeveloped or being utilized at less than the anticipated zone intensity.

## 2.5. Planning Period

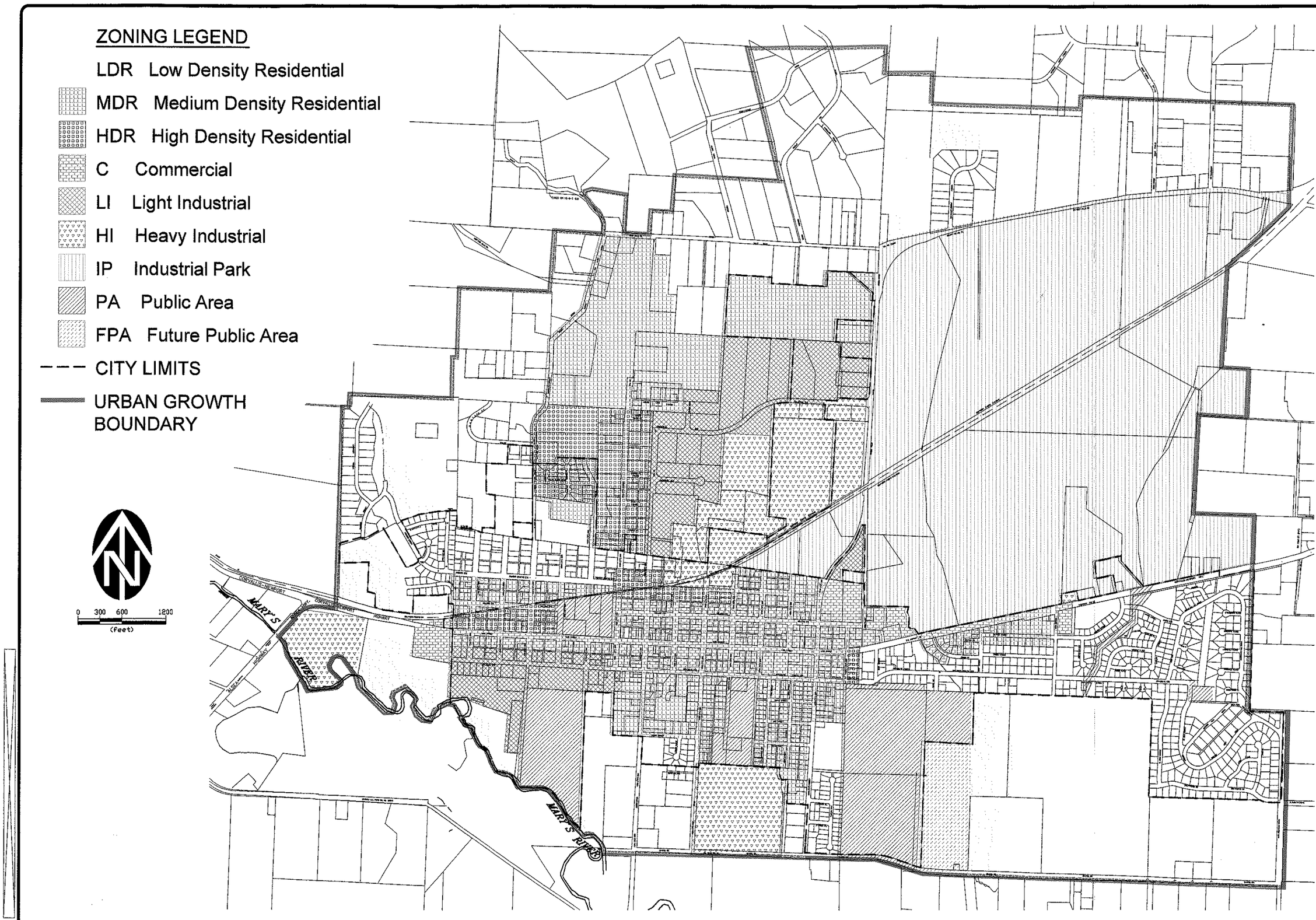
Choosing a "reasonable" design period for which a utility system should be designed is a somewhat arbitrary decision. If the design period is too short, the public faces the prospect of demands exceeding capacity, requiring the system to be continually upgraded or replaced. For systems that do not lend themselves to economical incremental expansion, short design periods lead to excess expenditures of capital. Sewage collection and treatment facilities fall into this category, including collector and trunk sewers, for which DEQ suggests a design period of 30-50 years.

On the other hand, choosing a design period which is too long can lead to facilities with excess capacity which may never be needed if population growth does not occur at the

projected rates. Such facilities can place an economic burden upon the present population and may become obsolete before being fully used.

The Department of Environmental Quality (DEQ) has established 20 years as being the proper planning period for sanitary sewer system improvements. This report will evaluate the anticipated sewage collection, pumping, treatment and disposal needs during the 20 year planning period. The collection system piping will be planned for the ultimate development of land within the UGB based on current land use designations. Although this may result in capacities greater than those needed during the 20-year planning period, sewage collection lines are, by their very nature, unsuited for incremental expansion without extensive capital outlays. The planning period for proposed wastewater treatment systems will be 20 years from the projected completion of the improvements.

It should be recognized that projections into the future are subject to many variables and inaccuracies. Accordingly, it is recommended that the sewer system capabilities and needs be reviewed at five-year intervals and this report updated as appropriate.

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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

ZONING MAP

FIGURE
2-4

JOB NUMBER
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Section 3

# Regulatory Requirements & Basis of Planning

# SECTION 3
# REGULATORY REQUIREMENTS & BASIS OF PLANNING

## 3.1. Regulating Agencies

The U.S. Environmental Protection Agency (EPA) regulates disposal and/or reuse of sewage sludge and septage, as well as the discharge of wastewater effluent, whether to surface waters or subsurface disposal. The basis of the regulations imposed or overseen by the EPA is the Federal Water Pollution Control Act of 1972 (Public Law 92-500) often referred to as the Clean Water Act (CWA). The scope of the Clean Water Act has been revised and expanded over the subsequent years. The EPA promulgates regulations to implement the requirements of the CWA and subsequent legislation, and is required to coordinate its requirements with other federal agencies, such as the National Oceanic and Atmospheric Administration, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service and with state agencies such as the Department of Environmental Quality (DEQ), the Department of Fisheries, and the Department of Health.

In Oregon, the lead agency in the regulation of sanitary sewerage systems is the Department of Environmental Quality (DEQ). Compliance with state water quality standards is a high priority to the DEQ in terms of how wastewater treatment facilities are regulated. For the sake of clarity, wastewater regulations are often broken into two major categories as follows:

- Wastewater Collection and Pumping
- Wastewater Treatment & Disposal

The following is a brief summary of the regulatory requirements and standards that form the basis of the facility planning effort. The requirements for the collection and pumping systems are summarized first, followed by a discussion of issues relating to the wastewater treatment.

In addition to the wastewater regulations outlined above, any work within the floodplain of the Marys River or wetlands is also under the jurisdiction of the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers.

## 3.2. Basis for Design of Wastewater Collection and Pumping Systems

### 3.2.1 Regulatory Requirements

For the sake of discussion and clarity, the requirements governing gravity wastewater collection and pumping systems are considered separately.

#### 3.2.1.1 Collection Piping

The requirements and regulations covering the design and sizing of the collection piping portion of the wastewater conveyance system include both City design standards and DEQ guidelines. The City has Public Works Design Standards that apply to all public sewer improvements within existing and proposed public right-of-way and public utility easements, as well as to all improvements to be maintained by the City. This includes both gravity collection piping and pump stations.

The City design criteria dictates that the collection system piping must be designed to convey all flows projected at the ultimate development of land within the tributary area based on current land use designations. Although this may result in capacities greater than those needed during the 20-year planning period, sewage collection lines are, by their very nature, unsuited for incremental expansion without extensive capital outlays. Under DEQ guidelines, there is one allowable exception to this requirement as it relates to large diameter trunk sewers serving tributary areas that are not expected to develop for 30 or more years. However, none of the proposed new gravity sewers within the study area fall under this category.

The City Public Works Design Standards and associated details implement and clarify current DEQ standards as contained in OAR 340-52, Appendix A and DEQ design guidelines. **Table 3-1** summarizes the minimum allowable slope based on mainline pipe sizes.

**TABLE 3-1**
**Minimum Mainline Pipe Slopes**

| Inside Pipe Diameter (inches) | % Slope (ft/100 ft) |
|---|---|
| 8 | 0.40 |
| 10 | 0.28 |
| 12 | 0.22 |
| 15 | 0.15 |
| 18 | 0.12 |
| 21 | 0.10 |
| 24 | 0.09 |
| 27 | 0.08 |

### 3.2.1.2 Pump Stations and Force Mains

DEQ has extensive design guidelines for public pump stations. Under the authority granted by OAR 340-52, DEQ has established requirements and guidelines for the design of public sanitary sewer pump stations. These design guidelines include OAR 340-52 Appendix B and various design memoranda issued by DEQ. DEQ has established 20-years as being the proper planning period for pump stations.

In addition to DEQ standards, the City has established a policy that all new sewer pump stations and pump station upgrades are to be standardized to the extent possible. This standardization is based on submersible pump stations with auxiliary power, as well as remote communications and control system (telemetry) conforming to the City's current system. **Table 3-2** summarizes design criteria assumed for new pump stations or the upgrades of the existing pump stations.

## TABLE 3-2
## Typical City Pump Station Minimum Design Criteria

| Category | Minimum Design Criteria |
|---|---|
| Design Flows | • 20-year peak instantaneous flow (5 yr, 24 hour storm) |
| Pump Station Structure | |
| • Wetwell Type | • Precast concrete, hatches with integral hatches/fall protection |
| • Operational Storage | • Based on pump starts or overflow storage as appropriate |
| • Valve Vault | • Precast concrete vault adjacent to wetwell |
| • Overflow | • Provide bypass in accordance with DEQ historical design requests. |
| Pumps | |
| • Pump Station Capacity | • Convey design flow with largest single unit out of service |
| • Type | • Submersible pumps |
| • Number | • 2 minimum |
| • Motor Size | • HP as required, 480 volt, 3 phase power preferred |
| • Min. Pump Cycle Time | • 6 minutes (10 starts per hour total) |
| • Pump Retrieval | • Jib crane installed on or adjacent to wetwell |
| Force Mains | |
| • Minimum Size & Material | • 4-inch, C-900 PVC, Class 52 Ductile Iron or fused HDPE |
| • Min allowable F.M. Velocity | • 3.5 fps |
| • Max allowable F.M. Velocity | • ±8 fps |
| Instrumentation & Control System | |
| • Location | • Building adjacent to pump station |
| • Control Building | • CMU block |
| • Pump Control | • Flygt Multitrode Probes, MPxPC Controller & MonitorPro as primary control, redundant pump control |
| • Pump Speed Control | • Soft starters or VFDs if required by City or utility company |
| Auxiliary Power | |
| • Type | • Permanent diesel generator w/ATS |
| • Location | • Control building adjacent to P.S. |
| • Fuel Supply | • Sub-base tank, 24 hour minimum or as required by City |
| • Silencer | • Critical grade, insulated |
| Telemetry | |
| • Type | • Match City system, programmed per City direction |
| • Alarms | • Remote alarms as required by City |
| Hydrogen Sulfide Control | |
| *Continuously Ascending Force Main* | |
| • Type | • Air Injection (compressor) |
| • Injection Rate | • 2 scfm/inch diameter of force main |
| • Control Strategy | • Continuous injection, air flow meter w/pressure gauge |
| • Injection Point | • Inside valve vault |
| • Compressor Location | • Inside control building |
| • Air Piping | • Stainless steel |
| *Ascending & Descending Force Main* | |
| • Type | • Chemical injection system |
| • Chemical Storage Volume | • 4 months min. @ Avg Annual Flows |
| • Chemical Feed Agent | • Bioxide by US Filter/Davis or equiv. |
| • Control Strategy | • On/off control tied to pump motor starters |
| • Injection Point | • Inside valve vault |
| • Storage Tank Location | • Inside control building |

## 3.3. Basis for Design of Wastewater Treatment Systems

The following sections summarize current regulations used to evaluate and develop the treatment and disposal alternatives for wastewater from the City of Philomath. The manner in which the treatment and disposal of wastewater and its byproducts is regulated is by setting minimum standards that must be met by the end product (i.e., treated effluent and biosolids). The minimum treatment standards for effluent are outlined in either a National Pollutant Discharge Elimination System (NPDES) permit for surface water discharges, or a Water Pollutant Control Facility (WPCF) permit for systems that do not directly discharge to surface water, such as land application or subsurface disposal.

For the most part, DEQ does not specify the particular treatment processes that must be used by a municipality or service district, beyond the requirement that all discharges receive the "best conventional pollution control technology." Within the general limits imposed by this requirement, the permittee is required to determine the most cost effective treatment processes which will result in effluent and biosolids which comply with the "end of pipe" quality requirements.

The criteria discussed below include general requirements for a surface (i.e., Marys River) discharge, general reuse criteria for land application of effluent, general criteria for subsurface disposal of treated effluent, EPA criteria for reliability and redundancy, and a summary of the specific requirements under the City's existing NPDES permit.

### 3.3.1 Effluent Quality

#### 3.3.1.1 Marys River Water Quality Standards (Surface Discharge)

The standards for river basins in the State of Oregon are established by the DEQ. These rules are reviewed every 3 years as a basis for setting new or modifying existing standards. Discharging treatment plant effluent to surface water (such as the Marys River) requires a National Pollutant Discharge Elimination System (NPDES) Permit from DEQ. The disposal of effluent to surface water is governed by OAR 340-41, *Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon.*

For surface water discharge, the City of Philomath is required to comply with Sections 340, 344, and 345 of OAR 340-41, which pertain to the Willamette Basin. General water quality requirements for the receiving stream, the Marys River, are as follows.

#### 3.3.1.2 Water Quality Limited Stream Standards

In addition to the general Willamette Basin Standards, the Marys River has been classified by DEQ as being "Water Quality Limited" (WQL) and is listed on the 303(d) list. Section 303(d) of the 1972 Clean Water Act requires each state to identify and list all streams, rivers, lakes and estuaries that do not meet

current water quality standards. The State of Oregon is required to submit an updated list of these "water quality limited" streams to the EPA every two years.

The portion of the Marys River that includes the City of Philomath is from the mouth at the Willamette River (RM 0) upstream to river mile 13.8 west of the City. The existing treatment plant outfall is located at river mile 10.2. Parameters of concern include temperature during the low flow summer months, Fecal Coliform bacteria during the fall, winter and spring months, and Dissolved Oxygen (DO) from October 1 to May 31 (see **Appendix B**).

Since the recommended alternative does not include a summertime discharge, the temperature listing has no impact on Philomath's wastewater treatment facilities. Similarly, since all effluent is disinfected prior to discharge to the Marys River, the Fecal Coliform bacteria listing also has no impact on Philomath's treatment facilities. Conversely, all of the alternatives evaluated herein include discharge of treated wastewater containing some low levels of oxygen demanding wastes during the winter months. Therefore, the DO listing may impact the City's treatment and disposal facilities.

As part of the Clean Water Act, total maximum daily loads (TMDL's) must be established for water bodies included on the 303(d) list. TMDL's are mass load allocations that are set by the DEQ to ensure water quality standards are met. The Marys River is included in the Upper Willamette Sub Basin. The target date for setting TMDL's in the Upper Willamette Sub Basin is 2009. At that time, the DEQ will determine if the existing mass load allocations to the City's WWTP discharge should be reduced. If the City's mass load allocations are reduced, the reductions will go into effect when the City's NPDES permit is renewed in 2012 at the earliest. If the DEQ determines during the 2012 permit renewal that a reduction in mass load allocations is necessary, and treatment plant modifications are likely to be required, a Mutual Agreement Order (MAO) may be written as appropriate. The MAO would typically allow the City the duration of the NPDES permit cycle (from 2012 to 2017) to make the needed improvements to the facilities. Therefore, the 303(d) listing for DO in the Marys River, does not directly impact the current facilities planning effort.

Since the magnitude is unknown at this time, it would be premature to evaluate specific treatment options to address a decrease in the mass load allocation. Nonetheless, all of the treatment alternatives evaluated herein, are suitable for expansion or modification as required to meet a mass load allocation reduction. In short, it is the policy of the City to proceed with the facilities planning effort based on the current mass load allocations and address any reductions if and when they occur.

### 3.3.1.3 Temperature

As outlined in OAR 340-041-0028, the purpose of the temperature criteria is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stages in waters of the State. The temperature standard is a function of the beneficial use designated for a particular receiving listed below. Several additional temperature criteria for Lahontan cutthroat and redband trout use, bull trout spawning and juvenile rearing use, Natural Lakes, Oceans and Bays, Cool Water Species, and specifically for the Borax Lake Chub are included in OAR 340-041-0028. However, discussions of these are not included below because they are not generally applicable to the City.

- For a stream designated as having salmon and steelhead spawning use, the seven-day-average maximum temperature may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated in the maps and tables set out in OAR 340-041-0101 to 340-041-0340.

- For a stream designated as having core cold water habitat use on the tables and maps set out in OAR 340-041-0101 to 340-041-0340, the seven-day-average maximum temperature may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit).

- For a stream designated as having salmon and trout rearing and migration use, on the tables and maps set out in OAR 340-041-0101 to 340-041-0340, the seven-day-average maximum temperature may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit).

- For a stream designated as having a migration corridor use on the tables and maps set out in OAR 340-041-0101 to 340-041-0340, the seven-day-average maximum temperature may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit). In addition, these water bodies must have cold water refugia that is sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body.

As set forth in OAR 340-0410-340, Figure 340A, the Marys River is designated as having salmon and trout rearing and migration use. As such, the temperature criteria requires that the seven-day-average maximum temperature may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit). Based on DEQ data, the temperature in the Marys River exceeds this criteria during summertime low flow conditions. However, as previously mentioned, the recommended alternative does not include a summertime surface water discharge. Therefore, since the discharge period does not coincide with the period during which the stream is water quality limited, the 303(d) listing for temperature has no impact on the City's treatment facilities.

#### 3.3.1.4 BOD/TSS

As outlined in OAR 340-41-345(3)(a)(A), during periods of low stream flows (approximately May 1 through October 31), current standards require that treatment result in monthly average effluent concentrations below 10/10 (mg/l BOD & mg/l TSS). During periods of high stream flows (approximately November through April), a minimum of secondary treatment, or equivalent treatment, must be provided.

The City's current NPDES permit allows discharge from the treatment plant from November 1 to April 30. Discharge to the Marys River during the months of May through October is not allowed. The permit limits allows a monthly average concentration of 30/50 (mg/l BOD & mg/l TSS) during the winter discharge period (November 1 through April 30).

#### 3.3.1.5 Dissolved Oxygen

In accordance with OAR 340-41-0016, the DO standard requires that for water bodies identified as having a salmonid spawning use on the tables and maps set out in OAR 340-041-0101 to 340-041-0340 as well as any active spawning area used by resident trout species, the following criteria apply during the applicable spawning through fry emergence periods set forth in the tables and graphs.

- The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l.

- Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels must not be less than 95 percent of saturation.

- The spatial median intergravel dissolved oxygen concentration must not fall below 8.0 mg/l.

For water bodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen my not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen may not be less than 90 percent of saturation.

For water bodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen may not be less than 6.5 mg/l as an absolute minimum.

For water bodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen may not be less than 5.5 mg/l as an absolute minimum.

#### 3.3.1.6 Turbidity

Current DEQ standards require that discharge may not increase turbidity of the stream by more than 10 percent, as measured relative to a control point immediately upstream of the turbidity causing activity (OAR 340-41-0036). The DEQ is currently in the process of updating this turbidity standard. The updated standard may impact the City. These impacts could include additional treatment processes not included herein. It is premature to plan for improvements required to address the new turbidity standard before the standard is officially adopted.

#### 3.3.1.7 pH

As outlined in OAR 340-41-345, the Willamette Basin Water Quality Standard specifies an allowed pH range of 6.5 to 8.5. The NPDES permit limits effluent pH to the range of 6.0 to 9.0. This limit is based on Federal wastewater treatment guidelines for sewage treatment facilities, and is applied to the majority of NPDES permittees in the State.

Within the mixing zone, the water quality standard for pH does not have to be met. It is the DEQ's position that mixing with ambient water within the mixing zone will ensure that the pH at the edge of the mixing zone meets the standard, and the Department considers the permit limits to be protective of the water quality standard. The DEQ standards therefore apply to the effluent discharge stream, which is easily monitored, rather than relying on in-stream criteria.

#### 3.3.1.8 Bacteria

Based on OAR 340-41-0009, the current basin standards for bacteria are a 30-day log mean of 126 *E. coli* organisms per 100 ml (based on a minimum of 5 samples), with no single sample exceeding 406 *E. coli* organisms per 100 ml.

#### 3.3.1.9 Toxic Substances

Discharge cannot raise the concentration of toxic substances outside of the regulatory mixing zone above the criteria listed in Table 20 of OAR Chapter 340, Division 41. Within the regulatory mixing zone, the chronic criteria set forth in Table 20 of OAR 340-041 must generally be met. The DEQ may further partition the regulatory mixing zone to define the zone of immediate dilution within which acute standards as set forth in Table 20 of OAR 340-041 must generally be met.

### 3.3.1.10 Mixing Zone

A mixing zone is a designated portion of receiving water that serves as a zone of dilution where wastewater and receiving waters mix thoroughly. The DEQ may suspend all or part of the water quality standards, or set less restrictive standards, within the defined mixing zone under the conditions outlined below.

DEQ typically describes the actual mixing zone limits and requirements in the NPDES discharge permit. The mixing zone is defined by DEQ on the basis of receiving water and effluent characteristics. The mixing zone limits or outfall location may be changed if DEQ determines that the water within the mixing zone adversely affects any existing beneficial uses in the receiving waters. For a particular discharge location the DEQ may establish a regulatory mixing zone (RMZ) within which chronic standards must be met. The DEQ may further partition the RMZ to define the zone of immediate dilution (ZID). The ZID represents the zone within which acute standards must be met.

a) The water within the mixing zone shall be free of:

- Materials in concentrations that will cause acute toxicity to aquatic life (bioassay testing required and approved by DEQ). Acute toxicity is lethality to aquatic life as measured by significant difference in lethal concentration between the control and 100 percent effluent in an acute bioassay test. Lethality in 100 percent effluent may be allowed due to ammonia, chlorine, and other parameters as approved by the Department only when it is demonstrated on a case-by-case basis that immediate dilution of the effluent within the mixing zone reduces toxicity below lethal concentrations.

- Materials that will settle to form objectionable deposits.

- Floating debris, oil, scum, or other materials that cause nuisance conditions.

- Substances in concentrations that produce deleterious amounts of fungal or bacterial growths.

b) The water outside the boundary of the mixing zone shall:

- Be free of materials in concentrations that will cause chronic (sub-lethal) toxicity. Chronic toxicity is measured as the concentration that causes long-term sub-lethal effects, such as significantly impaired growth or reproduction in aquatic

organisms, during a testing period based on test species life cycle.

- Meet all other water quality standards under normal annual low flow conditions.

#### 3.3.1.11 Other

OAR 340-41 also regulates the development of fungi or other growths, the creation of tastes or odors, the formation of appreciable bottom deposits, discoloration and floating solids, offensive aesthetic conditions, radioisotopes, total dissolved gas concentrations, and other extreme deleterious effects on the receiving water.

### 3.3.2 Effluent Disposal

#### 3.3.2.1 Wastewater Effluent Reuse (Land Application)

During dry weather, an alternative to direct discharge to the Marys River is to apply the treated effluent to meet irrigation demands for agricultural lands, golf courses or parks. Effluent can also be reused as reclaimed water for specific nonagricultural industrial uses such as cooling water, although the lack of any appropriate industrial user in Philomath renders this option infeasible.

Land application of treatment plant effluent for a non-discharging facility requires a Water Pollution Control Facility (WPCF) permit from DEQ, with requirements based on state water quality regulations. Reuse of effluent by land application is governed by OAR 340-55, *Regulations Pertaining to the Use of Reclaimed Water (Treated Effluent) from Sewage Treatment Plants*, and groundwater quality is governed by OAR 340-40, *Groundwater Quality Protection*.

However, requirements for less than total effluent reuse can be included in a NPDES permit. Therefore, if the City desires to implement an effluent reuse plan in the future, a separate permit will not be required. The level of treatment required for land application of effluent depends on the type of land use, the access of the site to the public, and the available buffer areas around the site. Therefore, the site must be identified before the actual treatment requirements can be determined.

The DEQ will typically not approve of a surface water discharge unless it is demonstrated that there are no feasible non-discharging alternatives.

a) Application Rates

The goal of a wastewater reuse program for agricultural use (land application) is to apply the effluent at agronomic rates. This is defined as the rate necessary to meet the crop's gross irrigation and nutrient requirements. The gross irrigation requirement is the total crop water demand adjusted to compensate for precipitation, irrigation application efficiency, and soil moisture storage. The nutrient requirement is the amount of fertilizer, (i.e., available nitrogen, phosphorus, and potassium) that is required to obtain an optimum crop yield. In wastewater effluent, the available nitrogen includes organic nitrogen, ammonia nitrogen, and nitrate-nitrite nitrogen.

Furthermore, a draft guidance document issued by DEQ entitled *Guidance for Reclaimed Water Regulations OAR 340-55* states that " in the case of agricultural use of reclaimed water, the Department will be primarily concerned with assuring that the reclaimed water is applied at rates such that it is unlikely that water will runoff from the surface of the fields, that nitrogen and other parameters are not applied at excessive rates that would significantly impact groundwater, and that the reclaimed water is not incompatible with the type of crop proposed."

b) Seasonal Limitations

There are obvious seasonal limitations to a land application system because there are varying crop water requirements throughout the year. Most of the crops grown in the Willamette Valley typically have a growing season from April through October.

c) Treatment and Monitoring Requirements

As previously noted, DEQ has established treatment and monitoring requirements for potential agricultural and nonagricultural uses of the treated effluent in OAR 340-55. DEQ has classified reclaimed water into four categories and assigned a minimum degree of treatment required:

- Level I: Less than biological treatment or biological treatment without disinfection.
- Level II: Biological treatment plus disinfection.
- Level III: Biological treatment plus disinfection (stricter coliform limit).
- Level IV: Biological treatment, clarification, coagulation, and filtration treatment plus disinfection.

Limits for total coliform bacteria and turbidity have been established for the four treatment categories. These standards serve as a general guideline for defining the anticipated water quality required for the various uses. In addition to the water quality limits, DEQ has provided standards for the minimum monitoring required for total coliform and turbidity based on the four categories. **Table 3-3** summarizes the treatment and monitoring requirements for the four reuse categories listed above. DEQ may include additional effluent limitations or permit conditions if they have reason to suspect that the treated effluent may contain physical or chemical contaminants that would impose potential hazards to public health or the environment.

The amount of effluent that can be applied will vary depending on antecedent precipitation, temperature and crop maturity.

**TABLE 3-3**
**Treatment & Monitoring Requirements for Agricultural Use of Reclaimed Water**

| | Reuse Category Level<br>Minimum Degree of Treatment Required | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| | Less than biological treatment or biological treatment without disinfection | Biological treatment plus disinfection | Biological treatment plus disinfection | Biological treatment, clarification, coagulation and filtration plus disinfection |
| Parameter - Total Coliform (number/100 ml) | | | | |
| 7 day median | No limit | 23 | 2.2 | 2.2 |
| 2 consecutive samples | No limit | 240 | No limit | No limit |
| Maximum | No limit | No limit | 23 | 23 |
| Parameter - Turbidity (NTU) | | | | |
| 24 hour mean | No limit | No limit | No limit | 2 |
| 5% of the time during any 24 hour period | No limit | No limit | No limit | 5 |
| Parameter - Minimum Monitoring Requirements | | | | |
| Total Coliform | Not Required | 1/week | 3/week | Daily |
| Turbidity | Not Required | Not Required | Not Required | Hourly or continuous |
| From OAR 340-55 | | | | |

d) Crop Limitations & Buffer Zone Requirements

DEQ rules based on OAR 340-55 also contain a number of general requirements addressing acceptable uses based on effluent water quality level, irrigation system, public access requirements, and buffer zones for irrigation. Although a detailed examination of these requirements is beyond the scope of this document, a brief summary is presented below.

Agricultural uses include general agricultural and specific agricultural uses. General agricultural uses include food crops, processed food crops, orchards and vineyards, fodder, fiber, and seed crops, as well as pasture for animals. Specific agricultural uses range from general produce (such as lettuce and carrots) to Christmas trees. Nonagricultural uses cover irrigation at parks, playgrounds, golf courses, cemeteries, and similar landscape irrigation. Based on the assumption that the existing and new treatment facilities are and will be capable of producing a Level II effluent, the potential uses are limited to irrigation of agricultural crops processed before human consumption or crops not for human consumption.

DEQ also provides guidelines on public access and buffer zones for reuse irrigation systems depending on the quality level of the effluent.

As discussed in OAR 340-55, public access requirements for the different effluent levels range from "prevented" (fences, gates, locks) to no direct public contact during the irrigation cycle. Based on a Level II effluent reuse program, public access must be "controlled." This means that this effluent can only be used to irrigate rural or non-public lands with limited potential for direct public contact. The site used would also require signs indicating the use of reclaimed water in the irrigation system. The level of public access control for Level III quality effluent would be similar.

Buffer zones for surface and spray irrigation systems are intended to protect public health and the environment. Assuming a Level II quality effluent, the minimum buffer zones for different irrigation systems are listed in **Table 3-4**.

**TABLE 3-4**
**Irrigation System Buffer Zone Requirements**

| System Type | Boundary Buffer Zone (feet) |
|---|---|
| Center Pivot | 75-300 |
| Travelling Gun | 300 |
| Wheel Line | 70 |
| Hand Set | 70 |
| Solid Set – Aluminum | 70 |
| Solid Set – Micro Spray | 35 |
| Solid Set – Drip | 10 |

### 3.3.2.2 Subsurface (On-Site) Disposal of Wastewater Effluent

Another alternative to direct discharge to the Marys River is subsurface disposal of treated effluent using a drainfield or disposal field. Under this alternative, the treated effluent is discharged to a system of buried pipes that distribute the effluent for final treatment and absorption by the soil in the unsaturated zone above any permanent or temporarily perched groundwater levels.

Subsurface disposal of sewage or effluent for a non-discharging facility also requires a Water Pollution Control Facility (WPCF) permit from DEQ, with requirements based on state water quality regulations. Subsurface disposal of effluent is governed by OAR 340-71, *On-Site Sewage Disposal.*

The specific requirements for community wide on-site system are summarized in OAR 340-71-500. Prior to the construction of an on-site system, a site evaluation must be performed to determine the physical qualities of the soil, how existing groundwater is distributed and moves in the soils, and other conditions that determine whether or not a soil based on-site treatment and/or disposal system is feasible.

Subsurface disposal is viable during the entire year, assuming that acceptable soil types are available and the drain field is above seasonal or perched groundwater tables. In addition, it does not have the same type of setback requirements as land application, as the effluent is not accessible to humans during the disposal process. Therefore, the treatment requirements are significantly less stringent than for land application or other reuse alternatives.

The existing treatment plant property and adjacent land are located on poorly drained alluvial soils with high groundwater tables. These types of soils are not suited for subsurface disposal. Therefore, any alternative that includes subsurface disposal would have to also include a pump station and force main to transport the effluent from the treatment plant to a suitable offsite drain field. The complexity and associated expense of such a system when compared to the alternatives evaluated herein renders subsurface disposal an infeasible disposal method in Philomath. As such, subsurface disposal will be removed from further consideration. The preceding discussion is provided for the sake of completeness.

### 3.3.3 Septage Management Regulations

DEQ mandates that if septic tanks are used to remove solids from the flow, the septage sludge must be disposed of at a facility with an approved point of discharge, such as a wastewater treatment plant which has been designed to accept septage. The 40 CFR 257 regulations outline the rules pertaining to the treatment and disposal of industrial, commercial or domestic septage. Treatment and land application of septage sludge must meet the same pathogen reduction standards as for sewage sludge.

Although the City does not appear to currently have an ordinance covering restrictions to the disposal of septage at the City's WWTP, there is a current City policy in effect to refuse to accept septage at the WWTP. We recommend that the City continue with this policy, and require that it be hauled to a larger community (i.e., Corvallis) with staffing and facilities which are better equipped to handle septage.

### 3.3.4 Biosolids Management

The term "sludge" refers to the solids that settle and are removed when a liquid with suspended solids passes through a settling basin or tank. Organic sludge may originate from several sources in a wastewater treatment plant, but can typically be classified as either raw or primary sludge (primary settling of untreated sewage) or secondary sludge (excess biological sludge from secondary treatment processes). All sludge must be stabilized prior to reuse or disposal. Stabilized sludge is a mixture of solids and liquids that is one of the end products of the wastewater treatment process.

Adequately processed sludge is classified in regulations as *biosolids*. It is commonly disposed of by applying it to agricultural or forest land after adequate processing.

### 3.3.4.1 Biosolids Quality

Wastewater biosolids are subject to differing regulations and restrictions based on quality. The Code of Federal Regulations (40 CFR 503) defines standards for three measures of biosolids quality:

- Pathogens.
- Vector attraction (the tendency of the sludge to attract rodents, insects and other organisms that can spread disease).
- Trace elements.

Biosolids that meet the higher of two standards for all three of these measures are designated exceptional quality (EQ) biosolids. EQ biosolids have fewer reporting and monitoring requirements and virtually no restrictions on use. Use is restricted for biosolids that do not meet the higher standard by any of these three measures. The following is a short discussion of each of these measurements of sludge quality.

a) Pathogen Requirements

Pathogen requirements define two classes of biosolids - Class A and Class B. Class A is the higher standard and requires complete destruction of pathogens before disposal. Class B requirements call for reducing pathogens before disposal and applying the biosolids to land in such a way that pathogens are further reduced.

To be classified as Class A, biosolids must be treated using one of the EPA's *Processes to Further Reduce Pathogens* (PFRP), or an equivalent process. These processes include composting, heat drying, heat treatment, thermophilic aerobic digestion, beta ray irradiation, gamma ray irradiation, and pasteurization. Regardless of the process used, Class A biosolids must not exceed maximum allowable fecal coliform density or Salmonella bacteria density.

Class B biosolids must be treated using one of the EPA's *Processes to Significantly Reduce Pathogens* (PSRP), or an equivalent process. These processes include aerobic digestion, air drying, anaerobic digestion, composting, and lime stabilization.

b) Vector Attraction Requirements

Biosolids must meet one of the following requirements for reducing vector attraction if they are to be applied to land without restrictions:

- Volatile solids in the sludge shall be reduced by a minimum of 38 percent.

- The specific oxygen uptake rate for sludge treated by aerobic digestion shall be less than or equal to 1.5 mg oxygen per hour per gram of total solids at a temperature of 20°C.

- Aerobic processes shall treat the sludge for a minimum of 14 days with an average temperature of at least 45°C and a minimum temperature of 40°C.

- Alkali addition shall raise the pH of the sludge to a minimum of 12 for two hours and maintain the pH at a minimum of 11.5 for an additional 22 hours without additional alkali.

The use of the land where the biosolids is applied is restricted if vector attraction reduction is achieved by measures, such as injecting the biosolids below the surface of the land or disposing of them on the surface and incorporating them into the soil within six hours.

c) Trace Elements

Ten elements typically found in biosolids have been identified as critical. Two limits have been set for each of these trace elements: Exceptional Quality (EQ) and a ceiling limit. If all the trace elements are below the EQ limit, then no restrictions are placed on loading rates. If any of the trace elements are over the ceiling limit, then the biosolids are not suitable for land application. If the trace elements fall between these two limits, restrictions are placed on loading rates.

### 3.3.4.2 Biosolids Use Restrictions Based on Quality

**Table 3-5** outlines some of the general restrictions on the use of biosolids depending on the quality of the biosolids.

**TABLE 3-5**
**General Biosolids Use Restrictions Based on Quality Rating**

| Sludge Quality Rating by Category | | | |
|---|---|---|---|
| Pathogens | Vector Attraction | Trace Elements | Use Restrictions |
| EQ | EQ | EQ | No restrictions are imposed on application or use with regard to pathogens, vector attraction, or trace elements. |
| Class B | EQ | EQ | Application is subject to EPA defined waiting periods for crops, grazing, and public access. Biosolids cannot be distributed for home use, in bags, or in containers. |
| EQ | - | EQ | Biosolids must be injected or tilled into the soil. Biosolids cannot be distributed for home use, in bags, or in containers. |
| EQ | EQ | - | Bulk application must not exceed EPA defined cumulative loading rates. Biosolids distributed in bags or containers are subject to annual loading rate restrictions. |
| All Other Biosolids Qualities | | | Application is subject to trace loading requirements and pathogen waiting periods. Biosolids must be injected or tilled into the soil and cannot be distributed for home use, in bags, or in containers. |

EQ – Exceptional Quality Biosolids

a) Special Biosolids Management Considerations

As noted schedule C of the City's current NPDES permit, the City must prepare a sludge management plan and obtain DEQ approval prior to removal and/or reuse of sludge. New biosolids application sites or expansion of existing sites must be approved by DEQ prior to use. Site criteria for land applying biosolids includes geological formation, flood plain proximity, groundwater and surface water proximity, topography, and soils, as well as method of application. **Table 3-6** contains an overview of some of the general criteria contained in OAR 340-50.

**TABLE 3-6**
**General DEQ Site Criteria for Biosolids Application**

| Parameter | Criteria |
|---|---|
| Geology | Must have a stable formation |
| Within Flood Plain | Restricted period of application and incorporation of biosolids |
| Groundwater | At time of application; 4-foot minimum depth to permanent groundwater; 1-foot minimum depth to temporary groundwater |
| Topography<br><br>Slope less than or equal to 12%<br><br>Slope greater than 12% but less than 20% | Must have appropriate management to eliminate surface runoff<br><br>• Surface application of liquid dewatered or dried biosolids<br><br>• Direct incorporation of liquid biosolids into the soil, surface application of dewatered or dried biosolids |
| Soils | • Minimum rooting depth of 24 inches<br>• No rapid leaching<br>• Avoid saline or alkali soil<br>• pH of 6.5 to 8.2 for heavy metal accumulator crops, or pH can be raised by adding lime to the soil. |
| Method of Application & Proximity to Water Bodies | Buffer strips may be required to protect water bodies. Size depends on method of application and proximity to sensitive area (determined at discretion of DEQ), generally as follows:<br><br>• Direct injection: no limit required<br>• Truck spreading: less than 50 foot buffer strip<br>• Spray irrigation: 300 to 500 foot buffer strip<br>• Near ditch, pond, channel, or waterway: greater than 50 foot buffer strip<br>• Near domestic water source or well; greater than 200 foot buffer strip |

Land application of biosolids at sites used for agricultural purposes requires special management considerations. These relate to access to the site, types of crops grown, plant nutrient rates, timing and duration of biosolids application (i.e., site life and seasonal constraints), and grazing restrictions. A brief discussion of each of these issues follows.

b) Access

Controlled access must be provided for municipal biosolids application sites for 12 months following surface application of biosolids. Controlled access is defined as public entry or traffic being unlikely. Privately owned rural land is typically assumed to have controlled access, while public lands such as parks may require fencing to ensure access control.

c) Crops

Biosolids or biosolids derived products are not to be used directly on fruits or vegetables which may be eaten raw. As a general rule, crops grown for human consumption should not be planted within 18 months of application of municipal biosolids. If the edible parts will not be in contact with the biosolid amended soil, or if the crop will be processed or treated prior to marketing in such a manner to ensure that pathogen contamination is not a concern, this requirement may be waived by DEQ. There are no restrictions on planting times for crops not grown for direct human consumption.

d) Nutrient Loading

Biosolids application to agricultural land should not exceed the annual nitrogen loading required for maximum crop yield. Biosolids are, therefore, typically managed according to their fertilizer value. Biosolids may be applied above agronomic rates on a onetime basis or less than once per year so long as runoff, nuisance conditions, and groundwater concerns are adequately addressed. In cases of higher than agronomic application rates, the acceptable loading rate and application frequency is typically based on nitrogen accumulation and annual nitrogen use.

e) Site Life

Sites generally have a limited application life, which may be determined by the chemistry of the soil and the metals loading from the biosolids. Site life is determined by dividing lifetime biosolids loading limits (based on the most limiting constituent) by the annual application rate.

f) Seasonal Constraints

The main consideration in land applying on sloping ground is to avoid surface runoff and soil erosion. Additionally, biosolids application should be restricted to the dry season to prevent soil damage that may occur from equipment traffic in during the wet season.

g) Grazing Restrictions

Grazing animals should not be allowed on pasture or forage for 30 days after application of stabilized biosolids, 180 days after application of non-stabilized biosolids, and 7 days after application of air-dried biosolids.

h) Site Monitoring and Reporting

As previously noted, site monitoring is typically not required where "EQ" biosolids are applied at or below agronomic rates based on crop nitrogen requirements. However, if the biosolids contain high concentrations of heavy metals or other toxic elements, or if crop nitrogen requirements are exceeded on a regular basis, soil monitoring and special management practices may be required. At the discretion of DEQ, monitoring wells and groundwater background characterization and/or monitoring may be required on any site on a case by case basis.

### 3.3.5 Reliability and Redundancy Criteria

The EPA has established minimum standards for mechanical, electrical, fluid systems, and component reliability for all new or expanding sewerage facilities, including treatment plants. These reliability standards establish minimum levels of reliability for three classes of sewerage facilities. Pump stations associated with, but physically removed from the actual treatment works may have a different classification than the treatment works itself.

The purpose of these reliability standards is to ensure that the treatment facilities will operate effectively on a day-to-day basis and that provisions are made for operation during power failures, flooding, peak loads, equipment failures, and maintenance shutdowns. These reliability and redundancy standards are designed to ensure that unacceptable degradation of the receiving water will not occur due to the interrupted operation of specific treatment process or unit operation.

The reliability classification will be based on the water quality and public health consequences of a component or system failure. Specific requirements pertaining to treatment plant unit processes for each reliability class are described in EPA's technical bulletin, *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability*, EPA 430-99-74-001. EPA and DEQ guidelines for classifying sewerage works are summarized as follows:

- Reliability Class I. These are works whose discharge, or potential discharge, (1) is into public water supply, shellfish, or primary contact recreation waters, or (2) as a result of its volume and/or character, could permanently or unacceptably damage or affect the receiving waters or public health if normal operations were interrupted.

  Examples of Reliability Class I works are those with a discharge or potential discharge near drinking water intakes, into shellfish waters, near areas used for water contact sports, or in dense residential areas.

- Reliability Class II. These are works whose discharge, or potential discharge, as a result of its volume and/or character, would not permanently or unacceptably damage or affect the receiving waters or public health during periods of short-term operations interruptions, but could be damaging if continued interruption of normal operations were to occur (on the order of several days).

  Examples of a Reliability Class II works are works with a discharge or potential discharge moderately distant from shellfish areas, drinking water intakes, areas used for water contact sports, and residential areas.

- Reliability Class III. These are works not otherwise classified as Reliability Class I or Class II.

**Table 3-7** contains the typical redundancy requirements for treatment plant and pump station components that are designed in accordance with the EPA Reliability Class I standards. In addition to the standards listed in the table, unit operations must be designed to pass the peak hydraulic flow with one unit out of service. Mechanical components in the facility must also be designed to enable repair or replacement without violating the effluent limitations or causing diversion of untreated sewage. The information in this table is not specific to the proposed alternative, and some of the plant components shown are not necessarily included in the existing or future facilities. Some of the items listed below apply regardless of the Reliability classification of the treatment facility.

The most significant difference between Class I and Class II reliability is that for Level II reliability, only 50 percent of secondary sedimentation design capacity is required with one unit out of service. Also, backup components are not mandatory for wastewater treatment systems used to provide treatment in excess of typical biological treatment and disinfection. Reliability Class I would require two grit basins and aeration basins, while Reliability Class II would only require a single aeration basin. More stringent requirements may be imposed by DEQ if an effluent reuse program is proposed. None of the proposed alternatives include the need for a biosolids program.

| TABLE 3-7<br>Typical EPA Reliability Class I Requirements | |
|---|---|
| System Component | Capacity/Redundancy Requirements |
| Raw Sewage Pumps | Handle peak flow with largest unit out of service. As a minimum, the Peak flow is defined as the flow associated with a 5-year, 24-hour storm. |
| Mechanical Bar Screens | Provide one backup with either manual or mechanical cleaning (manual cleaning acceptable if only two screens) |
| Grit Removal | Provide a minimum of two units. |
| Primary Sedimentation | Handle 50% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component. |
| Activated Sludge Process | A minimum of two equal size basins. No backup basin required. |
| Aeration Blowers | Supply the design air capacity with the largest unit out of service. Provide a minimum of two units. |
| Air Diffusers | Allow for the isolation of largest section of diffusers (within a basin) without measurably impairing oxygen transfer. |
| Secondary Sedimentation | Handle 75% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component. |
| Disinfection Contact Basin | Handle 50% of the design flow with largest unit out of service. Design flow is defined as the flow used as the design basis of the component. |
| Effluent Pumps | Handle peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works. |
| Electrical Power | Two separate and independent sources of electrical power shall be provided, either from two separate utility substations or from a single substation and a plant based generator. Designated backup source shall have sufficient capacity to operate all vital components, critical lighting, and ventilation during peak flow conditions, except that components used to support the secondary processes need not be included as long as treatment equivalent to sedimentation and disinfection is provided. |

### 3.3.6 Design Considerations & Constraints

The design must take into account existing and projected flows and loadings, as well as the regulatory requirements as outlined previously. General design considerations incorporated in the alternatives are discussed below.

#### 3.3.6.1 Design Period

The design period must be long enough to ensure the new facilities will be adequate for future needs, but short enough to ensure effective use within their economic and useful life span. The alternatives evaluated will be based on the effluent quality criteria discussed in the previous paragraphs. The design period will be twenty years for pump stations and treatment/disposal facilities, and buildout to City zoning for the gravity collection system components.

#### 3.3.6.2 Treatment Efficacy

For alternatives involving wastewater treatment, a primary consideration will be the degree of treatment required to meet the discharge requirements and sufficient sizing of the facility to handle future projected peak hydraulic and organic loads.

#### 3.3.6.3 Reliability

Although reliability can be enhanced by redundancy, conservative selection of the proper equipment helps ensure long life and minimize maintenance costs. Each unit process should be selected based on its ability to effectively treat the waste stream directed to it. Capabilities of the treatment plant operator and the community should also be considered. Processes that require a high degree of manual labor, special schooling, and unique instrumentation should generally be avoided.

#### 3.3.6.4 Durability

Conveyance and treatment systems should consist of materials and equipment that are capable of satisfactory performance over the entire design life/period of the system components. The selection of wastewater system components is a matter of engineering judgement based on such factors as the type and intensity of use, type and quality of materials used in construction, the quality of workmanship during installation, manufacturer's reputation, and the expected maintenance that must be performed during life of the component.

#### 3.3.6.5 Flexibility

The design of the conveyance and treatment system should allow for flexibility in operation and maintenance. For alternatives involving wastewater treatment, the operator should have the ability to route flows around the individual process units as required for repairs without significantly degrading effluent quality. This can be achieved by providing redundant units for critical processes and having multiple interconnections between units. In other cases, units can be oversized to assure flexibility. Such design flexibility will also help ensure that discharge requirements can be met under changing influent conditions, and should allow for the construction and connection of new process units as needed.

#### 3.3.6.6 Operability

Operation of wastewater systems entails considerable responsibility and cost, especially since it directly impacts public health. The personnel assigned to operate and maintain a treatment facility must be appropriately trained. The more sophisticated the process or equipment, the greater the level of expertise required. Qualified individuals are usually more readily available in

metropolitan areas, as is financial support for continued education and advanced training. However, small communities or service districts can have more difficulty in securing and retaining personnel with the required qualifications, as well as budgeting the money required to pay them. Consequently, the selection of a treatment process or equipment should reflect the regional and local training level of operations and maintenance personnel.

#### 3.3.6.7 Miscellaneous

Consideration of site location, operational tasks, public perception, aesthetics, health and safety concerns, noise, odors, access to equipment, and hazards all must be considered when assessing treatment alternatives.

## 3.4. NPDES Permit - Specific Standards

OAR 340-41 outlines basin standards, as described above, while the NPDES permit issued by DEQ provides regulations for a specific wastewater collection & treatment system and its associated discharge(s). DEQ regulations require that non-discharging options be considered before discharge to surface water can be approved. An NPDES permit includes wastewater discharge limitations with regard to the concentrations of biochemical oxygen demand (BOD), total suspended solids (TSS), *E. coli* bacteria, as well as the mass loads of BOD and TSS and any other limitations required to maintain in-stream water quality.

The City has an NPDES Permit that was issued by DEQ on December 28, 2000 and is classified as a minor NPDES permit. The permit number is 102060 and the expiration date is 11/30/05 (see **Appendix B**).

The NPDES permit is divided into five sections as follows:

- Schedule A - Waste Discharge Limitations Not to be Exceeded
- Schedule B - Minimum Monitoring and Reporting Requirements
- Schedule C - Compliance Conditions and Schedules
- Schedule D - Special Conditions
- Schedule F - General Conditions

A short discussion of items of particular interest to this report follows.

### 3.4.1 Schedule A – Waste Discharge Limitations

There is one outfall identified in the current NPDES permit. Outfall 001 is the treated effluent discharge to the Marys River from the WWTP.

#### 3.4.1.1 Outfall 001

A summary of the permit limitations for effluent discharge to the Marys River through Outfall 001 is presented in **Table 3-8**. BOD limitations are for 5-day BOD ($BOD_5$) testing.

**TABLE 3-8**
**Current NPDES Permit Discharge Limitations**
NPDES Permit Schedule A, Treated Effluent, Outfall 001
Discharge Permitted November 1 – April 30

| Constituent | Max. Concentration (mg/L) | | Max. Mass Load (lb/day)* | | |
|---|---|---|---|---|---|
| | Avg. Monthly | Avg. Weekly | Avg. Monthly | Avg. Weekly | Daily |
| $BOD_5$ | 30 | 45 | 460 | 690 | 920 |
| TSS | 50 | 80 | 760 | 1100 | 1500 |
| pH | Range | | 6.0 – 9.0 | | |
| *E. coli* Bacteria | Monthly Geometric Mean | | 126 cts/100 ml | | |
| | Maximum Single Sample | | 406 cts/100 ml | | |
| $BOD_5$ Removal | Min. Monthly Average Removal | | 65% | | |
| TSS Removal | Min. Monthly Average Removal | | 55% | | |

* Based upon winter discharge rate of 1.82 MGD.

The mixing zone for the Outfall 001 is defined as a band extending out twenty (20) feet (not to exceed one-half the total stream width) from the south bank of the river and extending from a point ten (10) feet upstream of the outfall to a point one-hundred (100) feet downstream from the outfall. The zone of immediate dilution (ZID) is defined as that portion of the mixing zone within a ten (10) foot radius of the discharge point.

The permit also summarizes the conditions and restrictions relating to sewer system overflows.

- Sewer Overflows in Winter: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm.

Based on NOAA Atlas 2, Volume X (Oregon), the 5 year 24 hour storm within the study area is 3.8 inches in 24 hours.

- Sewer Overflows in Summer: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm.

Based on NOAA Atlas 2, Volume X (Oregon), the 10 year 24 hour storm within the study area is 4.8 inches in 24 hours.

The permit clarifies that for overflows between May 22 and June 1, no violation will be triggered if the City demonstrates that the overflow was a result of a storm event greater than a one-in-five-year, 24-hour duration storm.

### 3.4.2 Schedule B – Minimum Monitoring & Reporting Requirements

**Table 3-9** summarizes the minimum monitoring requirements imposed by the NPDES permit for influent and effluent flows.

**TABLE 3-9**
**Minimum Monitoring And Reporting Requirements**
NPDES Permit Schedule B

| Item or Parameter | Min Frequency | Sample Type |
|---|---|---|
| **Influent Flows** | | |
| Total Flow | Daily | Reading |
| Flow Meter Calibration | Annual | Verification |
| pH | 2/week | Grab |
| $BOD_5$ | 1 per 2 weeks | Composite |
| TSS | 1 per 2 weeks | Composite |
| **Effluent Flows** | | |
| Total Flow (MGD) | Daily | Reading |
| Flow Meter Calibration | Annual | Verification |
| pH | 2/week | Grab |
| Chlorine Used (lb) | Daily | Measurement |
| Chlorine Residual | Daily | Grab |
| $BOD_5$ | 1 per 2 weeks | 24 hr Composite |
| TSS | 1 per 2 weeks | 24 hr Composite |
| Pounds discharged ($BOD_5$ & TSS) | 1 per 2 weeks | Calculation |
| Avg. % Removal ($BOD_5$ & TSS) | Monthly | Calculation |
| Temperature | 2/week | Reading |
| *E. coli* | 1 per 2 weeks | Grab |
| **Marys River** | | |
| Flow (Downstream) | 2/week | Measurement |

Schedule B also includes monitoring requirements for biosolids in the Cell #1 of the treatment lagoons. The permit requires that depth and extent of the sludge blanket be measured within twelve months of the issuance of the permit and at five year intervals thereafter unless sludge levels warrant more frequent measurements or removal of biosolids. Westech Engineering submitted a report to the DEQ on behalf of the City on November 20, 2001 demonstrating a relatively small volume of sludge accumulation. The DEQ concurred with the findings of the report and agreed that subsequent sludge measurements could be made at 5-year intervals. Therefore, the next sludge measurements must be submitted to the DEQ by November 20, 2006. The sludge survey prepared by Westech Engineering and the DEQ's approval letter are included in **Appendix C**.

There is one final annual report that must be submitted to DEQ. By February 1 of each year, an annual report must be submitted that details sewer collection maintenance activities during the past year that reduce inflow and infiltration, as well as those activities planned for the following year.

### 3.4.3 Schedule C – Compliance Conditions and Schedules

The following discussion is limited to those conditions that may impact the improvements recommended by this report, or which are addressed in conjunction with this report. Some of the compliance schedules referred to in Schedule C have already passed.

- Biosolids Management Plan (C3). Six months prior to the removal of accumulated solids from any of the lagoons, the City shall submit to the Department and updated biosolids management plan developed in accordance with OAR 340-50.

## 3.5. Basis of Cost Estimates

In order to compare between different alternatives, the comparative costs of the principal alternatives must be estimated. The cost estimates are based on numerous assumptions necessary due to the relative lack of detail available at the facilities planning stage. The basic assumptions are summarized below.

### 3.5.1 Accuracy of Cost Estimates

It is important to note that the cost estimates are estimates made without detailed engineering data or designs. The accuracy or precision of cost estimates is a function of the level to which alternatives are developed (i.e., detail and design) and the techniques used in preparing the actual estimate. Estimates are typically divided into three basic categories as follows:

a. Planning Level Estimates. These are order-of-magnitude estimates made without detailed engineering data. This type of estimate is normally accurate within +35% to –25% (i.e., final cost may be as much as 35% more or 25% less than the estimated amount). A relatively large contingency is typically included to reduce the risk of underestimating. This is particularly important since many times the project financing must be secured before the detailed design can proceed.

b. Budget Estimates. This type of estimate is prepared using process flow sheets, layouts, and equipment details during preliminary design. This type of estimate is typically accurate to within ±25%.

c. Engineer's Estimate. This estimate is prepared based on well-defined engineering data, typically when the construction plans and specifications are completed, and is sometimes called a definitive estimate. Since this type of estimate is based on comprehensive plans and elevations, piping and instrument diagrams, electrical diagrams, equipment data sheets, structural drawings, geotechnical data, and a complete set of specifications, The engineer's estimate is expected to be accurate within +15 percent to -5 percent (i.e., 15% more to 5% less than the estimate).

Since the alternatives (during the facilities planning process) are not developed in sufficient detail for a more precise estimate, the estimates presented in this document are order-of-magnitude estimates. Even though the final project cost may vary significantly from these estimates, the estimates are necessary to evaluate and compare the alternatives, and will be reasonably accurate relative to each other.

### 3.5.2 Adjustment of Cost Estimates over Time

As the costs of material, labor and equipment rise over time, comparable changes will occur in the costs presented in this study. However, since the relative costs of the alternatives compared to each other should remain reasonably constant, the recommendations based on the cost estimates should remain valid.

A commonly used indicator of these changes in construction costs is the Engineering News-Record (ENR) construction cost index. The index is computed from the prices for structural steel, Portland cement, lumber, and common labor, and is based on a value of 100 in the year 1913. The construction costs developed in this analysis are based on current ENR 20 cities index (for index number, see **Section 8**). The costs presented herein can be related to those at any time in the past or future by applying the ratio of the then-prevailing cost index to index number used at present.

### 3.5.3 Engineering & Administrative Costs & Contingencies

The cost of engineering services for major projects typically covers special investigations, pre-design reports, topographic surveying, geotechnical investigations, contract drawings and specifications, construction administration, inspection, project start-up, the preparation of O&M manual narratives, and performance certifications. Depending on the size and type of project, engineering costs may range from 16 to 25 percent of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complex mechanical systems. The higher percentage applies to smaller, more complex projects, projects that involve remodeling of existing plants, or where full time inspection is required by the funding agencies or desired by the Owner.

The City will have administrative costs associated with any construction project. These include internal planning and budgeting/payments, administration of engineering and construction contracts, legal services, and coordination with regulatory and funding agencies. For a typical project of this size, the City's administrative, legal and permitting costs are expected to be about 10 percent of the contract cost. The total cost for engineering and administration is assumed to be 30 percent.

### 3.5.4 Construction Costs Estimates

Preliminary construction costs for collection system improvements recommended in this report are based on a number of assumptions as follows. The cost estimates reflect projects bid in late winter or early spring for summer construction. These

estimates are based on construction costs for similar projects and manufacturer's information. The costs do not reflect a detailed investigation of existing utilities and soils. It is important to note that the cost estimates are planning level estimates, not engineering estimates, and are intended to be within the range of plus 35% to minus 25% of the actual project cost.

The elements which comprise these budget estimates for the piping portion of the collection system improvements include:

- 8 to 10 inch Pipeline Construction Cost (materials, installation & surface restoration, etc.) - $7.75 per inch-diameter per foot.
- 12 to 15 inch Pipeline Construction Cost (materials, installation & surface restoration, etc.) - $7.00 per inch-diameter per foot.
- 18 to 24 inch Pipeline Construction Cost (materials, installation & surface restoration, etc.) - $6.25 per inch-diameter per foot.
- Manholes - $3500 each
- Service Laterals - $2000 each
- Railroad & Highway Bores - $300/ft
- Manhole Rehabilitation - $1500 each
- Construction Contingencies - 10% of estimated construction cost
- Engineering Costs (surveying, engineering design, and construction administration) - 20% of estimated construction cost
- Legal, Permits & Administrative Costs (permitting, administration, legal, easement acquisition and financing) - 10% of estimated construction cost

Example: 300 lineal feet of new 12-inch pipe with 2 manholes & 3 laterals

| | | |
|---|---|---|
| Est. Construction Cost = | 300 feet x 12 inches x $7.75 = | $27,900 |
| | 2 manholes x $3500 = | $7,000 |
| | 3 laterals x $2000 = | $6,000 |
| Constr. Contingencies = | $27,900 x 10% = | $2,790 |
| Engineering = | $27,900 x 20% = | $5,580 |
| Legal, Permits & Admin = | $27,900 x 10% = | $2,790 |
| Total Estimated Project Cost = | | $52,100 |

The budget estimates for the pump stations and treatment plant work are based on construction costs for similar projects and manufacturer's information, and the assumption that the pump stations will be constructed in accordance with the pump station design criteria as previously outlined in **Table 3-2**. For the pump stations, construction contingencies of 20% of the estimated construction cost were assumed, as well as engineering costs (surveying, engineering design, and construction administration) of 20% of estimated construction cost, and legal, permits & administrative costs (permitting, administration, legal, land & easement acquisition and financing) of 10% of estimated construction cost.

The planning level estimates for the new wastewater treatment system are based on construction costs for similar projects and manufacturer's information, and the assumption that the treatment plant will be constructed in the recommended location. The estimates also include estimated costs for application for NPDES permit modification if required. For the WWTP improvements, construction contingencies of 15% of the estimated construction cost were assumed, as well as engineering costs (surveying, engineering design, and construction administration) of 20% of estimated construction cost, and legal, permits & administrative costs (permitting, administration, legal, easement acquisition and financing) of 10% of estimated construction cost.

These construction costs are planning level estimates, but they should help the City in the process of planning and allocating resources in the most cost effective manner. All costs are estimates of probable costs and do not reflect changes that could include increasing labor costs, material, and phased construction dates. Unit costs used for installation of sanitary sewers include excavation and export of material, bedding and backfill, cutting of asphalt, repaving of streets, pipe placement, bypass pumping and manholes.

Once the Facilities Plan is adopted by the City, the projects listed can be selected for completion through the City's budgeting process. The steps for completion are:

- Project identification and planning level cost estimate (completed by Facilities Plan)
- Project selection and secure project financing
- Retain consulting engineer for project
- Prepare pre-design report for review by regulatory agencies and to refine cost estimates
- Preparation of plans, specifications and final engineering cost estimates
- Bidding and contract award
- Construction

Section 4

# Existing Wastewater Facilities

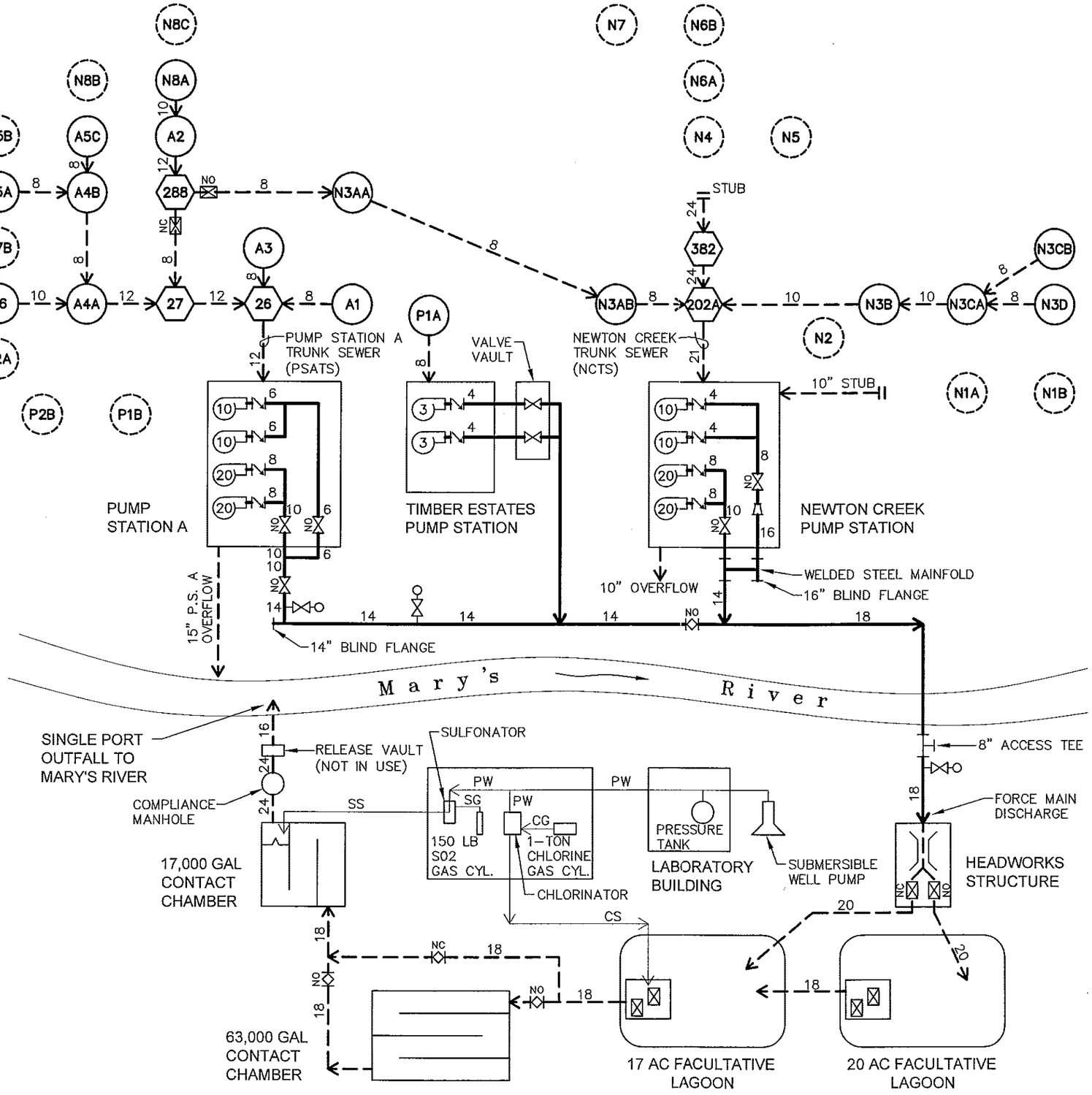
# SECTION 4
# EXISTING WASTEWATER FACILITIES

This section provides an overview of the existing wastewater facilities including the existing wastewater collection system, pump stations, and the wastewater treatment plant. It also summarizes known or reported problems related to each of these components.

## 4.1. General Overview of Existing Wastewater Facilities

Philomath's wastewater facilities consist of a conventional gravity collection system that conveys wastewater from the users to one of three pump stations. In general, the collection system serving the western portion of town conveys flows to Pump Station A. Pump Station A is located at the City shops complex near the south end of 16$^{th}$ street. The collection system serving the eastern portion of town conveys flows to the Newton Creek Pump Station. The Newton Creek Pump Station is located on Chapel Drive west of the Newton Creek Bridge. The Timber Estates Pump Station is a minor pump station located on Chapel Drive west of the Newton Creek Pump Station. This pump station serves a moderately sized residential subdivision known as Timber Estates. The three stations pump wastewater through a common force main to the treatment plant located south of the Marys River on the west side of Bellfountain Road. The treatment plant consists of a headworks for flow measurement and influent sampling, two facultative lagoons, a chlorination building with chlorine disinfection equipment, a laboratory building, a chlorine contact chamber, and an outfall to the Marys River. An overall schematic representation of the existing wastewater collection and treatment system including pump stations and force mains is presented in **Figure 4-1**.

**Figures 4-2** through **4-5** show the existing wastewater collection facilities. Larger scale plots of these figures are included in **Appendix A**. These collection system maps show the sizes, pipe material, and year constructed for each line segment. The reader is encouraged to refer to these figures throughout the following discussion.




# LEGEND

- A1 — DEVELOPED SEWER BASIN
- A5B — UNSERVED SEWER BASIN
- 26 — MANHOLE
- 12 → — GRAVITY TRUNK SEWER & SIZE (INCHES)
- 18 → — FORCEMAIN & SIZE (INCHES)
- (10) — SUBMERSIBLE SEWAGE PUMP W/ HP RATING
- CHECK VALVE
- GATE VALVE
- PLUG VALVE
- AIR/VACUUM RELEASE VALVE
- SLIDE GATE
- TRANSFER STRUCTURE W/ SLIDE GATES
- PW — POTABLE WATER
- CG — CHLORINE GAS
- CS — CHLORINE SOLUTION
- SG — SULFUR DIOXIDE GAS
- SS — SULFUR DIOXIDE SOLUTION
- NO — NORMALLY OPEN
- NC — NORMALLY CLOSED

VERIFY SCALE
BAR IS 2INCHES HIGH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY
0 1" 2"

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | REVISIONS | |

DSN. CB
DRN. TMT
CKD. CB
DATE: MAY 03


WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
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City of Philomath
2003 Sanitary Sewer Facilities Plan

# EXISTING WASTEWATER FACILITIES PROCESS SCHEMATIC

FIGURE 4-1

JOB NUMBER 960.3130.0


May 06, 2003 - 2:39pm
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CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
## SOUTHWEST QUADRANT

SHEET 1 OF 4

JOB NUMBER 960.308.0


WESTECH ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS AND PLANNERS
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MAP UPDATED: APRIL 2003

SCALE
HORIZ. 1" = 200'
VERT.

DSN. DJ
DWN. DJ
CHK. RD
DATE: FEB. 1998

| NO. | DATE | DESCRIPTION | BY |
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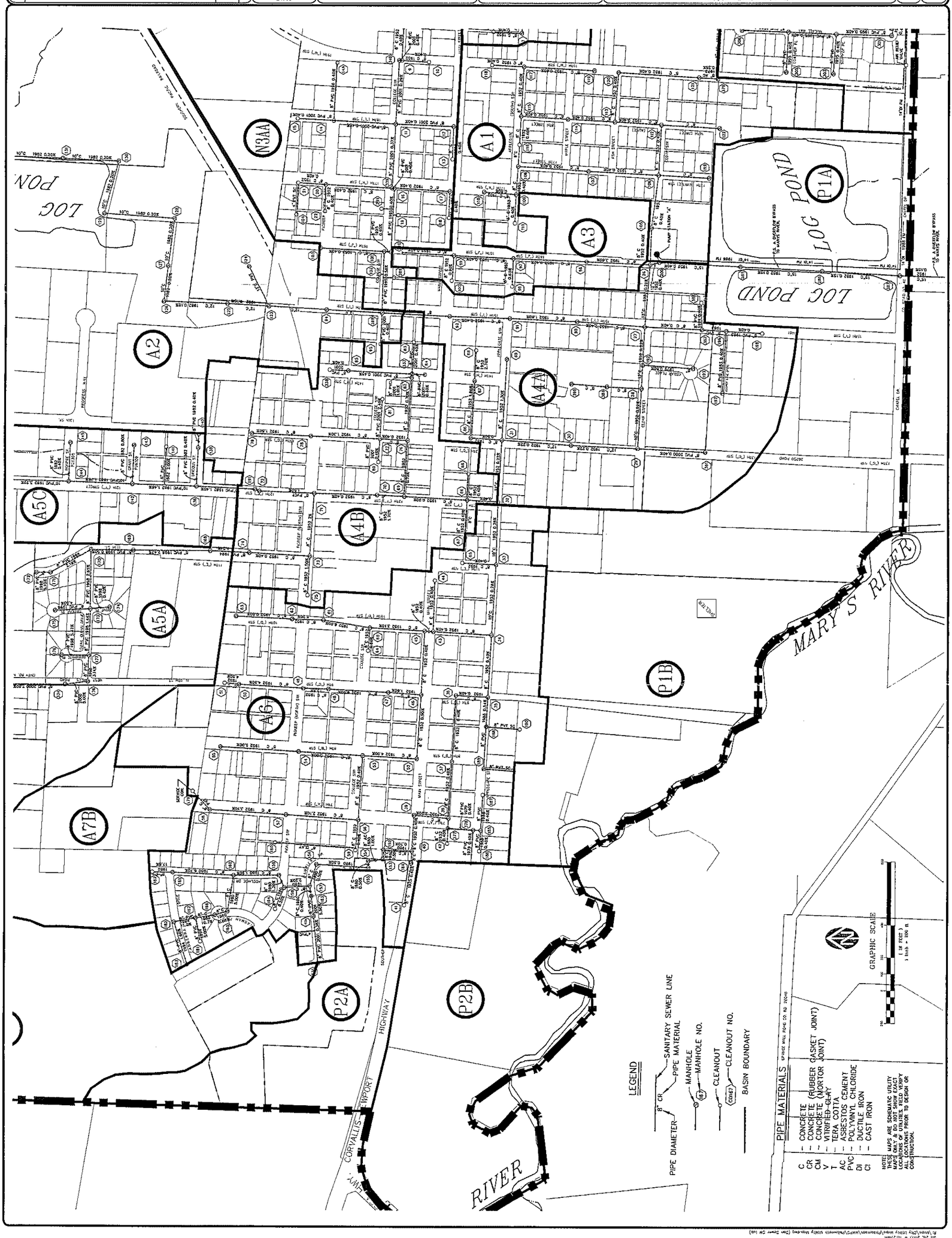

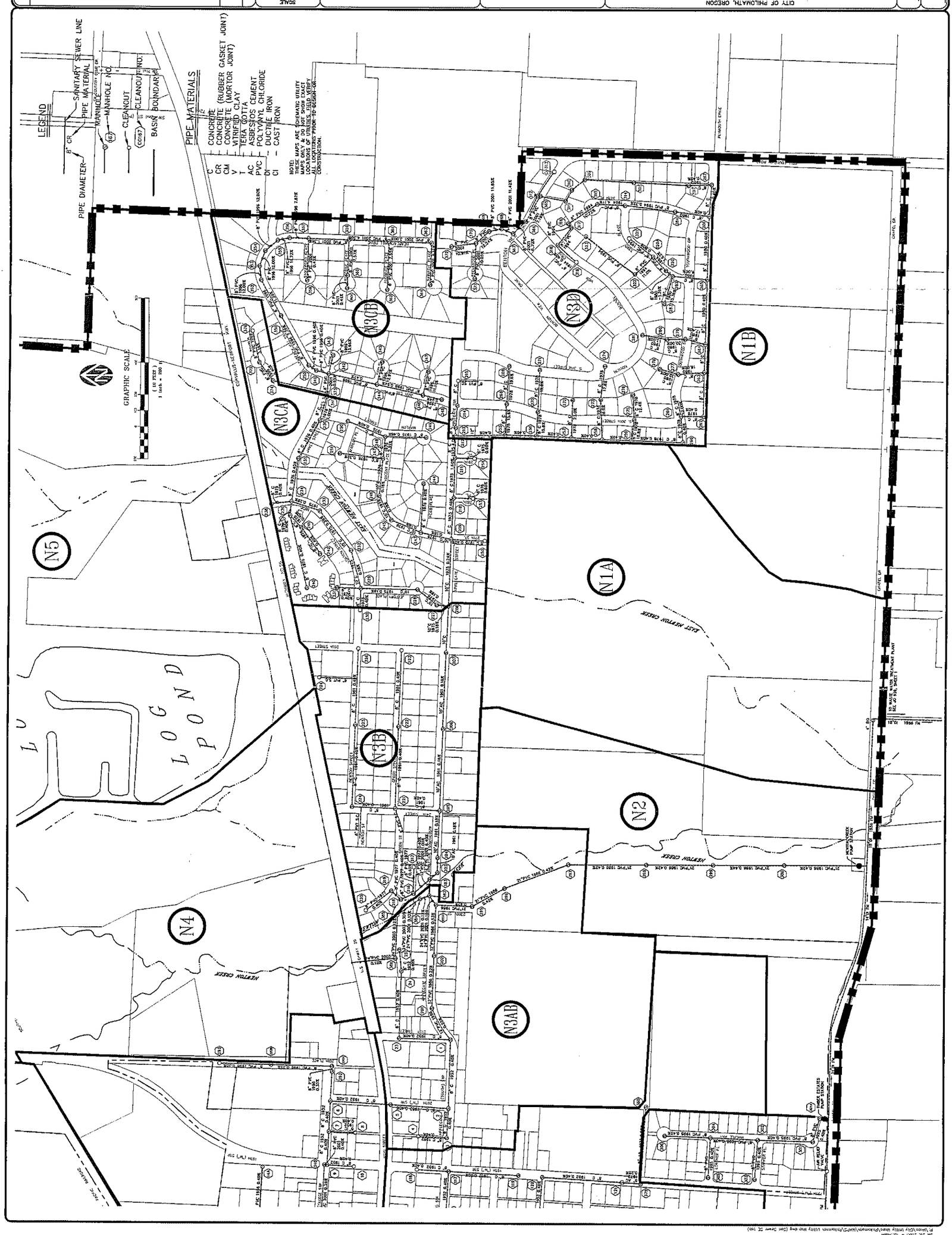
LEGEND
SANITARY SEWER LINE
PIPE MATERIAL
MANHOLE NO.
CLEANOUT
CLEANOUT NO.
BASIN BOUNDARY
PIPE DIAMETER
PIPE MATERIALS
C – CONCRETE (RUBBER GASKET JOINT)
CR – CONCRETE (MORTAR JOINT)
CM – VITRIFIED CLAY
V – TERA GOTTA
T – ASBESTOS CEMENT
AC – POLYVINYL CHLORIDE
PVC – DUCTILE IRON
DI – CAST IRON
CI
NOTE: THESE MAPS ARE SCHEMATIC UTILITY MAPS ONLY & DO NOT SHOW EXACT LOCATIONS OF ALL UTILITIES. FIELD VERIFY ALL LOCATIONS PRIOR TO DESIGN OR CONSTRUCTION.
GRAPHIC SCALE
N5
N3CA
N3B
N3D
N1B
N1A
N2
N4
N3AB
LOG POND
BASIN
CITY OF PHILOMATH, OREGON
SANITARY SEWER SYSTEM MAP
SOUTHEAST QUADRANT
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
SHEET 2 OF 4
JOB NUMBER 960.308.0
MAP UPDATED: APRIL 2003
DATE: FEB. 1998
DESIGN: DJ
DRAN: DJ
CHKD: RG
APPD:
SCALE: HORIZ. 1" = 200'
VERT.
NO. DATE DESCRIPTION BY
REVISIONS

GRAPHIC SCALE

( IN FEET )
1 inch = 200 ft.

## LEGEND

- PIPE DIAMETER — 8" CR — PIPE MATERIAL — SANITARY SEWER LINE
- MANHOLE (167) — MANHOLE NO.
- CLEANOUT (C0167) — CLEANOUT NO.
- BASIN BOUNDARY

## PIPE MATERIALS

| | |
|---|---|
| C | – CONCRETE |
| CR | – CONCRETE (RUBBER GASKET JOINT) |
| CM | – CONCRETE (MORTOR JOINT) |
| V | – VITRIFIED CLAY |
| T | – TERA COTTA |
| AC | – ASBESTOS CEMENT |
| PVC | – POLYVINYL CHLORIDE |
| DI | – DUCTILE IRON |
| CI | – CAST IRON |

NOTE:
THESE MAPS ARE SCHEMATIC UTILITY MAPS ONLY & DO NOT SHOW EXACT LOCATIONS OF UTILITIES. FIELD VERIFY ALL LOCATIONS PRIOR TO DESIGN OR CONSTRUCTION.

N8C

N7

N8B

N8A

A5B

A7A

2ND

TAXED ON 12-E-1 400

WEST HILLS RD

NORTH ROSE

NORTH ROSE DRIVE

NORTH CREEK

JOHNS ST

DESIGN: DJM
DRN: RJC
CKD: DJM
DATE: FEB. 1998

SCALE
HORIZ. 1" = 200'
VERT:

| NO. | DATE | DESCRIPTION REVISIONS | BY |
|---|---|---|---|

MAP UPDATED: APRIL 2003

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: mail@westech-eng.com

CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
## NORTHWEST QUADRANT

SHEET
3 OF 4

JOB NUMBER
960.308.0

Jul 28, 2003 - 10:19am
R:\Work\City Utility Maps\Philomath\MAPS\Philomath Utility Map.dwg (Sew Sewer NW Tab)

N6B

N7

N6A

LOG POND

LOG POND

POND

GRAPHIC SCALE

( IN FEET )
1 inch = 200 ft

LEGEND

8" CR — SANITARY SEWER LINE
PIPE DIAMETER — PIPE MATERIAL
MANHOLE
MANHOLE NO.
CLEANOUT
CLEANOUT NO.
BASIN BOUNDARY

PIPE MATERIALS

C – CONCRETE
CR – CONCRETE (RUBBER GASKET JOINT)
CM – CONCRETE (MORTOR JOINT)
V – VITRIFIED CLAY
T – TERA COTTA
AC – ASBESTOS CEMENT
PVC – POLYVINYL CHLORIDE
DI – DUCTILE IRON
CI – CAST IRON

NOTE:
THESE MAPS ARE SCHEMATIC UTILITY MAPS ONLY & DO NOT SHOW EXACT LOCATIONS OF UTILITIES. FIELD VERIFY ALL LOCATIONS PRIOR TO DESIGN OR CONSTRUCTION.

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | REVISIONS | |

SCALE
HORIZ: 1" = 200'
VERT:

DSN. DM
DRN. RS
CKD. DM
DATE: FEB. 1995

MAP UPDATED: APRIL 2003

WESTECH ENGINEERING, INC.
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CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
## NORTHEAST QUADRANT

SHEET
4 OF 4

JOB NUMBER
960.308.0

## 4.2. History and Development of Sewerage Facilities.

Philomath's original sewer system was built in 1952. It served most of the area within the present City limits west of Newton Creek. Concrete, mortar joint pipe was used for the sewer construction. Two sewage lift stations were built at that time. One was located at the sewage treatment plant and was intended to lift all sewage into the treatment plant. This was known as pump station A. At that time the sewage treatment plant was located at the City shops facility near the south end of 16th Street. A second lift station was constructed near the High School on Applegate Street. This lift station, known as pump station B, originally served the portion of the City east of 16th Street on the north side of Main Street and all of the area east of 19th Street on the south side of Main Street. Pump station B discharged through a force main into Manhole #117 on Applegate Street where sewage flowed by gravity to pump Station A. Pump stations A and B essentially divided the City into two distinct drainage basins. This configuration remained until the mid 1980's, when large-scale sewer improvements were constructed.

In 1985, the capacity of pump station A was increased. The station was converted to a submersible pump station with four new submersible pumps, new pump controls, new discharge piping, and a new top slab on the wet well. In 1986 the City constructed large-scale sewerage system improvements that changed the overall configuration of the collection and treatment system. As part of this project, pump station B was abandoned. This reduced flows to pump station A, since pump station B discharged into the collection system for pump station A. Therefore, the 1985 renovation of pump station A together with the 1986 demolition of pump station B provided the additional capacity in pump station A required for growth. As part of the 1986 project, flows from the collection system that originally drained to pump station B were rerouted to a new pump station on Chapel drive. This new pump station is known as the Newton Creek Pump Station, and remains in service essentially unaltered from the original 1986 project. In order to reroute flows, the sewer between Manhole #1 and Manhole #202A was reconstructed. The slope of this segment was reversed so that flow occurred from Manhole #1 to Manhole #202A. A new 21-inch gravity trunk sewer was constructed to convey flows south of Manhole #202A to the Newton Creek Pump Station.

The 1986 project also included the construction of a new treatment plant south of the Marys River. New force mains from pump station A and the Newton Creek pump station were constructed to convey flows to the new treatment plant,. From pump station A, a new 14-inch ductile iron force main was constructed south to Chapel Drive and east along Chapel Drive where it joined with a common 18-inch ductile iron force main at the Newton Creek Pump Station. Flows from both pump stations are conveyed through a common force main east of the Newton Creek Pump Station across Newton Creek and south to the new Treatment Plant.

The new treatment plant was designed as a summer-holding winter-discharge facility with a headworks, two facultative lagoons, and disinfection facilities. A new single-port discharge into the Marys River was also constructed. With the exception of a few minor modifications and the dechlorination project discussed below, the treatment plant has been operated as designed since originally constructed. Once the new WWTP was placed into service, the existing WWTP near the City shops was decommissioned.

Another project that had a significant impact on the configuration of the City's sewerage system was the 1995 Basin Transfer. This project consisted of rerouting a significant portion of the Pump Station A collection basin to the Newton Creek Pump Station. This decreased flow to Pump Station A, and thereby increased its useful life. In order to reroute the flows, a new sewer was constructed in College Street from Manhole #16 to Manhole #288 at 15th Street. All flows upstream of Manhole #288, that were originally routed to pump Station A were redirected to the Newton Creek Pump Station.

A final project that impacted the configuration of the City's sewerage system was the Timber Estates residential development located northwest of the intersection of Chapel Drive and 19th Street. Wastewater from this development is collected and conveyed by gravity to a small pump station located on Chapel Drive. This pump station discharges into the 14-inch ductile iron force main between Pump Station A and the Newton Creek Pump Station.

## 4.3. Wastewater Collection System

The City's existing sanitary sewage collection system collects wastewater from residences, businesses, industries, and public facilities and conveys the water to one of three pump stations where it is pumped through a common force main to the City's wastewater treatment plant. This section provides an overview of the existing wastewater collection system within the study area with an emphasis on flow routing and known and reported problems.

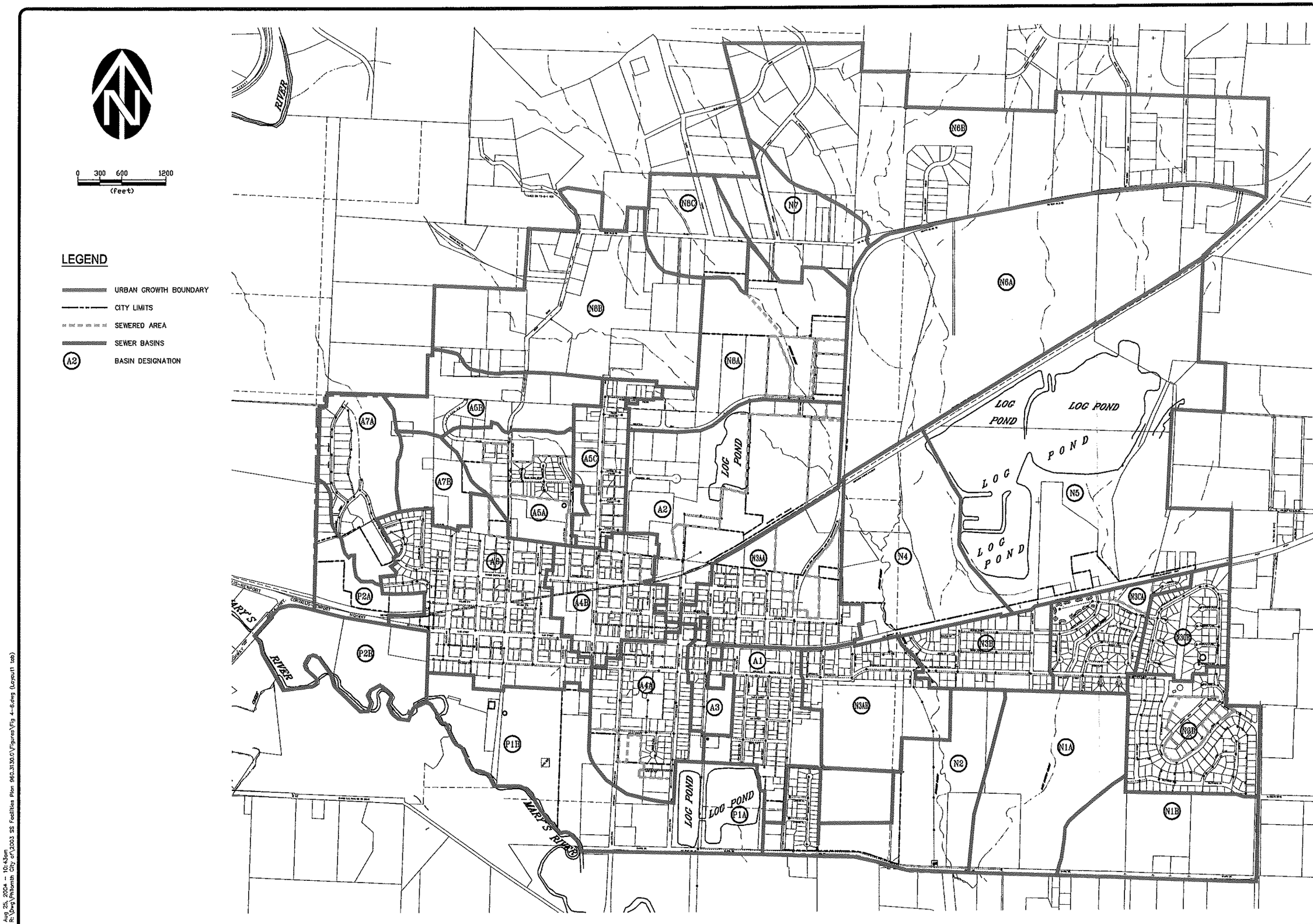
Although all public sewers within the study area are owned by the City, three entities have jurisdiction over the right-of-ways within which the sewer mainlines are located. In addition to the City, the Oregon Department of Transportation (ODOT) has jurisdictional oversight for facilities constructed within the Highway 34/20 right-of-way. While Benton County technically has jurisdictional oversight for sewer facilities constructed within County right-of-ways. Benton County typically defers review to the City for sewer facilities in County right-of-ways within City Limits.

### 4.3.1 Sewer Drainage Basins

To aid in the analysis of the collection system, it is convenient to divide the collection system into separate drainage basins. The basin boundaries are based on a combination of factors including topography, the layout of the existing system, property boundaries, and land use. The collection system is divided into 32 distinct

basins as shown in **Figure 4-6**. The basin designations and boundaries are modified from the original basins as determined in the 1985 Facilities Plan.

As part of the 1985 Facilities Plan, the basins were designated by prefixes with "A" designating basins served by Pump Station A, "N" designating basins served by the Newton Creek Pump Station, and "P" designating basins which require additional pump stations. In order to maintain consistency with previous work, this basin designation scheme was retained even though the drainage patterns have developed differently than originally planned. For example, basin N8A was originally planned to be routed to the Newton Creek Pump Station via a trunk sewer running parallel to Green Road. Instead, sewer was extended into basin N8A from basin A2. Therefore, until the 1995 basin transfer project the sewered portion of basin N8A was routed to pump station A. As part of the 1995 basin transfer project, flows from Basin A2 were diverted through basin N3AA toward the Newton Creek Pump Station. Therefore, at the present time, flows from basin N8A are routed into basin A2 which discharges in to the Newton Creek Pump Station gravity collection system. The routing of the existing system is shown schematically in **Figure 4-1.** Though all of the sewer basins are shown in **Figure 4-1**, only those connected with the gravity piping symbol are currently served.

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REVISIONS

DSN. CB
DRN. TMT
CKD. CB
DATE: JULY 03

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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

# SANITARY SEWER BASIN MAP

FIGURE
4-6

JOB NUMBER
960.3130.0

Aug 25, 2004 - 10:43am
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**Table 4-1** lists the basin, name and approximate area within each of the basins.

**TABLE 4-1**
**Collection System – Drainage Basin Areas**

| Sewer Basin Designation | Total Area (Acres) | Sewered Area (Acres) | Nonsewered Area (Acres) |
|---|---|---|---|
| A1 | 68 | 68 | 0 |
| A2 | 120 | 55 | 65 |
| A3 | 15 | 15 | 0 |
| A4A | 61 | 48 | 13 |
| A4B | 50 | 44 | 6 |
| A5A | 46 | 18 | 28 |
| A5B | 48 | 0 | 48 |
| A5C | 35 | 35 | 0 |
| A6 | 108 | 106 | 2 |
| A7A | 50 | 0 | 50 |
| A7B | 24 | 0 | 24 |
| N1A | 90 | 0 | 90 |
| N1B | 68 | 0 | 68 |
| N2 | 68 | 0 | 68 |
| N3AA | 74 | 54 | 20 |
| N3AB | 61 | 61 | 0 |
| N3B | 41 | 41 | 0 |
| N3CA | 41 | 37 | 4 |
| N3CB | 34 | 34 | 0 |
| N3D | 62 | 52 | 10 |
| N4 | 94 | 0 | 94 |
| N5 | 268 | 0 | 268 |
| N6A | 248 | 0 | 248 |
| N6B | 256 | 0 | 256 |
| N7 | 47 | 0 | 47 |
| N8A | 93 | 37 | 56 |
| N8B | 138 | 0 | 138 |
| N8C | 38 | 0 | 38 |
| P1A | 50 | 12 | 38 |
| P1B | 91 | 0 | 91 |
| P2A | 24 | 0 | 24 |
| P2B | 51 | 0 | 51 |
| Totals | 2563 | 717 | 1846 |

### 4.3.2 Gravity Collection System

The service area with the City is served by a conventional gravity collection system. Wastewater is collected and conveyed by gravity to Pump Station A, the Newton Creek Sump Station, or the Timber Estates Pump Station.

The original collection system was constructed in 1952 as part of the original sewer system. The original construction utilized primarily concrete mortar joint pipe. Additions to the original system have utilized a variety of pipe materials including concrete with rubber joints, Asbestos Cement pipe, ABS truss pipe, and most recently PVC. Public Works design standards were adopted in 1998. The public works design standards allow only PVC and ductile iron pipe for the construction of gravity sewers.

The total estimated length of pipe in the gravity collection system is approximately 91,930 feet (±17.4 miles) with approximately 393 manholes and mainline cleanouts. **Table 4-2** contains a summary of the estimated quantities of piping by size and material type in the gravity collection system.

**TABLE 4-2**
**Gravity Collection System**
**Estimated Piping Quantities**

| Pipe Size | Total Estimated Pipe Quantities (feet) | | | | |
|---|---|---|---|---|---|
| | AC | Concrete | Clay | PVC | Totals |
| 6" | - | 379 | 499 | 436 | 1,314 |
| 8" | 668 | 46,477 | - | 26,134 | 73,279 |
| 10" | 1,398 | 6,201 | - | 2,175 | 9,774 |
| 12" | - | 3,041 | - | 1,030 | 4,071 |
| 21" | - | - | - | 2,657 | 2,657 |
| 24" | - | - | - | 835 | 835 |
| Totals | 2,066 | 56,098 | 499 | 33,267 | 91,930 |

Review of **Table 4-2** above shows that the majority of the collection system is constructed of 8-inch sewer mains. Nearly 80% of the total length of the gravity sewer main is 8-inch diameter pipe. In regard to pipe materials, the majority of the gravity collection system is constructed of concrete pipe. As previously discussed, the original gravity collection system was constructed in 1952. In fact, approximately 33,270 feet or 36% of the total pipe length was constructed in 1952 and is now more than 50 years old. Due to the age of the concrete pipe, as well as the construction methods employed at the time, much of the original 1952 system collects excessive amounts of I/I and is generally in questionable condition.

It should be noted that the Newton Creek Sanitary Sewer Extension project is tentatively scheduled for completion in the summer of 2003. This project includes the construction of a 24-inch diameter trunk sewer north from manhole #382 across the Highway. This sewer extension is included on the utility maps and in quantities listed in **Table 4-2**, and is considered to be existing for the purposes of this facilities plan.

### 4.3.3 Existing Pump Stations

Wastewater is conveyed by the gravity collection system to one of three pump stations as discussed above. In general, the collection system serving the western portion of town conveys flows to Pump Station A. Pump Station A is located at the City shops complex near the south end of 16th street. The collection system serving the eastern portion of town conveys flows to the Newton Creek Pump Station. The Newton Creek Pump Station is located on Chapel Drive west of the Newton Creek Bridge. The Timber Estates Pump Station is a minor pump station located on Chapel Drive west of the Newton Creek Pump Station. This pump station serves the moderately sized Timber Estates subdivision northwest of the 19th Street and Chapel Drive intersection in sewer basin P1A. The three stations pump wastewater through a common force main to the treatment plant located south of the Marys River on the west side of Bellfountain Road.

A fourth minor pump station is located at the City Park south of Applegate Street on 23rd Street. This pump station serves the public restroom facility located at Pioneer Park. This pump station is relatively small and similar in nature to a single-unit residential pump station. As such, it is not included in the facilities planning effort, and is only mentioned here for completion. **Table 4-3** contains a summary of some of the import characteristics of each of the three pump stations. A more detailed description of each of the stations is then presented.

**TABLE 4-3**
**Summary of Existing Pump Stations**

| Category | Pump Station A (PSA) | Newton Creek Pump Station (NCPS) | Timber Estates Pump Station (TEPS) |
|---|---|---|---|
| • Basins served | A1, A3, A4A, A4B, A5A, A5C, A6 | A2, N3AA, N3AB, N3B, N3CA, N3CB, N3D | P1A |
| • Construction date | 1952, Renovated 1985 | 1986 | 1995 |
| Flows<br>• Design Discharge Rate | 2.23 MGD (1550 GPM) @ 44' TDH | 3.04 MGD (2110 GPM) @ 43' TDH (Ultimate wet well capacity = 7.05 MGD) | 0.155 MGD (108 GPM) @ 37' TDH |
| Wetwell | | | |
| • Type | • Concrete | • Concrete | • Concrete |
| • Diameter | • 10' | • 16' | • 6' |
| • Rim Elevation | • 265.25 | • 252.00 | • 272.50 |
| • 100 Yr Flood Elevation | • 264 | • 251.01 | • ± 260 |
| • Influent Invert Elevation | • 247.15 | • 241.25 | • 262.67 |
| • Low Water Pump Off Elev. | • 243.00 | • 229.20 | • 257.50 |
| • Depth | • 24.25' | • 23.75' | • 16' |
| • Operational Storage | • 2,400 gallons | • 13,200 gallons | • 283 gallons |
| • Additional Pipe Stubs | • none | • 10" SE Side of wet well | • none |

## TABLE 4-3 Continued
## Summary of Existing Pump Stations

| Category | Pump Station A (PSA) | Newton Creek Pump Station (NCPS) | Timber Estates Pump Station (TEPS) |
|---|---|---|---|
| Pumps | | | |
| • Type | • Submersible Sewage Pumps | • Submersible Sewage Pumps | • Submersible Sewage Pumps |
| • Number | • 4 total | • 4 total | • 2 total |
| • Manufacturer & Model | • (2) Flygt CP 3152 (434)<br>(2) Flygt CP 3127 (442) | • (2) Flygt CP 3152 (432)<br>(2) Flygt CP 3127 (461) | • (2) ABS AFP 1040-1 Series AFP 1 |
| • Motor Size | • (2) 20 hp & (2) @ 10 hp | • (2) 20 hp & (2) @ 10 hp | • (2) 3.7 hp |
| • Motor Speed | • (4) 1750 rmp, single speed | • (4) 1750 rmp, single speed | • (4) 1780 rmp, single speed |
| • Power | • 230 Volt 3 phase | • 460 Volt 3 phase | • 230 Volt 1 phase |
| Force Mains | | | |
| • Size & Type | • 14" DI (PSA to NCPS)<br>18" DI (NCPS to WWTP) | • 18" DI (NCPS to WWTP) | • 4" DI (TEPS to 14" FM Sta ± 31+44)<br>14" DI (Sta ±31+44 to NCPS)<br>18" DI (NCPS to WWTP) |
| • Length | • 4640' (14" PSA to NCPS)<br>5360' (18" NCPS to WWTP) | • 5360' (18" NCPS to WWTP) | • 30' (TEPS to 14" FM Sta ± 31+44)<br>1493' (14" FM Sta to NCPS)<br>5360' (18" NCPS to WWTP) |
| • FM Discharge | • Common F.M. Sta 0+00 | • Common F.M. Sta 46+36.50 | • Common F.M. Sta 31+44 |
| • FM Discharge El. | • ± 256 | • ± 256 | • ± 256 |
| • Maximum Static Head | • 13 feet | • 26.80 feet | • -1.5 feet |
| Hydrogen Sulfide Control | none | none | None |
| Auxiliary Power | | | |
| • Type & Location | • Permanent onsite Natural Gas Powered Generator | • Permanent onsite Diesel Powered Generator | • Portable Gas Powered Generator located at City shops |
| • Fuel Supply | • Natural Gas Line | • 240 gal capacity buried fuel tank | • 1.6 gallon fuel tank |
| • Transfer Switch | • Automatic | • Automatic | • Manual |
| • Rating | • 60 KW, 230V 3 phase | • 30 KW, 480V 3 phase 60 Hz | • 3.5 KW, 230V 1 phase 60 Hz |
| • Min Equipment to Operate | • (2) 20 HP pumps started sequentially, building Lighting | • (2) 10 HP pumps started sequentially, building Lighting | • (1) 3.7 HP pump |
| Telemetry | Telephone Dialer System | Telephone Dialer System | Telephone Dialer System |
| Overflow | | | |
| • Location | • Bypass in MH #200 | • Roadside ditch north of Chapel Drive | • Roadside ditch north of Chapel Drive |
| • Type | • Overflow pipe in MH #200 | • Overflow pipe from wet well to ditch | • Overflow pipe from wet well to ditch |
| • Elevation | • 258.00 | • 250.00 | • 268.25 |
| • Discharge point | • Marys River | • Newton Creek | • Newton Creek |
| • Overflow Storage | • 8,800 gallons | • 18,000 gallons | • 2,300 gallons |

#### 4.3.3.1 Pump Station A

Pump Station A consists of a circular wet well, four submersible sewage pumps, and associated controls and piping. Pump Station A is a four-plex pump station with two 20 HP and two 10 HP submersible pumps that are individually controlled in response to the water level in the wet well. The pumps pump from the concrete wet well through valved discharge piping and into the 14-inch force main. The pump station controls are located in a control building adjacent to the wet well.

The wet well is a cast-in-place concrete structure originally built in 1952 with an intermediate floor about 16 feet below grade. The intermediate slab was removed during the 1985 improvements. Access to the wet well is gained through a hatch on the northeastern quarter of the top slab. A ladder descends to within one foot of the wet well floor. The wet well is equipped with ventilation equipment.

Most of the pump discharge piping is located in the wet well. Sewage is pumped from the wet well by the pumps into vertical standpipes. Each standpipe is equipped with a check valve. A 6-inch pipe collects sewage from the small pumps and conveys it outside of the wet well. Likewise, 10-inch pipe conveys flow from the large pumps to the outside of the wet well. Immediately outside the wet well, a 6-inch by 10-inch tee connects the two discharge lines. Immediately downstream of this tee, the discharge piping connects to the 14-inch force main.

In general, the station has operated as designed since 1985 with a few modifications. In 1986, the City added a natural gas fired auxiliary power unit with an automatic transfer switch to provide backup power for the pump station. The auxiliary power unit is located in a weatherproof enclosure adjacent to the pump station and the automatic transfer switch is located in the control building. Another modification was the replacement of the wet well float switches with an ultrasonic water surface level sensor (Miltronics MultiRanger Plus). The original 1985 modifications included the installation of two 20 HP and two 5 HP submersible pumps. The two 5 HP submersible pumps were replaced with two 10 HP submersible pumps in 1999 as an interim means to increase the capacity of the station.

The pump station is equipped with an alarm and telemetry system that monitors high and low water level conditions as well as a generator fail to start condition. When an alarm condition occurs, the signal is transferred to Guardian Alarm of Corvallis through a phone dialer system. Guardian Alarm monitors the system and contacts the operator when an alarm signal is received. The telemetry system does not allow for remote monitoring, nor does the station have any data logging capabilities.

The City currently utilizes a portable crane for the retrieval of the pumps. A socket is mounted inside each of the hatch openings.

#### 4.3.3.2 Newton Creek Pump Station

The Newton Creek Pump Station consists of a circular wet well, a small CMU block control building, four submersible sewage pumps, an auxiliary power unit, and associated controls and piping. The pump station was completed in 1986 and has operated largely as designed ever since.

The wet well is a cast in place concrete structure approximately 25 feet deep and 16 feet in diameter. While the existing pumps provide a capacity of 3.04 MGD, the wet well is sized for an ultimate capacity of 7.05 MGD. In addition to the main 21-inch inlet, a 10-inch diameter ductile iron stub enters the wet well at an invert elevation of 237.90 feet. This stub is intended to serve sewer basins N1A and N1B. The wet well is accessed through a hatch on the northeastern quarter of the top slab. A ladder descends to within one foot of the wet well floor. The wet well is equipped with ventilation equipment.

Most of the pump discharge piping is located in the wet well. Sewage is pumped from the wet well by the pumps into vertical standpipes. Each standpipe is equipped with a check valve. An 8-inch pipe collects sewage from the small pumps and conveys it outside of the wet well. Likewise, 10-inch pipe conveys flow from the large pumps to the outside of the wet well. Immediately outside the wet well, the 8-inch and 10-inch pipes flow into a welded steel manifold onto which a 14-inch ductile iron force main is attached. The steel manifold is equipped with a flange connection for a future 16-inch force main. The 14-inch ductile iron force main extends a short distance to Chapel Drive where it intersects the 14" force main from Pump Station A. The two force mains are connected with a ductile iron tee. On the downstream side of the tee, the force main increases to 18-inches in diameter.

The pumps operate according to the water level in the wet well. Ten float switches in the wet well open and close circuits, thereby starting and stopping the individual pumps. Each pump has a float switch that turns it on, and another that turns it off.

The control building is located adjacent to the pump station with approximate dimensions of 11 feet by 19 feet. The building houses the electrical control panels and pump motor starters, the auxiliary power unit, and the blower and ductwork for the wet well ventilation system. The building is equipped with an automatic intake louver located south of the auxiliary power unit that opens when the auxiliary power unit is in operation.

The pump station is equipped with an alarm and telemetry system that monitors high and low water level conditions as well as a generator fail to

start condition. When an alarm condition occurs, the signal is transferred to Guardian Alarm of Corvallis through a phone dialer system. Guardian Alarm monitors the system and contacts the operator when an alarm signal is received. The telemetry system does not allow for remote monitoring, nor does the station have any data logging capabilities.

The station is also equipped with a 30 KW auxiliary power unit. The auxiliary power unit is sized to operate the two 10 HP pumps, the control system and building lighting. Fuel is supplied to the auxiliary power unit from a 240 gallon underground tank buried south of the control building.

The City currently utilizes a portable crane for the retrieval of the pumps. A socket is mounted inside each of the hatch openings.

#### 4.3.3.3 Timber Estates Pump Station

Timber Estates Pump Station consists of a circular wet well, two submersible sewage pumps, and associated controls and piping. Timber Estates Pump Station is a duplex pump station with two 3.7 HP submersible pumps that are individually controlled in response to the water level in the wet well. The pumps pump from the concrete wet well through valved discharge piping and into the 14-inch force main. The pump station controls are located in a control cabinet adjacent to the wet well.

The wet well is a cast in place concrete structure approximately 16 feet deep and 6 feet in diameter. An 8-inch gravity sewer enters at invert elevation 262.67. There is an 8-inch overflow located at invert elevation 268.50 feet. The overflow discharges in the roadside ditch on the north side of Chapel Drive. This ditch ultimately discharges to Newton Creek. The wet well is accessed through a hatch on the top slab.

The existing pumps provide a capacity of 0.155 MGD. Each pump is mounted on a guide rail system to permit raising and lowering of the pumps. A lifting chain is attached to each pump. The pumps are controlled according to the water level in the wet well. There are four float switches in the wet well that open and close the control circuits, thereby starting and stopping the individual pumps.

The 4-inch discharge pipe from each pump passes through a 4-foot diameter precast circular valve vault. The vault is constructed using manhole barrel sections and contains no drainage provisions. Consequently, the valve vault remains full of water most of the time. This problem should be addressed during the planning period. The valve vault contains two 4-inch ball type check valves and two 4-inch gate valves. Shortly outside the valve vault the two discharge pipes joint into a single 4-inch pipe that connects to the 14" common force main in Chapel Drive.

The City owns a portable gas generator that is capable of running one of the pumps at the station. A manual transfer switch is provided for switching to auxiliary power

The pump station is equipped with an alarm and telemetry system that monitors high level and overflow. When an alarm condition occurs, an automatic dialer system begins to call preprogrammed telephone numbers. When a call is answered, the autodialer will deliver a prerecorded message and reset itself upon reception of a signal from the person being called. The telemetry system does not allow for remote monitoring, nor does the station have any data logging capabilities.

In general, the station has operated as designed since 1995 with no modifications.

### 4.3.4 Existing Force main

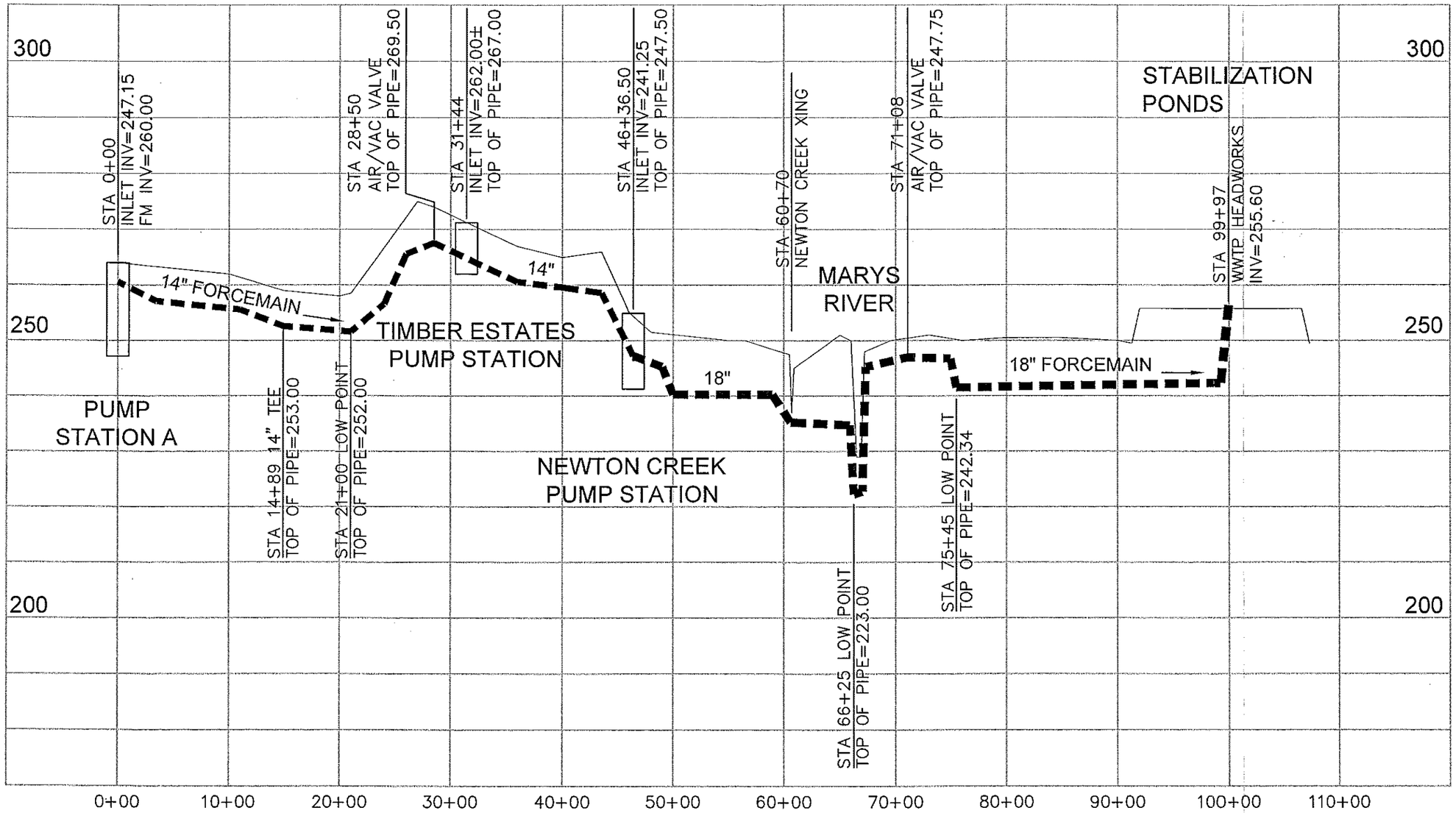
The three pump stations described above pump wastewater through a common force main to the treatment plant located south of the Marys River on the west side of Bellfountain Road. Portions of the force main are shown in **Figures 4-1** and **4-2**. The force main begins at Pump Station A, where it extends south to Chapel Drive. The force main continues east on Chapel Drive to the Timber Estates Pump Station near the intersection of Chapel Drive and 19$^{th}$ Street. From the Timber Estates Pump station, the force main continues east along Chapel Drive to the Newton Creek Pump Station. The entire force main between Pump Station A and the Newton Creek Pump Station is 14-inch diameter class 50 ductile iron pipe. Immediately downstream of the connection with the Newton Creek Pump Station, the force main transitions to 18-inch diameter class 50 ductile iron pipe. From the Newton Creek Pump Station, the force main continues east along Chapel Drive for approximately 920 feet, where it bends south, and continues under the Marys River and discharges at the treatment plant headworks. The total length of the 14-inch force main between Pump Station A and the Timber Estates Pump Station is approximately 3,144 feet. From the Timber Estates Pump Station to the Newton Creek Pump Station the length of 14-inch force main is approximately 1,496 feet. From the Newton Creek Pump Station to the wastewater treatment plant, the length of 18-inch force main is approximately 5,360 feet.

The profile of the force main is continuously descending from Pump Station A to a low point beyond the 14-inch tee in Chapel Drive. The horizontal distance along the pipe from Pump Station A to the low point is approximately 2,100 feet. From the low point, the force main ascends to a high point with an air/vacuum release valve at approximately 750 feet east along Chapel Drive. The elevation of the top of the pipe at this high point is approximately 270 feet. From the high point in Chapel Drive the force main descends toward the Newton Creek Pump Station. Approximately 294 feet east of the high point, the Timber Estates Pump Station connects to the 14-inch

force main. From the transition to the 18-inch force main at the Newton Creek Pump Station, the force main continues to descend before and after a 900 foot flat section to a low point under the Marys River. The horizontal distance along the pipe alignment from the Newton Creek Pump Station to the low point is approximately 1,984 feet. From the low point under the Marys River, the 18-inch force main ascends to a high point with an air/vacuum release valve located approximately 483 feet from the Marys River low point along the pipe alignment. The elevation of the top of the pipe at this high point is approximately 247.75 The force main then descends to a low point located approximately 437 feet from the high point along the pipe alignment. From this final low point, the 18-inch force main continues to ascend for the final 2,452 feet to the wastewater treatment plant headworks. The elevation of the invert of the flume in the headworks which controls gravity flow into the lagoons is approximately 256.35 feet.

The approximate profile of the force main from Pump Station A to the WWTP is shown in **Figure 4-7**.

The force main is equipped with a few notable appurtenances in addition to the two air/vacuum release valves mentioned above. These include a 14-inch eccentric plug valve located immediately west of the discharge tee for the Newton Creek Pump Station and an access port immediately south of the Marys River. Also worth noting is that two bores with bore casings were used in the construction of the force main. These are located under Chapel Drive where the force main crosses to the treatment plant and under the Marys River.




# COMMON FORCEMAIN PROFILE

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1" = 20' V

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WESTECH ENGINEERING, INC.
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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

COMMON FORCEMAIN PROFILE

FIGURE
4-7

JOB NUMBER
960.3130


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### 4.3.5 Infiltration and Inflow

The collection system is typical of many western Oregon sewer systems in that it experiences higher flows during the winter months because of infiltration and inflow (I/I). Average dry weather flow to the WWTP is about 0.454 mgd, while the average wet weather flow is about 1.100 mgd. This increase in flow is strongly related to precipitation. During prolonged dry periods, flow to the treatment plant will asymptotically decrease approaching dry weather flow values. During these low flow periods, the majority of the waste stream is composed of wastewater collected from the individual users. After a period of rainfall, flow increases as the ground becomes saturated and the amount of groundwater entering the collection pipes increases. During prolonged wet periods flow to the WWTP will actually track precipitation. In other words, when precipitation increases, flow to the WWTP also increases, and when precipitation decreases, flow to the WWTP decreases. This is known as rainfall induced infiltration and inflow. During high flow periods the waste stream is made up of wastewater collected from the individual users and groundwater resulting from I/I. The relationship between sewer flows and rainfall is so pronounced, that DEQ now recommends that sewer flows be related to rainfall amounts for determining critical flow quantities used for sizing wastewater facilities. This is discussed in more detail in **Section 5**. By utilizing the methodology recommended by the DEQ, it becomes possible to assign a return interval to a particular flow rate. In other words, it becomes possible to estimate flow associated with a 2-year 24-hour storm, a 5-year 24-hour storm, a 10-year 24-hour storm, and so on. For the purposes of this plan, only the flow associated with a 5-year 24-hour storm (PDAF5) was estimated. For Philomath, this value is approximately 4.080 mgd.

The I/I problem is significant and is a major concern to the City. The ratio between the average daily dry weather flow and the PDAF5 is approximately 9. This ratio is higher than many comparable collection systems in the Willamette Valley. High I/I flows are problematic for a number of reasons. They utilize reserve capacity and ultimately decrease the useful life of the gravity collection system. Since all of the wastewater in Philomath is pumped to the treatment plant, I/I increases pump run times and power costs. Finally, I/I is a burden to the treatment facilities since it must be treated and discharged as though it was wastewater.

### 4.3.6 Field Investigations

Westech personnel inspected the collection system on multiple days during and immediately following a major winter storm in late January 2003. Work on the first day of fieldwork was concentrated in the Pump Station A basin. No surcharging was observed in the Pump Station A basin during the first day of fieldwork. During the second day of fieldwork, a large portion of the Pump Station A basin was surcharged. The surcharging limits are shown in **Figure 4-8**. Field investigations included manhole inspections, spot checking instantaneous flows in the sewers, noting surcharging limits and flow mapping.

Flow mapping is a method used to help identify those portions of the collection system which contribute the most I/I and to quantify the amount of I/I originating within a section of the collection system. It consists of measuring the instantaneous flow in the sewer at strategic manholes in the collection system. The work is typically performed between midnight and 6 A.M. when sanitary flows are lowest. This allows the assumption that all flow in the collection system is from I/I. Typically, flow mapping is completed either during or immediately following a major winter storm so that the I/I contributions are highest. The results of the flow mapping are shown on **Figure 4-8**.

Based upon the field investigations, a review of the Daily Monitoring Reports (DMRs), and pump station hour readings the following statements can be made regarding I/I and the City's efforts to reduce I/I. The reader is encouraged to refer to **Figure 4-8** during the following discussion.

- While the City has some base I/I throughout the winter months. The vast majority of the I/I is either direct inflow or rainfall induced infiltration (RII). Once the soil is wet during the winter and early spring a major rainstorm will result in increased flows observed at the WWTP within a few hours after the precipitation starts.

- Though I/I flows decrease after a major storm, prolonged dry periods (i.e., a few weeks) are required before flows to the WWTP return to near summer levels. This suggests that a significant volume of groundwater must be drained before I/I levels return to low flow values. Conceptually, one can envision that the I/I flows slowly drain a relatively large storage reservoir.

- The newer portions of the collection system that are constructed of PVC pipe materials contribute very little I/I.

- Inadequate pump station and trunk sewer capacity results in surcharging in the lower portions of the pump station A collection basin.

- Surcharging of the lower portions of the Newton Creek Pump Station collection basin occurs during very large storms as a result of inadequate capacity in the 8-inch trunk sewer upstream of manhole 1.

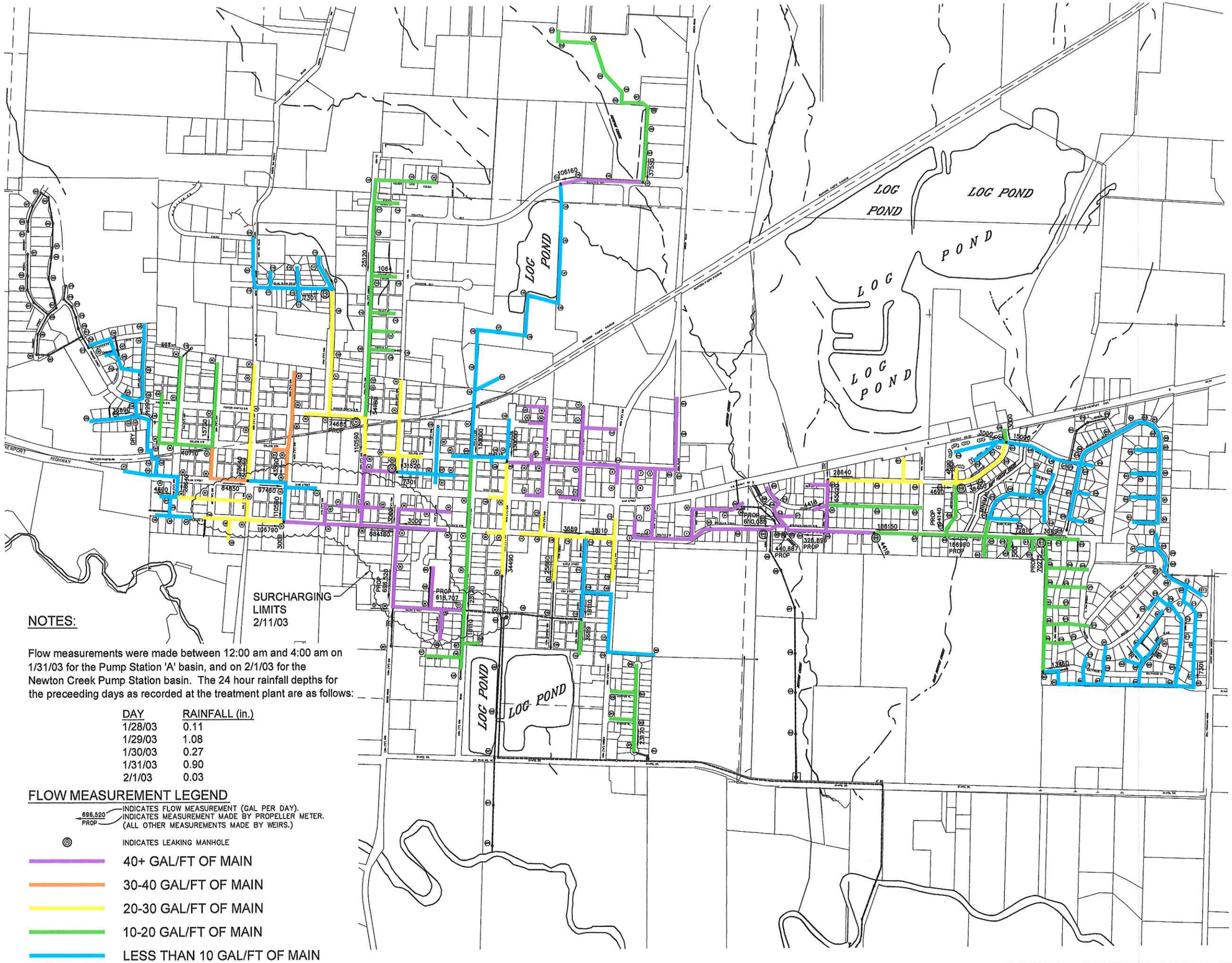
- Surcharged conditions in the lower end of the Pump Station A collection system during major storm events may act to reduce I/I into that portion of the collection system.

- I/I originates from all major components within the collection system – manholes, service laterals and sewer mains.

- Of 40 manholes that were inspected and were not surcharged, 8, or approximately 20% were observed to leak at various locations.

- Within the Pump Station A collection system, approximately 35% of the I/I originates in sewer basins A4A and A4B, from manhole 27 upstream to manholes 34 and 70. This area represents approximately 10-15% of the overall length of sewer main in the Pump Station A basin. Therefore, future I/I reduction efforts might best be focused in this area.

- Within the Newton Creek Pump Station collection system, the most severe I/I problems were observed in sewer basins N3AA, N3AB, and N3B from manhole 202A upstream to manholes 206, 224, and 290. This includes the portion of College Street Sewer that was replaced in 2001. It is not likely that the new College Street Sewer has a significant I/I problem. That the flow mapping data suggests this, is an artifact of where the readings were taken. A closer examination of this basin will likely show that the older portions of the sewer pipe contribute large amounts of I/I.




NOTES:

Flow measurements were made between 12:00 am and 4:00 am on 1/31/03 for the Pump Station 'A' basin, and on 2/1/03 for the Newton Creek Pump Station basin. The 24 hour rainfall depths for the preceeding days as recorded at the treatment plant are as follows:

| DAY | RAINFALL (in.) |
|---|---|
| 1/28/03 | 0.11 |
| 1/29/03 | 1.08 |
| 1/30/03 | 0.27 |
| 1/31/03 | 0.90 |
| 2/1/03 | 0.03 |

FLOW MEASUREMENT LEGEND

696,520 PROP — INDICATES FLOW MEASUREMENT (GAL PER DAY). INDICATES MEASUREMENT MADE BY PROPELLER METER. (ALL OTHER MEASUREMENTS MADE BY WEIRS.)

INDICATES LEAKING MANHOLE

- 40+ GAL/FT OF MAIN
- 30-40 GAL/FT OF MAIN
- 20-30 GAL/FT OF MAIN
- 10-20 GAL/FT OF MAIN
- LESS THAN 10 GAL/FT OF MAIN

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WESTECH ENGINEERING, INC.
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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

# COLLECTION SYSTEM FLOW MAPPING DATA

FIGURE 4-8

JOB NUMBER 960.3130.0

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### 4.3.7 Description of Known Existing Collection System Deficiencies

Problems with the Collection System were identified from meetings and discussions with City staff and from field investigations. During major winter storms, the lower portions of the collection system surcharge due to inadequate capacity in Pump Station A and inadequate capacity in portions of the collection system piping. The types of problems discussed can generally be divided into the following categories; lack of capacity, end of useful life and lack of maintenance. A short discussion of each of these categories follows. The deficiencies listed in this section are largely based on field observations and operational problems. Since components of the collection system (i.e., gravity collection piping) are not monitored on a full-time basis, this list of deficiencies should not be considered all-inclusive. As described in **Section 6**, several additional collection system deficiencies exist that are revealed through quantitative analysis.

Pump Station A lacks capacity to convey existing peak flows and should be replaced early in the planning period. The Newton Creek pump station is in relatively good condition and is sufficiently sized to convey the existing peak flows. A few minor improvements may be required during the planning period. These are likely to include control and telemetry modifications and removal and replacement of the existing buried fuel tank.

**Lack of Capacity**. This type of problem results from pipes that are too small to handle the peak sewage flows. This problem is a result of peak sewage flows increasing either due to development upstream or deterioration of the upstream system (i.e., increased I/I). Portions of the lower gravity collection piping appear to lack the capacity to convey peak flows.

**End of Useful Life**. This type of problem is the result of old, damaged, or worn out facilities that no longer function as designed. The most common example of this type of problem includes broken or collapsed pipes. The correction of these types of problems requires replacement or reconstruction of the existing system.

**Lack of Maintenance**. Grease, dirt, sediment, and other debris introduced into the sanitary sewer system may settle out or become lodged in pipes and manholes, resulting in surcharging due to the reduced capacity of the system. This type of problem can be prevented or minimized by routine inspection and cleaning of the gravity system.

A second problem in this category results when manholes are located within or adjacent to ditches or other storm drainage facilities that are not maintained. Under this scenario, the stormwater in the ditches often enters the sanitary sewer system through manhole lids or castings that are not tightly grouted to the manhole cone.

**Infiltration/Inflow**. I/I flows in the collection system utilize capacity in the sewer mains which was intended for sanitary sewage. When excessive, it results in surcharged sewers, abnormally high pump run times and bypasses. As stated in prior sections, the lower end of the collection system surcharges and upon occasion bypasses to surface waters or backs up into residences.

**Table 4-4** outlines the major known problem areas, as well as the category that the problem falls under.

**TABLE 4-4**
**Known Collection System Problem Areas**

| Location | Problem Category |
|---|---|
| **Pump Station A Collection System** | |
| Pump Station A | Lack of Capacity; Wet Well at end of Useful Life |
| Basin A4A, A4B, A6 | I/I |
| Cedar Street (From MH 26 to MH 29) | Lack of Capacity |
| 13th Street (From MH 29 to MH31) | Lack of Capacity |
| Applegate Street (From MH 31 to MH 35) | Lack of Capacity |
| 10th Street (From MH 34 to MH 45) | Lack of Capacity |
| Main Street (From MH 45 to MH 46) | Lack of Capacity |
| 12th Street (From MH 32 to MH 71) | Lack of Capacity |
| Manholes Throughout the Collection System | I/I |
| **Newton Creek Pump Station Collection System** | |
| Buried fuel tank at Newton Creek Pump Station | End of Useful Life |
| Basin N3AA, N3AB, N3B | I/I |
| Applegate Street (From MH 203 to MH 208) | Lack of Capacity |
| Applegate Street (From MH 1 to MH 2) | Lack of Capacity |
| 20th Street (From MH 2 to MH 6) | Lack of Capacity |
| College Street (From MH 6 to MH 9) | Lack of Capacity |
| Manholes Throughout the Collection System | I/I |

### 4.3.8 Collection System Non-Compliance Issues

The City has not received any notice of non-compliance letters (NON's) from DEQ for the past few years addressed to problems in the collection system.

There are a number of areas in the collection system that will likely experience compliance problems unless significant upgrades are completed within the planning period. These include the replacement or reconstruction of over capacity and faulty sewers that contribute significant I/I. Continued I/I control efforts are needed in the collection system regardless if growth within the collection system occurs. The specific projects are discussed in more detail in **Section 6**.

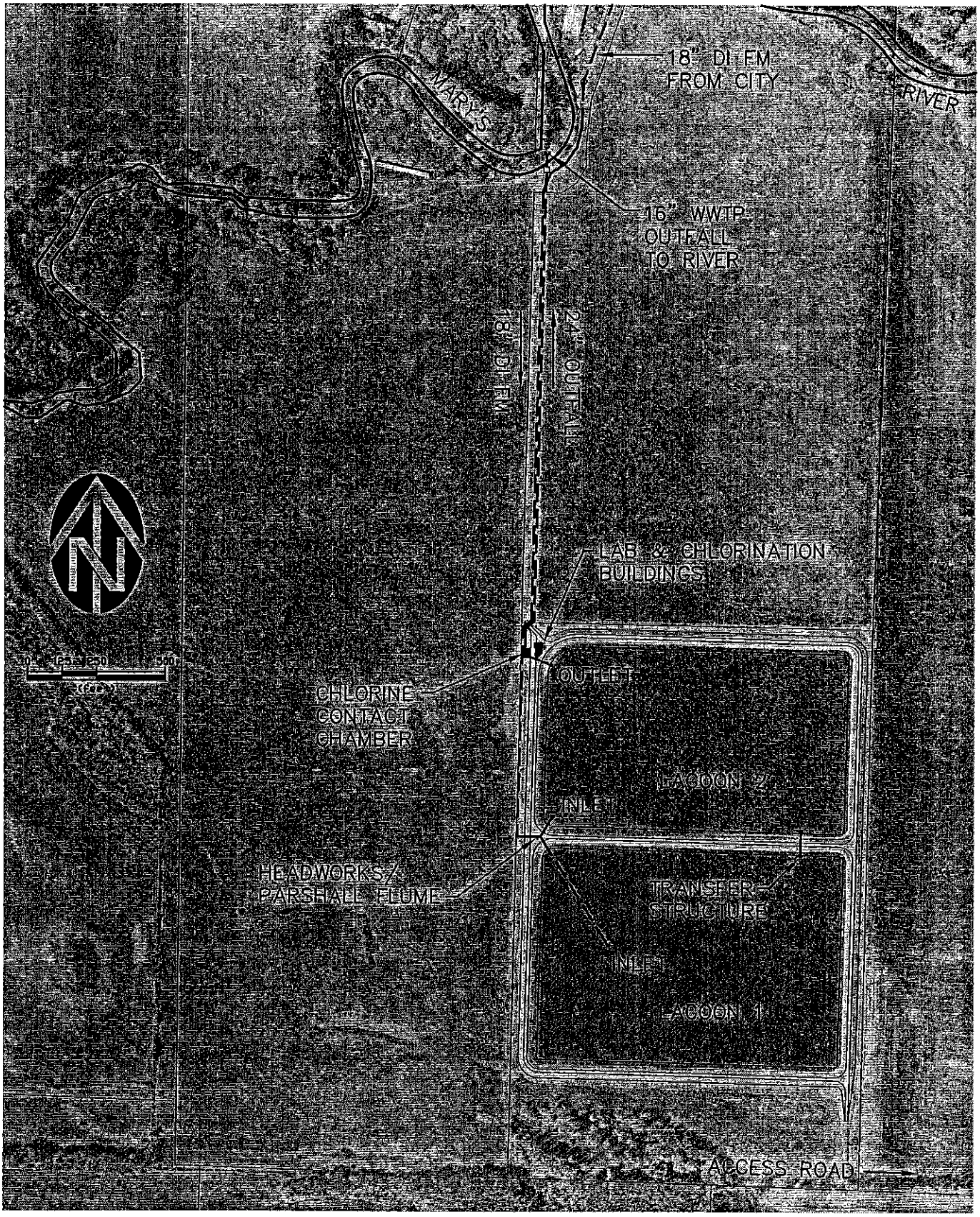
## 4.4. Wastewater Treatment and Disposal System

The City of Philomath owns, operates and maintains the wastewater treatment plant (WWTP) serving the City. The WWTP is located south of the City on the south side of the Marys River west of Bellfountain Road. The WWTP has two stabilization lagoons that normally operate in series on a summer-holding winter-discharge operational scheme. Treated wastewater is discharged through an outfall pipeline during the winter discharge season (November 1-April 30) to the Marys River. The WWTP and outfall were constructed in 1986 and continue to operate largely as designed. In addition to the lagoons, the treatment plant includes a headworks for flow measurement and influent sampling, a chemical building with chlorine disinfection equipment, a laboratory building, and a chlorine contact chamber. The wastewater facilities are schematically presented in **Figure 4-1**. The existing treatment plant plan is presented in **Figure 4-9**. The City is currently constructing dechlorination improvements that will add an additional chlorine contact chamber as well as a sulfur dioxide dechlorination system. These improvements are included in **Figure 4-1** and are considered completed for the purposes of this report. A summary of the existing treatment facilities is presented in **Table 4-5** followed by a short discussion of the individual unit processes.

## TABLE 4-5
## Summary of Existing Treatment Facilities

| | | |
|---|---|---|
| Design Year | 1996 | |
| Organic Loading Rates<br>• First Lagoon<br>• Average of All Lagoons | <br>• 50 lbs BOD/acre/day<br>• 35 lbs BOD/acre/day | |
| Design Flows<br>• ADWF<br>• AWWF<br>• PWWF | <br>• 0.475 MGD<br>• 1.20 MGD<br>• 3.73 MGD | |
| Design Loadings<br>• BOD<br>• TSS | <br>• 976 PPD<br>• 1081 PPD | |
| Design Net Summer Evaporation | 15 Inches | |
| Lagoon Features<br>• Type<br>• Area<br>• Storage<br>• Minimum Depth<br>• Maximum Depth<br>• Minimum Freeboard<br>• Width at Dike Top<br>• Inside Dike Slope<br>• Outside Dike Slope | Northern Lagoon<br>• Facultative (non aerated)<br>• 17.5 Ac<br>• 123.2 Ac -ft<br>• 2 Feet<br>• 8 Feet<br>• 3 Feet<br>• 12 Feet<br>• 3:1 Feet<br>• 2:1 Feet | Southern Lagoon<br>• Facultative (non aerated)<br>• 20.0 Ac<br>• 108.6 Ac-ft.<br>• 2 Feet<br>• 8 Feet<br>• 3 Feet<br>• 12 Feet<br>• 3:1 Feet<br>• 2:1 Feet |
| Influent Flow Measurement<br>• Primary Device<br>• Location<br>• Measurement Range<br>• Meter Type<br>• Meter Range | <br>• 12" Parshall Flume<br>• Headworks<br>• 0.258 – 7.500 MGD<br>• Stevens Model 61R Float Operated Mechanical Meter<br>• 0 – 7.0 MGD | |

| TABLE 4-5 Continued<br>Summary of Existing Treatment Facilities | |
|---|---|
| Influent Sampling<br>• Location<br>• Method<br>• Automatic Sampler | <br>• Headworks<br>• Grab & Composite<br>• ISCO Portable Sampler |
| Disinfection Facilities<br>• Type<br>• Location<br>• Chlorinator<br>• Maximum Feed Rate<br>• Control System<br>• Injection Point<br>• Contact Chamber<br>• Contact Volume<br>• Minimum Contact Time | <br>• Gas Chlorination System (1 Ton Cylinders)<br>• Chemical Building<br>• Wallace & Tiernan V500<br>• 200 lbs per day<br>• Flow paced from effluent meter reading<br>• Northerly Lagoon Outlet Structure<br>• Two Cast-in-Place Concrete Tanks with Baffles<br>• 80,000 gallons<br>• 30 minutes at 3.85 MGD |
| Dechlorination Facilities<br>• Type<br>• Location<br>• Sulfonator<br>• Maximum Feed Rate<br>• Control System<br>• Injection Point | <br>• Sulfur Dioxide Gas Feed System (150-lb Cylinders)<br>• Chemical Building<br>• Capitol Series NXT 3000<br>• 50 ppd with spare parts required to resize to 100 ppd<br>• manual<br>• Effluent Measurement Weir |
| Effluent Flow Measurement<br>• Primary Device<br>• Location<br>• Measurement Range<br>• Meter Type<br>• Meter Range | <br>• 4- Foot Sharp Crested Rectangular Weir<br>• Contact Chamber Outlet<br>• 0.779 – 8.705 MGD<br>• Stevens Model 61R Float Operated Mechanical Meter<br>• 0 – 3.5 MGD |
| Effluent Sampling<br>• Location<br>• Method<br>• Automatic Sampler | <br>• Compliance Manhole<br>• Grab & Composite<br>• ISCO Portable Sampler |
| Telemetry System | none |
| Auxiliary Power | none |
| Outfall<br>• Location<br>• Size & Type | <br>• Marys River<br>• 16-inch Class 50 Ductile Iron Single Port |

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WESTECH ENGINEERING, INC.
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City of Philomath 2003 Sanitary Sewer Facilities Plan

# EXISTING PHILOMATH SEWAGE TREATMENT PLANT

FIGURE 4-9

JOB NUMBER 960.3130.0

### 4.4.1 Headworks

Discharge from the pump stations is delivered to the treatment facilities through an 18-inch diameter force main that discharges into the headworks structure. The headworks structure includes a Parshall flume for flow measurement. The flume has a 12-inch wide throat and is equipped with an adjustable steel baffle designed to reduce turbulence in the flume. The flume is equipped with a staff gauge for spot checking. Adjacent to the flume is a stilling well and float operated mechanical flow recorder. Influent sampling is accomplished by a non-refrigerated, portable sampler. Flow from the flume is directed into either pond by positioning the aluminum slide gate at the outlet. Under normal operating conditions, flow is directed to the southerly lagoon. Flow from the headworks is carried through 20-inch discharge piping to the two lagoons and discharged at a single location below the water surface. The discharge piping to the southerly lagoon extends approximately 475 feet to a single port discharge located as shown in **Figure 4-9**. The discharge piping to the northerly lagoon extends approximately 100 feet to a single port discharge located as shown in **Figure 4-9**. The concrete in the headworks structure shows signs of minor to moderate hydrogen sulfide attack.

### 4.4.2 Influent Flow Measurement

Influent flow is measured at the Parshall flume. A Stevens Model 61R flow meter measures the total and instantaneous flow. Total flows are recorded on the totalizer and instantaneous flows are recorded on a 4-inch wide strip chart recorder. The flow meter is equipped with two sets of gears for measuring summer and winter flows. There is no telemetry system for the remote monitoring of the flow signal.

### 4.4.3 Facultative Lagoons

The two facultative lagoons provide biological treatment and biosolids digestion for the wastewater. The ponds were constructed of native onsite clay soils. The lagoons have no synthetic liners. The lagoons operate in series and are intended to provide both storage of wastewater during the non-discharge season and treatment to secondary standards. The lagoons are designed to operate between a minimum depth of 2 feet and a maximum depth of 8 feet. These design parameters provide for three feet of freeboard from the top of the dikes. The sizing criteria for the south lagoons is governed primarily by the need to store wastewater during the six month non discharge season.

The southerly lagoon provides the initial treatment of the waste stream. From the southerly lagoon, wastewater flows by gravity through a transfer structure at the northeast corner of the lagoon and into the southeast corner of the northerly lagoon. The transfer structure is a cast-in-place concrete structure that regulates flow between the two lagoons. Canal gates are positioned at different elevations and allow the operator to draw off water from different levels in the water column. The structure

has two 13-inch by 24-inch blockouts near the top of the walls. The blockouts function as emergency overflows if pond levels become to high. Access to the interior of the structure is gained through a hinged wooden hatch. Flow between the two lagoons is thorough an 18-inch ductile iron pipeline.

Following additional treatment in the northerly lagoon, treated effluent is withdrawn from the northwest corner of the lagoon. The outlet structure is almost identical to the transfer structure. The outlet structure has an interior two foot high concrete wall to prevent pond water depth from falling below two feet. A shear gate in the interior wall allows the pond water to be drawn down for maintenance purposes. Effluent from the outlet structure flows through an 18-inch ductile iron pipeline to the chlorine contact chamber.

The lagoons have been in service since 1986. Biosolids tend to accumulate in the lagoons over time, especially in the first cell near the influent pipe discharge point. Biosolids have not been removed from the lagoons to date. In order to ascertain the quantity of biosolids present in the lagoons, Westech Engineering completed a biosolids survey of the lagoons in November 2001 (see **Appendix C**). The survey shows that the biosolids accumulations in the primary lagoon have a maximum depth of about 2.0 feet immediately adjacent to the discharge point. As is typical in most lagoon biosolids surveys, the maximum depth occurs in the immediate vicinity around the influent pipe discharge. The biosolids depth decreases quickly a short distance (e.g., ±75 feet) from the pipe discharge. The average biosolids depth measured was about 0.35 feet. The average depth of biosolids measured in the second lagoon is less than 0.1 feet. The relatively small accumulation of biosolids is believed to be due to the fact that the lagoons are lightly loaded from an organic standpoint and because there are no major commercial or industrial users in the collection system. The City is required to perform a biosolids survey every five years. Based on the amount of accumulated biosolids measured during the 2001 survey, it is not likely that the City will need to remove the biosolids during the planning period if the recommendations included herein are implemented in the next ± 5 years and the characteristics of the waste stream remain constant.

A lagoon leakage test was performed to determine if the seepage rate from the lagoons exceeded the DEQ's maximum allowable seepage rate of 1/8 inch per day. City personnel conducted a leakage test of the lagoons in August 2002 (See **Appendix C**). Each lagoon was isolated from the other lagoon during the test period. No treated effluent was discharged from the WWTP during the test. The leak testing showed average seepage rates of 0.049 and 0.011 inches per day for the southerly and northerly lagoons respectively. Based upon this evaluation, the seepage rate from the lagoons is acceptable and no corrective work is necessary at this time.

### 4.4.4 Chemical and Control Building

The chemical and control building is a two room concrete block building. The chlorinator, sulfonator, chlorine injector, sulfur dioxide injector, electrical panel, and

chlorine scale gauge are housed in a small room on the south side of the building. The chlorine scale, 1-ton chlorine cyliners, 150-pound sulfur dioxide cylinders, and the sulfur dioxide scale are housed in the building's north room. The building is equipped with a chlorine leak detector and exhaust fan.

### 4.4.5 Laboratory Building

The laboratory building is a single room portable facility that was constructed in 2002. The laboratory building houses the lab equipment refrigerators, and the pressure tank for the onsite water supply system. The laboratory building is equipped with a sink and a restroom.

### 4.4.6 Chlorine Gas Disinfection System

The chlorination system includes a chlorinator and injector housed in the south room of the control building. The chlorinator is a Wallace & Tiernan V500 flow proportional unit. It has a V-notch orifice and maximum feed rate of 50 pounds per day. The injector is a 1½-inch unit-injector mounted on a PVC panel. The dosage is set manually at the chlorinator and the feed rate is paced off of a flow signal from the effluent flow meter. The chlorination system is a solution feed system. Chlorine gas is mixed with feed water at the injector. The chlorine gas and feed water solution is piped through a 2-inch PVC line to the outlet structure where it is discharged through a diffuser.

The north room of the control building is designed for ton chlorine cylinders. The scale is designed for two cylinders. One spare cylinder can also be placed in the room. The cylinders rest on trunions that allow for the cylinders to be rotated. The building is equipped with an electric hoist and trolley for loading and unloading the cylinders. Chlorine gas is withdrawn from the ton cylinders with equipment designed for automatic switchover. The Chlorine gas is under pressure only to the vacuum regulator check unit. Beyond this unit, the gas is under vacuum. Adjacent to each vacuum regulator check unit is a drip-leg heater to ensure that no liquid chlorine is withdrawn from the ton cylinders.

Chlorine contact time is provided in two contact chambers. The initial chamber was constructed in the summer of 2003 and provides approximately 63,000 gallons of contact volume. The second chamber was constructed as part of the original WWTP construction project and provides approximately 17,000 gallons of contact volume. The original treatment facilities utilized the 24-inch outfall pipeline to provide contact time. This pipeline terminated in an outfall structure that included an overflow weir to keep the 24-inch pipe flowing full. This outfall structure is located adjacent to the Marys River outfall. When the dechlorination improvements were made, the City decided to inject the dechlorinating agent downstream of the effluent measurement weir so the dechlorination equipment could be housed in the existing chemical building. The new contact chamber was required to provide the contact volume originally provided in the outfall pipeline. With the new contact chamber, the contact volume available in the 24-inch pipeline was no longer required and, consequently,

the outfall structure is no longer in use. The two contact chambers are designed to provide a minimum 30 minutes of contact time at a discharge rate of 3.85 MGD. Effluent from the lagoon flows into the 63,000 gallon tank then through the 17,000 gallon tank. The inlet piping for the 63,000 gallon tank is valved to allow for bypassing directly into the 17,000 gallon tank.

### 4.4.7 Effluent Flow Measurement

Treated effluent is measured at the second chlorine contact chamber as it passes over a 4 foot rectangular suppressed weir. A Stevens model 61R flow meter similar to the influent meter is used to measure and record flow values. The effluent meter is geared to measure flows to a maximum of 7.0 MGD. The effluent meter provides a 4 to 20 mA signal which is used to pace the chlorinator.

### 4.4.8 Sulfur Dioxide Gas Dechlorination System

The dechlorination system is similar in many respects to the chlorination sytem. The dechlorination system includes a sulfonator and injector housed in the south room of the control building. The sulfonator is a Capitol Series NXT 3000 unit. It has a V-notch orifice and is currently set for a maximum feed rate of 50 pounds per day. The City has spare parts that allow the sulfonator to be resized to feed 100 pounds per day. The injector is a 1½-inch unit-injector mounted on a PVC panel. The dosage and feed rate are set manually at the sulfonator. The sulfonator is not flow proportionally controlled, although this feature may be added should the City desire to do so. The dechlorination system is a solution feed system. Sulfur dioxide gas is mixed with feed water at the injector to create a sulfur solution. The sulfur solution is piped through a 1-inch PVC line to the effluent measurement weir where it is discharged through a diffuser.

The 150-pound sulfur dioxide gas cylinders are located in the north room of the chemical building. The scale is designed for two cylinders. Several spare cylinders can also be placed in the room. The cylinders rest in racks located against the interior wall of the building. Sulfur dioxide gas is withdrawn from the cylinders with equipment designed for automatic switchover. The gas is under pressure only to the vacuum regulator check unit. Beyond this unit, the gas is under vacuum.

### 4.4.9 Marys River Outfall

A 24-inch ductile iron pipe conveys effluent to the outfall structure discussed above. Downstream from the outfall structure, a 16-inch ductile iron pipe conveys the disinfected effluent from the outlet box to the Marys River. The outfall discharges with a single port near the south bank of the river.

In August of 2001, Westech Engineering prepared a mixing zone study to fulfill the requirements of the MAO between the City and the DEQ. The results of this study are included in **Appendix C**. The purpose of the study was to determine if the existing outfall met chlorine and ammonia toxicity standards. The results of the study

indicated the existing single port outfall met the ammonia toxicity limit, but did not meet chlorine toxicity limits. The study further demonstrated that a multiple port diffuser would not meet the chlorine toxicity limits for all cases. Based on this finding the City decided to install the dechlorination system discussed above. As a result of the dechlorination improvements, the WWTP effluent now meets the chlorine toxicity limits.

### 4.4.10 Feed Water Supply System

A small submersible well pump and pressure tank system provides feed water for generating chemical solutions and for supplying the various fixtures in the laboratory building. The well is located north of the laboratory building. According to discussions with the City, the capacity of the well is approximately 5-10 gallons per minute.

### 4.4.11 Description of Existing Treatment System Deficiencies

The existing treatment facilities have functioned well since their construction. The treatment facilities have no serious deficiencies at this time. With the exception of a few minor deficiencies, the treatment plant as a whole is in reasonably good condition. There are some minor improvements that should be made. The lagoons need some routine maintenance including adding additional rock to the dike roadways and adding dike riprap to guard against erosion and Nutria problems. The influent and effluent samplers and flow meters are becoming outdated and will reach the end of their useful life during the planning period. As such, the City should plan to replace these facilities.

Based upon the biosolids survey performed in 2001, it appears that the primary lagoon may not require removal of biosolids during the planning period. If biosolids must be removed from the lagoon during the planning period, it will likely be near the end of the planning period. As a condition of the City's NPDES permit, biosolids surveys are required at five year intervals to aid in determining when biosolids must be removed.

The existing lagoons are adequately sized on both a hydraulic and organic loading basis for the present flows and loads. If the City grows as projected, additional treatment, storage, and disposal capacity will be required during the planning period. Options for expanding the capacity of the plant are discussed in **Section 7**.

## 4.5. Existing Sanitary Sewer Funding Mechanisms

Funding for the City's existing wastewater system comes from two major sources, user fees and system development charges (SDC). Since SDCs cannot be used to finance operation, maintenance (O&M), and replacement costs of a sewer system, the O&M and repair costs must be financed from the user fees.

**Sewer User Fee.** The City's sewer Ordinance #624 (**Appendix D**) provides the method for assessing sewer user fees. The City sewer users are billed on a monthly basis for sanitary sewer service. Users are first classified as residential, commercial, or industrial. Residential users are charged a base monthly fee plus a use charge based upon actual water consumption during the winter months, and the average winter consumption during the summer months. Commercial and Industrial users are charge a base monthly fee plus a use charge based on actual water consumption on a year-around basis. The present base rate is $10.00. For multi-unit residential connections the base charge is multiplied by the number of units and discounted by 50%. The use charge varies depending on user classification. For residential users the use charge is $1.80 per 100 cubic feet (748 gallons). For commercial and industrial users, the use charge is $1.91 per 100 cubic feet. For typical residential users, this monthly rate equates to approximately $345.30 per year or $28.78 per month per dwelling unit. The City's sewer use ordinance also contains provisions for adjusting the user fee for high strength wastes.

**Sewer SDC.** SDC fees are tied to water meter size as shown in **Table 4-6**.

**TABLE 4-6**
**Existing Sewer SDC Fees**

| Meter Size | SDC Fee |
|---|---|
| ¾ Inch | $1,346 |
| 1 Inch | $1,912 |
| 1 ½ Inch | $3,243 |
| 2 Inch | $5,194 |
| 3 Inch | $10,497 |

Section 5

# Wastewater Flows and Loads

# SECTION 5
# WASTEWATER FLOWS AND LOADS

## 5.1. General

In order to select and size both collection and treatment facilities for the planning period, projected wastewater flow and organic loading must be determined. The projected flows and organic loadings were determined based on a number of variables including the following.

- Rate of projected population increase
- Land use zoning within the UGB
- Projected per capita and per acre flowrates and organic loadings.

This section develops wastewater flow and loading projections which are used for sizing the collection system components as well as the treatment plant components. The projected design flowrates were determined based on a number of variables including zoning of land within the service area, anticipated development density at buildout and within a 20-year planning period, and projected per capita and per acre flowrates.

## 5.2. Wastewater Flows

Dry weather flows, wet weather flows, and infiltration and inflow (I/I) are factors that are important in the design of wastewater collection, treatment and disposal facilities. The MMDWF usually determines the maximum organic loadings of the major process units. The MMWWF determines the size and capacity of the major process units necessary to provide the desired degree of treatment. The PHF determines the hydraulic capacity of pipelines, pumps, channels, and inlet structures and the reserve capacity of units such as clarifiers and disinfection facilities.

### 5.2.1 Flow Classification and Design Criteria

For the purposes of monitoring wastewater flows and identifying future design flows, the following flow classifications will be used. The definitions are generally listed in order of increasing flows.

- Average Dry Weather Flow (**ADWF**) - Average daily wastewater flow during the months of May through October. During these periods with little precipitation and low groundwater levels, the flows consists mainly of sanitary sewage, as well as commercial and industrial waste discharges. Base infiltration may be present.

- Average Annual Flow (**AAF**) - Average daily wastewater flow during the entire year.

- Average Wet Weather Flow (**AWWF**) - Average daily wastewater flow during the months of November through April.

- Maximum Month Dry Weather Flow (**MMDWF**) - The monthly average flow with a 10 percent probability of exceedence during the months of May through October in any given year. In other words, this flow represents the wettest dry weather season monthly average flow that is anticipated to have a ten-year recurrence interval. For western Oregon. May or October are usually the months which have the highest dry weather flow.

- Maximum Month Wet Weather Flow (**MMWWF**) - The monthly average flow which with a 20 percent probability of exceedence during November to April in any given year. This flow represents the wettest wet season monthly average flow that is anticipated to have a five-year recurrence interval. For western Oregon, December or January are usually the months that have the highest wet weather flow.

- Peak Daily Average Flow (**PDAF**) – The peak daily flow associated with a 5-year, 24-hour storm. In western Oregon the peak daily flow always occurs during the wet season. Therefore PDAF is often referred to as the maximum day wet weather flow.

- Peak Hour Flow (**PHF**) - Maximum flow over an hour duration experienced during a five-year, 24-hour storm. This value typically determines the maximum hydraulic capacity of major process units, trunk sewers and pump stations without surcharging.

The major components of the total wastewater flow rates include domestic, commercial, industrial and institutional sources which are either existing or anticipated to develop during the study period, as well as adequate allowances for infiltration and inflow (I/I). The basic criteria used for projecting future wastewater flows in this section are outlined in **Table 5-1**.

| TABLE 5-1<br>Flow & Loading Projection Design Basis | |
|---|---|
| Flow Category | Design Criteria |
| • Base Sanitary Sewer Flow | 100 gpcd |
| • Population Density Per Acre | |
| - Low Density Residential (LDR) | 10.7 |
| - Medium Density Residential (MDR) | 20.4 |
| - High Density Residential (HDR) | 30.0 |
| • Commercial | 1500 gpad (15.0 people/acre) |
| • Industrial (assumes 'dry' industries) | 2750 gpad (27.5 people/acre) |
| • Public | 500 gpad (5.0 people/acre) |
| Peaking Factors | |
| • Residential Flows | 3.0 |
| • Commercial Flows | 3.0 |
| Infiltration/Inflow (I/I) | |
| • New Gravity Sewers | 1600 gpad |
| • Existing Sewers | As measured |
| Organic Loading (BOD) | |
| • Residential | 0.22 ppcd |
| • Industrial | 6.0 ppad |
| Solids Loading (TSS) | |
| • Residential | 0.24 ppcd |
| • Industrial | 6.6 ppad |
| Design Flow = Average Sewage Flows x Peaking Factor + I/I | |

A short discussion of each of these flow and loading components follows.

#### 5.2.1.1 Domestic Flows

Domestic flow is waste generated from normal residential households. For planning purposes, the average daily per capita rate of 90 gallons per capita per day (90 gpcd) has been selected for this study. The population densities listed in **Table 5-1** were used together with the average daily per capita flow rate to project domestic use on a per acre basis.

#### 5.2.1.2 Commercial Flows

Allowances for commercial sewage flows often can be equated with the per capita flows developed for domestic sewage. For this study, sewage flows expected from commercial areas were based on an anticipated average employed population of 30 employees per acre. Average sewage contribution from commercial areas can vary from 10 to 150 gpcd, with a typical average of 50 gpcd. Office and retail establishments usually contribute 12 to 25 gpcd while hotel and motels contribute flows from 50 to 150 gpcd. Based on 30 employees per acre and average commercial flow of 50 gpcd, this would mean that flow contribution from these areas would be 1,500 gallons per acre per day (gpad). It is assumed that the peak flow for these commercial areas would

follow the same relationship that has been established between the peak and average flow rates for residential areas.

#### 5.2.1.3 Industrial Flows

It is difficult to predict the exact type or extent of future industrial development that may occur in Philomath. Industrial flows vary considerably depending on the type of industry (wet or dry). Flows from industries such as light manufacturing and machinery typically are not much greater than flows from residential areas.

Some industrial users (i.e., food processors or silicon wafer fabricators) require very large quantities of water and generate correspondingly high wastewater flows and loadings. For the purposes of this study, projected wastewater loadings from projected industrial development in Philomath are based on "dry industries" which typically contribute 2,750 gpad per acre or less. BOD and suspended solids concentrations similar to domestic sewage are assumed. This decision is based in part by the capacity of the City's water treatment plant. The water treatment plant does not have capacity to provide the quantities of water required to support "wet" industries.

Should any industrial user capable of producing large wastewater flows, higher concentrations, or hazardous effluent want to locate in Philomath, a careful review should be made to determine if the collection system and the treatment and disposal system can adequately serve the industry.

For this study, wastewater flow rates were based on an average employed population of 55 persons per acre and an average employee wastewater flow contribution of 50 gpcd. This means for industrial land within the study area, the average flow would be 2,750 gpad. The peak flow for these industrial acres would follow the same general relationship as was discussed previously for residential areas.

#### 5.2.1.4 Peaking Factors

Sanitary wastewater flows into the collection system will vary significantly throughout the day. In order to adequately design a sewage collection and treatment system, it is critical to be able to predict the peak wastewater flows rather than simply the average flowrates. Peaking factors are the ratio of peak flow to average flow, and are often related to the population served. It can be noted that as the population increases, the peaking factor tends to be less pronounced. At the population levels projected to occur in the basins throughout the City, peaking factors of 2.75 to 3.5 are typical. For the purposes of this report a peaking factor of 3.0 was assumed.

#### 5.2.1.5 Infiltration and Inflow

Estimates of peak I/I flows are most necessary to the design of new facilities to prevent these flows from overloading the sewers, pump stations and treatment facilities, resulting in possible bypasses of untreated or partially treated sewage into waterways or other areas. Non storm related infiltration and dry weather infiltration are less important. Although these I/I flows require pumping and treatment, their cost to the City is relatively minor by comparison.

Although modern sewer construction techniques make it possible to install sewer systems that will be relatively tight initially, infiltration and inflow into these systems may increase over time (in areas with clay soils) due to various physical factors and deterioration of sewer system components. Proper inspection and maintenance of the collection system is essential to controlling I/I over the long term.

As part of the preparation of this report, the City's DMRs were reviewed to determine the extent of the I/I contribution to the system flows.

### 5.2.2 Existing Wastewater Flows

To determine the existing wastewater flows, the DRM data from the winter of 1997 through the winter ending in April 2002 was analyzed. A summary of the DMR data is presented in **Appendix E**. The summer 2002 flow data was discarded due to the fact that it appeared to have been in error. After investigating the problem, the City determined that the summertime gears in the influent meter were not properly calibrated when installed and made corrections. The population of Philomath in 1997 was 3700. The current population is 4100. This increase should not have a significant impact on the flow data over this period. The DMR data was compared to the rainfall data collected at the Hyslop Field weather station near Corvallis.

The dry weather sanitary sewage flow presently averages about 0.454 mgd. The wet weather flow averages approximately 1.100 mgd. The wet weather flow is approximately two and one-half times the dry weather flow. This observation is typical in western Oregon where rainfall induced inflow and infiltration is significant. The sanitary sewage flows vary from a low occurring in the early morning hours to a peak flow, often occurring between 7:00 a.m. and 10:00 a.m.

At present, there are approximately 1,465 active sewer connections in the City. **Table 5-2** contains a breakdown of these service connections by user category.

| TABLE 5-2<br>Sewer Connection Summary<br>(As of January 2003) | |
|---|---|
| User Classification | Number of Services |
| Residential/Multi-Residential | 1,276 |
| Commercial/Schools | 179 |
| Industrial | 10 |
| Total | 1,465 |

**Table 5-3** contains a summary of the average wet weather and average dry weather flows measured at the treatment plant over the past five years.

| TABLE 5-3<br>Historical Influent Flows at the WWTP | | |
|---|---|---|
| Water Year Ending In October | AWWF (mgd) | ADWF (mgd) |
| 1997 | 1.154 | 0.502 |
| 1998 | 1.151 | 0.453 |
| 1999 | 1.383 | 0.435 |
| 2000 | 1.127 | 0.465 |
| 2001 | 0.612 | 0.417 |
| 2002 | 1.223 | NA |
| Average | 1.100 | 0.454 |

OAR 340-041 prohibits the discharge of raw sewage to waters of the State except during storm events greater than the 5-year, 24-hour storm for the wet weather period and the 10-year, 24-hour storm for the dry weather period. To this end, the DEQ recommends that treatment facilities are hydraulically sized to accommodate flowrates expected from a wet weather 5-year, 24 hour storm, and that design loading rates are determined from flowrates associated with a dry weather 10-year, 24-hour storm.

To determine the flowrates associated with a particular storm frequency requires a quantitative knowledge of the relationship between wastewater flowrates and rainfall. The DEQ published guidelines that present a methodology for determining wastewater flowrates in areas impacted by rainfall induced inflow and infiltration. This methodology is based on the assumption that under saturated subsurface conditions (high groundwater levels), wastewater flowrates can be directly correlated to rainfall. This assumption is valid for areas that receive large amounts of rainfall such as the Willamette Valley. To establish a relationship between monthly rainfall and average monthly flow, the average monthly wastewater flow rates for wet weather months are plotted against their corresponding monthly rainfall values. This data is plotted in figure **Figure 5-1.** A linear regression is performed to establish the relationship between monthly rainfall and monthly precipitation. This relationship can be used to predict plant inflows as a function of monthly rainfall depth.

The MMDWF is the monthly average flow for the rainiest summer month of high ground water. In the Willamette Valley the MMDWF invariably occurs in May. The DMR data for Philomath supports this observation. As previously mentioned, MMDWF is defined by the 10-year recurrence interval. Therefore, the MMDWF may be estimated by the monthly flowrate for the month of May with a 10-year recurrence interval. The relationship established in **Figure 5-1** may be used if the rainfall depth for the month of May that is associated with a 10-year recurrence interval is known. Rainfall depths corresponding to various exceedence probabilities have been calculated for the Hyslop Field data set. For the month of May, rainfall depth associated with the 90% exceedence probability (a.k.a., 10-year recurrence interval) is 3.49 inches. Using this rainfall depth in the relationship established in **Figure 5-1** the MMDWF can be estimated.

The MMWWF represents the highest monthly average attained during the winter period of high groundwater. The DEQ methodology is based on the assumption that high groundwater levels are not consistently maintained until the month of January. Therefore, heavy storms do not begin to cause a reliable or consistent infiltration and inflow response until January. This leads to the assumption that the MMWWF occurs in January. Therefore, in the same manner used to determine the MMDWF, the rainfall depth associated with a 20% probability of exceedence (a.k.a., 5-year recurrence interval) for the month of January is used in the correlation between plant flows and rainfall to determine the MMWWF.

The PDAF is defined as the peak daily average flow associated with a 5-year storm. The PDAF will occur under saturated subsurface conditions when the influence of rainfall on infiltration and inflow is the strongest. The PDAF is determined by plotting observed peak average daily flow against the corresponding daily rainfall depths. The 5-year 24-hour rainfall depth is used in a linear regression of the data to determine the PDAF. The data used to determine the PDAF is plotted in **Figure 5-2**. These data points were carefully selected to ensure that groundwater levels were saturated for the period over which flow data was collected.

A statistical approach is used to determine the PHF. This approach involves assuming that a particular year includes a 5-year storm with high groundwater conditions producing the MMWWF and the PDAF. During this 5-year storm the PHF occurs within the peak day. These assumptions enable one to determine the portion of the year over which each flow component occurred. For example, the MMWWF occurs 1/12 of the time or with an 8.33% probability, the AAF occurs half of the time or with a 50% probability, and so on. The rainfall depth is assumed to be a random variable with a log-normal probability distribution. If this assumption is accurate, the AAF, MMWWF, and PDAF should plot as a straight line on log-probability paper. These flow components are plotted on **Figure 5-3**. Since the PHF occurs 1 hour out of this hypothetical year (i.e., 1/8760 or 0.011% probability), by extrapolating a linear regression to a probability of 0.011% the PHF may be determined.

**Figure 5-1**
**MMWWF and MMDWF Determination**
(existing conditions based on DEQ guidelines for western Oregon)

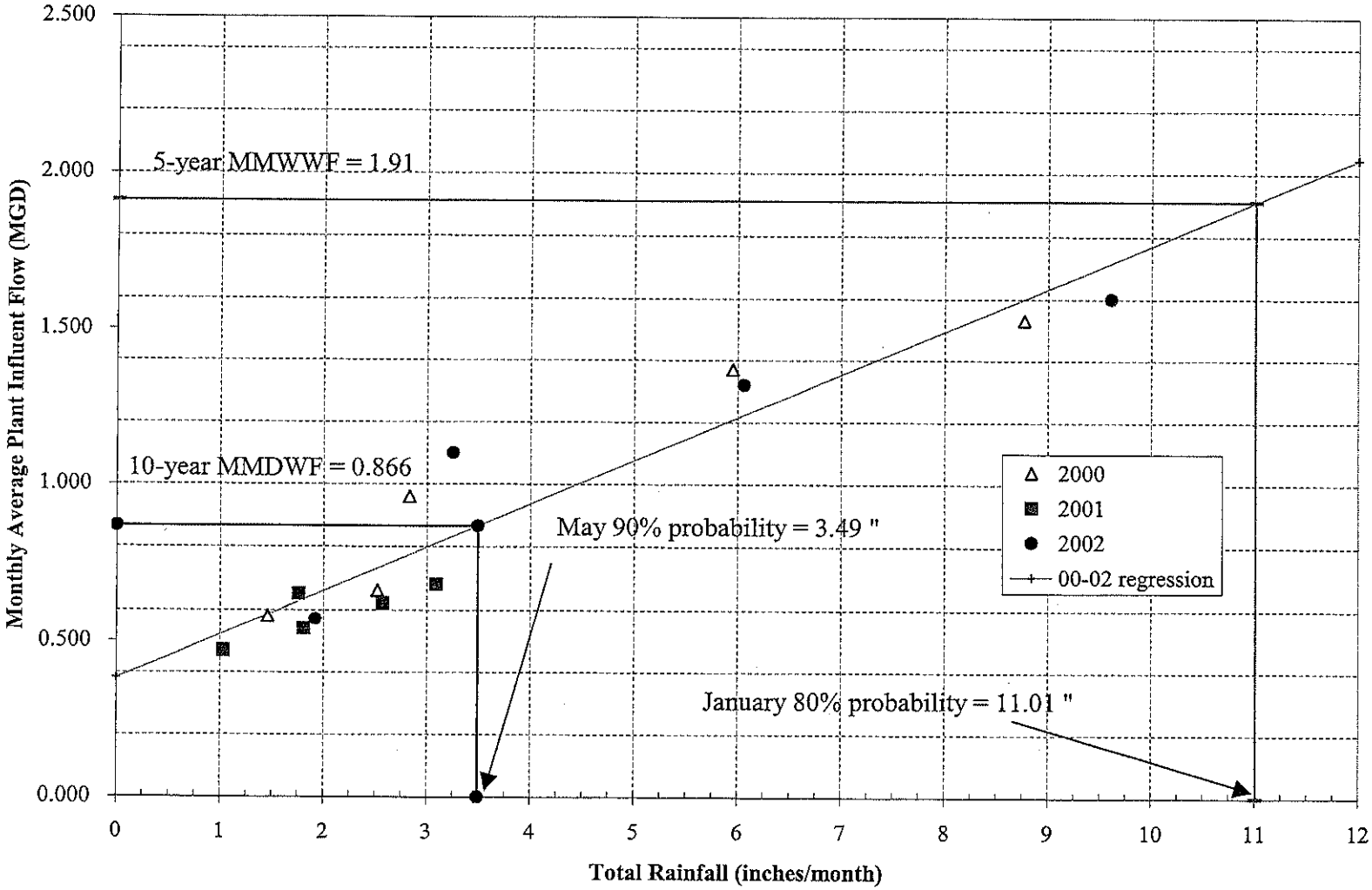


**Figure 5-2**
**PDAF Determination**
(existing conditions during significant storm events
based on DEQ guidelines for Western Oregon)

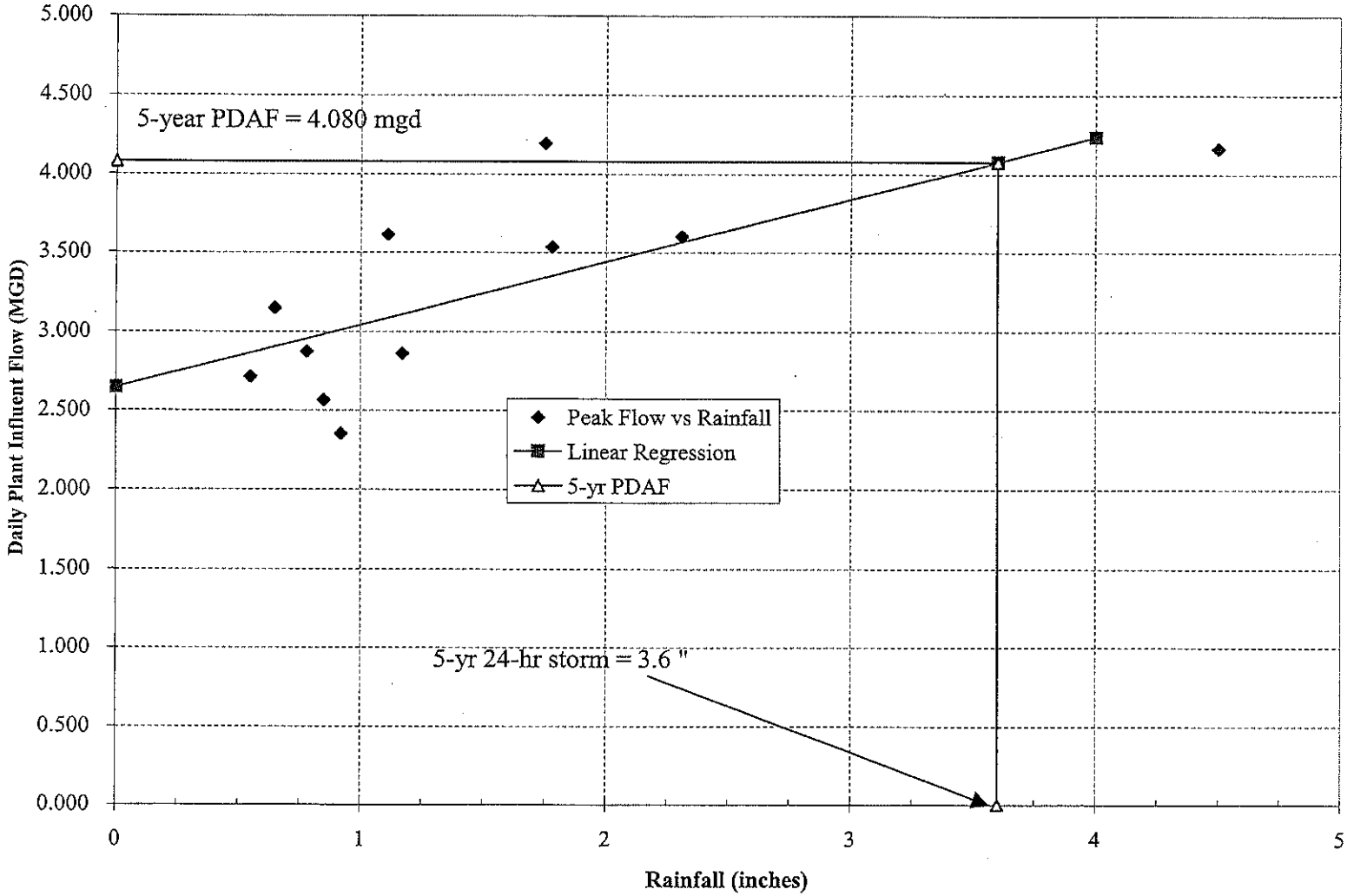


**Figure 5-3**
**PHF Determination**
(existing conditions by statistical extrapolation
based on DEQ guidelines for western Oregon)

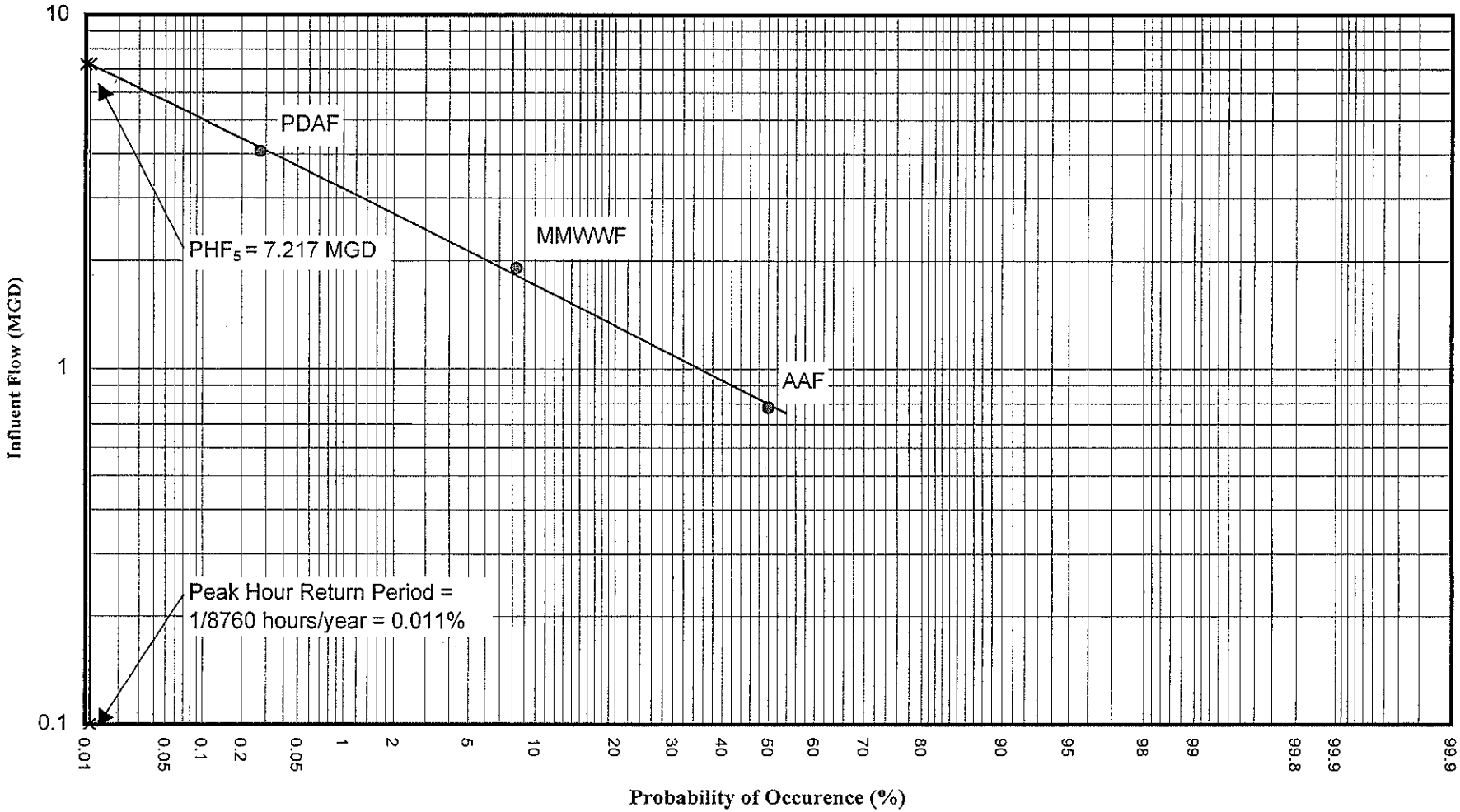


**Table 5-3** contains a summary of the existing flow components to the WWTP.

**TABLE 5-4**
**Summary of Current Flow Components**

| Flow Component | Flows (mgd) |
|---|---|
| AAF (Average Annual Flow) | 0.774 |
| ADWF | 0.454 |
| MMDWF | 0.866 |
| AWWF | 1.100 |
| MMWWF | 1.910 |
| PDAF | 4.080 |
| PHF | 7.217 |

### 5.2.3 Wastewater Flow Projections

The development and forecasting of wastewater flowrates is necessary to determine the design capacity of the different components of the collection and treatment system. Average and peak flowrates need to be developed for both the existing conditions and the future (design) conditions. The design of different components of the collection and treatment system is based on different magnitude flowrates and loadings.

The sanitary component of the wastewater flow is expected to increase proportionally with the increase in population. The projected ADWF and corollary flowrates are based on the following assumptions.

- The per capita flow rate will remain constant during the planning period.
- The population will increase by the projected percentage each year during the planning period.
- The per capita flow rate multiplied by the projected equivalent population equals the residential, commercial, and industrial sanitary component of the flow.
- There will be no contribution from "wet" industries during the planning period. Commercial and industrial development will be "dry" with flows comparable to residential developments.
- The City's infiltration and inflow reduction program will prevent any increase in infiltration and inflow into the existing collection system.
- All growth will occur in conformance with current land use policies as outlined in the City's Comprehensive Plan.

**Table 5-5** summarizes the projections for the different components of the wastewater flow over the 20-year planning period for the WWTP.

**TABLE 5-5**
**Wastewater Flow Projections**

| Year | ADWF (mgd) | MMDWF (mgd) | AAF (mgd) | AWWF (mgd) | MMWWF (mgd) | PDAF (mgd) | PHF (mgd) |
|---|---|---|---|---|---|---|---|
| 2005 | 0.477 | 0.902 | 0.808 | 1.143 | 1.978 | 4.216 | 7.468 |
| 2010 | 0.520 | 0.968 | 0.868 | 1.222 | 2.103 | 4.462 | 7.925 |
| 2015 | 0.567 | 1.041 | 0.935 | 1.310 | 2.241 | 4.737 | 8.435 |
| 2020 | 0.619 | 1.122 | 1.010 | 1.407 | 2.396 | 5.044 | 9.002 |
| 2025 | 0.678 | 1.213 | 1.094 | 1.516 | 2.568 | 5.385 | 9.634 |
| 2027 | 0.703 | 1.252 | 1.130 | 1.563 | 2.642 | 5.532 | 9.906 |

The projected design flows by basin are as outlined in **Table 5-6**. The flow calculations shown are based on projected population and development at the end of the study period. The 2027 basin flow contributions are based on the assumption that development occurs uniformly within all basins during the study period. Clearly, this is not the case. Growth is more likely to occur in an uneven, piecemeal fashion. In fact, some basins are likely to see no growth within the planning period. Therefore, as some basins develop faster than others, the net result will be that any trunk sewer improvements will be required sooner rather than later. For basins that are already fully developed, the 2027 PHF is the same as the PHF at buildout. This demonstrates a key point that is worth reemphasizing. This Facilities Plan is based on the assumption that existing I/I flows will not increase. Much of the City's core collection system is more than 50 years old. Therefore, many of the original pipes are likely to approach the end of their useful life during the planning period. As the system continues to age, the City must aggressively implement I/I correction measures. This is discussed in more detail in **Section 6.**

| TABLE 5-6<br>**Projected Peak Flows By Basin**<br>(Estimated peak hour flows for trunk sewer sizing) | | |
|---|---|---|
| Basin | 2027 PHF (mgd) | Buildout PHF (mgd) |
| A1 | 0.362 | 0.362 |
| A2 | 0.307 | 0.523 |
| A3 | 0.194 | 0.194 |
| A4A | 0.757 | 0.822 |
| A4B | 0.493 | 0.514 |
| A5A | 0.255 | 0.378 |
| A5B | 0.124 | 0.268 |
| A5C | 0.195 | 0.207 |
| A6 | 0.982 | 0.986 |
| A7A | 0.104 | 0.224 |
| A7B | 0.050 | 0.108 |
| N1A | 0.167 | 0.360 |
| N1B | 0.139 | 0.299 |
| N2 | 0.096 | 0.208 |
| N3AA | 0.865 | 0.906 |
| N3AB | 0.434 | 0.434 |
| N3B | 0.437 | 0.443 |
| N3CA | 0.557 | 0.566 |
| N3CB | 0.082 | 0.082 |
| N3D | 0.270 | 0.278 |
| N4 | 0.223 | 0.481 |
| N5 | 0.622 | 1.342 |
| N6A | 0.484 | 1.044 |
| N6B | 0.463 | 0.998 |
| N7 | 0.099 | 0.213 |
| N8A | 0.429 | 0.581 |
| N8B | 0.343 | 0.740 |
| N8C | 0.068 | 0.147 |
| P1A | 0.190 | 0.309 |
| P1B | 0.173 | 0.374 |
| P2A | 0.050 | 0.108 |
| P2B | 0.124 | 0.267 |

## 5.3. Wastewater Composition and Loading

The composition and concentration of wastewater constituents are important in the design of wastewater treatment and disposal facilities. Treatment processes are designed hydraulically to pass the design flowrates while providing adequate treatment, or removal, of the organic and solids components from the wastewater. Wastewater composition is less important for the design of collection and pumping systems where the hydraulic considerations control.

For the purposes of monitoring wastewater loads and identifying future design loads, the following classifications will be used:

- Average Load - Average daily wastewater load.
- Maximum Load - Maximum month wastewater load.

### 5.3.1 Historic Wastewater Composition

The BOD and TSS concentrations in the influent wastewater are measured twice monthly. These concentrations have been converted to loading rates and are shown for the last several years in **Table 5-7**. For reference, the design BOD loading (i.e., design organic treatment capacity) for the existing WWTP is 976 ppd BOD.

**TABLE 5-7**
**Historical Annual & Monthly Loading At WWTP**

| Year | BOD | | TSS | |
|---|---|---|---|---|
| | Average Annual (ppd) | Maximum Month (ppd) | Average Annual (ppd) | Maximum Month (ppd) |
| 1997 | 859 | 1276 | 915 | 1598 |
| 1998 | 1029 | 1782 | 1025 | 1977 |
| 1999 | 869 | 1698 | 1218 | 4162 |
| 2000 | 766 | 1101 | 956 | 1230 |
| 2001 | 913 | 2039 | 988 | 1671 |
| Average | 887 | 1579 | 1020 | 2128 |

### 5.3.2 Wastewater Load Projections

Similar to flows, the total wastewater loads are expected to increase directly proportionally to the increase in population. The projected loadings are based on the following assumptions.

- Design values of 0.22 ppcd and 0.24 ppcd for average dry weather load conditions were used for BOD and TSS, respectively. These values correspond very well to the loading rates presented in **Table 5-7** if one assumes an average population of 4,100 residents.

- The loads will increase proportionally with population and commercial/industrial development, which will increase by the projected percentage each year during the planning period.

- The per capita BOD and TSS load rate multiplied by the projected population equals the residential, commercial and industrial component of the load.

- There will be no significant industrial contribution beyond typical residential strength sewage during the planning period.

The per capita loads and resulting load projections for 20-year planning are shown in **Table 5-8**.

**TABLE 5-8**
**Wastewater Load Projections**

| Year | Average Daily BOD (ppd) | Average Daily TSS (ppd) |
|---|---|---|
| 2005 | 962 | 1050 |
| 2010 | 1072 | 1170 |
| 2015 | 1194 | 1303 |
| 2020 | 1331 | 1452 |
| 2025 | 1482 | 1617 |
| 2027 | 1548 | 1689 |

## 5.4. Summary of Flows and Loading

The recommended design flows and loads for the City's wastewater treatment facilities are summarized in **Table 5-9**. These values will be used in subsequent sections of this Facilities Plan.

**TABLE 5-9**
**Projected Flows And Loads, 2027**

| Component | |
|---|---|
| ADWF – Average Dry Weather Flow(mgd) | 0.703 |
| AWWF – Average Wet Weather Flow(mgd) | 1.563 |
| AAF – Annual Average Flow(mgd) | 1.130 |
| MMDWF – Maximum Month Dry Weather Flow(mgd) | 1.252 |
| MMWWF – Maximum Month Wet Weather Flow(mgd) | 2.642 |
| PDAF – Peak Daily Average Flow(mgd) | 5.532 |
| PHF – Peak Hour Flow(mgd) | 9.906 |
| Average BOD (ppd) | 1548 |
| Average TSS(ppd) | 1689 |

Section 6

# Collection System Evaluation and Recommendations

# SECTION 6
# COLLECTION SYSTEM EVALUATION AND RECOMMENDATIONS

## 6.1. General

This section includes an analysis of the collection system. The first subsection focusses on operation, maintenance, and rehab of the collection system. This is followed by the development and evaluation of alternatives for potential improvements to the wastewater collection system, including gravity mains, pump stations, and force mains.

This section addresses the following key questions:

- What are the current collection system operation and maintenance practices and how can they be improved?
- What are the existing collection system deficiencies?
- What collection system components are likely to become deficient during the planning period or prior to complete buildout of the system?
- How shall the existing and projected deficiencies be corrected?

The existing and projected collection system deficiencies are presented along with a set of alternatives, or tools, for addressing each of the deficiencies. Each of the alternatives are evaluated against each of the collection system deficiencies to determine the most cost-effective, long-term solution for the City's collection system. The recommended collection system improvements are divided into individual projects and cost estimates are presented.

## 6.2. Collection System Operation, Maintenance & Rehabilitation

This section discusses the need for sanitary sewer system maintenance and provides recommendations for the basic elements necessary for a maintenance program. The need for system-wide preventive maintenance is addressed first, then the general recommended approaches to collection system maintenance are outlined.

### 6.2.1 Need for System-Wide Preventive Maintenance

Maintenance of sewerage systems is necessary to insure the proper operation of the facilities and to obtain the full useful life of those facilities. Sanitary sewer systems represent significant investment of public capital. If a sewer system is allowed to fall into disrepair because of the lack of maintenance, it will not operate efficiently or as designed. Health problems and property damage may result from sanitary sewer backups, surcharging and/or overflows. Without proper maintenance, a system's capacity can be reduced by debris clogging, root intrusion growth, structural damage, infiltration and inflow (I/I), and other factors that eventually lead to failures throughout the system. Repair of failed sections of a sanitary sewer system are

costly, quite often exceeding the original cost of construction. In spite of this, many jurisdictions do not adequately fund the level of maintenance necessary to protect their investment in the sewerage system. Collection system maintenance can be separated into two types: preventive and corrective.

Preventive maintenance involves scheduled inspection of the system and data gathering to identify problem areas and analysis of this data so that scheduled maintenance can be targeted at specific problems. As a general rule, as preventative maintenance increases, the amount of corrective maintenance required decreases.

Corrective maintenance, often referred to as emergency maintenance, is typically performed when the sewer system fails to convey sewage. Causes for initiating corrective maintenance may include blockages, solids buildup, excessive I/I, flooding and sewer breaks. Corrective maintenance requires immediate action, and the jurisdiction will typically pay a premium to have this work performed.

### 6.2.2 Present Maintenance Practices

The City has a relatively active collection system maintenance program. The City currently cleans and inspects every line in the collection system on an annual basis. The City also owns a vactor truck and cleaning equipment. In addition, the City allocates funds for TV inspection work. Where possible, minor emergency repairs are performed by City crews with City owned equipment. However, the City does not own the equipment to perform major repairs on most sewer mainlines. Therefore, these services must be contracted out.

### 6.2.3 Preventative Maintenance Program Recommendations

The following paragraphs outline some recommendations for implementing preventive and corrective maintenance throughout the City's sanitary sewer collection system. These include the following:

- Continue the systematic sewer cleaning and inspection program.
- Establish a sewer rehabilitation and replacement program for removal of excessive I/I and replacement or repair of aging sewers.
- Develop a routine maintenance program for the WWTP & pump stations.

#### 6.2.3.1 Sewer Cleaning Program

It is important that the systematic program for the cleaning of gravity sewers be continued. Regular cleaning is necessary to prevent blockages, grease accumulation and sediment buildup in sewer lines. Normally, sanitary sewers laid at steep grades require less frequent cleaning than those laid at flat grades. Sewers at flat grades can experience sedimentation and grease buildup problems and will require more frequent cleaning and maintenance. During

our recent inspection work many of sewers were observed to be in need of cleaning.

As part of the cleaning program, it is important that the City continue to keep records, including conditions encountered such as pipe failures, grease and solids buildup, and other problems. These records are useful in scheduling corrective work and to establish a long term cleaning frequency schedule for different sewers. As the database is established, a schedule for subsequent cleaning can be tailored to the physical character of each line, the area served, and its performance history. Specific problem areas requiring more frequent cleaning can be incorporated into this program.

#### 6.2.3.2 Sewer Inspection Program

The City should continue its current sewer inspection program. The inspection program should include both above ground and internal inspection of the sewer system.

Above ground inspection is performed by inspecting right-of-ways and easements and noting evidence of structural failure, flooding, manholes covers above or below the present level of streets, or other problems.

The two common methods of internal inspection are TV inspection performed in conjunction with the cleaning activities, and smoke testing. TV inspection of a sewer system utilizes a specially designed television camera and equipment to view the interior of the piping system. A video tape and written record of the inspection is generated and retained by the City. Leaking sewer service connections, debris or root buildup, structural failures, leaking joints and other problems can be easily identified and documented. TV inspection of sewers requires that the sewers be cleaned immediately prior to the inspection.

Due to the high cost of purchasing TV inspection equipment, as well as operator training requirements, it can be more economical to contract out to private firms for TV inspection services rather than owning and operating the equipment. These private firms provide all personnel and equipment necessary to clean the sewer and perform the inspections. TV inspection of sewers is typically performed during the winter months so that sources of I/I can more easily be noted and identified. As the City continues to grow, it may become more economical for the City to own and operate TV inspection equipment. Regardless if the work is done "in house" or contracted out, the City should continue its current TV inspection practices.

Smoke testing is conducted by blowing harmless nontoxic smoke into the sewer system and observing the points at which it escapes. Smoke testing is typically performed during the summer months so that groundwater does not

interfere with the smoke. Smoke testing can be used to identify potential leaks into the system caused by broken pipes, bad joints, manhole failures, and similar deficiencies. Smoke testing is also very effective for locating storm sewer cross connections and illegal connections, such as roof and foundation drains. The equipment necessary to perform smoke testing is relatively inexpensive and can be purchased by the City.

#### 6.2.3.3 Sewer Rehabilitation & Replacement Program

A sewer rehabilitation and replacement program should include mainline, manhole and service lateral rehabilitation or replacement. This type of sewer rehabilitation program is typically referred to as an I/I reduction program. The details of this program are discussed below (see **Section 6.5.1**).

## 6.3. Identification of Collection System Deficiencies

The purpose of this section is to determine the components of the existing collection system that are or will become deficient. This includes components that lack capacity to convey existing peak flows or will lack capacity as flows increase due to growth. A number of existing collection system deficiencies were identified in **Section 4**. This section is intended to supplement those discussions. Together with the deficiencies listed in **Section 4**, the intent of this section is to present an overall list of deficiencies that must be addressed by the City.

The existing sewage collection system was analyzed under projected peak flow conditions at the end of the planning period and at buildout. In addition to the capacity of the gravity mains, the existing pump stations and force mains were analyzed for projected 20-year peak flows. Discussions relating to each of these system components follow.

### 6.3.1 Gravity Main Capacity Analysis

The peak design flows developed in **Section 5** were used as the basis for a basin-by-basin evaluation of the existing sanitary sewer trunk lines. Pipe sizes, lengths, slopes, and locations were determined from construction drawings provided by the City. The evaluation was limited to the main trunk lines conveying sewage through the basins. This approach was taken since most of the pipes within a basin will actually encounter only a fraction of the total basin flow. The projected flows for the trunk lines were assumed to be the entire flows contributed by that basin.

The peak wet weather I/I was determined by distributing the I/I contribution to the existing PHF determined in **Section 5** to each of the presently served basins by the proportions observed during the flow mapping effort. For example, if basin A1 was observed to contribute 10% of the total observed I/I during the flow mapping effort, then 10% of the I/I contribution to the PHF was assumed to be contributed by basin A1.

The capacity of the gravity mains were calculated assuming non-pressure flow (i.e., no surcharging) and utilized Manning's equation. The pipe roughness coefficient used in the Manning's equation varies according to the material used and the age of the pipe material. For this planning effort, an "n" value of 0.013 was be used in Manning's formula regardless of pipe material. In theory, new PVC sewers have manufacturer's "n" value of as low as 0.009. However, sand and grit as well as slime buildup on the pipe walls over time tend to render a true "n" value of 0.013. The resultant pipe capacity was compared against the portion of the projected flow that was routed through that basin.

Surcharging of a sewer occurs when the pipe is flowing under some pressure. This condition is evidenced when the water surface at the manholes is above the pipe crown. Under severe surcharge conditions, sewage overflow at manholes or backflow and flooding of buildings connected to the sewer system may occur. Occasionally, minor surcharging may occur in portions of a gravity sewer system. This condition may be tolerated for short periods to the extent that no potential for overflow or damage exists. The ability of the sewer pipe to flow under minor surcharge conditions without flooding may be thought of as the safety factor built into the system to compensate for partial obstructions in the sewer lines or short term flows slightly higher than design. Since even minor surcharging on a regular basis indicates that there is no longer any safety factor left in the hydraulic design of the pipe, it will only be a matter of time before the system experiences a major surcharge and overflow. Once a surcharging condition is noted, the cause should be determined and corrected as soon as possible, either by cleaning the system to remove blockages, by flow reduction measures and/or system improvements.

Each of the major trunk sewers within each basin were analyzed with respect to three classes of deficiencies. These are; 1) sewers that lack capacity to convey existing peak flows, 2) sewers that are likely to lack the capacity to convey peak flows associated with growth during the planning period, and 3) sewers that are likely to lack the capacity to convey peak flows at buildout conditions. Philomath's gravity collection system includes sewers that fall into all three categories. These are discussed in greater detail later in this section. At a minimum the City will have to address sewers that fall into categories one and two during the planning period. Should any of the existing sewer lines that fall into the third category need to be replaced as part of I/I reduction efforts or other maintenance reasons, they should be sized to accommodate flows at buildout.

### 6.3.2 Infiltration and Inflow Analysis

As is typical in Western Oregon, Philomath experiences increased wastewater flows resulting from I/I. The level of I/I experienced is correlated with both the groundwater levels and precipitation from major winter storms.

Base infiltration that results from higher groundwater levels during the winter months and that continuously enters the collection system through cracks and faults in pipes,

laterals and manholes is relatively significant. A review of the DMRs over the past five years shows that the ratio between the AWWF and ADWF is approximately 2.4. The corresponding ratio between the PDAF at the WWTP to the AWWF during the past five years is approximately 3.7. For the period examined (i.e., 1996–2002), there have been several storms with a return frequency equal to or greater than 5 years. Additionally, 1997 was the wettest year on record in most of Western Oregon. Therefore, the DMR data evaluated is believed to enable an accurate assessment of the I/I problem.

Based on field observations, the collection system is subject to routine surcharging, particularly in the lower portions of the pump station A collection system. This indicates that portions of the gravity collection system as well as pump station A are not capable of conveying the peak flows. No known overflows have occurred to date. However, as previously mentioned, even minor surcharging is generally a sign that overflows may be imminent. The Newton Creek pump station is capable of conveying the peak flows to the WWTP. Although nearing its design capacity, the WWTP is not yet in violation of the discharge permit limitations. Though significant, the existing I/I problem in Philomath is not excessive when compared to similarly sized communities in the Willamette Valley. However, much of the core collection system is more than 50 years old and will approach, or reach, the end of its useful life during the planning period. As collection piping ages, the I/I problem will increase. Without improvements, the worsening I/I problem will likely result in overflows and bypasses during the planning period. Another problem with I/I is the added pumping costs required to transport larger volumes of wastewater to the treatment plant. As the volume of I/I progressively increases, the pumping costs will increase at a rate faster than expected when compared to the City's growth rate. As such, the I/I problem associated with the aging pipelines is a problem that the City should address during the planning period.

### 6.3.3 Pump Station Capacity Analysis

The three major pump stations within the City were analyzed for 20 year projected peak flows for each basin as developed in **Section 5**, as well as anticipated flows at buildout. Existing pump capacities, as well as other pump station information (i.e., force main dimensions, pump data and capacities), were previously summarized in **Section 4**.

The existing pump station capacities were compared to the existing and projected 20-year peak hour flows. All pumps were analyzed for pump capacity with the single largest pump out of service. Since the Timber Estates Pump Station is a duplex station (i.e., two pumps), it was analyzed for pump capacity assuming only a single pump in operation (i.e., 100% redundancy) per DEQ guidelines. The results of this analysis indicated that Pump Station A does not have the capacity to convey existing peak flows. This conclusion is confirmed by the regular surcharging observed upstream of Pump Station A. The Newton Creek pump station has the capacity to convey the existing peak hour flows, but not the projected 2027 peak hour flows. The

Timber Estates Pump Station has the capacity to convey existing and projected peak flows.

**TABLE 6-1**
**Summary Of Pump Station Pumping Capacity Analysis**

| (Description) | Existing Capacity (gpm) | Existing Peak Flows (gpm) | Required 2027 Capacity (gpm) (1) | Required Buildout Capacity (gpm) (1) | Recommended Upgrades (see discussions later in this section) |
|---|---|---|---|---|---|
| Pump Station A | ± 1550 | ± 2110 | ± 3230 | ± 3460 | -Replace Entire Station |
| Newton Creek Pump Station | ± 2110 | ± 2090 | ± 4220 | ± 6580 | -Upgrade control system<br>-Remove underground storage tank<br>-Upgrade pumping capacity as required by growth. |
| Timber Estates Pump Station | ± 108 | ± 60 | ± 66 | ± 70 | - Upgrade control system |
| (1) Flow projections based on the assumption that flows from Basin N8A are transferred from basin A2 to basin N6A. | | | | | |

As noted in this table, Pump Station A must be replaced and the underground fuel storage tank for the auxiliary power unit at the Newton Creek Pump Station must be removed. Other improvements required during the planning period include control systems upgrades for the Newton Creek and Timber Estates pump stations. The analysis suggests that the pumping capacity of the Newton Creek Pump Station will have to be increased during the planning period. At the very least this will include additional pumps, discharge piping modifications, a larger auxiliary power unit and modifications to the control system. The existing wet well is sized to accommodate a peak flow of 7.05 MGD (4900 GPM). Therefore, the wet well should not need to be replaced during the planning period.

### 6.3.4 Force Main Capacity Analysis

Key design criteria for sewer force mains include maximum velocity, minimum intermittent velocity and detention time. If the velocity in a force main exceeds 5-6 feet per second the friction losses in the pipe can become excessive leading to high pumping costs. High pipe velocities also increase the effects of pressure transients, which increase the wear and tear on the piping and can ultimately lead to premature failures. When pumping raw sewage a minimum velocity of 2 to 2.5 feet per second must be maintained at least on an intermittent basis to prevent solids accumulation in the piping. In sewage force mains, excessive detention time can lead to corrosion problems caused by low pH values both in the pipeline and at the discharge point. Low pH values can also cause problems with treatment processes. To minimize these problems a maximum detention time of 16 hours is preferred.

The existing force mains were evaluated against these criteria for existing and projected peak hourly flows. All force main segments are adequate to convey the existing peak flows. The 14-inch segment from Pump Station A to the Newton Creek Pump Station has the capacity to convey peak flows at buildout. However, the force

main may need to be replaced before buildout is achieved due to age. Nonetheless, the 14-inch segment from Pump Station A to the Newton Creek Pump Station will likely not require improvements during the planning period. The 18-inch segment from the Newton Creek Pump Station to the treatment plant lacks capacity to convey the projected peak flows at the end of the planning period (2027). Therefore, as part of the Newton Creek pump Station capacity increase, a new force main parallel to the existing force main should be constructed. The timing and costs of this improvement are discussed later in this section.

### 6.3.5 Collection System Improvements to Serve Currently Undeveloped Areas

There are a number of areas within the City that are currently undeveloped and lack gravity sewer service. New gravity mainlines will need to be installed to serve these areas as they develop. Current City ordinances require that mainlines and pump stations required to serve these areas be installed at the expense of the developer. These lines should be sized as required to serve all upstream areas.

### 6.3.6 Summary of Collection System Deficiencies

The known deficiencies described in **Section 4** have been combined with the deficiencies described above to develop a complete list of collection system deficiencies. These deficiencies are listed in **Table 6-2**.

**TABLE 6-2**
**Summary of Collection System Deficiencies**

| Location | Description of Deficiency |
|---|---|
| **Gravity Collection Piping** | |
| 16th Street (Pump Station A to MH 26) | Lacks capacity to convey existing peak flows. |
| Cedar Street (MH 26 to MH 29) | Lacks capacity to convey existing peak flows. |
| 13th Street (MH 29 to MH31) | Lacks capacity to convey existing peak flows. |
| Applegate Street (MH 31 to MH 35) | Lacks capacity to convey existing peak flows. |
| 12th Street (MH 32 to MH 71) | Lacks capacity to convey existing peak flows. |
| 10th Street (MH 34 to MH 45) | Lacks capacity to convey existing peak flows. |
| Main Street (MH 45 to MH 46) | Lacks capacity to convey existing peak flows. |
| Applegate Street (MH 202A to MH 2) | Lacks capacity to convey existing peak flows. |
| 20th Street (MH 2 to MH 339) | Lacks capacity to convey existing peak flows. |
| College Street (MH 6 to MH 290) | Lacks capacity to convey existing peak flows. |
| Basin A4A, A4B, A6 | Excessive I/I. |
| Basin N3AA, N3AB, N3B | Excessive I/I |
| All 1952 Mortar Joint Concrete Pipe | Approaching the end of useful life. |
| Manholes Throughout the Collection System | Excessive I/I. |
| College Street (MH 290 to MH 288) | May lack capacity to convey peak flows before end of planning period. |
| Industrial Park Sewer (MH 288 to MH 134) | May lack capacity to convey peak flows before end of planning period. |
| Main Street (MH 46 to MH 52) | May lack capacity to convey peak flows before end of planning period. |
| 9th Street (MH 35 to MH 36) | May lack capacity to convey peak flows before end of planning period. |
| Alley ½ Block South of Main (MH 36 to MH 38) | May lack capacity to convey peak flows before end of planning period. |
| 7th Street (MH 38 to MH 39) | May lack capacity to convey peak flows at buildout. |
| Main Street (MH 39 to MH 184) | May lack capacity to convey peak flows at buildout. |
| **Pump Stations** | |
| Pump Station A | Lacks capacity to convey existing peak flows. |
| Newton Creek Pump Station Control System | May become antiquated before end of planning period. |
| Newton Creek Pump Station Buried Fuel Tank | Will reach end of useful life early in the planning period. |
| Newton Creek Pump Station | May lack capacity to convey peak flows before end of planning period. |
| Timber Estates Pump Station Control System | May become antiquated before end of planning period. |
| **Force mains** | |
| 14" FM From PS A to NCPS | May lack capacity to convey peak flows at buildout. |
| 18" FM From NCPS to WWTP | May lack capacity to convey peak flows before end of planning period |
| **Undeveloped Areas** | |
| All undeveloped Areas | No sewer service |

## 6.4. Identification of Collection System Alternatives

Facilities planning requires the examination of a broad range of alternatives for each portion of the wastewater system. This section examines the alternatives for collecting wastewater within the study area and conveying it to the point of treatment. This section develops and screens wastewater collection alternatives using criteria such as land requirements, topographic constraints, reliability, operational flexibility, construction and long-term O&M costs, and regulatory restrictions. The alternatives listed in this section represent the tools used in the facilities planning effort to address the previously listed deficiencies in order to provide a comprehensive long-term solution for the City's collection system.

### 6.4.1 No Action

The no action approach implies that no improvements will be made to the existing collection system (excluding maintenance or repairs). Obviously, this approach is recommended for those areas of the system which have sufficient capacity to convey the design flows and are in acceptable condition. Although this approach may be justified in isolated areas within the system on a case-by-case basis where there is insufficient capacity to convey peak design flows (i.e., minor surcharging for short periods of time), this approach is effectively eliminated by DEQ guidelines and regulations.

Although it is always an option to not improve the system, the result will be health risks, damages, and inconveniences where sewage collection and pumping facilities are inadequate. Furthermore, delaying required improvements almost inevitably leads to a greater future problem. However, to ensure that system improvements are justified, it is necessary to consider the costs and advantages of proposed improvements against the risks entailed by the no action alternative. It should be noted that since resources are limited and the sewer system cannot be upgraded all at one time, the phasing plan adopted by the City for the improvements will in effect require that the no action alternative be adopted on a temporary basis for all but the first phase improvements.

It should be noted that since the detailed hydraulic analysis of the system was limited to the trunk sewer collection system, the recommendations do not encompass the minor or local portions of the sewer collection system unless there may be problems due to blockages, pipe failures or maintenance problems.

### 6.4.2 Reroute Sewage (Basin Transfer)

Under this scenario, sewage would be diverted or rerouted from one sewer basin or system to another. This approach is practical in cases where an existing sewer and pump station has capacity in excess of that needed to convey design flows from that basin, and where flow diversion is practical from a construction and topographic standpoint.

### 6.4.3 Upgrade Existing Collection System, Pump Stations, & Force Mains

This approach involves constructing replacement pipes and/or upgrading pump stations and force mains to provide adequate capacity for the design flows. This is the most obvious alternative since it provides assurance that the sewage collection system can convey the design flows through town and that overflows will be kept to a minimum, which in turn limits the City's liability.

### 6.4.4 Infiltration/Inflow Reduction

As stated previously, the collection system collects large amounts of I/I during the winter months. While reduction of the existing I/I flows and minimization of future

I/I flows is important, experience in western Oregon has shown that the goal of complete elimination of I/I is unreasonable and largely unattainable. An understanding of I/I hydraulics is necessary to understand why this is so, and to illustrate the place that I/I reduction has in the overall management and improvement program.

Infiltration is groundwater that enters the collection system through faults in manhole barrels or bases, mainline pipes or service laterals. Inflow, on the other hand, is surface water or storm runoff that enters the collection system directly from sources such as manhole lids, open cleanout covers, roof drain connections or sump pump connections. Such inflow connections are illegal under the City's current ordinances. Unless there are illegal drainage connections, typically very little water entering the sewer system is direct inflow.

Inflow sources can most easily be identified by smoke testing the existing sewer system. When smoke is blown into the mainlines, it tends to exit through any connections open to the atmosphere, including roof drains and cleanout covers. If done during dry weather, the smoke testing can also reveal faulty sewer laterals. The water seal in the traps for sinks, bathtubs and toilets keeps the smoke from entering houses.

Most soils in the Willamette Valley and in the study area have relatively low permeability and are poorly drained during the winter months. Ground water levels remain relatively close to the surface during much of the winter. Even in areas where ground water levels are high during the dry weather months, little dry weather infiltration occurs because the groundwater permeates very slowly into the sewer trenches.

Many of the trenches dug when the sanitary sewers were installed are backfilled with granular materials. Even in areas with native backfill, the trench excavation destroyed the relatively tight soil structure and the replaced materials pass water much more readily than did the original soil. As the sewer trenches are generally deeper than any other utilities, stormwater tends to collect in the old trenches as soon as there is enough precipitation to cause surface runoff.

The factors limiting the amount of infiltration entering the sewer system include:

- The amount of water available to enter.
- The number and size of faults allowing the water to enter.
- The available hydrostatic head.

In the older portions of the sewer system, there are generally more than enough breaks, leaks and faults in the sewer system to allow virtually all water collecting in the sewer trenches to enter the sewer piping. Inadequate downstream capacities (pipe capacities and/or pump station capacities) cause surcharges that inhibit the rate at which water enters the sewer system.

After a period of precipitation, the sewer system effectively drains the collected waters from the sewer trenches. Because the soils drain poorly, the sewer trenches tend to be recharged from surface runoff for several days after a period of precipitation, thereby maintaining high I/I flows for several days after the precipitation ceases. As the trenches are gradually drained, the I/I flows decrease.

As the sewers are repaired, the number of system faults in each area are reduced until the size and number of faults start to inhibit the flow of I/I into the sewers. When that happens, groundwater levels in the sewer trenches rises. Peak I/I flows are smaller, but as long as some faults remain at elevations generally below trench-water levels, the I/I flows several days after a precipitation period remain high. The relationship between ground water levels, precipitation and I/I is complex and transient. Ground water levels in the sewer trenches often are unrelated to nearby groundwater levels in undisturbed soils.

Although complete elimination of infiltration from the sewer system is not a viable alternative, work can be done to reduce or maintain the amount of I/I. The goal of an I/I reduction program is to repair leaks and eliminate direct inflow and infiltration sources into the gravity mainlines, manholes and services. Over the years, experience has shown that the best approach is to focus on a particular area until significant I/I reduction is achieved before moving on to other areas of the collection system. The most logical locations to start work are those areas with the most significant I/I problems.

As previously described, smoke testing can be used to identify direct inflow sources. Once identified, spot repairs can be made. The City's sewer ordinance requires property owners to disconnect inflow sources on private property upon receiving a thirty (30) day notice from the City. All inflow sources on public property will likely remain the City's responsibility.

Several options are available for reducing infiltration and inflow into the collection system. These include complete replacement of mainlines manholes and services, in place rehabilitation (i.e., pipe bursting, cured in place pipe, slip lining, grouting, etc.), and spot repairs. Selection of the proper technology must be done on a project by project basis to determine the most cost-effective approach. Examples of factors that must be considered include pipe size, depth, level of deterioration, backfill, soil condition, alignment, surface restoration and number of services.

### 6.4.5 New Trunk Sewers, Pump Stations, & Force Mains

The construction of new collection system components including trunk sewers, lift stations, and force mains is the only method considered herein for providing service to undeveloped areas. This method basically involves extending the conventional gravity collection system into the undeveloped areas and installing new pump station where topographical limitations require. Septic tank effluent pumping (STEP) or

Septic tank effluent gravity (STEG) collection systems were not considered practical given the City's reliance on a conventional gravity system and the potential deterioration of concrete components in the existing system from hydrogen sulfide present in STEP and STEG effluents.

## 6.5. Evaluation of Alternatives and Development of Complete Collection System Recommendation

Each of the alternatives listed previously were evaluated against each of the collection system deficiencies to determine the most cost-effective, long-term solution for the City's collection system. This section presents the results of this evaluation and summarizes the overall collection system recommendation. The City's goal is to develop a sewage collection system that not only meets existing needs, but also accommodates future development.

Based on the anticipated sewage flows previously discussed, it is recommend that the City establish a formal Capital Improvement Program to replace and/or upgrade the major components in the existing collection system to provide capacity to convey the design flows under fully developed conditions. Further it is recommend the City implement a program of phased construction of these improvements as funding becomes available.

A conceptual design was developed for each major improvement project to determine the approximate size and features needed to convey the design flows. As part of this process, alternatives such as alignment, feasibility of reusing existing portions of the system were identified and evaluated. This involved evaluation of topographic opportunities, available vacant lands, and natural resource constraints with field reconnaissance to confirm the conceptual level feasibility of each alternative.

### 6.5.1 Existing Gravity Sewer Collection System

#### 6.5.1.1 I/I Reduction Program

As described, the I/I problem is significant. As an alternative to addressing I/I, the City could chose to collect, treat, and dispose of all existing and anticipated I/I. This would amount to the "do nothing" option with respect to the I/I problem. Without continued I/I reduction efforts, the amount of I/I in the existing system will continue to increase as the collection system continues to age. This increase in flow will exceed the capacity of sections of piping in addition to those currently at capacity. As a result, additional sections of collection piping would have to be upsized and pump stations and force mains would have to be oversized to handle the anticipated increase in I/I. Once collected and conveyed to the treatment plant, the I/I must be treated and disposed of. In order to treat the anticipated increase in I/I, the hydraulic capacity of the treatment plant would have to be oversized. All of these improvements would be in addition to the improvements listed in the recommended plan. As such, the "do nothing" alternative with respect to the I/I problem is not the least cost alternative. Even if this fact is ignored, the

real problem with the "do nothing" approach is in relation to disposal at the WWTP. As the City continues to grow during and beyond the planning period, wintertime disposal will become a controlling factor with regard to the treatment facilities. This is due to the fact that the Marys River has been listed as water quality limited by the DEQ. The end result of this listing is that the DEQ will likely not approve an increase in the existing mass loads to the Marys River. This limits the amount of pollutants the City can discharge. Since wastewater flows will grow as the City grows, the only way to maintain the pollutant loads to the river is to provide a higher level of treatment. As wastewater flows increase, eventually the City will be forced to produce a higher quality effluent than it currently does. If the I/I problem is not addressed, the City may be forced to make the modifications required to produce a higher quality effluent during the planning period. Given this fact, and the fact that the "do nothing" alternative with respect to the I/I problem is not the most cost effective solution, it will be dropped from further consideration.

The majority of the problems associated with the existing gravity collection system are the result of the age of the original 1952 gravity piping and the materials and construction methods used to install the system. The system is now more than 50 years old and is showing significant signs of deterioration. This deterioration results in a significant amount of infiltration into the collection piping and appurtenances. This infiltration is the major reason for many of the capacity issues in the existing gravity collection piping. If all of the infiltration and inflow sources could be removed, the existing gravity piping would most likely have the required capacity to convey existing and projected peak flows. Though, complete elimination of infiltration and inflow is not possible, it can be significantly reduced. Reducing the amount of I/I into the collection system has a number of benefits. Some of these are listed as follow.

- **Reduction in wintertime disposal requirements.** All of the infiltration and inflow that enters the collection system must be treated and disposed of as if it were wastewater. During the winter, the only disposal method available to the City is to discharge treated wastewater to the Marys River. The DEQ limits the amount of wastewater that can be discharged by setting mass load limits. As discussed in **Section 7**, the existing mass load limits are sufficient to provide for wintertime discharge of lagoon effluent during the planning period. However, as one looks beyond the planning period, finding wintertime disposal methods is going to become a significant concern for the City. Efforts to reduce I/I will result in a decrease in the amount of additional wintertime disposal that must be provided in the future.

- **Reduces pumping costs.** In Philomath all wastewater that is collected from the users is pumped to the treatment plant. As such, reducing the amount of I/I will decrease pumping costs.

- **Extends the life of the pumping and treatment facilities.** I/I utilizes capacity that could be used for wastewater. If the amount of I/I can be reduced, the time until the pumping and treatment facilities reach capacity can be extended.

The only way to reduce I/I is to replace or repair the faulty collection piping and manholes. When designing an I/I reduction program, the key question that needs to be answered is how much of the collection system should be addressed on an annual basis. Since much of the original 1952 collection system is nearing the end of its useful life, the City should embark on an I/I reduction strategy that results in replacing or repairing the entire 1952 collection system over the next ± 30 years. By the end of this time period, the 1952 collection system still remaining in service will be 80 years old and require extensive and ongoing maintenance at considerable cost. Based on the flow mapping data (see **Section 4**), much of the collection piping located in basin N3B that was constructed in 1961 shows signs of an I/I problem. Therefore, this piping is included in the I/I reduction plan.

The total length of gravity mainline that should be included in the I/I reduction plan is approximately 35,000 feet. In order to replace or repair this entire length over a 30-year period, 1,150 feet must be done on an annual basis. The annual cost of this work is based on the assumption that all mainline manholes and all public portions of the services are replaced. This assumption is conservative. It may be more cost effective to repair the existing mainline using in-place methods for certain portions of the collection system. If so, the cost savings can simply be used to replace a longer section of the system or to replace the private portions of the services. It is also likely that unforeseeable (at the facilities planning stage) difficulties will result in certain projects costing more than estimated herein. As such, it is likely that individual cost savings and overruns will balance out over the 30-year term of the effort. If not, the overall duration of the project may be extended or decreased. The intent of the effort is to repair the aging collection system. It makes little difference if it requires, 25, 30, or 35 years. Furthermore, at the end of the 30-year period, it is highly likely that other portions of the collection system will need to be replaced or repaired due to age and deterioration. As such, the I/I reduction effort should be extended indefinitely.

The City currently has and ongoing I/I reduction plan that is funded at approximately $65,000 per year. The recommendation is to increase the funding dedicated to the plan by the amount necessary to replace approximately 1,150 feet of sewer mainline annually. The estimated costs for

this work are summarized in **Table 6-3**. As shown in **Table 6-3**, the annual project cost for the proposed I/I reduction plan is approximately $222,000.

**TABLE 6-3**
**Annual I/I Reduction Plan Cost Estimate**

| Item | Unit | Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|
| TV Inspection | L.F. | 1,150 | $2.00 (2) | $2,300 |
| 12" Mainline (1) | L.F. | 1,150 | $84.00 | $96,600 |
| Manholes | Each | 4 (3) | $3,500 | $14,000 |
| Services | Each | 23 (4) | $2,000 | $46,000 |
| Subtotal Construction Cost | | | | $158,900 |
| Construction Contingency @ 10% | | | | $15,890 |
| Engineering Costs @ 20% | | | | $31,780 |
| Administrative Costs @ 10% | | | | $15,890 |
| Total Project Costs | | | | $222,460 |

(1) 12" mainline assumed to be average size over entire project area.
(2) Assumed unit price based on TV work done at ± 5,000 foot increments.
(3) Based on average manhole spacing of 300 feet.
(4) Based on average service spacing of 50 feet.

Experience has shown that successful I/I correction requires a carefully planned iterative approach. The first step involves fieldwork and data collection within the proposed work area. Each line should be cleaned and inspected with television monitoring equipment. With the exception of smoke testing, all fieldwork should be done during wet periods when reliable I/I flows are high. The data must be carefully analyzed to refine the locations of the problem areas and to determine if the line should be replaced entirely or if an in-place repair technology is more appropriate. After the improvements are constructed, more fieldwork and inspections should be performed to determine the success of the I/I correction. For example, if high I/I flows are observed from a particular section of sewer main that has been replaced including the manholes and the public portion of the services, a logical source would be the private portion of the services. This would indicate that to be successful, the entire system must be replaced/rehabilitated from the mainline to each structure.

Replacing the private portions of the services can be politically challenging. The City's current sewer ordinance requires users to repair the private portions of the services within sixty (60) days notice from the City that the service is causing excessive infiltration. At $1,000 to $2,000 per service, this can be a difficult cost for homeowners to bear. The political ramifications of implementing this policy must be carefully considered. In some successful I/I control programs grant funding to correct service laterals for low income users has been available and makes the I/I correction work less of a financial burden.

Most I/I correction programs have not been as successful as intended because the nature of sewer system I/I was not fully understood. In the past, many I/I reduction programs were based on the theory that to significantly reduce I/I, only the major leaks need to be identified and repaired. There are many reasons why this approach has failed. Two significant reasons are summarized as follows.

- The effects of "hydraulic transfer" have not been well understood. Water in the sewer trenches easily runs along the outside of the sewer pipes. After the mainline pipes that collect I/I are grouted or otherwise repaired, nearby pipes and adjacent service laterals begin collecting large I/I quantities and total system flows remain substantially unchanged. This is hydraulic transfer. Plugging some leaks causes the trench groundwater level to rise slightly. The trench backfill material is relatively permeable, allowing water to run along the pipeline and enter other faults at slightly higher elevations, or through smaller leaks that now have more pressure on them (greater hydraulic head).

- Service laterals have not been effectively addressed. In most systems, service lateral piping represents half of the total system. In many systems, very little is done to locate and stop service lateral leakage. Some have concluded that because service laterals are relatively shallow, they will not contribute much I/I. Frequently, however, service laterals contribute a major part of total I/I and significant I/I reductions cannot be achieved without repairing faulty service laterals. The connection of service laterals to the sewer main is particularly critical. Typically, a significant percentage of these connections in older systems are faulty and leaking profusely.

Some of the lessons from successful I/I correction programs of the past are as follows.

- Do I/I correction on a basin-by-basin basis. Significant I/I reductions are only reliably achieved by eliminating all or nearly all I/I contributing faults in a sewer basin. To repair much less tends to shift the entry of I/I from one fault to the next.

- Measure wet weather I/I flows from the selected basins before repair work starts.

- Initially determine what, in general, must be done to repair the faults contributing significant I/I. Locate as many such faults as reasonable, but realize that it is impossible to find them all. Some will not be discovered until some repairs are made.

- Establish a repair plan and budget for all known repairs. Make allowances for repair of faults not initially discovered. The repair plan must include repairs to mains, manholes and service laterals if each contributes significant I/I.

- Make the initial repairs and then re-measure wet weather I/I. Unless the I/I reductions are acceptable, find the remaining I/I sources and repair them. Repeat this process until acceptable I/I reductions are achieved. Experience has demonstrated that the ratio of I/I reduction per dollar spent will be much higher for the last repairs than the first.

I/I correction is a complex process. A process that is part art and part science, since there are often multiple methods for correcting the system faults. In general, the repairs must be long lasting, and the least expensive method of achieving a long-term repair should be utilized.

Several methods are available for rehabilitating pipelines to eliminate I/I. These methods include the following:

- Sewer replacement
- Chemical grouting of joints and lateral connections
- Slip lining (HDPE)
- Cured-in-place Pipe (Insituform or equivalent inversion lining)
- Folded & formed pipe (Nupipe, U-liner or equivalent)
- Pipe Bursting

Factors such as cost, structural conditions, safety, and potential for I/I migration will influence the selection of the proper technique and must be considered when selecting a rehabilitation method on any specific pipeline section.

Manholes are usually rehabilitated to correct structural deficiencies and to eliminate the entrance of ground and surface water. Each manhole should be evaluated to determine the type of problems occurring and the optimum method of rehabilitation and repairs including frame, cover, side wall, and base rehabilitation. Chemical grouting is usually very effective for correcting sources of infiltration in manholes.

#### 6.5.1.2 Construct Basin A2 Overflow Structure

Flow from Basin A2 is currently routed through basin N3AA to the Newton Creek pump station. The trunk sewers on the downstream end of basin N3AA as well as those downstream of basin N3AA lack capacity to convey existing and projected peak wastewater flows. As described later in this section, the recommended plan includes upsizing sections of these trunk sewers. To limit the magnitude and extent of the piping that must be upsized, the

recommended plan includes the construction of an overflow structure that prevents surcharging in basin N3AA by splitting flows from basin A2 between basin N3AA and basin A4A. During low and normal flow conditions, all of the flow from basin A2 should be directed into basin N3AA. As flows increase in response to wet weather conditions, any wastewater that cannot flow into basin N3AA without surcharging will overflow into basin A4A and flow by gravity to Pump Station A. The overflow structure should be constructed by modifying manhole #288 at 15th and College Street. Manhole #288 currently has two outlets. The outlet to the south drains to basin A4A. The outlet to the east drains into basin N3AA. The east outlet is at a slightly lower invert elevation than the southern outlet. A hand formed concrete ledge and slide gate prevents flow from entering the southern outlet. To provide the desired function, the concrete ledge and slide gate will need to be modified. The modifications should be designed to direct any flow deeper than 2/3 of the diameter of the eastern outlet into the southern outlet. This can be accomplished by chipping away the existing concrete ledge and installing an adjustable set of stop logs or other similar device. The total costs for this project should be less than $7,500).

This modification has number of benefits. Since the Newton Creek Pump Station is closer to the treatment plant than Pump Station A, it is less expensive to pump wastewater from the Newton Creek Pump Station than from Pump Station A. Therefore, as much flow as possible should be directed toward the Newton Creek Pump Station. The construction of the overflow structure results in only the highest flows being diverted to Pump Station A. The majority of the flow will be directed toward the Newton Creek Pump Station. The recommended plan includes maintaining this configuration indefinitely. Therefore, the majority of flow from Basin A2 will be diverted to the Newton Creek Pump Station.

#### 6.5.1.3 Basin N8A Basin Transfer

Sewer service has been extended into basin N8A from basin A2 rather than from basin N6A as planned in the original 1985 Facilities Plan. As a consequence, flows from basin N8A are contributing to the capacity problems downstream of basin A2. The overflow structure previously described partially alleviates the capacity problem. However, as a long-term solution, flows from basin N8A must be intercepted by the trunk sewer system that is described later in this section.

There is a significant amount of undeveloped land within and upstream of basin N8A (i.e., basins N8B and N8C). Without this basin transfer, the entire trunk sewer from manhole #27 to manhole #134 will have to be upsized prior to buildout since it lacks capacity to convey the projected flows. This would reroute a substantial amount of flow away from the Newton Creek Pump Station and into Pump Station A. Since pump station A is further from the

treatment plant than the Newton Creek Pump Station, rerouting basins N8A, N8B, and N8C to Pump Station A will significantly increase pumping costs over the long run. These pumping costs together with costs required to increase the trunk sewer size are excessive when compared to the costs of routing flows from basin N8A into basin N6A.

The drawback to this option is that a substantial amount of time may be required before the trunk sewer is extended to the point where flows from basin N8A can be rerouted. Currently, there is very little room for growth in basins A2, N8A, N8B, and N8C due to the downstream capacity problems. The recommended plan in effect may discourage growth in these areas until the trunk sewer system has been extended to the point where flows from basin N8C can be intercepted before discharging into basin A2.

#### 6.5.1.4 Replace Under-Capacity Sewer Lines

As described in **Section 4** and demonstrated in **Section 6.3,** large portions of the collection system lack capacity to convey present peak hourly flows. As such, major upgrades are required at this time. Many additional sections of the gravity collection piping lack capacity to convey projected flows at the end of the planning period and at buildout. As such, many additional sections of the gravity collection piping will likely require replacement during the planning period. The recommended improvements and project costs are listed in **Table 6-4**. A detailed breakdown of the construction costs, contingency, design and administration/financing costs are included in **Appendix I**. The sewer replacement projects include complete replacement of the main, all manholes, and services within five feet of structures. The lines are assumed to be constructed in the same horizontal alignment and at the same slope as the existing lines. The recommended sizes are noted in **Table 6-4**.

Technically, the projects listed in **Table 6-4** can be considered as part of the I/I reduction plan. Therefore, if the City desires, the funds earmarked for the I/I reduction plan can be used for the projects listed in **Table 6-4**. However, it should be noted that most of the projects listed in **Table 6-4** include an oversize component to accommodate upstream growth. Therefore, a portion of these projects is eligible for funding by the collection of SDC's. The oversize component of the overall project budget is included in **Table 6-4**.

As the projects listed in **Table 6-4** are completed, the flows should be evaluated to quantify any reductions in the amount of I/I. If during the implementation of the above improvements or the implementation of the I/I reduction program, significant reduction in the amount of I/I into the collection system is observed, the City may wish to reevaluate the pipe diameter recommendations listed in **Table 6-4**.

### 6.5.2 Pump Stations and Force mains

As demonstrated in **Section 6.3** the pump stations and force mains include a number of deficiencies. Key amongst these is that existing capacity problems with Pump Station A.

As described in **Section 4** pump station A was constructed as part of the original 1952 sewer system and subsequently renovated in 1985. Therefore, several of the main components of the pump station are more than 50 years old. In addition to its age, the pump station lacks capacity to convey peak flows. The size of the wet well must be increased to provide additional capacity. As such, the recommended plan includes complete replacement of Pump Station A. The estimated project cost for replacing Pump Station A is included in **Table 6-4**.

The other major pump station improvement project is the Newton Creek Pump Station capacity increase. This project consists of installing additional pumps with new control systems, renovating the discharge piping, installing a new auxiliary power unit, and installing a parallel force main from the Newton Creek Pump Station to the WWTP. At this time, it is difficult to determine if this improvement will be required during the planning period. The flow projections indicate that this upgrade may be necessary sometime late in the planning period. However, these projections are based on the assumption that growth will occur at an equal rate in each basin. As the projects required to increase the capacity of the pump station A collection system are made, this basin will become more suited for growth than the Newton Creek Pump Station basin. As such, a higher percentage of growth is likely to occur in the Pump Station A basin rather than the Newton Creek basin. Furthermore, the possibility exists that the I/I reduction program will decrease the amount of I/I, and subsequently decrease flows to both pump stations. Based on these arguments, it is possible that the Newton Creek Pump Station capacity increase may be delayed beyond the current planning period. As such, we recommend that the City evaluate growth patterns and the success of the I/I reduction plan at 5-year intervals during the planning period and amend the Facilities Plan as required.

Other minor improvements to the existing pump stations are the removal of the underground storage tank at the Newton Creek Pump Station, and the control system upgrade at the Timber Estates Pump Station. Total Estimated project costs are included in **Table 6-4**. A detailed breakdown of the costs is included in **Appendix I**.

### 6.5.3 Collection System Improvements to Serve Currently Undeveloped Area

With a few minor modifications, the gravity trunk sewer system recommended in the 1985 Facilities Plan should remain as the City's long term plan. The existing system of pump stations and force mains are designed around the long term collection system proposed in the 1985 Facilities Plan. Many of the trunk sewer improvements to date have followed the recommendations of the 1985 plan. For these and other reasons, departing from the 1985 plan at this time would require major system overhauls that

are not necessary and not cost effective. As part of this facilities planning effort, the collection system improvements proposed in the 1985 Facilities Plan were reevaluated both from a capacity and layout standpoint. As a result, some minor modifications and additions to the 1985 plan are presently proposed. The conceptual layout of the proposed trunk sewer improvements is shown in **Figure 6-1**. In addition to the trunk sewer system, two additional pump station are proposed to serve basins P1B and P2B. These are called the 13th Street Pump Station and the Applegate Street Pump Station respectively.

The collection system improvements to serve currently undeveloped areas have been partitioned into the individual projects listed in the recommended improvements to allow for inclusion in the CIP at the discretion of the City Council. The total project estimates are listed in **Table 6-4**. Detailed project estimates are included in **Appendix I**. Even if these projects are included in the CIP, it is assumed that developers will construct them. The final locations of the new pump stations and detailed alignment of the trunk sewers and force mains have not yet been determined, and will be based on the proposed development pattern of the land being served by the facility. The locations shown later in this section represent the general location required for the facilities in order to serve the tributary drainage basins. Alternate locations proposed by developers should be considered only if they are capable of providing service to the entire basin.

### 6.5.4 Summary of Recommended Collection System Improvements

The improvements outlined in **Table 6-4** of this report are shown on **Figure 6-1.** A schematic depiction of the long-term collection system routing is included in **Figure 6-2**. These improvements will result in a sewage collection system with the capacity needed to convey flows from within the planning area assuming development to zoning densities shown. The proposed improvements are intended to minimize the amount of new piping which must be installed, as well as to minimize the unnecessary replacement of existing sewer mainlines. The proposed trunk sewer system improvements largely follow existing street right-of-ways through the community along existing sewer alignments. As such, the alternative alignments are limited. Construction of the recommended new sewers to address capacity issues will also result in a decrease in the I/I contributions as the existing concrete sewers are replaced with new sewers of PVC pipe material.

The improvements are based on the complete development of the land within the UGB. Therefore, many will not be required during the planning period. The improvements address existing deficiencies, as well as potential deficiencies at the end of the planning period and at buildout. Only the improvements that address the existing deficiencies are required at this time. The remaining deficiencies are growth dependent. Of these, some may be required before the end of the planning and some may not. Nonetheless, should any of the sewer mainlines be replaced as part of the I/I correction work, they should be sized in accordance with the recommendations

listed in **Table 6-4** regardless of whether or not the mainline lacks capacity at the time of construction. The improvements are prioritized in **Section 8** if this report.

The alignment of future lines through the undeveloped portions of town has not yet been determined. The final alignment of sewer lines in these areas should be determined as property develops. Sewer lines should be placed within right-of-ways whenever possible. If the City Limits or UGB are to be expanded in the future, the sewer system should be re-examined to determine where additions are needed and if alternate alignments are justified.

The capacity problems in the collection system are well documented. Any additional development upstream of the identified bottlenecks prior to the implementation of the recommended improvements will exacerbate the capacity the problem and will result in additional surcharging of sewers and possible overflow or flooding of homes or businesses.

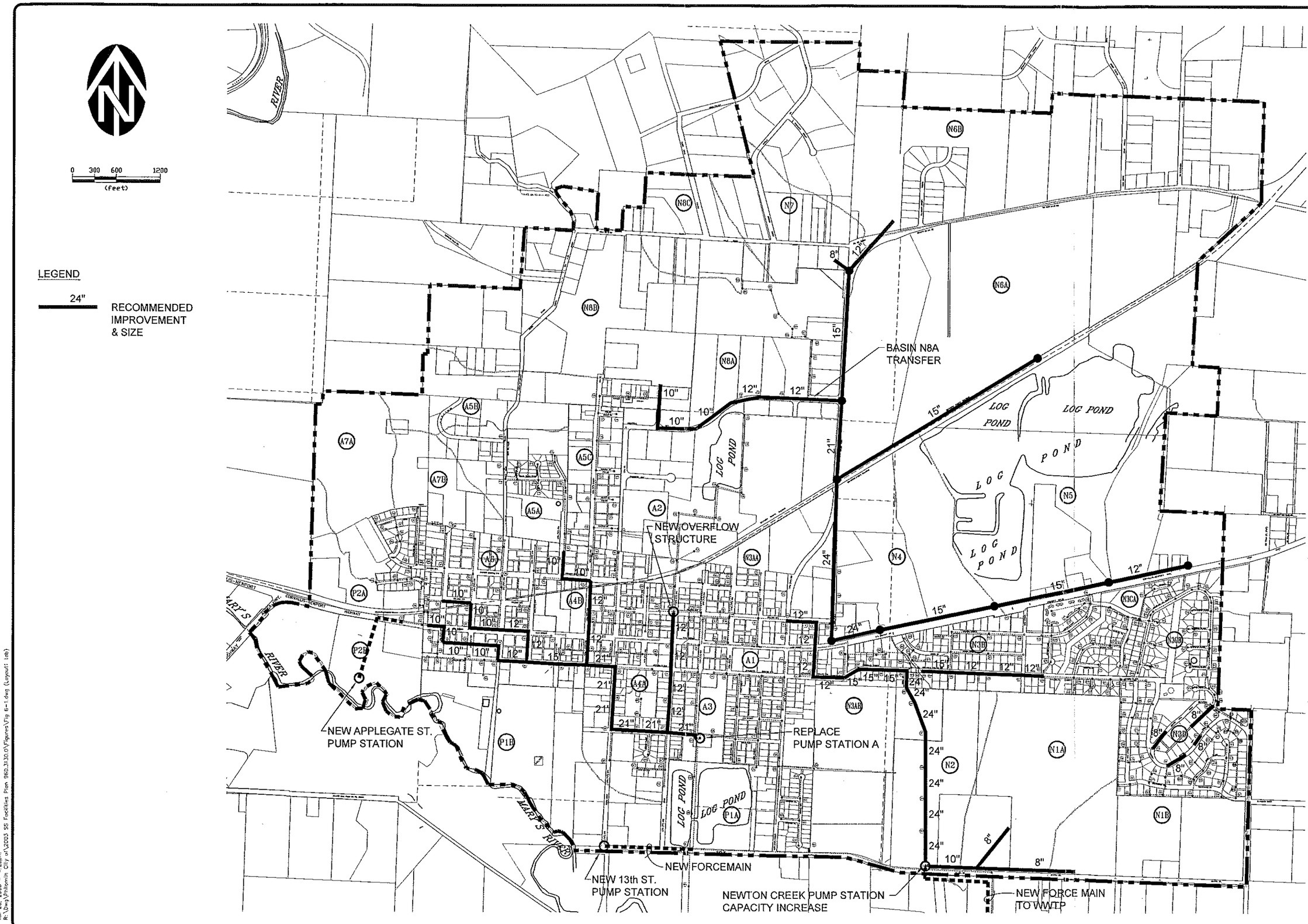
## TABLE 6-4
## Recommended Collection System Improvements

| Project Location(s) | Existing Size/Capacity | Length (ft) | Recommended Size/Capacity | Total Estimated Project Cost | Oversize Cost Required for Future Growth |
|---|---|---|---|---|---|
| **I/I Reduction Plan (Original 1952 Collection System)** | | 1150 ft/yr | As listed | $222,000/yr (1) | $0 |
| **Pump Station A (16th & Cedar)** | ±1550 gpm | - | ±3460 gpm | $1,125,000 | $468,000 |
| **Overflow Structure (15th & College)** | | | | $11,000 | $6,000 |
| **Buried Fuel Tank at Newton Creek Pump Station** | | | | $14,000 | $2,500 |
| **Pump Station A Trunk Sewer Improvements** | | | | | |
| Cedar Street (MH 200 to MH 29) | 12" | 1200 | 21" | $278,000 | $32,000 |
| 13th Street (MH 29 to MH 31) | 12" | 840 | 21" | $215,000 | $22,000 |
| Applegate Street (MH 31 to MH 32) | 12" | 390 | 21" | $93,000 | $10,000 |
| **Basin N3A Trunk Sewer Improvements** | | | | | |
| Applegate Street (MH 1 to MH 2) | 8" | 430 | 12" | $77,000 | $0 |
| 20th Street (MH 2 to MH 6) | 8" | 740 | 12" | $128,000 | $0 |
| College Street (MH 6 to MH 9) | 8" | 400 | 12" | $71,000 | $0 |
| **12th Street Trunk Sewer Improvements** | | | | | |
| 12th Street (MH 32 to MH 71) | 8" | 1150 | 12" | $188,000 | $22,000 |
| **Basin A6 Trunk Sewer Imps. Phase I** | | | | | |
| Applegate Street (MH 32 to MH 34) | 10" | 820 | 15" | $164,000 | $24,000 |
| Applegate Street (MH 34 to MH 35) | 10" | 400 | 12" | $63,000 | $8,000 |
| 10th Street (MH 34 to MH 45) | 10" | 420 | 12" | $80,000 | $8,000 |
| Main Street (MH 45 to MH 46) | 10" | 400 | 12" | $77,000 | $8,000 |
| **Basin N3B Trunk Sewer Improvements** | | | | | |
| Applegate Street (MH 203 to MH 205) | 10" | 390 | 15" | $90,000 | $15,000 |
| Applegate Street (MH 205 to MH 208) | 10" | 1280 | 12" | $227,000 | $12,000 |
| **Basin A6 Trunk Sewer Imps. Phase II** | | | | | |
| 9th Street (MH 35 to MH 36) | 8" | 200 | 10" | $32,000 | $4,000 |
| Alley (MH 36 to MH 38) | 8" | 770 | 10" | $124,000 | $17,000 |
| Main Street (MH 46 to MH 52) | 8" | 400 | 10" | $74,000 | $9,000 |
| 8th Street (MH 52 to MH 53) | 8" | 330 | 10" | $55,000 | $7,000 |
| **Timber Estates Pump Station Imps** | | | | $113,000 | $0 |
| **Newton Creek Pump Station Capacity Imps** | | | | | |
| New Force main to WWTP | | | | $832,000 | $832,000 |
| Pump Station Improvements | | | | $300,000 | $300,000 |
| **Basin A6 Trunk Sewer Imps. Phase III** | | | | | |
| 7th Street (MH 38 to MH 39) | 8" | 220 | 10" | $37,000 | $5,000 |
| Main Street (MH 39 to MH 40) | 8" | 230 | 10" | $46,000 | $5,000 |
| College Street (MH 53 to MH 56) | 8" | 400 | 10" | $62,000 | $8,000 |

(1) Funds generated as part of the I/I reduction plan may be used to complete the trunk sewer replacement projects listed in this table.

## TABLE 6-4 (Continued)
## Recommended Collection System Improvements

| Project Location(s) | Existing Size/Capacity | Length (ft) | Recommended Size/Capacity | Total Estimated Project Cost | Oversize Cost Required for Future Growth |
|---|---|---|---|---|---|
| **Basin A4B Trunk Sewer Imps. Phase II** | | | | | |
| Pioneer Street (MH 71 to MH 73) | 8" | 400 | 10" | $71,000 | $9,000 |
| 11th Street (MH 73 to MH 74) | 8" | 375 | 10" | $62,000 | $8,000 |
| **15th Street Trunk Sewer Improvements** | | | | | |
| 15th Street (MH 27 to MH 288) | 8" | 1630 | 12" | $296,000 | $50,000 |
| **Basin N3AA Trunk Sewer Improvements** | | | | | |
| Applegate Street (MH 202A to MH 1) | 12" | 875 | 15" | $197,000 | $197,000 |
| **Newton Creek Trunk Sewer Improvements** | | | | | |
| Newton Creek (MH 202A to NCPS) | 21" | 2660 | 24" | $593,000 | $593,000 |
| **Benton View Drive Sewer Improvements** | | 1150 | 8" | $167,000 | $167,000 |
| **East Highway 20 Trunk Sewer** | | | | | |
| From 24" Stub to Basin N4/N5 Boundary | | 1650 | 15" | $250,000 | $250,000 |
| From Basin N4/N5 Boundary to End 15" | | 1600 | 15" | $244,000 | $244,000 |
| From End 15" to End of Trunk Sewer | | 1050 | 12" | $139,000 | $139,000 |
| **20th Place Trunk Sewer** | | | | | |
| From 24" Stub to 20th Pl./Hwy 20 Intersection | | 680 | 24" | $167,000 | $167,000 |
| From 20th Pl./Hwy 20 Intersection to SPRR | | 2100 | 24" | $489,000 | $489,000 |
| Railroad Bore | | 100 | 24" | $52,000 | $52,000 |
| **Railroad Trunk Sewer** | | 1600 | 15" | $318,000 | $318,000 |
| **Green Road Trunk Sewer Phase I** | | | | | |
| From SPRR to Industrial Way | | 1100 | 21" | $228,000 | $228,000 |
| **Green Road Trunk Sewer Phase II** | | | | | |
| From Industrial Way to West Hills Rd. | | 1700 | 15" | $286,000 | $286,000 |
| From West Hills Rd. to End | | 900 | 12" | $132,000 | $132,000 |
| **Industrial Way Trunk Sewer** | | | | | |
| From Green Rd. to MH 134 | | 1300 | 12" | $195,000 | $195,000 |
| From MH 134 to End | | 2000 | 10" | $270,000 | $270,000 |
| **Applegate Street Pump Station** | | | | | |
| Pump Station | | | ±185 gpm | $525,000 | $525,000 |
| Force Main | | | | $67,000 | $67,000 |
| **13th Street Pump Station** | | | | | |
| Pump Station | | | ±400 gpm | $578,000 | $578,000 |
| Force main | | | | $97,000 | $97,000 |
| **Totals** | | | | $10,174,000 | $6,978,000 |

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REVISIONS

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BAR IS ONE INCH ON ORIGINAL DRAWING
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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CITY OF PHILOMATH
2003 SANITARY SEWER FACILITIES PLAN

# RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS

FIGURE
6-1

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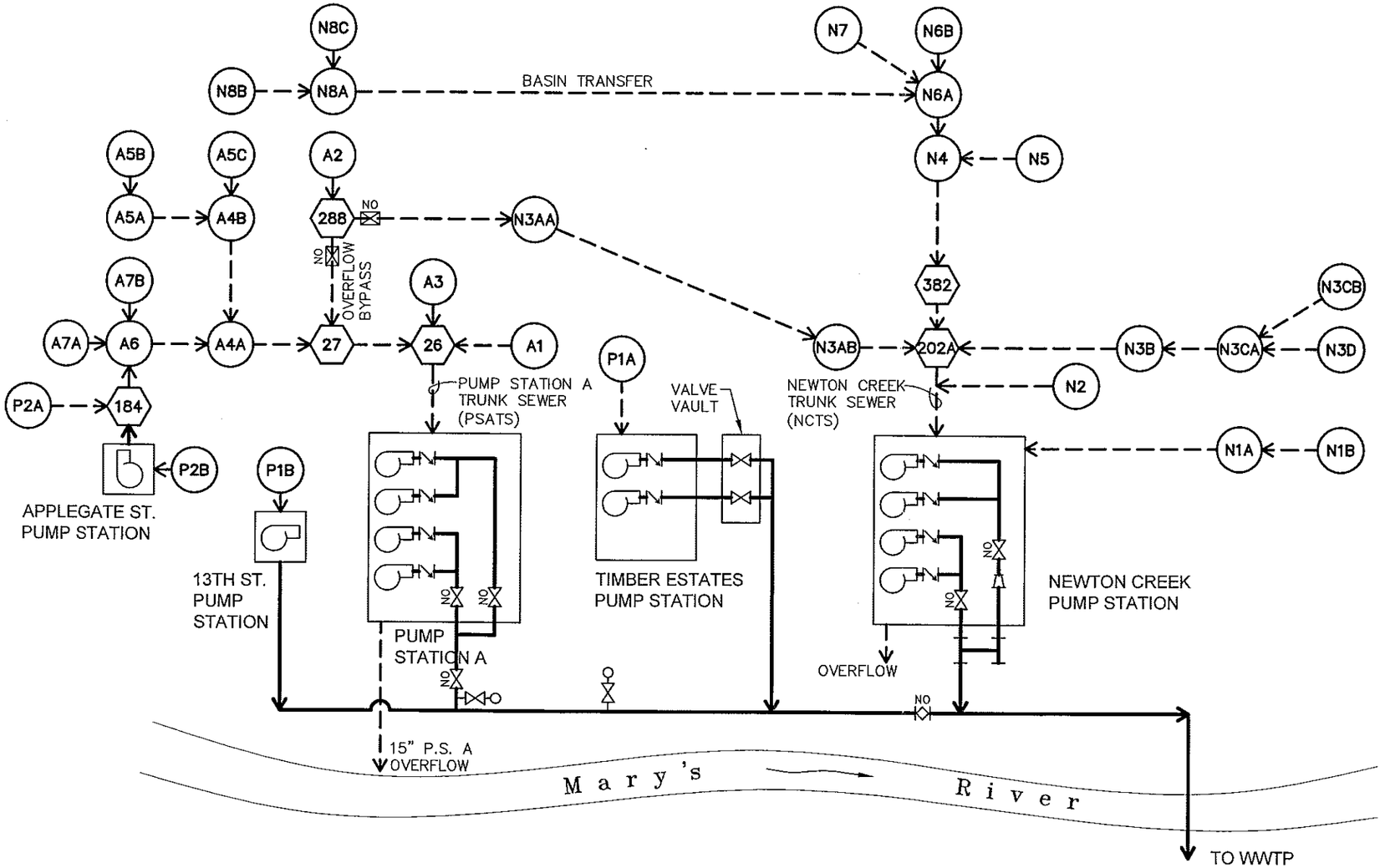


## LEGEND

- A1 — SEWER BASIN
- 26 — MANHOLE
- GRAVITY TRUNK SEWER
- FORCEMAIN
- SUBMERSIBLE SEWAGE PUMP
- CHECK VALVE
- GATE VALVE
- PLUG VALVE
- AIR/VACUUM RELEASE VALVE

| NO. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| 1 | REVISIONS | | |

VERIFY SCALE
BAR IS ONE-INCH ON ORIGINAL DRAWING
0 1" IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY .5"

DSN. CB
DRN. TMT
CKD. CB
DATE: JULY 03


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City of Philomath
2003 Sanitary Sewer Facilities Plan

# RECOMMENDED LONG-TERM COLLECTION SYSTEM FLOW ROUTING SCHEMATIC

FIGURE
6-2

JOB NUMBER
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Section 7

# Treatment System Evaluation and Recommendations

# SECTION 7
# TREATMENT SYSTEM EVALUATION AND RECOMMENDATIONS

## 7.1. Introduction & General Evaluation Criteria

This section develops and evaluates alternatives to adequately treat and dispose of projected flows and loads throughout the planning period. A wide range of alternatives were evaluated as part of the planning effort.

This section addresses the following key questions:

- What are the existing treatment system deficiencies?
- What treatment system components are likely to become deficient during the planning period?
- How shall the existing and projected deficiencies be corrected?

The existing and projected treatment system deficiencies are presented along with a set of basic alternatives, or tools, for addressing each of the individual deficiencies. The basic alternatives are assembled into sets of primary alternatives that each address all of the existing and projected treatment system deficiencies. A total of nine primary alternatives were evaluated for initial screening, seven of which were evaluated further and finally reduced to the five principle alternatives. For the sake of brevity, only the principal alternatives are described in this section. A present worth analysis for the five principle alternatives is presented as well as a final recommended treatment plan. Should the City choose not to implement the recommended plan, the remaining alternatives, or permutations thereof, may be reevaluated and implemented.

## 7.2. Identification of Treatment System Deficiencies

The purpose of this section is to determine the components of the treatment system that are or will become deficient during the planning period. A few minor treatment system deficiencies were identified in **Section 4**. This section is intended to supplement that listing. One of the primary goals of this section is to present an overall list of deficiencies that must be addressed by the City during the planning period. Treatment system deficiencies are typically the result of aging or outdated equipment and systems or systems that lack the capacity to accommodate increases in wastewater flows and organic loading due to growth in the community.

The capacity of the existing WWTP is governed by both the hydraulic loading and the organic loading. Once one or the other of these capacities has been reached, NPDES permit violations can be anticipated.

### 7.2.1 Hydraulic Storage Capacity

The existing treatment facilities operate under a summer-holding winter-discharge scheme. Wastewater that flows to the plant is stored in the lagoons throughout the summer holding period (May 1 to October 31) and released during the winter discharge season (November 1 to April 30). Under such a scheme, one of the key capacity criteria is the hydraulic storage available in the lagoons. Mass conservation methods may be used to determine the amount of storage required during the summer holding period. The volume of storage is determined by summing the plant inflows and outflows over the storage period. The storage requirements in order to maintain the summer-holding winter-discharge operational scheme throughout the planning period are listed in **Table 7-1**. The storage requirements are based on the following assumptions.

- ADWF * 184 days equals wastewater inflow.
- Zero wastewater outflow.
- 15 inches net summer evaporation (Evaporation – Rainfall).
- Zero lagoon leakage.
- 2 foot Minimum lagoon water depth.
- 8 foot Maximum lagoon water depth.
- 3 foot minimum lagoon freeboard.
- Additional lagoons constructed with same bottom, water surface, and top of dike elevations as existing lagoons.

**TABLE 7-1**
**Summer Holding Storage Requirements**

| Year | ADWF (mgd) | Existing Storage Available (ac-ft) | Storage Required (1) (ac-ft) | Storage Deficit (ac-ft) | Additional Lagoon Area Required (ac) |
|---|---|---|---|---|---|
| 2003 | 0.454 | 232 | 210 | 0 | 0 |
| 2005 | 0.477 | 232 | 223 | 0 | 0 |
| 2010 | 0.520 | 232 | 244 | 12 | 2.0 |
| 2015 | 0.567 | 232 | 266 | 34 | 5.7 |
| 2020 | 0.619 | 232 | 291 | 59 | 9.8 |
| 2025 | 0.678 | 232 | 318 | 86 | 14.4 |
| 2027 | 0.703 | 232 | 330 | 98 | 16.3 |

(1) Storage requirements include evaporative losses from additional lagoon area

As **Table 7-1** demonstrates, flows to the treatment plant will likely exceed the hydraulic storage capacity of the lagoons sometime between the years 2005 and 2010. Therefore the selected alternative must provide additional storage volume or provide a summertime discharge alternative.

### 7.2.2 Hydraulic Loading Capacity

The hydraulic structures, pipelines and unit processes must have the hydraulic capacity to convey anticipated peak flows throughout the design period. The facilities of concern include:

- Headworks
- Influent Measurement Equipment
- Distribution Piping
- Transfer Structure
- Outlet Structure and Piping
- Disinfection System
- Dechlorination System
- Effluent Measurement Equipment
- Outfall

Wastewater is pumped to the headworks where it is normally distributed to the southern lagoon. Therefore, the headworks, influent measurement equipment, and distribution piping must be capable of conveying and measuring the peak hourly flows delivered to the plant from the pump stations. The existing peak flows may be estimated by assuming all of the pumps at the three major pump stations are on. The projected peak hourly flow from the pump stations at the end of the planning period is difficult to estimate at this time. As recommended in **Section 6**, Pump Station A must be replaced and the capacity of the Newton Creek pump station may also need to be increased during the planning period. Therefore, the peak pumping rates cannot be known until a detailed design for these facilities is performed. Nonetheless, some general conclusions may be drawn from an analysis of the existing facilities.

**Headworks and Influent Flow Measurement Equipment**. Flow enters the existing headworks and passes through a 12-inch Parshall flume. The top of the headworks structure is approximately three feet above the bottom of the flume. Therefore, a flow depth of two feet provides for one foot of freeboard. Based on Parshall flume tables, two feet of head corresponds to a flow of 7.425 MGD. The existing peak hourly flow from the collection system is approximately 7.217 MGD (see **Section 4**). The projected peak hourly flow from the collection system at the end of the planning period is approximately 9.906 MGD. It is important to note that these peak hourly flows are from the gravity collection system to the pump stations. Common pump station design practice is to size the pumps such that the peak pump station discharge rate is higher than the inflow to the station. As such, the peak flow to the headworks will likely be higher than peak hourly flows from the gravity collection system. Therefore, the headworks very likely lacks hydraulic capacity to convey projected peak flows and maintain freeboard in the structure. It will need to be replaced sometime during the planning period. The anticipated peak flows also exceed the measurement range of the influent flow measurement equipment (see **Section 4**). Therefore, the influent flow measurement equipment will also need to be upgraded

during the planning period. Installation of a new ultrasonic flow meter with electronic data collection capabilities is recommended.

**Distribution Piping**. Flow is directed to one of the two ponds through 20-inch ductile iron discharge piping. Manning's equation may be used to estimate the capacity of this pipeline. Since the pipe outlet is submerged below the lagoon surface, flow is outlet controlled and the slope of the hydraulic grade line rather than the pipe slope should be used in the calculation. The remaining details of the calculation are as discussed in **Section 6** for the gravity collection system capacity analysis. The bottom of the headworks structure is approximately 2.25 feet above the high water level in the lagoons. The length of pipe from the headworks to the discharge point is approximately 465 feet. Therefore, the slope of the hydraulic grade line is 0.484%. At this slope, the capacity of the pipeline is approximately 6.27 MGD. When compared to the peak inflows discussed above, the distribution piping appears to lack the required capacity when the lagoons are at their maximum water level. This piping will either need to be replaced or the elevation of the headworks will need to be increased during the planning period. If the selected alternative includes retaining the southerly pond as the first pond downstream of the headworks, then the piping must be replaced or relief line must be installed.

**Maximum Discharge Rate.** The first lagoon acts as a flow equalization basin. Therefore, downstream flows are controlled by the maximum discharge rate from the plant. The discharge rate is set by the operator. For all practical purposes the peak discharge rate is controlled by the regulatory mass load limits to the Marys River. Wastewater of a particular quality can only be discharged at a rate that does not exceed the mass load limits. Therefore, the discharge rate is limited by the effluent quality. Though the permitted effluent limits are 50 mg/l TSS and 30 mg/L BOD, values less than 10 mg/l TSS and 10 mg/L BOD are not uncommon during the winter months. Therefore, the maximum discharge rate is, to some extent, an operational convenience that is dependent upon the quality of the final effluent. The maximum discharge rate is listed as a function of the effluent quality in **Table 7-2**.

**TABLE 7-2**
**Maximum Plant Discharge Rate**
Based on Existing Monthly Mass Load Limits
(460 lb BOD/day, 760 lb TSS/day)

| BOD (mg/L) | TSS (mg/L) | Allowable Maximum Discharge Rate (mgd) |
|---|---|---|
| 5 | 8 | 11.0 |
| 10 | 17 | 5.51 |
| 15 | 25 | 3.68 |
| 20 | 33 | 2.75 |
| 25 | 42 | 2.20 |
| 30 | 50 | 1.82 |

Clearly, excessively oversized discharge facilities are costly and impractical. Therefore, choosing a reasonable discharge rate is prudent. The existing chlorination facilities are sized to provide 30 minutes of contact time at a peak discharge rate of 3.85 mgd. Since the second chlorine contact chamber is relatively new, all principle alternatives include utilizing these facilities. Therefore, a peak discharge rate of 3.85 mgd will be used to determine the adequacy of the facilities downstream of the first lagoon cell.

**Transfer Structure and Piping**. Flow from the first to second lagoons is controlled by the transfer structure. The structure includes three canal gates at various elevations to allow flexibility in the level at which water is withdrawn. The three circular gates are 18, 14, and 12 inches in diameter from the bottom to the top respectively. If flow through the gates is modeled as an orifice, only 0.49 feet of head is required to drive 3.85 MGD through the structure if only the 18-inch gate is fully open. If the other gates are open, the head requirement is even less. This head differential is relatively small. Therefore, the hydraulic capacity of the transfer structures is adequate. The transfer pipe between the two lagoons is 18-inch diameter and 85 feet long. An analysis similar to the analysis for the distribution piping shows that only 0.27 feet of head is required to drive 3.85 MGD through the 18-inch transfer pipe. Again, this head differential is relatively small. Thus, the transfer piping should be adequate through the planning period.

**Outlet Structure and Piping**. Flow from the second lagoons is controlled by the outlet structure. The outlet structure is identical to the transfer structure. Therefore, based on the hydraulic analysis described above, the hydraulic capacity of the outlet structure is adequate. Under normal flow conditions, lagoon effluent flows through approximately 80 feet of 18-inch diameter piping before discharging into the chlorine contact chamber. The high water level in the chamber is approximately 2.5 feet below the high water level in the lagoons. This head differential is more than enough to drive 3.85 MGD through the outlet piping. As such, the hydraulic capacity of the outlet piping should be adequate through the planning period.

**Disinfection System**. As described above the contact chamber is designed to provide 30 minutes of contact time at a discharge rate of 3.85 MGD. Therefore, the contact chamber volume is adequate. The chlorine disinfection equipment is sized to deliver chlorine at a maximum feed rate of 200 pounds per day. At 3.85 MGD, this equates to a chlorine dosage of 6.2 mg/L. Based on DMR data for the plant, this chlorine dosage is significantly higher than the required dosage to provide disinfection. Therefore, the hydraulic capacity of the chlorine disinfection equipment should be adequate through the planning period. The disinfection equipment may need to be repaired periodically due to aging or outdated parts. However, the cost for these types of repairs is relatively small and should not place a significant burden on the City's OM&R budget.

**Dechlorination System.** The dechlorination system is sized to deliver sulfur dioxide at a maximum feed rate of 50 pounds per day. At 3.85 MGD, this equates to a dosage

of 1.6 mg/L. Based on plant records, the chlorine residual rarely approaches 1 mg/L. Since 1 part of sulfur dioxide is require to neutralize 1 part of chlorine residual, the dechlorination system should be adequate through the planning period. However, should the City choose to feed sulfur dioxide at a greater rate, the dechlorination system has been provided with the necessary parts to upsize to 100 pounds per day.

**Effluent Flow Measurement Equipment.** Effluent flows are measured with a 4-foot rectangular suppressed weir and a float actuated mechanical meter. The configuration of the weir within the contact chamber allows approximately 6.27 MGD to pass over the weir at the design high water level in the tank. Therefore, the hydraulic capacity of the weir is sufficient. The existing effluent flow meter is nearly 20 year old and though it has served the City well, the technology is outdated when compared to newer equipment now available. As such, it is recommended that the effluent flow meter be replaced with a new ultrasonic flow meter that has data storage and instrumentation control features. This improvement will allow the City to better manage treatment plant operation.

**Outfall.** After passing through the chlorine contact chamber, plant effluent is routed through approximately 1760 feet of 24-inch diameter pipe to an outlet structure. The top of the riverbank elevation near the outfall is approximately 250 feet. This elevation roughly corresponds to the 5-year flood event. The top elevation of the outfall structure is approximately 253 feet. The required head to drive 3.85 MGD through the 16-inch pipeline is approximately 0.6 feet. The head requirement to drive 3.85 MGD through 1760 feet of 24-inch diameter pipe is approximately 1.2 feet. Therefore the total head requirement from the chlorine contact chamber to the outfall is approximately 1.8 feet at the bank full condition. At these conditions, the water surface elevation in the chlorine contact chamber would be approximately 251.8 feet. The elevation of the top of the chlorine contact chamber walls is approximately 253 feet. Therefore, the capacity of the outfall pipelines is sufficient to discharge 3.85 MGD when the river is at a bank full condition and no modifications to these facilities are anticipated during the planning period.

### 7.2.3 Organic Loading Capacity

The facultative lagoons provide primary and secondary treatment of the waste stream. The organic loading capacity of the lagoons is finite. If this capacity is exceeded compliance problems will result. The lagoons were designed for an overall organic loading rate of 35 pounds BOD per acre per day with a maximum of 50 pounds BOD per acre per day to the first cell. An analysis of the existing plant shows that the BOD loading to the first cell controls the plant capacity. The first cell is approximately 20 acres. Therefore, the overall capacity of the plant is approximately 1000 pounds BOD per day (50 lbs/ac/day * 20 ac). Based upon the information presented in **Section 5**, the projected loading rates are listed in **Table 7-3**.

| TABLE 7-3<br>Organic Loading Requirements | | | |
|---|---|---|---|
| Year | BOD Loading (ppd) | Existing Organic Capacity of the Primary Cell (ppd) | Additional Primary Cell Capacity Required (ppd) |
| 2003 | 820 | 1000 | 0 |
| 2005 | 962 | 1000 | 0 |
| 2010 | 1072 | 1000 | 72 |
| 2015 | 1194 | 1000 | 194 |
| 2020 | 1331 | 1000 | 331 |
| 2025 | 1482 | 1000 | 482 |
| 2027 | 1548 | 1000 | 548 |

As **Table 7-3** demonstrates, the organic loading to the treatment plant will likely exceed the capacity of the lagoons sometime between the years 2005 and 2010. Therefore the selected alternative must provide additional organic treatment capacity.

### 7.2.4 Summary of Treatment System Deficiencies

Based on the discussions in **Section 4** and the information presented above the existing treatment system deficiencies are summarized in **Table 7-4**.

| TABLE 7-4<br>Summary of Treatment System Deficiencies | |
|---|---|
| Location | Description of Deficiency |
| Headworks | May lack capacity to convey projected peak flows at the end of the planning period. |
| Influent Flow Measurement and Sampling Equipment | May lack capacity to measure projected peak flows at the end of the planning period. End of useful life. |
| Distribution Piping | May lack capacity to convey projected peak flows at the end of the planning period. |
| Lagoon Dike Roadways | Aging in need new gravel surfacing. |
| Lagoon Dikes | Erosion due to lack of rip rap protection. |
| Lagoons | Lack hydraulic storage capacity required through the planning period. |
| Lagoons | Lack organic loading capacity required through the planning period. |
| Effluent Flow Measurement and Sampling Equipment | End of useful life. |

## 7.3. General Treatment System Alternatives

A broad range of alternatives must be considered as part of the planning for major improvements to wastewater treatment systems. These alternatives generally include no action, expansion of the existing wastewater treatment plant (WWTP), or construction of a new WWTP. The alternative of regional treatment via pumping to Corvallis is also considered for discussion purposes. Discussions of each of these general approaches is presented below.

### 7.3.1 No Action

The No Action alternative must be considered in the facilities planning process to help establish the need for action. Under this alternative, no significant changes would be made to the existing treatment facilities, and the City would continue to operate the existing WWTP as well as possible.

While this is an alternative, it is not considered feasible for the planning period considering the status of the current treatment facility, and the projected increases in flows and loadings. If the existing system deficiencies are not addressed, the plant will eventually reach a point where it is no longer possible to meet the discharge permit requirements and violations will occur, with attendant risks to residents and the environment. The No Action alternative is therefore not recommended and will not be considered further.

### 7.3.2 Regional Treatment

The only city or service district close to Philomath that it would even be conceptually feasible to approach about regional treatment is Corvallis. Even though regional treatment typically has the benefits of reducing capital and O&M costs in some cases, this alternative is not economically feasible based on the following. The total cost for the new pump stations and force main required to convey wastewater from Philomath to Corvallis will likely far exceed the cost to expand the existing WWTP.

- The force main length would be approximately 7.5 miles from Newton Creek Pump Station to the Corvallis Wastewater Reclamation Plant (WWRP), and would include two ridge crossings and two bridge crossings (Oak Creek and Dixon Creek). In addition some work within state highway right-of-ways would be required as well as a substantial amount of work in high traffic commercial areas within the City of Corvallis. There would also be substantial operation and maintenance costs associated with the new pump stations due to the extremely high head conditions. In concept, Pump Station A would have to oversized, and the Timber Estates and the Newton Creek Pump Stations would have to be immediately upgraded.

- Philomath would have to buy capacity in the Corvallis WWRP and pay a portion of the operation and maintenance costs. In essence, Philomath would have to pay Corvallis the avoided cost for them having to upsize their WWRP to accommodate the flows from Philomath. Although there might be some incremental savings of scale based on the larger size of the Corvallis WWRP, the capital and O&M costs required to pump wastewater to the Corvallis WWRP would exceed any cost savings.

The regional treatment alternative is therefore not recommended and will not be considered further.

### 7.3.3 Construct New WWTP

Under this alternative, consideration was given to constructing an entirely new plant with new liquid and solids streams. The new plant would utilize none of the existing treatment facilities. This alternative includes abandoning the existing facilities and constructing a new mechanical plant either adjacent to the existing facilities or at an alternative location.

As described in **Section 4**, the existing plant has and continues to serve the City well. The plant is relatively simple and inexpensive to operate and has proven to be very reliable. Though the facilities will reach capacity during the planning period, they are well suited for expansion, and with a few minor modifications will likely serve the City well through the next planning period. The bottom line is that the construction costs for a completely new plant far exceed the costs for expanding the existing plant. Therefore, construction of a new plant is not recommended and will not be considered further.

### 7.3.4 Upgrade Existing Treatment Plant

Under this alternative, consideration was given to upgrading the existing plant. As described above, the primary deficiency with the existing facilities is a lack of hydraulic and organic capacity to treat projected flows through the planning period. Under this alternative, additions or modifications to the existing facilities were considered. For the most part, the existing facilities would remain in service and the new facilities would provide the required additional hydraulic and organic capacity. The existing facilities are in relatively good condition and are well suited to incremental expansion. The entire subset of alternatives evaluated under this general alternative are less costly than a regional treatment scheme or a new plant. Therefore the recommended general approach is to evaluate alternatives for upgrading the existing facilities.

## 7.4. Primary and Secondary Treatment Alternatives

As described above, one of the primary deficiencies in the existing treatment facilities is the inability to provide the required organic treatment capacity throughout the planning period. This section, therefore, presents the alternatives that were evaluated to increase the organic treatment capacity of the plant.

### 7.4.1 Facultative Lagoons

This alternative includes providing an additional facultative lagoon to supplement the existing lagoons. The proposed improvements under this alternative would create a three-cell facultative lagoon system. As the City's experience with the existing facultative lagoon system demonstrates, this treatment technology is relatively simple and inexpensive to maintain and operate. The power requirements are minimal, and essentially no rotating machinery is required. Therefore, power and maintenance

costs are very low. The drawback of this alternative is that it tends to require the greatest amount of land area.

Several lagoon configurations were considered. These included placing the new lagoon at the upstream or downstream ends of the existing lagoons. Series and parallel flow streams were also considered. Another variable considered is lined versus unlined lagoons. In order to meet current seepage requirements, synthetic liners are often required. The existing lagoons are unlined. As described in **Section 4**, the seepage rate from the lagoons is below the current DEQ maximum. As such, a reasonable assumption is that the new lagoon could be constructed using only the native onsite clays. A significant amount of land adjacent to the existing WWTP is available where relatively tight soils could be "mined". Without a detailed geotechnical report, it is difficult to determine if unlined lagoons are feasible at this time. Nonetheless, eliminating the synthetic liner would present significant cost savings. As such, both lined and unlined lagoons were carried through the analysis as separate alternatives. Should the City choose the unlined lagoon alternative, a geotechnical investigation should be conducted early in the design process to verify the adequacy of the onsite materials.

Based on a typical maximum aerial loading rate of 35 pounds per acre per day, the information in **Table 7-3** suggests that the minimum facultative lagoon area required is approximately 16 acres. It is important to note that this does not include storage requirements. If the summer-holding winter-discharge operational scheme is to be maintained throughout the planning period a larger lagoon area will need to be provided in order to meet hydraulic storage capacity requirements. The disposal alternatives are considered later in this section.

### 7.4.2 Partially-Mix Lagoons

Partially mixed lagoons are typically deeper and more heavily loaded organically than facultative lagoons. Oxygen is supplied directly by floating mechanical aerators, submerged diffused aerators, or by floating mechanical mixers that enhance surface reaeration and algae growth. Key design parameters include the amount of aeration and mixing, total horsepower requirements, and aerator or mixer spacing. The aeration is designed to meet the oxygen requirements for BOD removal and in some cases, nitrification. Only a moderate degree of mixing is provided so that solids are not maintained in suspension as in the activated sludge process.

Several permutations of the partially mixed lagoon alternative were considered. These included converting one or both of the existing facultative lagoons to partially mixed lagoons or constructing a new partially mixed lagoon at the upstream end of the treatment plant. Two alternatives for supplying oxygen were also considered. These included floating mechanical aerators and floating solar powered mixers. In order to ensure mixing during periods of heavy cloud cover and at night, the solar powered mixers must be provided with backup power to be considered a viable alternative. The power costs for floating mechanical aerators is substantially higher

than for solar powered mixers. Therefore, aerators were dropped from further consideration.

A preliminary screening of the partially mixed lagoon alternatives showed that the organic treatment capacity of the existing lagoons could be sufficiently increased by adding mechanical mixers. Therefore, the primary advantage of this alternative is that no additional lagoons would be required for treatment purposes. However, in order to address the hydraulic capacity issues, a summertime discharge alternative must be provided as part of this alternative.

### 7.4.3 Completely-Mixed Aerated Lagoons

Completely mixed aerated lagoons are an extension of the partially mixed aerated lagoons. The level of aeration and mixing is increased to provide enough mixing to maintain the solids in suspension. Completely mixed aerated lagoons provide BOD removal in much the same way as the activated sludge process. Higher aeration rates permit shorter detention times and thus, smaller lagoon areas.

Consideration was given to constructing a completely mixed aerated lagoon at the upstream end of the existing lagoons. The aerated cell would be deeper and the water level would remain relatively constant. A large portion of the BOD would be removed in this cell before effluent was delivered to the existing facultative lagoons. To provide the required storage capacity either an additional storage lagoon or a summer discharge alternative would be required. Both of these options were considered. However, preliminary screening showed that the added power costs required for complete mixing were not cost effective when compared to the other alternatives. Therefore, this alternative was eliminated from further consideration.

### 7.4.4 Constructed Wetlands

Constructed wetlands are generally defined as systems designed for wastewater treatment in an area where natural wetlands do not exist. There are two different types of constructed wetlands. Free water surface wetlands consist of a relatively shallow channel along which the wastewater flows. Subsurface flow wetlands consisting of a layer of permeable media through which the wastewater flows. Both systems utilize emergent aquatic vegetation that promote microbial growth. Both systems also include some type of barrier beneath the wetland bed to prevent groundwater contamination. Primary treatment is required for constructed wetland systems.

Similar to the lagoon alternatives, constructed wetlands require a large area, especially for communities that experience high levels of precipitation. Recent case studies have shown that constructed wetlands can produce high quality effluent. Constructed wetlands can also be used for polishing in conjunction with facultative lagoons or other secondary treatment processes, further reducing BOD and TSS concentrations.

Constructed wetlands are designed as flow through systems that do not provide hydraulic storage. Therefore, they are only feasible in Philomath in conjunction with an additional storage lagoon or a summer discharge alternative. The area immediately surrounding the treatment plant is subject to flooding. Therefore, large dikes would need to be constructed around to the perimeter of the wetland to prevent inundation during high water events. In addition, since flow through constructed wetlands must be maintained to promote the health of the aquatic vegetation, effluent from the lagoon must be recycled during periods when the plant is not discharging to either the river or a land application facility.

A number of constructed wetland configurations were considered. However, due to the complications discussed above and the large land area requirements, none of the configurations were costs effective. Therefore, constructed wetlands were removed from further consideration.

## 7.5. Advanced Treatment Alternatives

Advanced treatment is not expected to be required to meet discharge requirements to the Marys River during the permitted winter discharge period and will not be considered further.

## 7.6. Effluent Disinfection Alternatives

Several effluent disinfection alternatives were considered including hypochlorite, ozone, ultraviolet light, and gas chlorine. The existing disinfection system is a gas chlorine system. The effluent is chlorinated as it leaves the second lagoon. Contact time is provided in two chlorine contact chambers. The sulfur dioxide solution is added to dechlorinate the chlorinated effluent prior to being discharged to the river. Both the chlorination and dechlorination systems have the required capacity to serve the City through the planning period. In addition, the first chlorine contact chamber and the dechlorination system are relatively new. Therefore, any alternative disinfection system must provide substantial cost savings or offer another significant advantage in order to justify changes at this time.

Converting to hypochlorite or ozone based systems were immediately eliminated from consideration based on the increased chemical or chemical generation costs. Ultraviolet disinfection is attractive because it eliminates the need for chemical usage, and eliminates problems with the formation of chlorination byproducts. Ultraviolet disinfection systems typically have higher power costs than chlorine gas systems. However, the cost savings of eliminating chemical usage typically offset the additional power costs. Therefore, for general comparison purposes, the operating costs for ultraviolet disinfection systems tend to be lower than for chlorine disinfection systems. The primary limitation of ultraviolet disinfection is that it is only effective for relatively clean effluents. Lagoon systems are subject to algae blooms that tend to shield pathogens from the ultraviolet light. Therefore, ultraviolet disinfection is only viable for non-lagoon treatment facilities or lagoon facilities that include a polishing step prior to disinfection. Ultraviolet disinfection was ultimately removed from consideration due to higher capital costs. As mentioned, the City has recently upgraded the chlorine gas disinfection facilities. These facilities have the required capacity to serve the

City through the planning period. As such, converting to an alternative disinfection system is not cost effective when compared to utilizing the existing system.

## 7.7. Hydraulic Storage/Effluent Disposal Alternatives

As described in **Section 7.2** the existing treatment facilities lack the hydraulic storage capacity required throughout the planning period. This section presents the alternatives that were evaluated to increase the hydraulic storage capacity of the plant. The need for hydraulic storage is driven by effluent disposal practices. For example, effluent from the existing plant is only discharged during the winter months. Consequently, all flow to the plant during the summer months must be stored for discharge during the next winter discharge period. The required storage volume is provided in the lagoons. If a summertime discharge was available, the need to store plant inflows during the summer months would be reduced and the hydraulic storage capacity of the plant would be lesser concern. Therefore, hydraulic storage and effluent disposal are not mutually exclusive issues. As such, they are considered together in the development of treatment alternatives.

Two broad categories of solutions were considered. The first category consists of alternatives that eliminate the need for additional hydraulic storage. These alternatives include providing a summertime surface water discharge or a summer reuse alternative. The second category simply includes adding additional storage volume and providing a higher level of treatment to discharge a higher volume of wastewater under the existing mass load limits.

### 7.7.1 Year-round Discharge to Marys River

Under this alternative, consideration was given to reducing the need for summertime hydraulic storage by discharging to the Marys River during the summer months. In order to discharge during the summer current regulations require an effluent with BOD and TSS concentrations below 10 mg/L. This would require an effluent polishing step at the downstream end of the existing lagoons. In addition, the City would have to demonstrate to the DEQ that the summertime discharge met all other effluent quality standards (i.e., temperature, DO, toxic substances, etc.). This alternative could potentially help cool the Marys River, which is water quality limited for temperature during the summer months. The plant effluent passes through approximately 1760 feet of 24-inch diameter buried pipe before being discharged. This pipeline could potentially cool the lagoon effluent below river temperatures. During low mid and late summer flows, the plant effluent would be a significant proportion of the overall flow in the stream. If the plant effluent was sufficiently cooled in the 24-inch outfall, it may reduce the temperature of the river.

The primary drawback of this alternative is that it would add significant operational complexity and operational cost to the WWTP. The polishing step would require significantly more operator attention and expertise than the existing facility. Therefore, operating costs would increase. In addition, the process of gaining regulatory approval for this alternative is likely to be long and expensive and have only a marginal chance of success. Discussions to date with DEQ personnel suggest

this alternative is not desired or considered feasible. Therefore, this alternative was eliminated from further consideration.

### 7.7.2 Summer Effluent Reuse

Under this alternative consideration was given to eliminating or reducing the need for hydraulic storage by discharging to a land application system during the summer holding period. A large number of reuse alternatives were evaluated. Key factors that were considered in developing each of the alternatives are listed as follows.

**Overall Project Approach** – One of the fundamental decisions that must be made when evaluating an effluent reclamation project is whether the project will be approached from a "wastewater disposal" philosophy or a "resource optimization" philosophy. With the "wastewater disposal" approach, the dominating priority is to dispose of excess wastewater. Using this approach, a municipality will generally desire to discharge the maximum amount of water that can be agronomically utilized on the lowest cost reuse site without much consideration to profitability or crop health. Crop selection criteria are developed to optimize water consumptive rates with little value placed on the agricultural crop. With the "resource optimization" approach, the dominating priority is to maximize the profitability of the agricultural crop by optimizing the use of the wastewater resource. In other words, wastewater is applied at rates that will produce the greatest profitability. The recommended approach is a resource optimization approach. The primary advantage of this approach is the greater potential for profitability. This approach also tends to be more environmentally friendly and is more compatible with the exclusive farm use zoning.

**Ownership Alternatives** - A number of ownership alternatives were considered. These include public versus private land ownership, public versus private operation, and land lease. The ownership alternatives are critical when evaluating the capital costs, operation and maintenance costs, and when evaluating revenue from potential crop sales. For example, capital costs for a publicly owned reuse facility are much higher than for land that is simply leased to a agricultural user. Likewise, O&M costs are higher for a publicly maintained facility than for a privately maintained facility. Finally, the division of crop revenue between the private owner/operator and the municipality must also be considered. Based circumstances in Philomath, two ownership alternatives were evaluated for further consideration. The first alternative includes public ownership of the land, crops, and all reuse facilities with operation contracted to a private farm operator. This alternative involves significant capital resource and risk but has the greatest potential for profitability. The second alternative includes a typical lease arrangement of irrigated land to a farm operator. The City would provide water at pressure to the lessee. The lessee would be responsible for all crop and irrigation costs, all operation costs, and would have full ownership of all proceeds from the sale of the harvest crops.

**Site Selection Considerations** – Key site selection criteria that were evaluated include proximity to the treatment plant, proximity to existing or future residential

development, topography, climate, groundwater, soil characteristics, and land use. The land immediately west and north of the existing treatment plant was evaluated for a potential reuse site and was determined to be well suited for a reuse facility.

**Wastewater Quantity and Quality Requirements** – Each of the reuse alternatives were evaluated based on the volume of treated effluent required as well as the effluent quality requirements. Based on the preliminary evaluation, the effluent from the plant was determined to be suitable for effluent reuse. Depending on the type of irrigation system, the effluent from a lagoon system may require filtering to prevent clogging the distribution system.

**Crop Selection Alternatives** – Key crop selection considerations include, agronomic application rates, harvesting schedule, history of use for land application facilities, replanting requirements, and market conditions. Several different crops were considered including grass pasture, alfalfa, grass silage, hybrid poplar, Christmas trees, peppermint, and ornamental trees. Of these, short rotation hybrid poplar trees grown for lumber and veneer markets and Frazier fir trees grown for the Christmas tree markets had the most promising economics. Therefore, these crops were further evaluated to estimate the profit potential. It was determined that hybrid poplars had a moderate potential for profitability while the Frazier firs had a much higher profit potential. However, Frazier firs required approximately twice the capital investment of hybrid poplars.

**Irrigation System Alternatives** - A number of irrigation alternatives were evaluated. These included center pivot, travelling gun, wheel line, hand set lines, aluminum solid set lines, polyethylene solid set lines with micro-spray heads, and polyethylene solid set lines with drip emitters. Based on the two crops identified as having potential for profitability, the appropriate types of irrigation systems are solid set type systems using either low cost polyethylene laterals with micro-spray heads, or aluminum laterals with bronze sprinkler heads.

The reuse alternatives were screened separately from the overall wastewater treatment facility. A total of three reuse alternatives were selected for further evaluation. These are listed as follows.

1) Land lease of City-owned land with a summer irrigation source to a private agricultural operator.
2) City-owned hybrid poplar agricultural facility with a contract operator.
3) City-owned Frazier fir agricultural facility with a contract operator.

Based on discussions with City personnel, the preference is to lease the land to a private agricultural user that will have full control of crop selection and may keep all proceeds from crop sales (reuse alternative 1). This option requires less initial capital investment, and poses the least amount of risk to the City. The drawback is that the City surrenders all potential profits from the sale of the crop. City personnel based this decision on the belief that the City should remain in the business of supplying a

wastewater utility to its customers only. The capital investment required to establish an agricultural enterprise would likely require higher user fees. City personnel do not believe the modest potential profitability justifies the increased cost and risk to the users.

### 7.7.3 Polish Lagoon Effluent and Continue Exclusive Winter-Discharge to Marys River

Under this alternative, consideration was given to maintaining the existing operational practices at the WWTP. This includes constructing an additional 20-acre lagoon to provide the summer storage capacity required through the planning period. Plant inflows would be stored through the summer and discharged in the winter as per the current operational scheme.

The permitted mass loads limit the volume of wastewater that may be discharged to the river. The existing NPDES permit includes mass load limits for BOD and TSS. The mass load is directly proportional to the product of the contaminant concentration and the discharge rate. Therefore, in order to discharge a higher volume of waste (increase the discharge rate) under the current mass loads, the contaminant concentrations must be reduced. Therefore, this alternative includes the installation of an effluent polishing step to reduce high BOD and TSS values associated with algae blooms.

A review of the existing DMR data shows that during the front and back ends of the discharge period, the plant experiences algae blooms from time to time. These algae blooms increase the BOD and TSS values in the effluent. The purpose of the polishing step would be to reduce the BOD and TSS values associated with the algae blooms. During periods when algae concentrations are low, the plant routinely produces an effluent with BOD and TSS concentrations below 10 mg/L. As such, the polishing step would only be necessary during the warmer fall and spring months when climatic conditions support algae blooms.

Two technologies were identified as likely being capable of providing the required level of treatment. These include cloth media filters and dissolved air flotation (DAF). The specific proprietary products that were considered are the AquaDisk cloth media filter manufactured by Aqua-Aerobics Systems, Incorporated, and a packaged DAF unit manufactured by the F.B. Leopold Company Inc. Should the City choose this alternative, an exhaustive evaluation of treatment technologies should be performed. Polishing lagoon effluent in the manner considered here is relatively untested in the wastewater treatment industry. As such, bench and pilot studies are also critical to determine the effectiveness of the selected technology prior to implementing this alternative.

The two treatment technologies considered have, in large part, been developed for the unrestricted effluent reuse market where regulatory standards approaching water treatment are the driving force (e.g., California Title 22). As such, manufactures of

these technologies typically approach applications from this perspective. For small low-density particles such as algae, it can be difficult to meet level IV reclaimed water standards with the above treatment technologies alone. As such, manufactures can be apprehensive to support the installation of these units to polish lagoon effluent. However, it should be noted that the proposed application does not require the production of an effluent capable of meeting unrestricted reuse standards. The lagoon effluent only needs to be marginally improved to meet the existing mass load limits through the planning period. This is demonstrated in **Table 7-5**. The average required discharge rate over the 181-day discharge period is listed in **Table 7-5**. This value was determined by performing an annual water balance on the proposed treatment plant. Based on the average discharge rate, the maximum BOD and TSS concentrations required to meet the permitted mass load limits were determined. These concentrations are listed by year in **Table 7-5**. As can be seen, the polishing step needs to reduce BOD and TSS levels below 20 mg/L and 35 mg/L respectively in order to meet the existing mass load limits through the planning period. Furthermore, during the majority of the winter discharge period, the BOD and TSS concentrations in the lagoons should be below these values prior to the polishing step. When this is the case, the polishing step may be bypassed.

**TABLE 7-5**
**Maximum Effluent Concentrations Based on Existing Mass Loads**

| Year | AAF (mgd) | Discharge Volume [1] (million gallons) | Average Discharge Rate [2] (mgd) | Maximum BOD Concentration [3] (mg/L) | Maximum TSS Concentration [4] (mg/L) |
|---|---|---|---|---|---|
| 2010 | 0.868 | 355 | 1.96 | 28.1 | 46.4 |
| 2015 | 0.935 | 380 | 2.10 | 26.3 | 43.4 |
| 2020 | 1.010 | 407 | 2.25 | 24.5 | 40.5 |
| 2025 | 1.094 | 438 | 2.42 | 22.8 | 37.7 |
| 2027 | 1.130 | 451 | 2.49 | 22.1 | 36.6 |

(1) Based on following assumptions: 5-year rainfall depth = 47.75 inches; 5-year annual pond evaporation = 23.05 inches; Total lagoon area = existing 37.5 acres + new 20 acres = 57.5 acres
(2) Based on 181 day discharge period
(3) Based on average monthly BOD mass load limit = 460 pounds per day
(4) Based on average monthly TSS mass load limit = 760 pounds per day

## 7.8. Biosolids Treatment and Disposal Alternatives

The majority of the biosolids are collected in the first lagoon cell. As described in **Section 4**, a biosolids survey was completed in November of 2001. Based on this data, it is not anticipated that the biosolids will need to be removed during the planning period. Furthermore, all of the alternatives evaluated are lagoon-based systems with no biosolids treatment facilities. As such, the biosolids treatment and disposal alternative which is most feasible will be removal of biosolids from the primary cell and beneficially land applied on adjacent agricultural lands during the next planning period.

## 7.9. Routine Maintenance for WWTPs

A routine maintenance program for the WWTP is just as important to the operation of the sewerage system as the systematic cleaning, inspection and rehabilitation program for the gravity collection system. In many respects, this program is even more critical, since major mechanical or control failures at the WWTP results in bypasses of untreated or partially treated wastewater.

The City currently has a file system with the status and maintenance history of all of the major components in the WWTP and influent pump stations. The City should continue their policy of preventative maintenance on system components.

Following the construction of the new WWTP improvements, the City should implement a policy to update and revise the O&M manuals as system components are replaced or upgraded.

## 7.10. Development of Principal Treatment System Alternatives

The existing treatment system deficiencies are listed in **Table 7-4**. The purpose of this subsection is to develop complete alternatives that address these deficiencies and that will provide reliable service through the planning period. For a number of the deficiencies listed, an evaluation of alternatives is not useful since the solutions are relatively obvious and straightforward. These solutions are common to all of the complete alternatives. As such, they are considered the as baseline improvements. The baseline improvements are listed in **Table 7-6.**

**TABLE 7-6**
**Baseline Improvements Common to all Principal Alternatives**

| Deficiency | Recommended Solution |
|---|---|
| Headworks lack of capacity. | Replace headworks structure designed to pass peak flows. |
| Influent flow meter lack of capacity and end of useful life. | Replace with ultrasonic flow meter tied to tipping bucked rain gauge and influent sampler. |
| Influent Sampler end of useful life. | Replace with automatic refrigerated sampler. |
| Lagoon dike roadways aging. | Regrade and resurface. |
| Lagoon dike erosion. | Construct dike protection rip rap. |
| Effluent flow meter end of useful life. | Replace with ultrasonic flow meter tied to effluent sampler. |
| Effluent sampler end of useful life. | Replace with automatic refrigerated sampler. |

The alternatives described above were compared against the deficiencies to develop the complete treatment system alternatives listed in **Table 7-7**. A brief description of each alternative follows.

## TABLE 7-7
## Principal Treatment System Alternatives

| Alternatives | |
|---|---|
| **1. Lined Facultative Lagoon/Summer Effluent Reuse** | |
| Deficiency | Method of Addressing Deficiency |
| Hydraulic Capacity | Additional lagoon for storage combined with summer land application. |
| Organic Capacity | Additional facultative lagoon with synthetic liner. |
| Distribution Piping Capacity | N/A. New lagoon constructed upstream of existing primary lagoon will require the installation of new discharge piping and new transfer structure and piping. |
| Disposal Method | Continue winter discharge and add summer effluent reuse (land application) as required. |
| **2. Unlined Facultative Lagoon/Summer Effluent Reuse** | |
| Deficiency | Method of Addressing Deficiency |
| Hydraulic Capacity | Additional lagoon for storage combined with summer land application. |
| Organic Capacity | Additional facultative lagoon without synthetic liner. |
| Distribution Piping Capacity | N/A. New lagoon constructed upstream of existing primary lagoon will require the installation of new discharge piping and new transfer structure and piping. |
| Disposal Method | Continue winter discharge and add summer effluent reuse (land application) as required. |
| **3. Lined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | |
| Deficiency | Method of Addressing Deficiency |
| Hydraulic Capacity | Additional lagoon for storage. |
| Organic Capacity | Additional facultative lagoon with synthetic liner. |
| Distribution Piping Capacity | N/A. New lagoon constructed upstream of existing primary lagoon will require the installation of new discharge piping and new transfer structure and piping. |
| Disposal Method | Polish lagoon effluent to continue summer-holding winter-discharge and retain existing mass load limits |
| **4. Unlined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | |
| Deficiency | Method of Addressing Deficiency |
| Hydraulic Capacity | Additional lagoon for storage. |
| Organic Capacity | Additional facultative lagoon without synthetic liner. |
| Distribution Piping Capacity | N/A. New lagoon constructed upstream of existing primary lagoon will require the installation of new discharge piping and new transfer structure and piping. |
| Disposal Method | Polish lagoon effluent to continue summer-holding winter-discharge and retain existing mass load limits |
| **5. Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse** | |
| Deficiency | Method of Addressing Deficiency |
| Hydraulic Capacity | Summer effluent reuse. |
| Organic Capacity | Increase capacity of existing lagoons by installing solar powered mechanical mixers. |
| Distribution Piping Capacity | Construct relief pipe |
| Disposal Method | Continue winter discharge and add summer effluent reuse (land application) as required. |

### 7.10.1 Alternative 1 – Lined Facultative Lagoon/Summer Effluent Reuse

Under this alternative the City would construct a new facultative lagoon with a synthetic liner to provide the organic treatment capacity through the planning period. The lagoon would be constructed at the upstream end of the existing primary lagoon. Preliminary analysis shows that a minimum 24-acre lagoon is required. All of the baseline improvements identified above, including a new headworks, would be constructed as part of this alternative. In addition, this alternative includes new distribution piping to the new lagoon as well as a new transfer structure between the new lagoon and the existing first lagoon cell.

To prevent overloading the first lagoon, flow from the new headworks must be split between the first and second lagoons. In order to accomplish this, the headworks structure must include a splitter box downstream of the primary measuring device. As a general operating principle, flow to the new cell should be maximized without exceeding a loading rate of 50 pounds per acre per day (ppad). Initially 100% of the flow stream could be routed into the first lagoon cell. As the organic loading rate increases, flow will be gradually split. The new 24 acre lagoon may be loaded up to 1200 pounds of BOD per day (50 ppad * 24 acres = 1200 ppd. The projected BOD loading rate at 2010 is 1072 pounds per day (see **Section 5**). Therefore, the new lagoon will be capable of treating 100% of the flow stream at that time. However, at the end of the planning period, the BOD loading is projected at 1550 ppd. Based on this loading rate, the split would be approximately 80% to the first lagoon cell (50 ppad * 24 acres / 1550 ppd * 100% = 80%) and 20% to the second lagoon cell.

Initially, all of the plant effluent can be discharged to the river without exceeding the existing mass load limits. However, as flows increase due to population growth, summertime disposal will be required to prevent permit violations. As such, this alternative includes the construction of summer effluent reuse facilities. As discussed above, the preferred reuse alternative is to lease the adjacent agricultural land to a farm operator. The farm operator would be responsible for all farming operations including planting, fertilizer, irrigation system, management, and harvest according to the requirements of an approved effluent reuse plant. The City would provide disinfected lagoon effluent at pressures suitable for irrigation. The City must construct an irrigation pump station downstream of the chorine contact chamber. Flow from the chamber would be routed to a booster pumping station with a discharge riser located at the edge of the treatment plant site. The farm operator would be responsible for delivering the water to the crops.

### 7.10.2 Alternative 2 – Unlined Facultative Lagoon/Summer Effluent Reuse

This alternative is essentially the same as alternative 1 with the exception that the new lagoon will not be constructed with a synthetic liner. The existing lagoons were constructed by compacting the native materials to form a seepage barrier. These lagoons meet the DEQ's seepage requirements. As such, it is reasonable to assume

that the new lagoon could be constructed in the same manner. By omitting the synthetic liner, the overall project costs can be reduced. However, this also increases the risk to the City. Should the seepage rate exceed DEQ standards in the future, the City could be forced to install a liner after the new lagoon has been placed into service. The installation of a synthetic liner after the lagoons have been placed into service will cost substantially more than if it is installed as part of the original construction effort (i.e., alternative 1). For this reason, a detailed geotechnical investigation at the initial design stage is recommended if this alternative is to be pursued.

### 7.10.3 Alternative 3 – Lined Facultative Lagoon/Summer-Holding Winter Discharge

This alternative is similar to alternative 1 with the exception that all lagoon effluent is routed through a polishing step prior to discharge. In this way, effluent BOD and TSS concentrations are sufficiently reduced such that all plant effluent can be discharged to the river. Therefore, this alternative does not include summer land application facilities. A new 24 acre lagoon would be constructed, as well as the ancillary lagoon improvements (i.e., discharge piping, transfer structure, etc.) described under alternative 1.

Under this alternative, the City would install an effluent polishing treatment unit to further reduce effluent BOD and TSS concentrations discharging to the river. Lagoon effluent would be intercepted downstream of the lagoons before passing into the chlorine contact chamber. It would then be routed through the polishing step and back into the chlorine contact chamber. The polishing equipment would be located in a new above grade building adjacent to the existing chlorination building. Due to topographic constraints, the lagoon effluent must be lifted to flow by gravity through the polishing step. Therefore, this alternative includes the construction of an effluent pump station along with the polishing process. The effluent pump station would draw suction directly from the lagoons and discharge to the polishing unit(s). From the polishing units, effluent would pass through the chlorine contact chamber before being discharged to the river.

### 7.10.4 Alternative 4 – Unlined Facultative Lagoon/Summer-Holding Winter Discharge

This alternative is the same as alternative 3 with the exception that the new lagoon will not be constructed with a synthetic liner. Therefore, the relationship between this alternative and alternative 3 is analogous to the relationship between alternative 2 and alternative 1. As such, this alternative is less expensive than alternative 3, but carries more risk.

### 7.10.5 Alternative 5 – Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse

Under this alternative the treatment capacity of the existing lagoons is increased by installing floating solar powered mechanical mixers. Mixing the lagoons increases the oxygen transfer rate by continually exposing oxygen deficient water from the bottom

of the lagoon to the surface layer. Increasing the oxygen transfer rate will enable to the City to increase the organic loading rate. Solar powered mixers are a relatively new technology with no installations at comparable facilities in the northwest. Therefore, though this alternative has the potential to offer substantial cost savings, it also increases the risk to the City. Should the mixers not live up to expectations, additional improvements will be required.

A preliminary analysis of this alternative showed that the installation of approximately six mixers in the first lagoon cell and three in the second would sufficiently increase the treatment capacity of the plant. The proposed mixers are Solar Bee Circulators, Model SB10000W with a total flow rate of 10,000 gpm as manufactured by Pump Systems, Incorporated. The six mixers in the first lagoon cell would be equipped with electric supplementary power kits. During the night and cloudy days when solar radiation is not sufficient to power the mixers, they will run off of electric power. The three mixers in the second cell will not be equipped with backup power and will be operated under solar power only. During the first 1-2 years of operation, the mixers will work to oxidize the sludge blanket in the first lagoon cell, and may actually reduce the volume of sludge. Due to the oxygen demand of the sludge, organic treatment capacity of the lagoons will not immediately be increased. Therefore, the mixers must be installed at least two years before any significant increase in treatment capacity is required/

Under this alternative, no additional lagoons would be constructed. As such, summer land application facilities similar to those described under alternative 1 must be constructed and will likely have to be constructed at an earlier date due to a reduced lagoon storage volume.

To address the distribution piping capacity issues, this alternative includes constructing a new relief pipe from the new headworks structure to the first lagoon cell. The existing distribution pipe from the existing headworks structure would remain in service. The relief pipe would be constructed such that flows in excess of the capacity of the main inlet piping would spill over into the relief pipe and flow by gravity to the first lagoon cell. The relief pipe would discharge at the lagoon edge rather than at the center of the lagoon. In this way, the relief pipe could be constructed without removing the lagoon from service.

## 7.11. Evaluation of Principle Treatment System Alternatives

As described above, five alternatives have been identified to address treatment system deficiencies. In this subsection, each alternative is compared to arrive at the best treatment plan. A present worth analysis was performed to compare the capital and annual costs for each alternative. The results of this analysis are presented in **Table 7-8**. The basis for the cost estimates is described in **Section 3**. Both capital and annual costs are estimated for each alternative. The capital costs are the total project costs including construction costs, engineering and surveying costs, administration costs, legal costs, permitting costs, and financing costs. A detailed breakdown of the capital costs is presented in **Appendix I**. The

annual costs include power costs as well as O&M costs. The annual costs over the planning period are converted to present worth using a discount rate (i.e., expected rate of return – inflation) of 5% per year. All facilities are assumed to have no salvage value at the end of the planning period. The results of this analysis are presented in **Table 7-8**. The advantages and disadvantages of each alternative are listed in **Table 7-9**.

**TABLE 7-8**
**Present Worth Cost Comparison of Principle Treatment Alternatives**

| Alternative<br>Item | Project Cost (Capital Cost) | Annual Cost | Present Worth |
|---|---|---|---|
| **1. Lined Facultative Lagoon/Summer Effluent Reuse** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New facultative lagoon with synthetic liner | $1,566,000 | $5,000 | $1,628,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Irrigation booster pump station & forcemain | $290,000 | $20,000 | $539,244 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for wastewater utility | $100,000 | $2,500 | $131,156 |
| **Alternative 1 Totals** | **$3,015,225** | **$34,000** | **$3,438,940** |
| **2. Unlined Facultative Lagoon/Summer Effluent Reuse** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New facultative lagoon with native clay liner | $1,044,000 | $5,000 | $1,106,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Irrigation booster pump station & forcemain | $290,000 | $20,000 | $539,244 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $1,000 | $21,162 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for wastewater utility | $100,000 | $2,500 | $131,156 |
| **Alternative 2 Totals** | **$2,493,225** | **$34,750** | **$2,926,287** |

## TABLE 7-8 (Continued)
## Present Worth Cost Comparison of Principle Treatment Alternatives

| Alternative<br>Item | Project Cost (Capital Cost) | Annual Cost | Present Worth |
|---|---|---|---|
| **3. Lined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New facultative lagoon with synthetic liner | $1,566,000 | $5,000 | $1,628,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Lagoon outlet piping modifications | $50,750 | $0 | $50,750 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Effluent lift station & controls | $326,250 | $15,000 | $513,183 |
| Effluent polishing equipment & controls | $1,305,000 | $20,000 | $1,554,244 |
| Effluent polishing equipment building & sitework | $181,250 | $1,000 | $193,712 |
| Yard piping modifications | $29,000 | $0 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | $84,100 | $2,000 | $109,024 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for wastewater utility | $100,000 | $2,500 | $131,156 |
| **Alternative 3 Totals** | **$4,629,075** | **$51,000** | **$5,264,648** |
| **4. Unlined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New facultative lagoon with native clay liner | $1,044,000 | $5,000 | $1,106,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection (existing lagoons) | $217,500 | $0 | $217,500 |
| Existing dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Lagoon outlet piping modifications (existing secondary lagoon) | $87,000 | $0 | $87,000 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Effluent lift station & controls | $326,250 | $15,000 | $513,183 |
| Effluent polishing equipment & controls | $870,000 | $20,000 | $1,119,244 |
| Effluent polishing equipment building & sitework | $181,250 | $1,000 | $193,712 |
| Yard piping modifications | $29,000 | $0 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | $84,100 | $2,000 | $109,024 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for wastewater utility | $100,000 | $2,500 | $131,156 |
| **Alternative 4 Totals** | **$3,708,325** | **$51,000** | **$4,343,898** |

## TABLE 7-8 (Continued)
## Present Worth Cost Comparison of Principle Treatment Alternatives

| Alternative<br>Item | Project Cost (Capital Cost) | Annual Cost | Present Worth |
|---|---|---|---|
| **5. Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| Relief pipe from new headworks to first lagoon | $29,000 | $0 | $29,000 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New influent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| Solar powered mechanical mixing equipment, installed | $464,000 | $12,000 | $613,547 |
| Power distribution for backup power to mixers | $92,655 | $0 | $92,655 |
| New Auxiliary power unit with automatic transfer switch | $29,000 | $2,000 | $53,924 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Lagoon dike rip-rap protection | $72,500 | $0 | $72,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Irrigation booster pump station & forcemain | $290,000 | $25,000 | $601,555 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $1,000 | $21,162 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for wastewater utility | $100,000 | $2,500 | $131,156 |
| **Alternative 5 Totals** | **$1,480,980** | **$48,750** | **$2,088,513** |

## TABLE 7-9
## Comparison of Principle Treatment Alternatives

| Alternatives | |
|---|---|
| **1. Lined Facultative Lagoon/Summer Effluent Reuse** | |
| Advantages | Disadvantages |
| • Very low power requirements | • High capital costs |
| • Same as existing treatment technology | • Reliance on land application |
| • Relatively simple | |
| • Guaranteed to work (i.e., time tested) | |
| • Very approvable from a regulatory standpoint | |
| • Construction of land application facilities can be deferred and possibly pushed into the next planning period depending on the effectiveness of I/I reduction efforts. | |
| • Low risk of permit violations | |
| **2. Unlined Facultative Lagoon/Summer Effluent Reuse** | |
| • Same as alternative 1 | • Same as alternative 1 |
| • Lower capital costs | • Higher risk of seepage problems |
| **3. Lined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | |
| • No land application required | • High capital costs |
| • Construction of polishing step can be deferred and possibly pushed into the next planning period depending on the effectiveness of I/I reduction efforts. | • Operational complexity |
| | • More expensive to implement due to pilot testing requirements |
| | • High power costs |
| | • Not time tested |
| | • Higher risk of permit violations |
| | • Requires mass load allocation increase |
| **4. Unlined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | |
| • Same as alternative 3 | • Same as alternative 3 |
| • Lower capital costs | • Higher risk of seepage problems |
| **5. Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse** | |
| • Lowest capital cost | • Not time tested |
| | • Higher risk of failure |
| | • Land application required sooner |
| | • Requires the greatest summer discharge volume |
| | • Increased maintenance requirements |

Based on the seepage characteristics of the existing lagoons, the construction of a synthetic liner may well not be necessary. As such, alternatives 1 and 3, are removed from further consideration. Alternative 4, is more costly and more complex than alternatives 2 and 5. As such alternative 4 is also removed from further consideration.

As demonstrated in **Table 7-8**, alternative 5 is the least costly. However, this is alternative also carries the highest risk. This is due to a number of factors. The solar powered mixers described under alternative 5 have not been used in western Oregon or Washington. As such, the application is not time-tested. There is also no practical way to test the effects of the mixers. The number, spacing, and size of the mixers would be determined based on the projected BOD loading at the end of the planning period. There is no practical way to simulate this loading scenario to verify that the mixers will work as designed. In other words, there is no practical way to run a pilot study. As a result, there is some risk of premature failure with this alternative. This alternative has the smallest hydraulic storage capacity. Therefore, land application facilities will be required sooner rather than later. In addition, the volume of water that must be land applied is highest with this alternative.

Alternative 2, is the next lowest cost alternative. Though more expensive, this alternative includes a number of advantages over alternative 5. Alternative 2, employs the same technology currently in use at the City's WWTP. This technology is relatively straightforward and inexpensive to operate. It has served the City well, and is almost guaranteed to provide reliable treatment through the planning period. This alternative also has a lower reliance on land application both from a quantity and timing standpoint. Due to the larger hydraulic storage volume, the construction of land application facilities may be delayed the longest. This has the added benefit of providing the most time for the implementation of the I/I correction program described in **Section 6**. As I/I reduction measures are implemented, the possibility exists that the I/I component of the wastewater flow may be reduced to such an extent that land application facilities may not be needed until very late in the current planning period. If this proves to be the case the cost difference between alternatives 2 and 5 becomes almost negligible.

The cost savings associated with alternative 5 are not believed to be significant enough to justify the increased risk. Therefore, alternative 2 is the recommended treatment alternative.

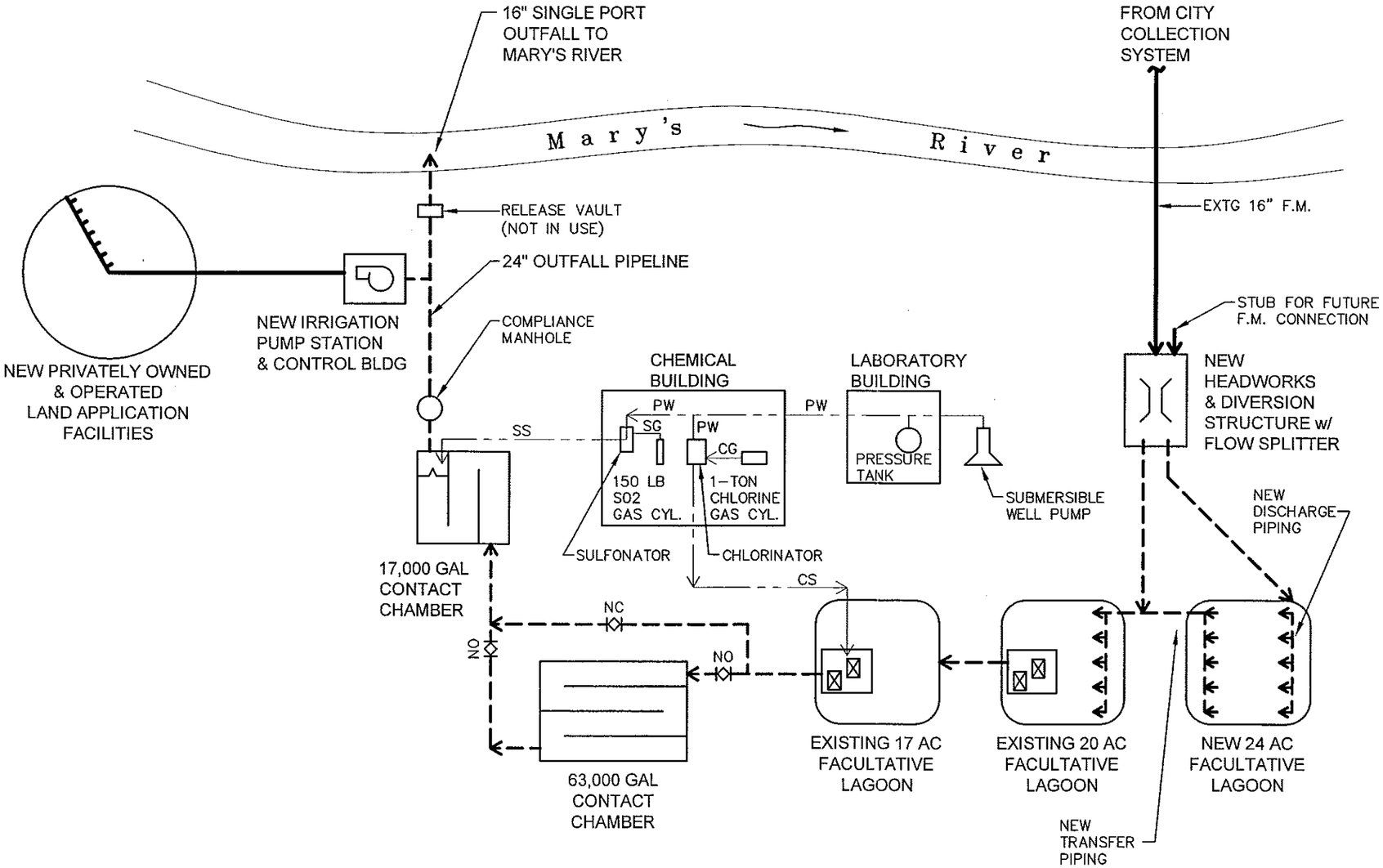
## 7.12. Recommended Treatment Plan

Alternative 2 is the recommended treatment plan. A process schematic for the recommended plan is included in **Figure 7-1**. The recommended improvements should be constructed in two phases. The components included in each phase are listed in **Table 7-10**. The purpose of phase I is to increase the organic treatment and hydraulic storage capacity of the plant. The existing treatment plant is sufficient for current flows and loadings. Therefore, the phase I treatment system improvements are not required immediately. They should be constructed when the flows and loadings to the existing plant exceed either the organic treatment or hydraulic storage capacity. Based on the analysis presented above (i.e., see **Tables 7-1** and **7-3**), the existing plant should reach capacity sometime between the years 2005 and 2010. The purpose of the phase II improvements is to increase the effluent disposal capacity of the plant. Phase II improvements will be necessary when either the summer storage capacity of the plant is exceeded, or when the discharge volume results in violation of the permitted mass load limits.

## TABLE 7-10
## Recommended Treatment System Improvements

| Project<br>**Unlined Facultative Lagoon/Summer Effluent Reuse** | Total Estimated Project Cost [1] | Oversize Cost Required for Future Growth |
|---|---|---|
| **Phase I WWTP Improvements** | | |
| New headworks | $145,000 | $145,000 |
| New influent flow and rainfall measurement equipment | $12,325 | $5,175[3] |
| New refrigerated wastewater sampler | $17,400 | $7,300[3] |
| New facultative lagoon with native clay liner | $1,044,000 | $1,044,000 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $203,000 |
| Lagoon dike rip-rap protection | $217,500 | $91,350[3] |
| Lagoon dike roadway rehabilitation | $58,000 | $24,360[3] |
| New SCADA system for wastewater utility | $100,050 | $42,000[3] |
| New effluent flow measurement equipment | $8,700 | $3,650[3] |
| New effluent refrigerated wastewater sampler | $17,400 | $7,300[3] |
| **Total Phase I WWTP Improvements** | **$2,058,275** | **$1,808,035** |
| **Phase II WWTP Improvements** | | |
| New 3-phase power service | $72,500 | $72,500 |
| Irrigation booster pump station & forcemain | $290,000 | $290,000 |
| Irrigation control building | $72,500 | $72,500 |
| **Total Phase II WWTP Improvements** | **$435,000** | **$435,000** |

(1) Total project cost includes construction costs, 15% contingency, 20% engineering, and 10% legal and administration costs. See Appendix I.
(2) Costs are in 2003 dollars and are based upon dry weather construction.
(3) Percentage of project required for future growth = (2027 population – current population)/2027 population = 42%




## LEGEND

- GRAVITY SEWER
- FORCEMAIN
- CHEMICAL FEED SYSTEM
- SUBMERSIBLE SEWAGE PUMP
- PLUG VALVE
- SLIDE GATE
- TRANSFER STRUCTURE W/ SLIDE GATES
- PW — POTABLE WATER
- CG — CHLORINE GAS
- CS — CHLORINE SOLUTION
- SG — SULFUR DIOXIDE GAS
- SS — SULFUR DIOXIDE SOLUTION
- NO — NORMALLY OPEN
- NC — NORMALLY CLOSED

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City of Philomath
2003 Sanitary Sewer Facilities Plan

# RECOMMENDED TREATMENT PLANT SCHEMATIC

FIGURE
7-1

JOB NUMBER
960.3130.0

Section 8

# Recommended Capital Improvement Priorities & Implementation Plan

# SECTION 8
# RECOMMENDED CAPITAL IMPROVEMENT PRIORITIES AND IMPLEMENTATION PLAN

## 8.1. General Prioritization Issues

As summarized in the previous sections, there is a need for sanitary sewerage system improvements within the study area to correct existing and projected deficiencies. Some of these deficiencies are more critical than others. Some are deficient under existing conditions, while others will become deficient as time passes and the existing systems continue to age. In order to assist the City in the planning and scheduling the construction of needed improvements, the improvements recommended in previous sections are grouped as Priority 1, Priority 2 and Priority 3 as outlined below.

In order that the recommended improvements resolve existing problems and meet the requirements for future growth within the study area, this prioritization is necessary, since the City obviously cannot afford all of the long term improvements required for the study area at this time. Some improvements are not critical at the present time, but will be needed later as development occurs and flows increase. Additional pipelines may be needed to serve future developments. In such cases, if current City policies are maintained, a portion or all of the cost for installing such pipelines will be borne by the developers as required by the particular development conditions.

- **Priority 1** (Critical Near Term Improvements) - These are those projects representing existing deficiencies (currently needed to meet existing and near future projected flows) or public health problem areas needing immediate attention. Priority 1 improvements are further broken into Class A and Class B Priorities, with Class A being the most critical. It is recommended that Priority 1 improvements be accomplished as soon as practical considering financing, construction time and timing associated with other related projects.

- **Priority 2** (Vital Future Improvements) - These are improvements that are anticipated to be needed in the future as the existing on-site systems age and begin to fail. Although not critical at this time, they should be considered improvement projects that if not constructed at this time, will be upgraded to Priority 1 at some time in the future.

- **Priority 3** (Long Term Improvements/Possible Future Need) - These improvements are needed to improve system reliability or to convey future design flows if land develops to future City zone intensities. While important, they are not considered to be critical at the present time. If possible, these improvements should be incorporated into other improvement projects that may allow for concurrent construction. They

may be constructed by developers in conjunction with the utility construction associated with development.

Each of the projects was examined and assigned a priority for implementation according to the criteria described hereafter. In keeping with the organization of preceding sections, the prioritization of the collection system improvements and the treatment system improvements are presented separately.

In addition to the two phases of WWTP improvements, 23 projects are recommended for inclusion in the collection system portion of the Sanitary Sewer Capital Improvements Plan (Priority 1 & 2 projects). The preliminary project cost estimates for the projects in each of these categories are approximately as listed below. A breakdown of the construction costs, contingency, design and administration/financing costs are contained in **Appendix I**.

Priority 1A
- Collection System .....$2,584,000
- I/I Reduction .....$220,000/yr

Priority 1B
- WWTP Phase I .....$2,058,275

Priority 2
- Collection System .....$1,847,000
- WWTP Phase II.....$435,000

Priority 1A Total (excluding annual I/I Budget) .....$2,584,000
Priority 1B Total .....$2,058,275
Priority 2 Total.....$2,282,000

**Total 1A & 1B** (excluding annual I/I Budget) .....**$4,642,275**
**Grand Total** (excluding annual I/I Budget).....**$6,924,275**

Costs are 2003 dollars and assume dry weather construction, ENR July 2003 20 Cities Index = 6696 (see **Section 3**).

### 8.1.1 Collection System Project Prioritization Criteria

Four criteria were used to evaluate individual projects and alternative capital improvement programs for the collection system. Each of the projects and alternative capital improvement programs were examined and rated according to the following criteria.

- Public Health Concerns. The driving force behind this Facilities Plan and the proposed improvements is the need to correct existing health hazards within the study area.

- Anticipated Time until Projected Flow Increases. The anticipated timeframe for the development of land within the basins and tributary to the proposed improvements was considered.

- Structural Damage/End of Useful Life. Projects to replace damaged components or components that have reached the end of their useful life and no longer function as designed were assigned a higher priority.

- Capital Costs. Capital costs of the projects were considered, including the costs of implementing a project, such as surveying, design, permitting, construction, legal fees and administration. Costs for acquisition of land and/or easements were included based on assumed property values. Projects that will need to be constructed by developers in conjunction with future developments were given a lower priority than projects that may be largely the responsibility of the City.

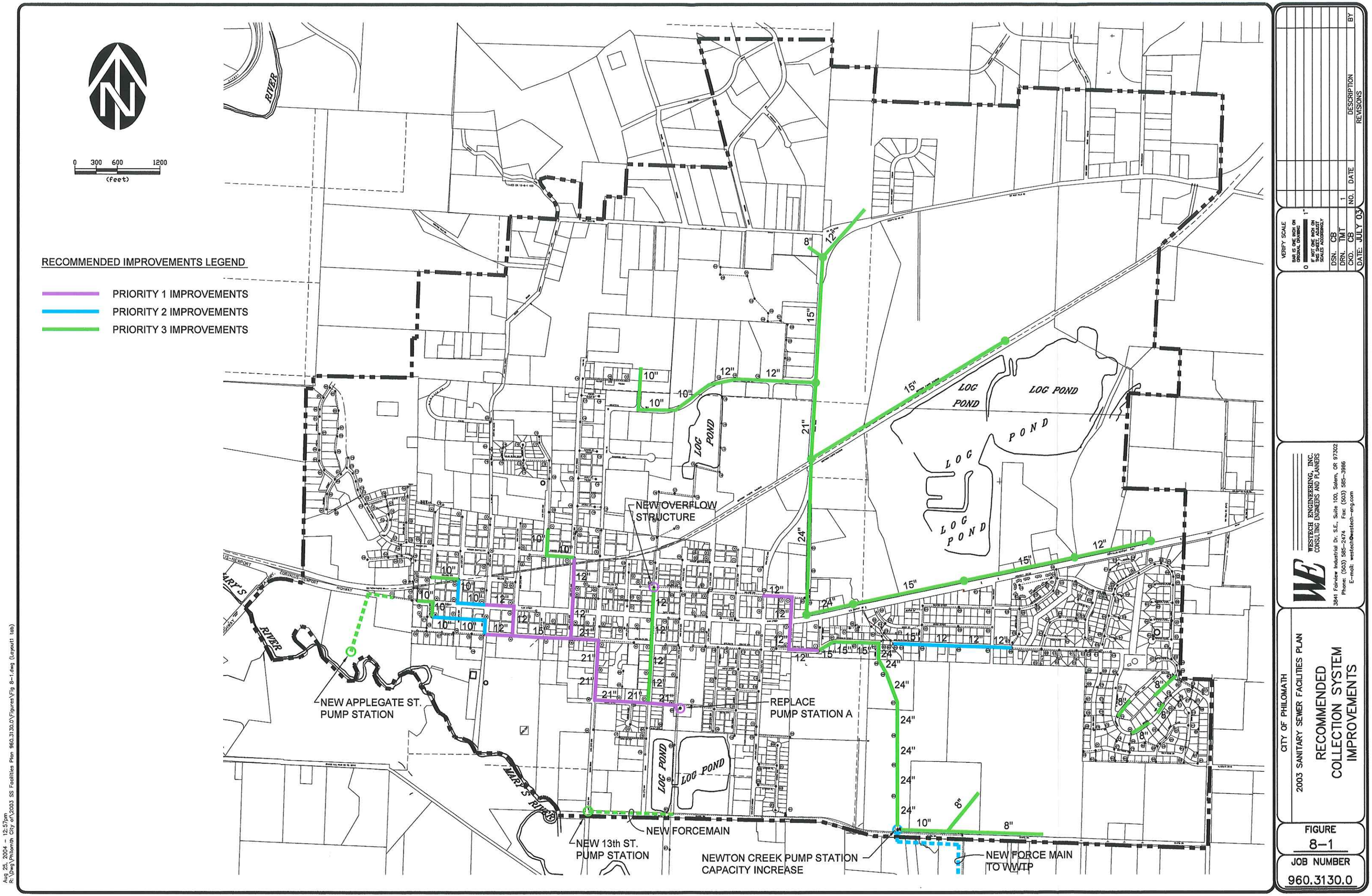
### 8.1.2 Ranking of Recommended Improvements

Many of the problems identified in the existing collection system are the result of sewer facilities that are inadequately sized for the areas draining to them under buildout conditions. **Table 8-1** outlines and prioritizes the proposed capital improvements relating to both the collection and treatments systems. **Figure 8-1** shows the recommended collection system improvements by priority.

## TABLE 8-1
## Recommended Capital Improvement Priorities

| Project Location(s) | Priority | Total Estimated Project Cost | Oversize Cost Required for Future Growth |
|---|---|---|---|
| **I/I Reduction Plan (Original 1952 Collection System)** | 1A | $222,000/yr [1] | $0 |
| **Pump Station A (16th & Cedar)** | 1A | $1,125,000 | $468,000 |
| **Overflow Structure (15th & College)** | 1A | $11,000 | $6,000 |
| **Buried Fuel Tank at Newton Creek Pump Station** | 1A | $14,000 | $2,500 |
| **WWTP Phase I Improvements** | 1B | $2,058,275 | $1,808,035 |
| **Pump Station A Trunk Sewer Improvements** | | | |
| Cedar Street (MH 200 to MH 29) | 1A | $278,000 | $32,000 |
| 13th Street (MH 29 to MH 31) | 1A | $215,000 | $22,000 |
| Applegate Street (MH 31 to MH 32) | 1A | $93,000 | $10,000 |
| **Basin N3A Trunk Sewer Improvements** | | | |
| Applegate Street (MH 1 to MH 2) | 1A | $77,000 | $0 |
| 20th Street (MH 2 to MH 6) | 1A | $128,000 | $0 |
| College Street (MH 6 to MH 9) | 1A | $71,000 | $0 |
| **12th Street Trunk Sewer Improvements** | | | |
| 12th Street (MH 32 to MH 71) | 1A | $188,000 | $22,000 |
| **Basin A6 Trunk Sewer Imps. Phase I** | | | |
| Applegate Street (MH 32 to MH 34) | 1A | $164,000 | $24,000 |
| Applegate Street (MH 34 to MH 35) | 1A | $63,000 | $8,000 |
| 10th Street (MH 34 to MH 45) | 1A | $80,000 | $8,000 |
| Main Street (MH 45 to MH 46) | 1A | $77,000 | $8,000 |
| **WWTP Phase II Improvements** | 2 | $435,000 | $435,000 |
| **Basin N3B Trunk Sewer Improvements** | | | |
| Applegate Street (MH 203 to MH 205) | 2 | $90,000 | $15,000 |
| Applegate Street (MH 205 to MH 208) | 2 | $227,000 | $12,000 |
| **Basin A6 Trunk Sewer Imps. Phase II** | | | |
| 9th Street (MH 35 to MH 36) | 2 | $32,000 | $4,000 |
| Alley (MH 36 to MH 38) | 2 | $124,000 | $17,000 |
| Main Street (MH 46 to MH 52) | 2 | $74,000 | $9,000 |
| 8th Street (MH 52 to MH 53) | 2 | $55,000 | $7,000 |
| **Timber Estates Pump Station Imps** | 2 | $113,000 | $0 |
| **Newton Creek Pump Station Capacity Imps** | | | |
| New Force main to WWTP | 2 | $832,000 | $832,000 |
| Pump Station Improvements | 2 | $300,000 | $300,000 |

(1) Funds generated as part of the I/I reduction plan may be used to complete the trunk sewer replacement projects listed in this table.

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CITY OF PHILOMATH

2003 SANITARY SEWER FACILITIES PLAN

# RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS

FIGURE
8-1

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## 8.2. Funding Issues

As a general rule, small communities are not able to finance major sewerage system improvements without some form of government funding such as low interest loans or grants. It is anticipated that the funding for the recommended capital improvement plan outlined herein will be from multiple sources, including systems development charges (SDC's), monthly user fees, as well as state and federal grant and loan programs. The following section outlines the major local and State/Federal funding programs that may be available for these projects. A recommended financing strategy will then be presented.

### 8.2.1 Upgrades Required for Current Residents versus for Future Growth

Although the No Growth/No Action alternative was discarded as an alternative for purposes of planning for the future upgrade of the wastewater collection and treatment system, it may need to be considered in a modified form as part of the process of obtaining funding for the proposed system upgrades. While some funding sources can be used for financing upgrades required to accommodate future growth, other funding sources specifically exclude projects required due to growth. For example, projects primarily needed for growth are not eligible for funding under the area wide benefit public works category of the Community Development Block Grant program.

It is anticipated that if no growth occurred during the planning period, the City would still be required to perform a significant amount of work on the collection system and WWTP during the study period. Only a few of the recommended improvements are required entirely to address future growth. Most of the alternatives are required initially to remedy current deficiencies but must be sized to accommodate future growth. In other words, most of the alternatives include and upsizing component that is necessary for future growth. To determine the portion of a particular project that is required to meet current deficiencies, the project cost was multiplied by the ratio the existing flows to the projected flows (e.g., 2027 flows for WWTP improvements and buildout flows for collection system improvements). The projects, or portions of the projects, required to accommodate future growth are listed in **Table 8-1.**

### 8.2.2 Annual Operation & Maintenance Costs

Annual Operation and Maintenance (O&M) costs are recurring costs typically funded through user rates. Long term replacement of the collection system and upgrading of the treatment plant are included under system replacement. **Table 8-2** presents annual O&M costs both for the proposed wastewater system and anticipated needs during the 20 year planning period. All costs are in 2003 dollars.

| TABLE 8-2<br>Annual Operation & Maintenance Costs | | |
|---|---|---|
| Item | 2002/2003 Budget | Recommended 2007 Budget |
| Personal Services | $188,359 | $233,000 |
| Materials & Services | $173,878 | $215,300 |
| Debt Service | $50,938 | $50,938 |
| Transfers | $99,150 | $122,700 |
| Operating Contingency | $20,000 | $25,000 |
| Unapropriated Reserve | $29,000 | $36,000 |
| TOTAL | $561,325 | $682,938 |

The 2002/2003 budget presented above does not include major capital improvements projects.

### 8.2.3 Existing Sanitary Sewer Funding Mechanisms

Funding for the City's existing wastewater system comes from two major sources, user fees and system development charges (SDC). Since SDCs cannot be used to finance operation, maintenance (O&M), and replacement costs of a sewer system, the O&M and repair costs must be financed from the user fees.

**Sewer User Fee.** The City's sewer Ordinance #624 (**Appendix D**) provides the method for assessing sewer user fees. The City sewer users are billed on a monthly basis for sanitary sewer service. Users are first classified as residential, commercial, or industrial. Residential users are charged a base monthly fee plus a use charge based upon actual water consumption during the winter months, and the average winter consumption during the summer months. Commercial and Industrial users are charge a base monthly fee plus a use charge based on actual water consumption on a year-around basis. The present base rate is $10.00. For multi-unit residential connections the base charge is multiplied by the number of units and discounted by 50%. The use charge varies depending on user classification. For residential users the use charge is $1.80 per 100 cubic feet (748 gallons). For commercial and industrial users, the use charge is $1.91 per 100 cubic feet. For typical residential users, this monthly rate equates to approximately $345.30 per year or $28.78 per month per dwelling unit. The City's sewer use ordinance also contains provisions for adjusting the user fee for high strength wastes.

**Sewer SDC.** SDC fees are tied to water meter size as shown in **Table 8-3.**

**TABLE 8-3**
**Existing Sewer SDC Fees**

| Meter Size | SDC Fee |
|---|---|
| ¾ Inch | $1,346 |
| 1 Inch | $1,912 |
| 1 ½ Inch | $3,243 |
| 2 Inch | $5,194 |
| 3 Inch | $10,497 |

### 8.2.4 Local Funding Sources

To a large degree, the type and amount of local funding used for the sewerage system improvements will depend on the amount of grant funding obtained and the requirements of any loan funding. Local revenue sources for capital improvements include ad valorem taxes (property taxes), various types of bonds, sewer user fees, connection fees, and system development charges (SDC). Local revenue sources for operating costs include ad valorem taxes and sewer user fees. The following sections discuss the local funding sources and financing mechanisms that are most commonly used for the type of capital improvements presented in this study.

#### 8.2.4.1 Existing Debt Service

The City currently has no outstanding debt associated with the sanitary sewer system.

#### 8.2.4.2 User Fees

Although user fees are not sufficient to finance major capital construction projects, they can be used to repay long term financing. User fees are typically the sole source of revenue to finance sewer system operation and maintenance. User fees are monthly charges to all residences, businesses, and other users that are connected to the sewer collection system. These fees are established by the City Council and may be modified as needed to account for changes in O&M costs, need for new improvements, etc. The monthly charges are typically based on a user classification (i.e., single family dwelling, multiple family dwelling, school, commercial, etc.), as well as the amount of wastewater discharged to the system. The most common method of estimating the wastewater discharge rate is to base it on water usage. This is how the City currently establishes rates for each user.

### 8.2.4.3 System Development Charge (SDC) Revenues

A system development charge (SDC) is a fee collected by the City as each piece of property is developed. SDCs are used to finance necessary capital improvements and municipal services required by the development. SDCs can be used to recover the capital costs of infrastructure required as a result of the development. As established in ORS 223, an SDC can have two principal elements, the reimbursement fee and the improvement fee. Fees are collected at issuance of building permits. It is important to note that operation, maintenance, and replacement costs cannot be financed or repaid by SDC revenues.

The reimbursement portion of the SDC is the fee for buying into existing or under construction capital facilities. The reimbursement fee represents a charge for utilizing excess capacity in an existing facility that was paid for by someone else. The revenue from this fee is typically used to pay back existing loans for improvements.

The improvement portion of the SDC is the fee designed to cover the costs of capital improvements that must be constructed to provide an increase in capacity.

Based on the information contained in this Facilities Plan, it is strongly recommended that the City update the SDC fee schedule based on the projected capital improvement costs for the recommended sewerage system improvements.

### 8.2.4.4 Connection Fees

Many cities charge connection fees to cover the cost of connecting new development to wastewater systems. There are two types of connection fees typically assessed. The first is for brand new connections, and is designed to cover the cost of City inspections at the time of physical connection to the sewer system.

The second type of fee is typically designed to defray the administrative cost to the City of setting up a new account, and is charged on both brand new services and when a sewer service is transferred to a new owner.

### 8.2.4.5 Capital Construction (Sinking) Fund

Sinking funds are often established as a budget line item to set aside money for a particular construction purpose. A set amount from each annual budget is deposited in a sinking fund until sufficient revenues are available to complete the project. Such funds can also be developed from user fee revenues or from SDCs. The City Council should consider setting aside reserves immediately for the expansion and upgrades recommended herein as

well as improvements that will be required at the end of the 20 year design life of the new facilities. This will allow the City to make future improvements without having to obtain outside financing.

### 8.2.4.6 General Obligation Bonds

One traditional way to fund municipal sewer projects is through the sale of municipal general obligation (GO) bonds. This is the most often used form of local financing for large scale utility improvements benefiting a major portion of the City. GO bonds utilize the City's basic taxing authority and are retired with property taxes based on an equitable distribution of the bonded obligation across the City's assessed valuation. General obligation bonds are normally associated with the financing of facilities that benefit an entire community and must be approved by a majority vote of the City's voters.

General obligation bonds are backed by the City's full faith and credit, as the City must pledge to assess property taxes sufficient to pay the annual debt service. This portion of the property tax is outside the State constitutional limits that limit property taxes to a fixed percentage of the assessed value. The City may use other sources of revenue including water user fee revenues to repay the bonds. If it uses other funding sources to repay the bonds, the amount collected as taxes is reduced commensurately.

The general procedure followed when financing water system improvements with GO bonds is typically as follows.

- Determination of the capital costs required for the improvement.
- An election by the voters to authorize the sale of bonds.
- The bonds are offered for sale.
- The revenue from the bond sale is used to pay the capital costs associated with the project(s).

GO bonds can be "revenue supported," wherein a portion of the user fee is pledged toward repayment of the bond debt. The advantage of this method is that the need to collect additional property taxes to retire the bonds is reduced or eliminated. Such revenue supported GO bonds have most of the advantages of revenue bonds, plus lower interest rate and ready marketability.

The primary disadvantage of GO bond debt is that it is often added to the debt ratios of the City, thereby restricting the flexibility of the municipality to issue debt for other purposes.

### 8.2.4.7 Revenue Bonds

These are similar to GO bonds, except they rely on revenue from the sales of the utility (i.e. user fees) to retire the bonded indebtedness. The primary

security for the bonds is the City's pledge to charge user fees sufficient to pay all operating costs and debt service. Because the reliability of the source of revenue is relatively more speculative than for GO bonds, revenue bonds typically have slightly higher interest rates.

The general shift away from ad valorem property taxes makes revenue bonds a frequently used option for payment of long term debt. Many communities prefer revenue bonding, because it insures that no additional taxes are levied. In addition, repayment of the debt obligation is limited to system users since repayment is based on user fees.

One advantage with revenue bonds is that they do not count against a City's direct debt. This feature can be a crucial advantage for a municipality near its debt limit. Rating agencies evaluate closely the amount of direct debt when assigning credit ratings. There are normally no legal limitations on the amount of revenue bonds that can be issued. However, excessive issue amounts are generally unattractive to bond buyers because they represent high investment risks.

Under ORS 288.805-288.945, Cities may elect to issue revenue bonds for revenue producing facilities without a vote of the electorate. Certain notice and posting requirements must be met and a sixty (60) day waiting period is mandatory.

The bond lender typically requires the City to provide two additional securities for revenue bonds that are not required for GO bonds. First, the City must set user fees such that the net projected cash flow from user fees plus interest will be at least 125% of the annual debt service (a 1.25 debt coverage ratio). Secondly, the City must establish a bond reserve fund equal to maximum annual debt service or 10% of the bond amount, whichever is less.

#### 8.2.4.8 Improvement Bonds

Improvement (Bancroft) bonds are an intermediate form of financing that are less than full-fledged GO or revenue bonds. This form of bonding is typically used for so-called Local Improvement Districts, or LIDs.

Improvement bonds are payable from the proceeds of special benefit assessments, not from general tax revenues or user fees. Such bonds are issued only where certain properties are recipients of special benefits not occurring to other properties. For a specific improvement, all property within the designated improvement district is assessed on the same basis, regardless of whether the property is developed or undeveloped. The assessment is designed to divide the cost of the improvements among the benefited property owners. The manner in which it is divided is in proportion to the direct or

indirect benefits to each property. The assessment becomes a direct lien against the property, and owners have the option of either paying the assessment in cash or applying for improvement bonds. If the improvement bond option is taken, the City sells Bancroft Improvement Bonds to finance the construction, and the assessment is paid over 20 years in 40 semiannual installments plus interest.

The assessments against the properties are usually not levied until the actual cost of the project is determined. Since the determination of actual costs cannot normally be determined until the project is completed, funds are not available from assessments for the purpose of paying costs at the time of construction. Therefore, some method of interim financing must be arranged.

The primary disadvantage to this source of revenue is that the development of an assessment district is very cumbersome and expensive when facilities for an entire City are contemplated. Therefore, this method of financing should only be considered for discrete improvements to the collection system where the benefits are localized and easily quantified.

#### 8.2.4.9 Certificates of Participation

Certificates of Participation are a form of bond financing that is distinct from revenue bonds. While it is more complex and typically has a higher interest rate than revenue bonds, it is a process controlled by the City Council, and it does not have to be referred to the voters, which can result in a significant time savings. Current rates for Certifications of Participation range from 4.5 to 5.5%.

#### 8.2.4.10 Ad Valorem Taxes

Ad valorem property taxes were often used in the past as a revenue source for public utility improvements. Historically, ad valorem taxes were the traditional means of obtaining revenue to support all local governmental functions. Ad valorem taxation provided a means of financing that reached all property owners that benefit or can potentially benefit from the water system, whether the property was developed or not. The construction costs for the project were shared proportionally among all property owners based on the assessed value of each property. Ad valorem taxation, however, is less likely to result in individual users paying their proportionate share of the costs as compared to their benefits.

### 8.2.5 State & Federal Grant & Loan Programs

Several state and federal grant and loan programs are available to assist municipalities finance wastewater system improvements. Based on data from the 2003 Community Development Block Grant Guidelines, 54.5% of families in Philomath are classified as low or moderate income. As such, Philomath is likely to qualify for many

programs. The primary sources of funding available for wastewater system financing are Rural Utilities Service (RUS), Special Public Works Fund (SPWF), the Water/Wastewater (W/W) Financing Program and the Community Development Block Grant (CDBG).

#### 8.2.5.1 Rural Utility Services

Rural Utility Service (RUS), formerly the Rural Economic and Community Development (RECD), provides federal loans and grants to rural municipalities, counties, special districts, Indian tribes, and not-for-profit organizations to construct, enlarge, or modify water treatment and distribution systems and wastewater collection and treatment systems. Preference is given to projects in low-income communities with populations below 10,000.

Borrowers of RDA loans must be able to demonstrate the following:

- Monthly user rates must be at or above the "state wide average" of approximately $43.11 per month.
- They have the legal authority to borrow and repay loans, to pledge security for loans, and to operate and maintain the facilities and services.
- They are financially sound and able to manage the facility effectively.
- They have a financially sound facility based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay for all facility costs including O&M and to retire indebtedness and maintain a reserve.

The maximum loan term is 40 years but the finance term may not exceed statutory limitations on the agency borrowing the money or the expected useful life of the improvements. The reserve can typically be funded at 10 percent per year over a ten-year period. Interest rates for RUS loans vary based on median household income (MHI). Based on the 2000 Census Data (**Appendix J**), the MHI for Philomath is $41,461. Maximum grant amounts and loan interest rates based on MHI are shown on **Table 8-4**. These interest rates are subject to market fluctuations. As such, the exact interest rate will depend on when the funding application is submitted.

| TABLE 8-4<br>RUS Grant Funds & Loan Interest Rates Based on MHI | | |
|---|---|---|
| Median Household Income (MHI) – 1990 data | Maximum Grant | Loan Interest Rate[1] |
| <$22,205 | 75% | 4.50% |
| $22,205 to $27,756 | 45% | 4.50% |
| > $27,756 | 0% | 4.62% |
| [1] – Current rates for the quarter 4/1/03-6/30/03. | | |

### 8.2.5.2 Oregon Economic and Community Development Department (OECDD)

a) Special Public Works Fund

The Oregon Economic and Community Development Department (OECDD) administers the SPWF program. The SPWF is a lottery-funded loan and grant program that provides funding to municipalities, counties, special districts, and public ports for infrastructure improvements to support industrial/manufacturing and eligible commercial economic development. Eligible commercial means commercial activity that is marketed nationally or internationally and attracts business from outside Oregon. Funded projects are usually linked to a specific private sector development and the resulting direct job creation (i.e., firm business commitment), of which 30% of the created jobs must be "family wage" jobs. The program also funds projects that build infrastructure capacity to support industrial/manufacturing development where recent interest by eligible business(s) can be documented.

The SPWF is primarily a loan program, although grant funds are available based on economic need of the community. Although the maximum loan term is 25 years, loans are generally made for 20-year terms. The maximum loan amount for projects funded with direct SPWF money is $1 million, while the maximum for projects financed with bond funds is $10 million.

b) Bond Bank Program

The Bond Bank program, administered by OECDD, attempts to lower the cost of issuing debt by pooling small revenue bond issues from many communities into one large revenue bond issue. It uses lottery proceeds to write down financing costs, and to improve the debt/equity ratio on projects. The interest rate for repayment of funds is typically around 6 percent, with up to a 25 year term.

c) Water/Wastewater Financing Program

OECDD also administers the W/W Financing Program, which gives priority to projects that provide system-wide benefits and help communities meet the Clean Water Act or the Safe Drinking Water Act standards. It is intended to assist local governments that have been hard hit with state and federal mandates for public drinking water systems and wastewater systems. In order to be eligible for this program, the system must be out of compliance with federal or state rules, regulations or permits, as evidenced by issuance of Notice of Non-Compliance by the appropriate regulatory agency. The funded project must be needed to meet state or federal regulations. Priority is given to communities under economic distress.

Similar to the SPWF, the W/W Financing Program is primarily a loan program, although grant funds are available in certain cases based on economic need of the community. Although the maximum loan term is 25 years, loans are generally made for 20-year terms. The maximum loan amount for projects funded with direct W/W money is $500,000, while the maximum for projects financed with bond funds is $10 million.

d) Economic and Community Development Block Grant

The OECDD administers the CDBG, but the funds are from the U.S. Department of Housing and Urban Development (HUD), so all federal grant management rules apply to the program. The federal eligibility standards are strict. There are two subcategories of Public Works projects eligible for funding, "Public Water and Wastewater," and "Public Works for New Housing." Only the former is considered in this discussion.

Grants are available for critically needed construction, improvement, or expansion of publicly owned water and wastewater systems for the benefit of current residents. Generally, projects must be necessary to resolve regulatory compliance problems identified by state and/or federal agencies.

The program separates projects into three parts. Grants are available for:

- Preliminary Engineering and Planning Projects

Generally, these grants fund preparation or update of Water System Master Plans and Wastewater Facility Plans, as required by the Oregon Department of Environmental Quality or Oregon Health Division. In

addition, funds for grant administration and preparation of a final design funding application can be included in the project budget. All plans produced with grant funds must be approved by the appropriate regulatory agency. Grants of up to $10,000 can also be made for problem identification studies to delineate problems and corrective measures, as required by a regulatory agency.

- Final Design and Engineering Projects

Final design and engineering, bid specifications, environmental review, financial feasibility, rate analysis, grant administration, and preparing a construction funding application are all eligible project activities. The final design, plans and specifications must be approved by the appropriate regulatory agency before a grant will be awarded.

- Construction Projects

These grants fund construction and related activities, grant administration and land/permanent easement acquisition.

OECDD has established an evaluation system that gives priority to projects that provide system-wide benefits. The overall maximum grant amount per water or wastewater project is $750,000 (including all planning, final engineering, and construction). The project cannot be divided locally into phases with the expectation of receiving more than one $750,000 grant. In order to qualify for grant funding under this program, the water user rates must be at or above statewide averages.

#### 8.2.5.3 Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) program is administered by the DEQ and provides loans to cities, counties, special districts, and Indian tribes to plan, design and construct water pollution control facilities, estuary management projects, and non-point source control plants. Applicants to the program must be a public agency. Current interest rates on construction loans are 2.94%. In addition, there is an annual servicing fee of 0.5% on the remaining balance. The term of the loans is 20 years.

### 8.2.6 Funding Scenarios

Several alternative funding scenarios with varying grant contributions were developed and evaluated to present a range of monthly user rates. Following adoption of the Facilities Plan and in conjunction with pursuing financing, the City should proceed with a formal user rate evaluation to determine the user fees required based on the most likely funding scenario. As previously stated, the SDC fee

structure should also be updated. As described later in this section, the recommended implementation schedule includes the completion of the Priority 1A improvements in summer of 2006 and the Priority 1B improvements in the summer of 2010. For demonstration purposes, the 2010 user fee was estimated based on various levels of grant funding.

As the funding scenarios demonstrate, the existing user fees are not sufficient to fund the recommended improvements even with a significant grant contribution. Therefore, rate increases are necessary if the City is to proceed with all of the recommended improvements.

- Scenario 1: No grant funding
- Scenario 2: $750,000 (29%) total grant funding for priority 1A improvements.
- Scenario 3: $1,000,000 (39%) total grant funding for priority 1A improvements.

Summaries of these scenarios are shown in **Table 8-5**.

The actual user fees required will depend upon a number of factors. A few of these factors including the level of grant funding, the number of service connections at the time the debt service payments begin, and the level of SDC revenue contributions available at that time. These factors are difficult to determine at the present time. In addition, estimated user rates are based on the assumption that all users consume the same amount of water and a uniform rate structure for all user classes. Since sewer rates are based on water consumption and user classification, the actual rates will vary accordingly. Therefore, the estimates in **Table 8-5** are rough approximations that merely demonstrate the point that the City's existing user fees are not sufficient to fund the recommended improvements.

## TABLE 8-5
## Preliminary 2010 Rate Analysis
(Priority 1A and 1B Improvements Only)

| Component | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| Capital Reserve Funds at end of year 2004 [1] | $327,000 | $327,000 | $327,000 |
| SDC Funds at end of year 2004 [1,2] | $272,400 | $272,400 | $272,400 |
| Capital Reserve Funds at end of year 2005 [3] | $403,350 | $403,350 | $403,350 |
| Anticipated funds from I/I reduction plan [4] | $444,000 | $444,000 | $444,000 |
| SDC Funds at end of year 2005 [2,5] | $439,200 | $439,200 | $439,200 |
| Total Grant Funding for Priority 1A Improvements | $0 | $750,000 | $1,000,000 |
| Total Project Budget – Priority 1A | $2,584,000 | $2,584,000 | $2,584,000 |
| Required Loan Amount for Priority 1A Improvements [6] | $1,297,450 | $547,450 | $297,450 |
| Capital Reserve Funds at end of year 2009 [3] | $258,600 | $258,600 | $258,600 |
| SDC Funds at end of year 2009 [7] | $696,600 | $696,600 | $696,600 |
| Total Project Budget – Priority 1B | $2,058,275 | $2,058,275 | $2,058,275 |
| Required Loan Amount for Priority 1B Improvements [8] | $1,103,075 | $1,103,075 | $1,103,075 |
| Existing Sewer Debt Service | $50,938 | $50,938 | $50,938 |
| Additional Debt Service for Priority 1A Imps. [9] | $104,110 | $43,929 | $23,868 |
| Additional Debt Service for Priority 1B Imps. [9] | $88,500 | $88,500 | $88,500 |
| Annual I/I Reduction Plan Costs | $222,000 | $222,000 | $222,000 |
| Annual O&M Costs | $632,000 | $632,000 | $632,000 |
| Total Annual Expenses | $1,097,550 | $1,037,370 | $1,017,300 |
| Estimated Avg 2010 Monthly User Fee [10] | $54.99 | $51.98 | $50.98 |

[1] – Based on Current CIP.
[2] – Includes both Improvement and Reimbursement portions of SDC fee.
[3] – Assumes $60,000 annual revenue and %5 interest earned per year.
[4] – Assumes sewer rates increased in summer of 2004 (see implementation schedule), and two years of I/I reduction funds collected.
[5] – Assumes SDC fees increased in summer of 2004 (see implementation schedule), and one year of SDC collections at updated SDC fees estimated to be ± $4500 on average.
[6] – Assumes construction of priority 1A improvements begins in the summer of 2006 and reserve funds and SDC funds at end of year 2005 as well as all I/I reduction funds used to fund project.
[7] – Based on estimated SDC fees of ± 4,500 on average per connection. Number of connections estimated from population growth projections (see Section 2), and 2.85 people per connection. Assumes 5% interest earned.
[8] – Assumes construction of priority 1B improvements begins in the summer of 2010 and reserve funds and SDC funds at end of year 2009 used to fund project.
[9] – Assumes 20 year term, 5% interest.
[10] – Assumes approximately 4,740 residents or approximately 1,663 connections at beginning of end of 2010.

### 8.2.7 Funding Recommendations

As is apparent from **Table 8-5**, the required user rate depends heavily on the amount of grant contribution. As previously stated, grant funding will require a user rate to be at least in the range of $40-$44 per month. The current City sewer rates are currently far below the monthly statewide average based on typical flow rates. As available grant funding on public works projects has decreased in the last several years, it will be incumbent upon the City to aggressively pursue grant funding. The first step in this process is to schedule a "one stop meeting" with Oregon Economic and Community Development Department (OECDD) and the preparation of applicable grant applications as soon as possible.

## 8.3. Recommended Implementation Schedule

### 8.3.1 Priority 1A an 1B

It is recommended that the City begin design work on the Priority 1A improvements as soon as possible after the final approval of the Facilities Plan. These include improvements to Pump Station A and upgrades to the gravity collection piping. The need for priority 1B improvements is growth dependent. Based on the growth projections presented herein, the priority 1B improvements are likely to be required by the end of 2010. Should growth occur faster or slower than projected herein, the schedule for the priority 1B improvements should be adjusted accordingly. A breakdown of the recommended project scheduled for Priority 1A and 1B improvements is presented in **Table 8-6**.

| TABLE 8-6<br>Recommended Implementation Schedule (Priority 1A & 1B) | |
|---|---|
| Milestone | Date |
| PHASE I | |
| Submit Draft Facilities Plan to DEQ & City | 8/30/03 |
| Receive Comments from DEQ & City | 1/31/04 |
| Submit Final Facilities Plan to DEQ | 7/31/04 |
| DEQ Approval of Final Facilities Plan | 8/31/04 |
| City adopts Final Facilities Plan | 9/30/04 |
| Perform Rate Study & Implement New User Rates & SDCs | 12/31/04 |
| Update CIP | 12/31/04 |
| Conduct Funding Meeting With OECDD and RUS | 2/15/05 |
| Submit Funding Applications | 5/31/05 |
| Finalize Funding Package | 12/31/05 |
| | |
| PHASE II – Priority 1A Improvements | |
| Select Design Consultant | 1/31/06 |
| Complete Predesign Report | 3/31/06 |
| DEQ Approval of Predesign Report | 4/30/06 |
| Start Detailed Design of Improvements | 5/31/06 |
| Complete Design of Improvements | 1/31/07 |
| DEQ Approval of Plans & Specifications | 3/15/07 |
| Advertise for Construction Bids | 4/15/07 |
| Receive Construction Bids | 5/15/07 |
| Award Contracts | 6/15/07 |
| Start Construction | 7/15/07 |
| Complete Construction of Priority 1A improvements | 12/31/07 |
| | |
| PHASE III – Priority 1B Improvements | |
| Select Design Consultant, Prepare Predesign Report | 1/31/09 |
| Start Detailed Design of Improvements | 6/1/09 |
| Complete Design of Improvements | 12/1/09 |
| DEQ Approval of Plans & Specifications | 2/1/10 |
| Advertise for Construction Bids | 4/1/10 |
| Receive Construction Bids | 5/1/10 |
| Award Contracts | 6/1/10 |
| Start Construction | 7/1/10 |
| Complete Construction of Priority 1B improvements | 11/1/10 |
| | |

**CITY OF PHILOMATH**
**Wastewater System Facilities Plan,**
**Philomath, Oregon**

**Existing Sanitary Sewer System Utility Maps**

# Appendix A

CHAPEL DR.

18"DI 1986 FM

TO WASTE WATER TREATMENT PLANT
SEE JO 959, SHEET 1

Cattle

BELFOUNTAIN RD.

WWTP
OUTFALL
TO RIVER

24" OUTFALL

18" DI FORCE MAIN

LAB BUILDING

CHLORINATION BUILDING

CHLORINE
CONTACT
CHAMBER

EVAPORATION PAN AND
RAIN GAUGE

OUTLET
STRUCTURE

POND 2

INLET
PAD

HEADWORKS/
PARSHALL FLUME

TRANSFER
STRUCTURE

INLET
PAD

POND 1

ACCESS ROAD

GRAPHIC SCALE

200 0 100 200 400 800

( IN FEET )
1 inch = 200 ft.

VERIFY GRAPHIC SCALE, MAPS MAY
NOT BE PLOTTED TO SCALE SHOWN.

## LEGEND

8" CR — PIPE DIAMETER; SANITARY SEWER LINE; PIPE MATERIAL

MANHOLE; MANHOLE NO. (167)

MAINLINE CLEANOUT; CLEANOUT NO. (CO167)

BASIN BOUNDARY

## PIPE MATERIALS

C – CONCRETE
CR – CONCRETE (RUBBER GASKET JOINT)
CM – CONCRETE (MORTOR JOINT)
V – VITRIFIED CLAY
T – TERA COTTA
AC – ASBESTOS CEMENT
PVC – POLYVINYL CHLORIDE
DI – DUCTILE IRON
CI – CAST IRON

NOTE:
THESE MAPS ARE SCHEMATIC UTILITY MAPS ONLY & DO NOT SHOW EXACT LOCATIONS OF UTILITIES. FIELD VERIFY ALL LOCATIONS PRIOR TO DESIGN OR CONSTRUCTION.

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | REVISIONS | |

SCALE
HORIZ: 1" = 200'
VERT:

DSN. DM
DRN. TMT
CHKD. DMB
DATE: FEB 2003

MAP UPDATED: 6-20-11

WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
# SEWAGE LAGOONS

SHEET
5 OF 5

JOB NUMBER
960.308.0

Jul 22, 2011 - 6:04pm
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Jul 22, 2011 - 6:03pm
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## LEGEND

PIPE DIAMETER
PIPE MATERIAL
SANITARY SEWER LINE
YEAR INSTALLED
PIPE SLOPE
MANHOLE
MANHOLE NO.
MAINLINE CLEANOUT
CLEANOUT NO.
BASIN BOUNDARY

## PIPE MATERIALS

C - CONCRETE
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T - TERA COTTA
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PVC - POLYVINYL CHLORIDE
D - DUCTILE IRON
CI - CAST IRON
HDPE - HIGH-DENSITY POLYETHYLENE

NOTE:
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GRAPHIC SCALE
( IN FEET )
1 inch = 200 ft.
VERIFY GRAPHIC SCALE. MAPS MAY NOT BE PLOTTED TO SCALE SHOWN.

TO WASTE WATER TREATMENT PLANT SEE JO 959, SHEET 1

CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
# SE QUADRANT


WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com


MAP UPDATED: 6-23-11

SCALE
HORIZ: 1" = 200'
VERT:

DSN. DM
DRN. RG
CKD. DM
DATE: FEB. 1998

| NO. | DATE | DESCRIPTION | BY |
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| 1 | | | |

REVISIONS

SHEET 2 OF 5
JOB NUMBER 960.308.0

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## LEGEND

PIPE DIAMETER — 8" CR — PIPE MATERIAL
1952 — YEAR INSTALLED
0.40% — PIPE SLOPE
SANITARY SEWER LINE
(S) (167) — MANHOLE NO.
MANHOLE
(CO167) — CLEANOUT NO.
MAINLINE CLEANOUT
BASIN BOUNDARY

## PIPE MATERIALS

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CR — CONCRETE (RUBBER GASKET JOINT)
CM — CONCRETE (MORTOR JOINT)
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HDPE — HIGH-DENSITY POLYETHYLENE

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GRAPHIC SCALE
( IN FEET )
1 inch = 200 ft.
200 0 100 200 400 800
VERIFY GRAPHIC SCALE. MAPS MAY NOT BE PLOTTED TO SCALE SHOWN.

GRANGE HALL ROAD CO. RD. 26046
RIVER
MARY'S RIVER
LOG POND
LOG POND
ALSEA HWY.
CORVALLIS-NEWPORT HWY (HWY 20)
SOUTHERN PACIFIC RR
APPLEGATE STR
DAMPIER ST
COLLEGE STR
Jade
Topaz
Sunshine Ave
Sunshine
MELVILL CRESCENT
PIONEER STREET
Amaltyar
Tasman
CANBERRA DR
ADELAIDE DR
Coastal View
Starlight
Fawn
6" CLAY
7TH ("A") STR
N 7TH ("A") STR
8TH ("B") STR
9TH ("C") STR
10TH ("D") STR
11TH ("E") STR
12TH ("F") STR
13TH ("G") STR
14TH ("H") STR
15TH ("I") STR
16TH ("J") STR
17TH ("K") STR
18TH ("L") STR
19TH ("M") STREET
17TH (MYRTLE) STR
18TH STREET
MAIN STREET (HWY 20)
PIONEER (NORTH) STR
(SOUTH) STR
CEDAR STREET
ASH STREET
MAPLE STREET
ALICE
CEDAR PLACE
HWY 20
SERVICE CON.
N. 9TH ST.
WEST D ST. ROAD (CR 32)
BOBWHITE PL.
QUAIL GLENN DRIVE
DOVE PL.
GROUSE PL.
Marilyn Dr
11th ST.
12th ("F") STREET
13th ST.
PROGRESS WAY
MONROE ST.
LINCOLN ST.
GRANT ST.
FERN RD
CHAPEL DR (GR 46)
CHAPEL
SOUTHERN PACIFIC RAILROAD
P.S. A OVERFLOW BYPASS TO MARYS RIVER.
PUMP STATION "A"
AIR RELIEF VALVE
STARKER PL.
LOWTHER PL.
MCCALL WAY
Window
Cooper

CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
# SW QUADRANT


WESTECH ENGINEERING, INC.
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MAP UPDATED: 6-23-11

SCALE
HORIZ: 1" = 200'
VERT:

DSN. DM
DRN. RG
CKD. DM
DATE: FEB. 1998

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | | REVISIONS | |

SHEET 1 OF 5
JOB NUMBER 960.308.0

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## LEGEND

PIPE DIAMETER — 8" CR — PIPE MATERIAL

1952 — 0.40% — SANITARY SEWER LINE
YEAR INSTALLED — PIPE SLOPE

MANHOLE
MANHOLE NO. (S 16)

MAINLINE CLEANOUT
CLEANOUT NO. (CO167)

BASIN BOUNDARY

## PIPE MATERIALS

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GRAPHIC SCALE
( IN FEET )
1 inch = 200 ft.

VERIFY GRAPHIC SCALE. MAPS MAY NOT BE PLOTTED TO SCALE SHOWN.

MELVILL CRESCENT
MARILYN DR.
Marilyn Dr
N 9th STR (CR 32)
Memory
Heritage Hills
Heritage Hills
Wyatt
WAY
LANE
P263
06
12th ST.
ADAMS ST.
HOUSER LANE
INDUSTRIAL
TIMBER ROAD
WAY
Swanson
INDUSTRIAL WAY
NEWTON CREEK
Periwinkle
Oregon Grape
Cranberry
Forget-Me-Not
Currant
Periwinkle
Cranberry
GREEN ROAD
GREEN ROAD
WEST HILLS RD
WEST HILLS RD
McBEE ROAD
EGAN DR
WOODED KNOLLS
WOODED KNOLLS
PHEASANT COURT
WOODED KNOLLS
EGAN DR
POND

8" PVC 2002
8" PVC 1998
10"PVC 1982
8" PVC 1982
10"C 1982
8" C 1982
8" PVC 1996
8" PVC 1989

CITY OF PHILOMATH, OREGON

# SANITARY SEWER SYSTEM MAP
# NW QUADRANT


WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
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E-mail: westech@westech-eng.com


MAP UPDATED: 6-23-11

SCALE
HORIZ: 1" = 200'
VERT:

DSN. DM
DRN. RG
CKD. DM
DATE: FEB. 1998

| NO. | DATE | DESCRIPTION | BY |
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| 1 | | REVISIONS | |

SHEET 3 OF 5
JOB NUMBER 960.308.0

CITY OF PHILOMATH
Wastewater System Facilities Plan,
Philomath, Oregon

NPDES Permit
MAO
303d Listings

# Appendix B

# NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
# WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

**ISSUED TO:**

City of Philomath
PO Box 400
Philomath, OR 97370

**SOURCES COVERED BY THIS PERMIT:**

| Type of Waste | Outfall Number | Outfall Location |
|---|---|---|
| Treated Wastewater | 001 | R.M. 10.2 |

**FACILITY TYPE AND LOCATION:**

Stabilization Lagoons without Aeration
Philomath STP
West of Bellfountain Road
Philomath

**Treatment System Class:** Level I
**Collection System Class:** Level II

**RECEIVING STREAM INFORMATION:**

Basin: Willamette
Sub-Basin: Upper Willamette

Receiving Stream: Mary's River
Hydro Code: 22E-MARY 10.2 D
County: Benton

**EPA REFERENCE NO:** OR003244-1

Issued in response to Application No. 989510 received November 17, 1995.

This permit is issued based on the land use findings in the permit record.

Gary Messer, Water Quality Manager
Western Region

December 28, 2000
Date

## PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

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Unless authorized by another NPDES permit, each other direct and indirect discharge to public waters is prohibited.

## SCHEDULE A

**1. Waste Discharge Limitations not to be exceeded after permit issuance.**

a. Treated Effluent Outfall 001

(1) May 1 - October 31: No discharge to waters of the State (unless approved in writing by the Department)

(2) November 1 - April 30:

| Parameter | Average Effluent Concentrations Monthly | Weekly | Monthly* Average lb/day | Weekly* Average lb/day | Daily* Maximum lbs |
|---|---|---|---|---|---|
| $BOD_5$ | 30 mg/L | 45 mg/L | 460 | 690 | 920 |
| TSS | 50 mg/L | 80 mg/L | 760 | 1100 | 1500 |

* Average dry weather design flow to the facility equals 0.475 MGD. Mass load limits based upon the winter discharge rate of 1.82 MGD to allow for disposal of summer accumulations of treated wastewater as well as winter stormwater impacting lagoon surface. Schedule C, Condition 1 requires the permittee to select the basis for calculating winter time (November 1 through April 30 each year) mass load limits. Upon review and approval of the engineering study to determine the design average wet weather flow, pursuant to OAR 340-41-120 (9), and upon request of the permittee, the Department intends to modify this permit and include revised mass load limits.

(3)

| Other parameters (year-round) | Limitations |
|---|---|
| *E. coli* Bacteria | Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 ml. (See Note 1) |
| pH | Shall be within the range of 6.0 - 9.0 |
| $BOD_5$ and TSS Removal Efficiency | Shall not be less than 65% monthly average for $BOD_5$ and 55% monthly for TSS. |
| Total Residual Chlorine | Shall not exceed 0.08 mg/l daily maximum and 0.03 mg/l monthly average. (See Note 2) |

(4) Except as provided for in OAR 340-45-080, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-41-0445 except in the following defined mixing zone:

The allowable mixing zone is that portion of the Marys River contained within a band extending out twenty (20) feet (not to exceed one-half the approximate total stream width) from the point of discharge and extending from a point ten (10) feet upstream of the outfall to a point one-hundred (100) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within ten (10) feet of the point of discharge.

(5) Raw sewage discharges are prohibited to waters of the State from November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm, and from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm.

If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

b. Groundwater

(1) No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater.

**NOTES:**

1. If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 72 hours after the original sample was taken. If the log mean of the five re-samples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.

2. These are interim chlorine limits and may be modified on the basis of information and data gathered as a result of the corrective action schedule in accordance with the Mutual Agreement and Order (MAO) Case No.
WQ/M-WR-00-144.

## SCHEDULE B

1. **Minimum Monitoring and Reporting Requirements** (unless otherwise approved in writing by the Department).

The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this permit. When possible, the permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

The facility influent sampling locations are the following:

* Collected at Parshall Flume.

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| Flow Meter Calibration | Annually | Verification |
| $BOD_5$ | 1 per 2 Weeks | Composite |
| TSS | 1 per 2 Weeks | Composite |
| pH | 2/Week | Grab |

b. Treated Effluent Outfall 001

The facility effluent sampling locations are the following:

* Collected on the upstream side of the weir in the outfall manhole located adjacent to the Marys River.

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Total Flow (MGD) | Daily | Measurement |
| Flow Meter Calibration | Annual | Verification |
| $BOD_5$ | 1 per 2 Weeks | Composite |
| TSS | 1 per 2 Weeks | Composite |
| pH | 2/Week | Grab |
| Temperature | 2/Week | Record |
| *E. coli* | 1 per 2 Weeks | Grab (See Note 1) |
| Quantity Chlorine Used | Daily | Measurement |
| Chlorine Residual | Daily | Grab |
| Pounds Discharged ($BOD_5$ and TSS) | 1 per 2 Weeks | Calculation |
| Average Percent Removed ($BOD_5$ and TSS) | Monthly | Calculation |

c. Sludge Management (Cell #1)

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Sludge Depth in Cell #1 | Annually (See Note 2) | Representative Measurement |

d. Mary's River (See Note 3)

| Item or Parameter | Minimum Frequency | Type of Sample |
|---|---|---|
| Flow (Downstream) | 2/week | Measurement |

## 2. Reporting Procedures

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the Department's Western Region - Salem office by the 15th day of the following month.

b. State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this permit.

c. Monitoring reports shall also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

## 3. Report Submittals

a. The permittee shall have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by February 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report shall state those activities that have been done in the previous year and those activities planned for the following year.

**NOTES:**

1. *E. coli* monitoring must be conducted according to any of the following test procedures as specified in **Standard Methods for the Examination of Water and Wastewater, 19th Edition**, or according to any test procedure that has been authorized and approved in writing by the Director or his authorized representative:

| Method | Reference | Page | Method Number |
|---|---|---|---|
| mTEC agar, MF | Standard Methods, 19th Edition | 9-28 | 9213 D |
| NA-MUG, MF | Standard Methods, 19th Edition | 9-63 | 9222 G |
| Chromogenic Substrate, MPN | Standard Methods, 19th Edition | 9-65 | 9223 B |
| Colilert QT | Idexx Laboratories, Inc. | | |

2. The 1st sludge measurement will be done within 12 months after permit issuance and then subsequent measurements will be done on 5-year intervals unless sludge levels warrant more frequent measurements or removal of biosolids.

3. Mary's River flow shall be taken at the USGS stream gauge on the Marys River located at R.M. 9.4.

## SCHEDULE C

Compliance Schedules and Conditions

1. By no later than December 28, 2001, the permittee shall submit either an engineering evaluation which demonstrates the design average wet weather flow, or a request to retain the existing mass load limits. The design average wet weather flow is defined as the average flow between November 1 and April 30 when the sewage treatment facility is projected to be at design capacity for that portion of the year. Upon acceptance by the Department of the design average wet weather flow determination, the permittee may request a permit modification to include higher winter mass loads based on the design average wet weather flow.

2. Within 180 days of permit modification to include higher winter mass load limits as specified in Condition 1 of this Schedule, the permittee shall submit to the Department for review and approval a proposed program and time schedule for identifying and reducing inflow. Within 60 days of receiving written Department comments, the permittee shall submit a final approvable program and time schedule. The program shall consist of the following:

   a. Identification of all overflow points and verification that sewer system overflows are not occurring up to a 24-hour, 5-year storm event or equivalent;

   b. Monitoring of all pump station overflow points;

   c. A program for identifying and removing all inflow sources into the permittee's sewer system over which the permittee has legal control; and

   d. If the permittee does not have the necessary legal authority for all portions of the sewer system or treatment facility, a program and schedule for gaining legal authority to require inflow reduction and a program and schedule for removing inflow sources.

3. Six (6) months prior to the removal of accumulated solids from the lagoon, the permittee shall submit to the Department a biosolids management plan developed in accordance with Oregon Administrative Rule 340, Division 50, "Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage". Upon approval of the plan by the Department, the plan shall be implemented by the permittee.

4. By no later than March 28, 2001, the permittee shall submit to the Department a report which either identifies known sewage bypass locations and a plan for estimating the frequency, duration and quantity of sewage bypassing treatment, or confirms that there are no bypass points. The report shall also provide a schedule to eliminate the bypass(es), if any.

5. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

## SCHEDULE D

**Special Conditions**

1. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

**Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.**

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 2.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified in the proper classification and at grade level I or higher.

   c. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   d. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or re-designation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program, 811 SW 6th Ave., Portland, OR 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

   e. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 1.b. above.

2. All biosolids shall be managed in accordance with the DEQ approved biosolids management plan (submitted in accordance with Schedule C, Condition 3), and the site authorization letters issued by the DEQ. Any changes in solids management activities that significantly differ from operations specified under the approved plan require the prior written approval of the DEQ.

   All new biosolids application sites shall meet the site selection criteria set forth in OAR 340-50-0070. The
   permittee does not currently have any approved sites. Property owners adjacent to any newly approved application sites shall be notified, in writing or by any method approved by DEQ, of the proposed activity prior to the start of application. For proposed new application sites that are deemed by the DEQ to be sensitive with respect to residential housing, runoff potential or threat to groundwater, an opportunity for public comment shall be provided in accordance with OAR 340-50-0030.

3. The permittee shall notify the DEQ Western Region - Salem Office (phone: (503) 378-8240) in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the Department.

# NPDES GENERAL CONDITIONS
# (SCHEDULE F)

## SECTION A. STANDARD CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Oregon Revised Statutes (ORS) 468B.025 and is grounds for enforcement action; for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Penalties for Water Pollution and Permit Condition Violations

Oregon Law (ORS 468.140) allows the Director to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit.

In addition, a person who unlawfully pollutes water as specified in ORS 468.943 or ORS 468.946 is subject to criminal prosecution.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee shall correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application shall be submitted at least 180 days before the expiration date of this permit.

The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions

This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants

The permittee shall comply with any applicable effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

8. Permit References

Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

## SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not include nonuse of singular or multiple units or processes of a treatment works when the nonuse is insignificant to the quality and/or quantity of the effluent produced by the treatment works. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.

(1) Bypass is prohibited unless:

(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices and requests as required under General Condition B.3.c.

(2) The Director may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Director determines that it will meet the three conditions listed above in General Condition B.3.b.(1).

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in General Condition D.5.

4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Event

For purposes of this permit, A Single Operational Event which leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation. A single operational event is an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational event does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational event is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions

(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.

(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of overflows. Overflows are prohibited unless:

(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and

(3) The overflows are the result of an upset as defined in General Condition B.4. and meeting all requirements of this condition.

c. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

d. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5.

7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee shall take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in such a manner as to prevent any pollutant from such materials from entering public waters, causing nuisance conditions, or creating a public health hazard.

## SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties of Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years, or by both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years or both.

5. Reporting of Monitoring Results

Monitoring results shall be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports shall be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value shall be recorded unless otherwise specified in this permit.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

8. Retention of Records

Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records of all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Records Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

## SECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall comply with Oregon Administrative Rules (OAR) 340, Division 52, "Review of Plans and Specifications". Except where exempted under OAR 340-52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers shall be commenced until the plans and specifications are submitted to and approved by the Department. The permittee shall give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit shall be transferred to a third party without prior written approval from the Director. The permittee shall notify the Department when a transfer of property interest takes place.

4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting

The permittee shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally (by telephone) within 24 hours, unless otherwise specified in this permit, from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office shall be called. Outside of normal business hours, the Department shall be contacted at 1-800-452-0311 (Oregon Emergency Response System).

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. If the permittee is establishing an affirmative defense of upset or bypass to any offense under ORS 468.922 to 468.946, and in which case if the original reporting notice was oral, delivered written notice must be made to the Department or other agency with regulatory jurisdiction within 4 (four) calendar days. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected;

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and

e. Public notification steps taken, pursuant to General Condition B.7.

The following shall be included as information that must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass which exceeds any effluent limitation in this permit.

b. Any upset which exceeds any effluent limitation in this permit.

c. Violation of maximum daily discharge limitation for any of the pollutants listed by the Director in this permit.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information that the Department may request to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified in accordance with 40 CFR 122.22.

9. Falsification of Information

A person who supplies the Department with false information, or omits material or required information, as specified in ORS 468.953 is subject to criminal prosecution.

10. Changes to Indirect Dischargers - **[Applicable to Publicly Owned Treatment Works (POTW) only]**

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;

b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

11. Changes to Discharges of Toxic Pollutant - **[Applicable to existing manufacturing, commercial, mining, and silvicultural dischargers only]**

The permittee must notify the Department as soon as they know or have reason to believe of the following:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:

(1) One hundred micrograms per liter (100 µg/L);

(2) Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 µg/L);

(2) One milligram per liter (1 mg/L) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

## SECTION E. DEFINITIONS

1. BOD means five-day biochemical oxygen demand.

2. TSS means total suspended solids.

3. mg/L means milligrams per liter.

4. kg means kilograms.

5. $m^3/d$ means cubic meters per day.

6. MGD means million gallons per day.

7. Composite sample means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.

8. FC means fecal coliform bacteria.

9. Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-41.

10. CBOD means five day carbonaceous biochemical oxygen demand.

11. Grab sample means an individual discrete sample collected over a period of time not to exceed 15 minutes.

12. Quarter means January through March, April through June, July through September, or October through December.

13. Month means calendar month.

14. Week means a calendar week of Sunday through Saturday.

15. Total residual chlorine means combined chlorine forms plus free residual chlorine.

16. The term "bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.

17. POTW means a publicly owned treatment works.

updated 8-8-00 der AR
updated 9-20-00 rad
updated 11-15-00 der PN

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

| | | |
|---|---|---|
| IN THE MATTER OF: | ) | MUTUAL AGREEMENT |
| | ) | AND ORDER |
| City of Philomath, | ) | NO. WQ/M-WR-00-144 |
| Permittee | ) | Benton COUNTY |
| | ) | |

WHEREAS:

1. On December 28, 2000, the Department of Environmental Quality (Department) issued National Pollutant Discharge Elimination System (NPDES) Permit Number 102060 (Permit) to the City of Philomath (Permittee). The Permit authorizes the Permittee to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewater into the Marys River, waters of the state, in conformance with the requirements, limitations and conditions set forth in the Permit. The expiration date on the Permit is November 30, 2005. Pursuant to Oregon Administrative Rule (OAR) 340- 014-0030, the Permit remains in effect as the Permittee made a timely application for renewal of the Permit, which was received by the Department on March 1, 2000.

2. The Permittee operates a wastewater treatment facility that uses chlorine as a disinfecting agent for the treated effluent prior to discharging to public waters.

3. Chlorine is a toxic substance that can be harmful to aquatic organisms. Discharges of any substances, including chlorine, that cause water quality stream standards violations outside of a designated mixing zone are prohibited by OAR 340-041-0455(2).

4. The Department has included a final chlorine effluent limit in the permit.

5. The Department and Permittee recognize that the Permittee may not be able to achieve compliance with the final chlorine effluent limit established in the Permit, without making necessary improvements in the Permittee's sewage treatment facility.

6. The Department and Permittee recognize that the Environmental Quality

Commission has the power to impose a civil penalty and to issue an abatement order for violations of conditions of the Permit. Therefore, pursuant to ORS 183.415(5), the Department and Permittee wish to limit and resolve the future violations referred to in Paragraph 5 in advance by this Mutual Agreement and Order (MAO).

7. This MAO is not intended to settle any violation of any interim effluent limitations set forth in Paragraph 5 above. Furthermore, this MAO is not intended to limit, in any way, the Department's right to proceed against Permittee in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

8. The Environmental Quality Commission shall issue a final order:

A. Requiring Permittee to comply with the following schedule:

(1) By no later than July 1, 2001, the Permittee shall have collected the needed field information and data to perform modeling and analysis for making improvements to the wastewater treatment facilities to comply with the final chlorine effluent limitation included in the Permit.

(2) By no later than September 1, 2001, the Permittee shall have performed modeling and analysis for making improvements to the wastewater treatment facilities to comply with the final chlorine effluent limitation included in the Permit.

(3) By no later than January 30, 2002, the Permittee shall submit draft engineering plans and specifications for providing wastewater control facilities as needed to assure that Permittee can continuously comply with the final chlorine effluent limitation included in the Permit.

(4) By no later than April 30, 2002, the Permittee shall submit final approvable engineering plans and specifications for providing wastewater control facilities as needed to assure that Permittee can continuously comply with the final chlorine effluent limitation included in the Permit.

(3) By no later than September 30, 2003, Permittee shall have construction of the wastewater control facilities completed to comply with the final chlorine effluent limitation in the Permit.

(4) By no later than November 30, 2003, Permittee shall have wastewater control facilities in operation to comply with the final chlorine effluent limitation in the Permit.

B. Requiring Permittee, to meet the following interim chlorine effluent limitation which shall be effective until completion of corrective actions as required by the schedule specified in Paragraph 8.A:

(1) The total residual chlorine concentration at the down stream side of the outfall manhole adjacent to the river shall not exceed 1.5 mg/l on a daily average basis.

C. Requiring Permittee, upon receipt of a written Penalty Demand Notice from the Department, to pay the following civil penalties:

(1) $250 for each day of each violation of the compliance schedule set for in Paragraph 8A.

(2) $100 for each violation of the total residual chlorine concentration limitation set forth in Paragraph 8.B.(1).

9. If any event occurs that is beyond Permittee's reasonable control and that causes or may cause a delay or deviation in performance of the requirements of this MAO, Permittee shall immediately notify the Department verbally of the cause of delay or deviation and its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Permittee proposes to carry out such measures. Permittee shall confirm in writing this information within five (5) working days of the onset of the event. It is Permittee's responsibility in the written notification to demonstrate to the Department's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of Permittee. If Permittee so demonstrates, the Department shall extend times of performance of related activities under this

MAO as appropriate. Circumstances or events beyond Permittee's control include, but are not limited to acts of nature, unforeseen strikes, work stoppages, fires, explosion, riot, sabotage, or war. Increased cost of performance or consultant's failure to provide timely reports may not be considered circumstances beyond Permittee's control.

10. Regarding the violations set forth in Paragraph 5., above, which are expressly settled herein without penalty, Permittee and the Department hereby waive any and all of their rights to any and all notices, hearing, judicial review, and to service of a copy of the final MAO herein. The Department reserves the right to enforce this MAO through appropriate administrative and judicial proceedings.

11. Regarding the schedule set forth in Paragraph 8.A., above, Permittee acknowledges that Permittee is responsible for complying with that schedule regardless of the availability of any federal or state grant moneys.

12. The terms of this MAO may be amended by the mutual agreement of the Department and Permittee.

13. The Department may amend the compliance schedule and conditions in this MAO upon finding that such modification is necessary because of changed circumstances or to protect public health and the environment. The Department shall provide Permittee a minimum of thirty (30) days written notice prior to issuing an Amended Order modifying any compliance schedules or conditions. If Permittee contests the Amended Order, the applicable procedures for conduct of contested cases in such matters shall apply.

14. This MAO shall be binding on the parties and their respective successors, agents, and assigns. The undersigned representative of each party certifies that he or she is fully authorized to execute and bind such party to this MAO. No change in ownership or corporate or partnership status relating to the facility shall in any way alter Permittee's obligations under this MAO, unless otherwise approved in writing by DEQ.

15. All reports, notices and other communications required under or relating to this

MAO should be directed to Robert Dicksa, DEQ Salem Regional Office, 750 Front St. N.E., Suite 120, Salem, Oregon 97301-1039, phone number 503-378-8240, extension 246. The contact person for Permittee shall be The City Manager, City of Philomath, 980 Applegate, P.O. Box 400, Philomath, OR 97370, phone number 541-929-6148.

16. Permittee acknowledges that it has actual notice of the contents and requirements of the MAO and that failure to fulfill any of the requirements hereof would constitute a violation of this MAO and subject Permittee to payment of civil penalties pursuant to Paragraph 8.C. above.

17. Any stipulated civil penalty imposed pursuant to Paragraph 8.C. shall be due upon written demand. Stipulated civil penalties shall be paid by check or money order made payable to the "Oregon State Treasurer" and sent to: Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204. Within 21 days of receipt of a "Demand for Payment of Stipulated Civil Penalty" Notice from the Department, Permittee may request a hearing to contest the Demand Notice. At any such hearing, the issue shall be limited to Permittee's compliance or non-compliance with this MAO. The amount of each stipulated civil penalty for each violation and/or day of violation is established in advance by this MAO and shall not be a contestable issue.

18. Providing Permittee has paid in full all stipulated civil penalties pursuant to Paragraph 17., above, this MAO shall terminate 60 days after Permittee demonstrates full compliance with the requirements of the schedule set forth in Paragraph 8.A. above.

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**PERMITTEE**

Jan 12, 2001
Date

Randy Kugler
City Manager

**DEPARTMENT OF ENVIRONMENTAL QUALITY**

1/17/01
Date

Kerri Nelson, Western Region Administrator

FINAL ORDER

IT IS SO ORDERED:

**ENVIRONMENTAL QUALITY COMMISSION**

1/17/01
Date

Kerri Nelson, Western Region Administrator
Department of Environmental Quality
Pursuant to OAR 340-11-136(1)

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## Water Quality Limited Streams Database
## Details for Waterbody Segment Record ID 8532

The table below provides details for **Record ID 8532**.

| Field | Details |
|---|---|
| **Waterbody Name** | Marys River |
| **Sub Basin Name** | UPPER WILLAMETTE |
| **HUC** | 17090003 |
| **LLID** | 1232609445565 |
| **River Mile** | 0 to 13.9 |
| **Parameter** | Dissolved Oxygen |
| **Criteria** | Spawning: 11 mg/L or 95% saturation |
| **Season** | October 1 - May 31 |
| **Listing Status** | 303(d) List |
| **Supporting Data** | LASAR 10373 RM 0.3: 54% (20/37 samples) < 11 mg/L and 95 % saturation. |
| **Sample Matrix Description** | Water Column |
| **List Date** | 2002 |
| **Beneficial Uses** | salmonid fish spawning |

For more information please contact Marilyn Fonseca by email at *fonseca.marilyn@deq.state.or.us* or by phone at (503) 229-6804.

*DEQ Online* is the official web site for the Oregon Department of Environmental Quality.

## Water Quality Limited Streams Database
## Details for Waterbody Segment Record ID 6055

The table below provides details for **Record ID 6055**.

| Field | Details |
|---|---|
| **Waterbody Name** | Marys River |
| **Sub Basin Name** | UPPER WILLAMETTE |
| **HUC** | 17090003 |
| **LLID** | 1232609445565 |
| **River Mile** | 0 to 13.9 |
| **Parameter** | Fecal Coliform |
| **Criteria** | Geometric Mean of 200, No more than 10%>400 |
| **Season** | Winter/Spring/Fall |
| **Listing Status** | 303(d) List |
| **Supporting Data** | DEQ Data (Site 402041; RM 0.2): 24% (11 of 45) FWS values exceeded fecal coliform standard (400) with a maximum value of 2400 between WY 1986 - 1995. City of Corvallis two sites 1996/97 showed no exceedence of E. coli standard of (406). |
| **Sample Matrix Description** | Water Column |
| **List Date** | 1998 |
| **Beneficial Uses** | water contact recreation |

For more information please contact Marilyn Fonseca by email at *fonseca.marilyn@deq.state.or.us* or by phone at (503) 229-6804.

*DEQ Online* is the official web site for the Oregon Department of Environmental Quality.

## Water Quality Limited Streams Database
## Details for Waterbody Segment Record ID 5920

The table below provides details for **Record ID 5920**.

| Field | Details |
|---|---|
| **Waterbody Name** | Marys River |
| **Sub Basin Name** | UPPER WILLAMETTE |
| **HUC** | 17090003 |
| **LLID** | 1232609445565 |
| **River Mile** | 0 to 13.9 |
| **Parameter** | Temperature |
| **Criteria** | Rearing: 17.8 C |
| **Season** | Summer |
| **Listing Status** | 303(d) List |
| **Supporting Data** | DEQ Data (Site 402041; RM 0.2): 85% (41 of 48) Summer values exceeded temperature standard (64) with exceedences each year and a maximum of 82.4 in WY 1986- 1995. |
| **Sample Matrix Description** | Water Column |
| **List Date** | 1998 |
| **Beneficial Uses** | resident fish and aquatic life<br>salmonid fish spawning<br>salmonid fish rearing<br>anadromous fish passage |

For more information please contact Marilyn Fonseca by email at *fonseca.marilyn@deq.state.or.us* or by phone at (503) 229-6804.

*DEQ Online* is the official web site for the Oregon Department of Environmental Quality.

**CITY OF PHILOMATH**
**Wastewater System Facilities Plan,**
**Philomath, Oregon**

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**November 2001 Sludge Survey Report**
**DEQ Approval Letter – November 2001 Sludge Survey Report**
**September 2002 Lagoon Leakage Test Report**
**August 2001 Mixing Zone Study Report**

# Appendix C

**WESTECH ENGINEERING, INC.**
CONSULTING ENGINEERS & PLANNERS

November 20, 2001

Mr. Jack Arendt
DEQ-Western Region
750 Front Street NE, Suite 120
Salem, OR 97301

RE: Philomath WWTP – South Lagoon Biosolids Survey
J.O. 960.3110.0

Dear Jack:

This letter and the attached supporting drawing are submitted on behalf of the City of Philomath and are intended to fulfill the requirements of Condition 1-C of Schedule B in the City's NPDES permit. This condition requires the City to perform a biosolids survey in the south lagoon (Cell #1). The remainder of this letter is divided into the following sections:

- Survey Methods.
- Survey Results and Discussion

Short discussions on these items follow.

**Survey Methods.**

Westech Engineering personnel performed a biosolids survey of the south lagoon on November 9, 2001. The survey was completed using a two-man crew in the boat and a surveyor on shore equipped with a total station. The sludge depth was measured at approximately 60 locations in the south lagoon. The highest concentration of survey points was taken in the immediate area around the inlet pipe coming from the Parshall flume. The remaining measurements were taken at representative locations around the lagoon to demonstrate the amount of sludge present in the lagoon. Personnel in the boat measured the depth from the water surface to both the top of the sludge blanket and floor of the lagoon at each location. The surveyor with the total station located on the shore of the lagoon determined the horizontal location of each sludge measurement point. Weather conditions during the survey period were dry with wind less than 5 mph.

**Survey Results and Discussion.**

The results of the sludge survey are as shown on the attached drawing. This drawing shows that there is a cone of sludge around the inlet pipe itself, but that the sludge depth decreases rapidly as the distance from the inlet pipe increases. This cone shaped sludge accumulation is typical of stabilization lagoons where the inlet pipe enters the lagoon in a vertical position. Review of the



3841 Fairview Industrial Dr. S.E., Suite 100, Salem, Oregon 97302
Phone: (503) 585-2474 Fax: (503) 585-3986

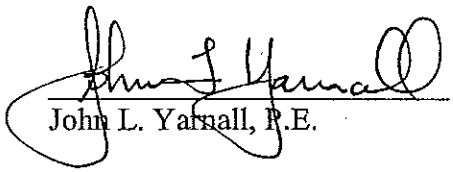
drawing shows that the accumulated depth of the sludge beyond about 75 feet from the inlet piping to be generally less than 0.5 feet in depth. The total volume of accumulated sludge in the lagoon is relatively small. Based upon our experience with other similar lagoon systems, we do not anticipate that the City will need to remove biosolids from the lagoons for at least 5-10 years.

The WWTP including the two stabilization lagoons was constructed in 1986. This is the first biosolids survey completed at the facility. The survey shows a relatively small accumulation of sludge around the inlet pipe which is typical. There is, however, very little accumulated sludge outside of the immediate area of the inlet pipe. Based upon the survey results and considering the survey represents 15 years of accumulated biosolids, there is little reason for the City to undertake an annual biosolids survey. Please consider this letter to be the City's formal request to change the frequency of the biosolids survey requirement from an annual occurrence to once each five (5) years as provided by Note 2 for Schedule B of the City's NPDES permit. The City requests that the Department provide a written response to this request within forty-five (45) days.

We hope this information is useful and that the Department now has sufficient information available to change the required frequency for the biosolids survey to five (5) years. Should you have questions regarding this letter, please do not hesitate to contact us at (503) 585-2474.

Sincerely,

**WESTECH ENGINEERING, INC.**



John L. Yarnall, P.E.

jly
enc.
cc: Mr. Beau Vencill, City of Philomath w/enc.

NORTH LAGOON

TOP OF FLUME
TBM ELEV = 259.60

TOP OF DIKE

WATER SURFACE (ELEV=251.8)

INLET/OUTLET STRUCTURE

SOUTH LAGOON

20" D.I. PIPE

INLET

+0.10

+0.20

+0.30

+0.40

+0.50

0.5

1.0

1.5

2.0

TOP OF DIKE

TOP OF DIKE

RAMP

WATER SURFACE (ELEV=251.8)

TOP OF DIKE

0 25 50 100
(feet)

SURVEYED 11-9-2001

## LEGEND

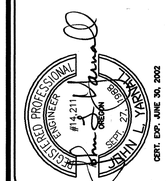
2.0 SLUDGE DEPTH CONTOURS (IN FEET)

+0.10 SPOT SURVEY SLUDGE DEPTH READINGS

| BY | DESCRIPTION | NO. | DATE |
|---|---|---|---|
| | REVISIONS | 1 | |

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
0 1"

DSN.
DRN. TMT
CKD. JLY
DATE NOV 2001




WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

CITY OF PHILOMATH

# WWTP - SOUTH LAGOON BIOSOLIDS SURVEY

SHEET 1 OF 1

JOB NUMBER 960.3110.0

Nov 14, 2001 - 11:11am
R:\Dwg\Philomath City of\WWTP BioSolids Survey 960.3110.0\Civil\SHEET1.dwg (Layout1 tab)

WWTP sludge survey, 2001

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Western Region - Salem Office
750 Front St. NE, Ste. 120
Salem, OR 97301-1039
(503) 378-8240
(503) 378-3684 TTY

December 3, 2001

Mr. Beau Vencill
City of Philomath
PO Box 400
Philomath, OR 97370

**RE: WQ-City of Philomath STP**
File No. 103468
Benton County
MAO WQ/M-WR-00-144 Condition 8A(2)
Approval – South Lagoon Biosolids Survey

Dear Mr. Vencill;

The Oregon Department of Environmental Quality (Department) has completed its review of the above referenced analysis as required per NPDES Permit 102060, Schedule B, Condition 1,c, Note 2. The study was received at the Salem office on November 21, 2001, and was submitted by Westech Engineering, Inc. Consulting Engineers. The following is a brief description of the report:

- Survey methods
- Survey Results and Discussion

Based on the results of the study, the Department concurs with the report conclusions. In accordance with Schedule B, Condition 1,c, Note 2, subsequent sludge measurements will be done on 5-year intervals unless observations or other indications warrant more frequent measurements or removal of biosolids. Please don't hesitate to contact me if you have any questions or need further assistance at (503) 378-8240, extension 240.

Sincerely,

Jack Arendt, R.G.
Senior Hydrogeologist
Western Region-Salem Office

WESTECH
DEC 04 2001
RECEIVED

JJA:clp
x:\jarendt\Sludge depth-app.doc

cc: John Yarnall, P.E.
Westech Engineering, Inc.
3841 Fairview Industrial Drive S.E., Suite 100
Salem Oregon 97302

**WESTECH ENGINEERING, INC.**
CONSULTING ENGINEERS & PLANNERS

September 4, 2002

Mr. Beau Vencill
Public Works Superintendent
PO Box 400
Philomath, OR 97370

RE: Philomath – WWTP Lagoon Leakage Test Results
J.O. 960.3010.0

Dear Beau:

This letter report and attached supporting information summarizes the results of the recent leakage test for the north and south lagoons at the WWTP. The remainder of this letter report is divided into the following sections.

- Background Information.
- Procedure/Methods.
- Test Results.
- Recommendations.

Short discussions on these items follow.

**Background Information.**

The City owns, operates and maintains the wastewater treatment plant (WWTP) located south of town. The WWTP consists of a headworks, two stabilization lagoons each about 20 acres in size, and disinfection facilities. The WWTP was constructed in the summer of 1986 and operates largely as originally constructed. To the best of our knowledge, lagoon leakage tests have never been conducted with the exception of initial tests performed as part of the initial construction work.

The best lagoon leakage test results are obtained when the number of variables is kept to a minimum. Under ideal conditions, each lagoon cell is tested independently with no effluent either added or removed from the cell during the test. This was the approach used in Philomath. Each lagoon was tested independently by diverting all plant flows to the lagoon not being tested. No discharge from the plant occurred during the test.



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Phone: (503) 585-2474 Fax: (503) 585-3986

**Procedures/Methods.**

The leakage tests were conducted with Westech and City personnel on the lagoons starting August 14th and concluding September 3rd. As stated above, no influent was sent to the subject lagoon during the test. No treated wastewater was removed from the lagoons during the test.

Equipment used for the test is as summarized below.

| | |
|---|---|
| ▪ Rain gauge | Nova Lynx Model 260-2531 rain gauge. |
| ▪ Class A Evaporation Pan | Nova Lynx Model 255-200 |
| ▪ Evaporation Pan Stilling Well | Nova Lynx Model 255-205 |
| ▪ Evaporation Pan Hook Gauge | Nova Lynx Model 255-214 |
| ▪ Lagoon Stilling Wells | 10-inch PVC w/ internal steel rulers |

Westech and City personnel set up the equipment. City WWTP operators took daily readings each day at approximately the same time. Westech personnel at the conclusion of the test period performed calculations and analysis. The water level in each of the lagoons was measured on a daily basis by reading the internally mounted steel rulers within the 10-inch PVC stilling wells mounted in the lagoons. The stilling wells in the lagoons are required to allow an accurate reading of the water surface elevation due to the presence of wind waves.

Precipitation during the test period for the north lagoon totaled 0.03 inches. There was no precipitation recorded during the test for the south lagoon. Because there was very little precipitation prior to and during the test, the dike soil and riprap was dry. For this reason, it was assumed that precipitation falling on the dike slope or roadway was adsorbed by soil and did not flow into the lagoons.

Evaporation was measured using a Class A evaporation pan on a wooden platform. A pan coefficient of 0.70 was used to determine the evaporation from the lagoons. A pan coefficient of 0.70 is at the lower end of the range for converting pan evaporation to lagoon evaporation. It was selected because of the relatively large size of the lagoons and because it results in the lowest evaporation rate (and thereby the highest seepage rate).

The average depth of the water in the lagoons during the test was approximately 4.5 feet. This is slightly lower than the average annual water level in the lagoons but is considered to be representative for testing purposes.

**Test Results.**

Table 1 shows the test data and calculated seepage rate for the North Lagoon. Review of the data shows that precipitation was recorded on only one day. Table 2 shows the test data and calculated seepage for the South Lagoon. The calculated average daily seepage rates from the north lagoon and the south lagoon are 0.049 inches and 0.011 inches respectively. This seepage rate is well below the Department of Environmental Quality's (DEQ) benchmark of 1/8" per day (0.125"/day) for sewage lagoons.

**Recommendations.**

Based upon the test results, the lagoons have a measured seepage rate well below the DEQ's benchmark of 0.125 inches per day. The testing to date verifies the adequacy of the existing natural lagoon liner, and no further leakage testing of the existing lagoons is warranted. The information obtained during the testing will be incorporated in the Facilities Plan.

Should you have any questions or need additional information regarding this matter, please contact us at (503) 585-2474.

Sincerely,

**WESTECH ENGINEERING, INC.**

John L. Yarnall, P.E.

jly
enc.

TABLE 1

CITY OF PHILOMATH
WWTP LAGOON LEAKAGE TEST REPORT FORM
NORTH LAGOON

| Date | Time | Rainfall (inches) | Hook Gauge Reading (inches) | Amount of Water Added to Pan | Stilling Well Staff Gauge Reading (Inches) | Lagoon Water Depth (to nearest 0.02 ft) | Lagoon Evaporation coef. = 0.7 (inches) | Lagoon Level Change (inches) | Seepage (inches) |
|---|---|---|---|---|---|---|---|---|---|
| 8/14/2002 | 11:25 AM | 0 | 4.31 | 0 | 29 7/8 | 4.44 | - | - | - |
| 8/15/2002 | 10:00 AM | 0 | 3.88 | 0 | 30 1/4 | 4.40 | 0.30 | -0.38 | 0.07 |
| 8/16/2002 | 9:45 AM | 0 | 3.52 | 0 | 30 5/8 | 4.38 | 0.25 | -0.38 | 0.12 |
| 8/17/2002 | 10:11 AM | 0 | 3.27 | 0 | 30 7/8 | 4.35 | 0.18 | -0.25 | 0.08 |
| 8/18/2002 | 9:37 AM | 0 | 2.90 | 0 | 31 | 4.33 | 0.26 | -0.13 | -0.13 |
| 8/19/2002 | 11:00 AM | 0 | 2.62 | 0 | 31 3/8 | 4.31 | 0.20 | -0.38 | 0.18 |
| 8/20/2002 | 11:00 AM | 0.03 | 2.42 | 0 | 31 7/16 | 4.30 | 0.17 | -0.06 | -0.08 |
| 8/21/2002 | 10:00 AM | 0 | 2.17 | 0 | 31 3/4 | 4.29 | 0.18 | -0.31 | 0.14 |
| 8/22/2002 | 11:00 AM | 0 | 2.01 | 0 | 31 7/8 | 4.27 | 0.11 | -0.13 | 0.01 |
| 8/23/2002 | 11:50 AM | 0 | 1.73 | 0 | 32 1/8 | 4.25 | 0.20 | -0.25 | 0.05 |

**Average Seepage (inches/day) = 0.049**

1. No water was discharged from the lagoon during the test period.
2. No water was added to the lagoon during the test period.

TABLE 2

CITY OF PHILOMATH
WWTP LAGOON LEAKAGE TEST REPORT FORM
SOUTH LAGOON

| Date | Time | Rainfall (inches) | Hook Gauge Reading (inches) | Amount of Water Added to Pan | Stilling Well Staff Gauge Reading (Inches) | Lagoon Water Depth (to nearest 0.02 ft) | Lagoon Evaporation coef. = 0.7 (inches) | Lagoon Level Change (inches) | Seepage (inches) |
|---|---|---|---|---|---|---|---|---|---|
| 8/23/2002 | 12:00 PM | 0 | 4.28 | 0 | 9 11/16 | 4.75 | - | - | - |
| 8/24/2002 | 12:00 PM | 0 | 4.00 | 0 | 9 7/8 | 4.73 | 0.20 | -0.19 | -0.01 |
| 8/25/2002 | 10:40 AM | 0 | 3.71 | 0 | 10 1/8 | 4.70 | 0.20 | -0.25 | 0.05 |
| 8/26/2002 | 11:00 AM | 0 | 3.55 | 0 | 10 1/4 | 4.70 | 0.11 | -0.13 | 0.01 |
| 8/27/2002 | 10:45 AM | 0 | 3.30 | 0 | 10 3/8 | 4.69 | 0.18 | -0.13 | -0.05 |
| 8/28/2002 | 11:40 AM | 0 | 3.02 | 0 | 10 7/16 | 4.68 | 0.20 | -0.06 | -0.13 |
| 8/29/2002 | 11:00 AM | 0 | 2.62 | 0 | 10 13/16 | 4.65 | 0.28 | -0.38 | 0.10 |
| 8/30/2002 | 10:00 AM | 0 | 2.33 | 0 | 11 1/8 | 4.64 | 0.20 | -0.31 | 0.11 |
| 8/31/2002 | 8:45 AM | 0 | 2.10 | 0 | 11 1/4 | 4.60 | 0.16 | -0.13 | -0.04 |
| 9/1/2002 | 9:24 AM | 0 | 1.92 | 0 | 11 3/8 | 4.59 | 0.13 | -0.13 | 0.00 |
| 9/2/2002 | 9:20 AM | 0 | 1.61 | 0 | 11 1/2 | 4.58 | 0.22 | -0.13 | -0.09 |
| 9/3/2002 | 11:00 AM | 0 | 1.33 | 0 | 11 7/8 | 4.57 | 0.20 | -0.38 | 0.18 |

**Average Seepage (inches/day) = 0.011**

1. No water was discharged from the lagoon during the test period.
2. No water was added to the lagoon during the test period.

**WESTECH ENGINEERING, INC.**
CONSULTING ENGINEERS & PLANNERS

August 30, 2001

**HAND DELIVERED**

Mr. Jack Arendt
DEQ-Western Region
750 Front Street NE, Suite 120
Salem, OR 97301

RE: Philomath WWTP Outfall
J.O. 960.310.0

Dear Jack:

This letter report and attached supporting information is submitted on behalf of the City of Philomath and is intended to fulfill the requirements of Condition 8A(2) of the City's Mutual Agreement Order (MAO WQ/M-WR-00-144) with the Department. The remainder of this letter report is divided into the following sections:

- Background Information.
- Field Work.
- Model Conditions.
- Model Results and Analysis.
- Selected Alternative and Schedule.

Short discussions on these items follow.

**Background Information.**

Discharge of treated effluent from the City's wastewater treatment plant (WWTP) is governed by the City's NPDES permit #102060 which has an expiration date of November 30, 2005. The operation of the WWTP is also governed in part by the MAO between the City and the Department. Condition 8A(2) of the MAO states that "by no later than September 1, 2001, the Permittee shall have performed the modeling and analysis for making improvements to the wastewater treatment facilities to comply with the final chlorine effluent limitation included in the Permit". The final effluent chlorine residual limits included in Schedule A of the Permit are 0.08 mg/l and 0.03 mg/l for a maximum daily and monthly average respectively. The Permit does contain language that these limits may be modified based upon work performed under the MAO requirements. The field work, modeling, discussion and analysis performed by the City and as described herein address how the chlorine standards will be met.



3841 Fairview Industrial Dr. S.E., Suite 100, Salem, Oregon 97302
Phone: (503) 585-2474 Fax: (503) 585-3986

The WWTP was designed and continues to operate as a summer holding winter discharge facility. Discharge of treated effluent to the Marys River is permitted November 1st through April 30th of each winter. No discharge to surface waters is permitted during the summer months. The WWTP includes two stabilization lagoons with a total water surface area of about 38 acres. The lagoons provide both treatment and storage of wastewater. Treated effluent is discharged to the Marys River through a 16-inch diameter ductile iron pipe with a single discharge port.

Like smaller unregulated rivers in the Willamette Valley, stream flow in the Marys River is very rainfall dependent. Stream flow is typically lowest during the early fall prior to the return of the winter rains. From a stream water quality standpoint, the worst case scenario occurs when the flow in the Marys River is low and the discharge rate from the WWTP is high. This case is most likely to occur during the month of November during a "dry" fall with below normal precipitation. The City performed stream flow measurements in early 1999 when the river was flowing about 780 cubic feet per second (cfs). Computer modeling using the CORMIX model was done at an assumed river flow of 450 cfs. This analysis showed the existing outfall with a discharge rate of 2.75 millions of gallons per day (mgd) and a chlorine residual of 0.5 mg/l did not satisfy the EPA limits for both acute and chronic toxicity (0.019 mg/l and 0.011 mg/l respectively). The analysis recommended additional field and modeling work be done at lower stream flow rates to determine if a multi-port diffuser together with a reduction in the chlorine residual could meet water quality standards under the low stream flow/high discharge rate scenario. The DEQ used this analysis together with their own modeling efforts as the basis for the MAO.

**Data Collection and Field Work.**

City and Westech personnel collected data used for computer modeling. Data sources utilized included the City's Discharge Monitoring Reports for the WWTP and Marys River pH and temperature as measured at the City's Water Treatment Plant intake (about 1 mile upstream of the WWTP outfall). Stream flow measurements, cross sections and velocity profiles were performed on March 20th and 28th of this year when the flows were estimated to be 330 and 450 cfs respectively. The cross sections, velocity profiles and photos are attached at the end of this letter report.

**Model Conditions.**

The computer model CORMIX was used to analyze the dilution achieved within the mixing zone. Cornell University developed CORMIX for the U.S. Environmental Protection Agency (EPA). CORMIX is an expert system that examines the hydrodynamic mixing of submerged discharges.

The CORMIX model uses several hydraulic parameters in calculating the effluent plume and corresponding dilution that result from a discharge to a receiving stream. The input parameters required include the following:

- Regulatory requirements including the standards for toxic substances and the regulatory mixing zone (RMZ).
- Receiving stream data including stream flow, temperature, and channel characteristics and effluent data including flow, temperature, and expected concentrations for pollutants of interest.
- Discharge design including port location, orientation, and size.

**Regulatory Requirements**

Regulatory requirements include standards for toxic substances like chlorine and ammonia, as well as the permitted RMZ.

***Standards for Toxic Substances***

The two toxic substances of concern for this mixing zone analysis are chlorine and ammonia. Standards for chlorine toxicity are included in the Oregon Administrative Rules Chapter 340 (OAR 340) Division 41. Standards for ammonia toxicity are regulated by the EPA and defined in the "Quality Criteria for Water 1986". Table 1 summarizes the standards for these substances. Concentration standards are shown in milligrams per liter (mg/l).

The EPA regulates the concentration of ammonia in receiving streams because of the toxicity of ammonia to fish. The EPA limits for ammonia concentrations are defined as acute toxicity, or one-hour average concentrations, and chronic toxicity, or four-day average concentrations. These limits depend on the temperature and pH of the receiving stream and whether or not salmonids are present in the stream. As stream temperature increases and as stream pH increases, ammonia concentration limits become more stringent. The worst-case condition for these parameters is believed to exist in early November. Table 1 shows the assumptions made with respect to the river for the development of the ammonia standards to be used in this analysis. These assumptions are based on City collected data and STORET data on the Mary's River provided by DEQ.

TABLE 1
TOXIC SUBSTANCE STANDARDS

| Substance | Stream Temperature | Stream pH | Salmonids Present | Standards (mg/l) | |
|---|---|---|---|---|---|
| | | | | Acute | Chronic |
| Chlorine | - | - | - | 0.019 | 0.011 |
| Ammonia | 12 degrees C | 7.5 | YES | 14.9 | 2.2 |

***Mixing Zone***

The RMZ for the City of Philomath discharge defines the zone within which chronic standards must be met. The RMZ is described in the current NPDES permit as the portion of the Mary's River not to exceed 100 feet downstream to 10 feet upstream and a width of 20 feet from the point of discharge. The zone of initial dilution (ZID) is often defined as 10 percent of the RMZ, or 10 feet downstream of the point of discharge based on the Philomath RMZ. The ZID represents the zone within which acute standards must be met.

**River and Effluent Data**

The river and effluent data used for the mixing zone analysis and the basis for this data are shown in Table 2 and in attached Spreadsheets 1-6. Flows are shown in cfs and mgd and velocities are shown in feet per second (fps).

It must be noted that mixing zone analyses typically consider the 7-day duration, 10-year frequency low flow (7Q10 low flow) stream flow for the worst-case design conditions. For this analysis, however, the 7Q10 low flow was not used because the 7Q10 low flow occurs in August when no discharge is allowed. The lowest stream flow conditions during the discharge period are most likely to occur during November and prior to the return of normal winter precipitation. Under these conditions, the 7Q10 is estimated to be slightly less than 20 cfs. This condition, however, is also not representative because it is DEQ's policy to request that WWTPs **not** discharge until the rains return and stream flow increases. The DEQ has done this at least once within the past 10 years, and the City complied with the request. It is important to note that the WWTP can continue to store effluent without discharging in such conditions because sanitary flows remain essentially constant, I/I flows are at their minimum and there is very little precipitation on the lagoons themselves. For the above reasons, the mixing zone analysis was based on conditions at or below average November flows (330 and 450 cfs), as indicated in Table 2.

TABLE 2
MARY'S RIVER AND WWTP EFFLUENT DATA

| Parameter | Analysis Data (3/28/01) | Analysis Data (3/20/01) | Basis for Analysis Data |
|---|---|---|---|
| Mary's River Flow | 450 cfs | 330 cfs | 450 cfs is the mean flow for the month of November. (1) |
| Mary's River Water Level | 235.6' | 234.2' | Approximation based on river flow. (2) |
| Mary's River Water Depth | 5.3 feet | 4.6 feet | Approximation based on river flow and water level. (3) |
| Mary's River Width | 57 feet | 54 feet | Approximation based on river flow and water level. (3) |
| Mary's River Velocity | 1.5 fps | 1.3 fps | Based on river flow, water level, water depth, and width. (4). |
| Mary's River Temperature | 12 degrees C | 12 degrees C | Difference between the river and effluent temperatures was assumed at 2 deg C (see effluent temperature below). |
| WWTP Effluent Flow | 2.75 mgd | 2.75 mgd | Capacity of the chlorine contact facility at the WWTP assuming 30 minutes contact time. |
| WWTP Effluent Temperature | 14 degrees C | 14 degrees C | Maximum assumed effluent temperature during November. (5) |
| WWTP Effluent Chlorine Residual | 1.2 mg/l | 1.2 mg/l | Maximum effluent chlorine residual. The average chlorine residual is ±0.40 mg/l. (5) |
| WWTP Effluent Ammonia Concentration | 20 mg/l | 20 mg/l | Maximum ammonia concentration out of the lagoons. Average ammonia concentration is ±10.4 mg/l |

1) From U.S. Geological Survey (USGS) Statistical Summaries of Stream flow Data in Oregon from 1941-1982 for the Mary's River near Philomath, OR, at River Mile 9.4, approximately one mile downstream of the Philomath outfall discharge point.
2) From field elevation measurements taken in March 2001 on the dates the stream flow measurements were taken.
3) From profile conducted for this analysis in March 2001. See the attached stream cross section and velocity profile information.
4) From CORMIX output.
5) From the 1999-2002 and 2000-2001 discharge season WWTP daily monitoring reports (DMRs).

## Model Results and Analysis.

### Model Results

CORMIX model results for the existing outfall configuration at both 330 and 450 cfs with varying chlorine residual and effluent ammonia concentrations are shown on Spreadsheets 1 and 2. These spreadsheets assume that the discharge rate from the WWTP is 2.75 mgd. Review of Spreadsheets 1 and 2 shows that ammonia limits are satisfied, but that chlorine limits for both acute and chronic toxicity are not met unless the chlorine residual is 0.05 mg/l. It is not feasible to achieve this chlorine residual and meet the E. coli limits unless the effluent is dechlorinated prior to discharge to the Marys River. In summary, discharge through the existing outfall configuration is not feasible under lower stream flow conditions unless the effluent is dechlorinated prior to discharge.

The use of a multi-port diffuser is a common method to enhance mixing. Spreadsheets 3 and 4 show the CORMIX model results under differing conditions assuming a discharge rate of 2.75 mgd and a stream flow of 330 cfs. Spreadsheet 3 assumes a 3-port diffuser while Spreadsheet 4 assumes that a 4-port diffuser will be used. Spreadsheet 5 is also based upon a stream flow of 330 cfs and a 3-port diffuser, but it assumes that the discharge rate from the WWTP is 1.0 mgd. The model results with differing ammonia concentrations and chlorine residuals are illustrated on Spreadsheets 3, 4 and 5. Review of the spreadsheets shows that ammonia does not present a problem under all conditions including effluent concentrations up to 20 mg/l. A review of the chlorine values, however, shows that acute chlorine toxicity remains a problem within the ZID for all chlorine residuals of 0.2 mg/l or greater including Spreadsheet 5 where the discharge rate was reduced to 1.0 mgd. The chlorine limits are met in all cases if the chlorine residual is 0.05 mg/l. The spreadsheets illustrate that the chlorine limits can not be realistically met using a multi-port diffuser under an assumed stream flow rate of 330 cfs unless the effluent is dechlorinated prior to discharge.

Spreadsheet 6 shows the CORMIX model results with a stream flow of 450 cfs and a 3-port diffuser. This spreadsheet assumes a discharge rate of 2.75 mgd from the WWTP. Review of the spreadsheet again shows that the ammonia limits are met, but that chlorine toxicity within the ZID remains a problem at chlorine residuals of 0.2 mg/l or greater.

### Discussion

The CORMIX model results demonstrate that the existing outfall will satisfy ammonia limits under low stream flow conditions (330 cfs), but that chlorine limits will not be met. The model results also show that the installation of a multi-port diffuser alone will not result in satisfactory

chlorine limits within the ZID under low stream flow conditions. If the treated effluent is dechlorinated prior to discharge such that the remaining chlorine residual is 0.05 mg/l or less, both chlorine and ammonia limits are met including with the existing single port outfall configuration.

The City desires to continue to discharge treated wastewater to the Marys River during the winter discharge season. Two potential alternatives exist to satisfy the chlorine toxicity requirements and fulfill the requirements as outlined in the MAO. The first alternative is to dechlorinate the effluent prior to discharge to the river. This technology is well established, would allow the existing outfall configuration to remain in its present configuration and would satisfy the chlorine toxicity requirements. Because of the relatively uniform discharge rate from the lagoons within a 24-hour period, the dechlorination system could be relatively simple. Under the dechlorination alternative, it is expected that discharge of treated wastewater could continue with little change from present operations. The second alternative would be operationally more complex and require close coordination with the Department to establish operating parameters. It would involve the installation of a multi-port diffuser with small diameter ports to enhance jet velocity into the river and only discharging under high stream flow conditions. The effluent chlorine residual would have to be closely managed to lower values than the City presently employs. Additionally, discharge from the WWTP under very high stream flow conditions would likely be restricted because of the reduced difference in water surface elevations between the water in the chorine contact chamber and the river. The reduced difference in water surface elevations would leave little available head to "force" effluent through the jets of the diffuser. Installation of the multi-port diffuser into the river would require an extensive and lengthy permitting process with local, state and federal agencies.

**Selected Alternative and Schedule.**

The City reviewed and discussed the two alternatives outlined above and decided to proceed with the dechlorination alternative. It is the City's intent to dechlorinate treated wastewater prior to discharge to the Marys River as the means to satisfy chlorine toxicity requirements. The existing single port outfall into the stream will remain in its present configuration. No work will be performed within the stream and as such no special permitting from the regulatory agencies for in-stream work is anticipated.

The City proposes to implement the dechlorination improvements within the schedule outlined in the MAO and as shown below in Table 3.

TABLE 3
PROPOSED IMPLEMENTATION SCHEDULE

| **Milestone** | **MAO Latest Completion Date** |
|---|---|
| DEQ Acceptance of this Letter Report | September 30, 2001 |
| Draft Engineering Plans & Specs. to DEQ | January 30, 2002 |
| Final Engineering Plans & Specs. to DEQ | April 30, 2002 |
| Construction Improvements Complete | September 30, 2003 |
| All Work Complete. WWTP in Compliance with NPDES Permit. | November 30, 2003 |

We hope this information is useful and demonstrates the City's commitment to improve its WWTP and protect water quality. Should you have questions regarding this letter report, please do not hesitate to contact us at (503) 585-2474.

Sincerely,

**WESTECH ENGINEERING, INC.**

John L. Yarnall, P.E.

jly
enc.
cc: Mr. Beau Vencill, City of Philomath w/enc.

# SPREADSHEET NO. 1

CITY OF PHILOMATH
MIXING ZONE ANALYSIS

CORMIX Results — Model File: PhExist330.cmx

Run Conditions:
- Existing outfall configuration
- Streamflow of 330 cfs (model calculates average velocity of 1.3 fps)
- Effluent flow rate of 2.75 mgd
- River temperature of 12 deg C and effluent temperature of 14 deg C

| Distance from Outfall | Regulatory Zone | CORMIX Dilution * | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 2.9 | | 2.8 | 4.1 | 6.9 | | 0.017 | 0.069 | 0.172 | 0.414 |
| 50 ft | | 7.9 | | 1.0 | 1.5 | 2.5 | | 0.006 | 0.025 | 0.063 | 0.152 |
| 100 ft | RMZ | 11.9 | | 0.7 | 1.0 | 1.7 | | 0.004 | 0.017 | 0.042 | 0.101 |
| 200 ft | | 32.4 | | 0.2 | 0.4 | 0.6 | | 0.002 | 0.006 | 0.015 | 0.037 |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | NO | NO | NO |

* CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume.

# SPREADSHEET NO. 2

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY OF PHILOMATH | | | | | | | | | | | |
| MIXING ZONE ANALYSIS | | | | | | | | | | | |
| | | | | | | | | | | | |
| CORMIX Results | | Model File: PhExist450.cmx | | | | | | | | | |
| | | | | | | | | | | | |
| Run Conditions: | | Existing outfall configuration | | | | | | | | | |
| | | Streamflow of 450 cfs (model calculates average velocity of 1.5 fps) | | | | | | | | | |
| | | Effluent flow rate of 2.75 mgd | | | | | | | | | |
| | | River temperature of 12 deg C and effluent temperature of 14 deg C | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | |
| Distance | Regulatory | CORMIX | | | | | | | | | |
| from Outfall | Zone | Dilution * | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 2.8 | | 2.9 | 4.3 | 7.1 | | 0.018 | 0.071 | 0.179 | 0.429 |
| 50 ft | | 7.4 | | 1.1 | 1.6 | 2.7 | | 0.007 | 0.027 | 0.068 | 0.162 |
| 100 ft | RMZ | 11.0 | | 0.7 | 1.1 | 1.8 | | 0.005 | 0.018 | 0.045 | 0.109 |
| 200 ft | | 16.4 | | 0.5 | 0.7 | 1.2 | | 0.003 | 0.012 | 0.030 | 0.073 |
| | | | | | | | | | | | |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | NO | NO | NO |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| * CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume. | | | | | | | | | | | |
| | | | | | | | | | | | |

# SPREADSHEET NO. 3

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY OF PHILOMATH | | | | | | | | | | | |
| MIXING ZONE ANALYSIS | | | | | | | | | | | |
| | | | | | | | | | | | |
| CORMIX Results | | Model File: PhMulti3-330.cmx | | | | | | | | | |
| | | | | | | | | | | | |
| Run Conditions: | | New outfall configuration with 3-port (each 6-inch) 9-foot diffuser added to end of existing outfall | | | | | | | | | |
| | | Streamflow of 330 cfs (model calculates average velocity of 1.3 fps) | | | | | | | | | |
| | | Effluent flow rate of 2.75 mgd | | | | | | | | | |
| | | River temperature of 12 deg C and effluent temperature of 14 deg C | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | | |
| Distance | Regulatory | CORMIX | | | | | | | | | |
| from Outfall | Zone | Dilution * | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 3.2 | | 2.5 | 3.8 | 6.3 | | 0.016 | 0.063 | 0.156 | 0.375 |
| 50 ft | | 17.3 | | 0.5 | 0.7 | 1.2 | | 0.003 | 0.012 | 0.029 | 0.069 |
| 100 ft | RMZ | 32.4 | | 0.2 | 0.4 | 0.6 | | 0.002 | 0.006 | 0.015 | 0.037 |
| 200 ft | | 39.8 | | 0.2 | 0.3 | 0.5 | | 0.001 | 0.005 | 0.013 | 0.030 |
| | | | | | | | | | | | |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | YES | NO | NO |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| * CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume. | | | | | | | | | | | |
| | | | | | | | | | | | |

# SPREADSHEET NO. 4

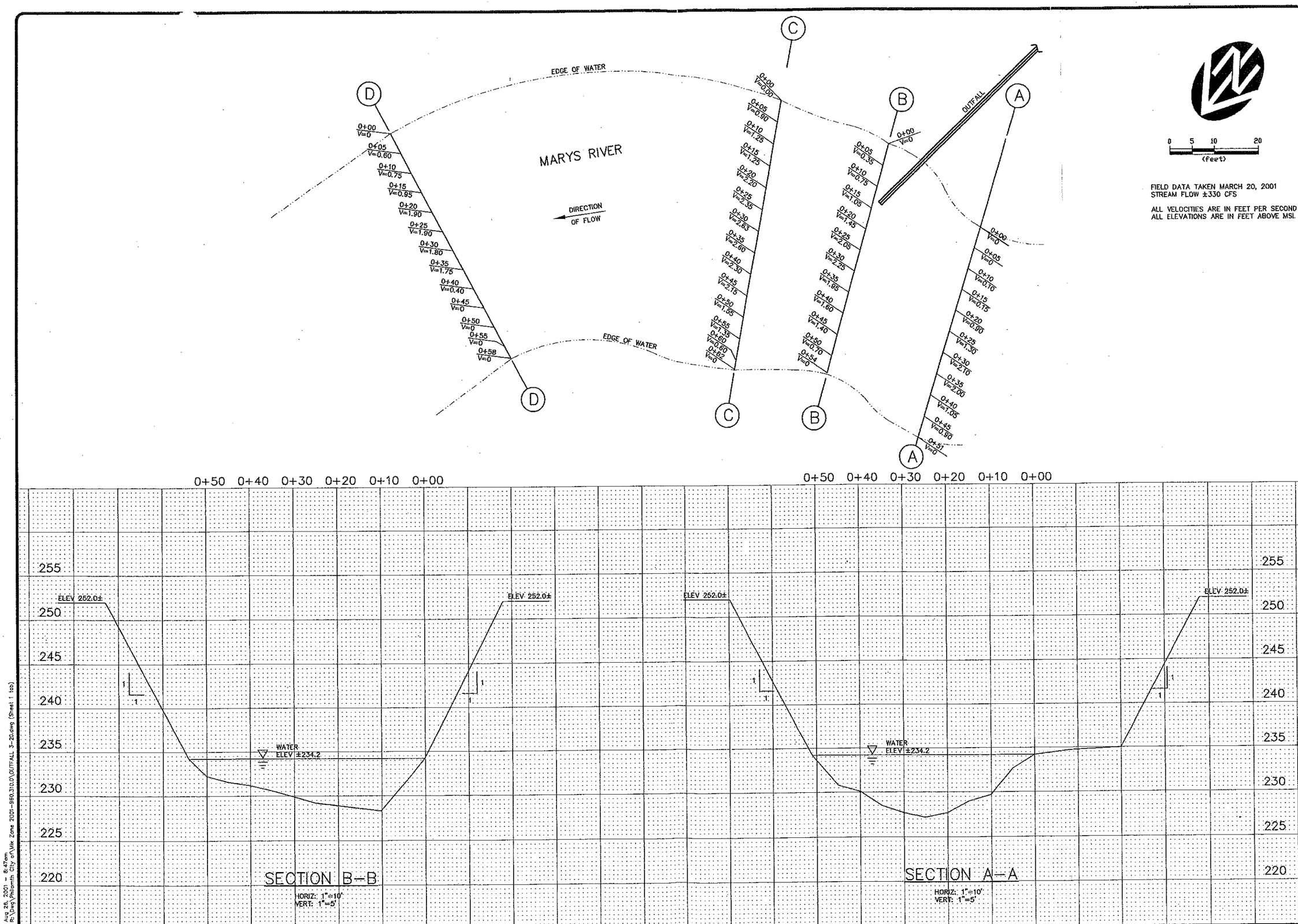
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY OF PHILOMATH | | | | | | | | | | | |
| MIXING ZONE ANALYSIS | | | | | | | | | | | |
| | | | | | | | | | | | |
| CORMIX Results | | Model File: PhMulti4-330.cmx | | | | | | | | | |
| | | | | | | | | | | | |
| Run Conditions: | | New outfall configuration with 4-port (each 6-inch) 12-foot diffuser added to end of existing outfall | | | | | | | | | |
| | | Streamflow of 330 cfs (model calculates average velocity of 1.3 fps) | | | | | | | | | |
| | | Effluent flow rate of 2.75 mgd | | | | | | | | | |
| | | River temperature of 12 deg C and effluent temperature of 14 deg C | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | | |
| Distance | Regulatory | CORMIX | | | | | | | | | |
| from Outfall | Zone | Dilution * | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 2.9 | | 2.8 | 4.1 | 6.9 | | 0.017 | 0.069 | 0.172 | 0.414 |
| 50 ft | | 14.7 | | 0.5 | 0.8 | 1.4 | | 0.003 | 0.014 | 0.034 | 0.082 |
| 100 ft | RMZ | 24.8 | | 0.3 | 0.5 | 0.8 | | 0.002 | 0.008 | 0.020 | 0.048 |
| 200 ft | | 32.5 | | 0.2 | 0.4 | 0.6 | | 0.002 | 0.006 | 0.015 | 0.037 |
| | | | | | | | | | | | |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | YES | NO | NO |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| * CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume. | | | | | | | | | | | |
| | | | | | | | | | | | |

# SPREADSHEET NO. 5

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY OF PHILOMATH | | | | | | | | | | | |
| MIXING ZONE ANALYSIS | | | | | | | | | | | |
| | | | | | | | | | | | |
| CORMIX Results | | Model File: PhMulti3-330a.cmx | | | | | | | | | |
| | | | | | | | | | | | |
| Run Conditions: | | New outfall configuration with 3-port (each 6-inch) 9-foot diffuser added to end of existing outfall | | | | | | | | | |
| | | Streamflow of 330 cfs (model calculates average velocity of 1.3 fps) | | | | | | | | | |
| | | Effluent flow rate of 1.00 mgd | | | | | | | | | |
| | | River temperature of 12 deg C and effluent temperature of 14 deg C | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | | |
| Distance | Regulatory | CORMIX | | | | | | | | | |
| from Outfall | Zone | Dilution * | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 2.7 | | 3.0 | 4.4 | 7.4 | | 0.019 | 0.074 | 0.185 | 0.444 |
| 50 ft | | 46.8 | | 0.2 | 0.3 | 0.4 | | 0.001 | 0.004 | 0.011 | 0.026 |
| 100 ft | RMZ | 88.3 | | 0.1 | 0.1 | 0.2 | | 0.001 | 0.002 | 0.006 | 0.014 |
| 200 ft | | 109.3 | | 0.1 | 0.1 | 0.2 | | 0.000 | 0.002 | 0.005 | 0.011 |
| | | | | | | | | | | | |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | YES | YES | YES |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| * CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume. | | | | | | | | | | | |
| | | | | | | | | | | | |

# SPREADSHEET NO. 6

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CITY OF PHILOMATH | | | | | | | | | | | |
| MIXING ZONE ANALYSIS | | | | | | | | | | | |
| | | | | | | | | | | | |
| CORMIX Results | | Model File: PhMulti3-450.cmx | | | | | | | | | |
| | | | | | | | | | | | |
| Run Conditions: | | New outfall configuration with 3-port (each 6-inch) 9-foot diffuser added to end of existing outfall | | | | | | | | | |
| | | Streamflow of 450 cfs (model calculates average velocity of 1.5 fps) | | | | | | | | | |
| | | Effluent flow rate of 2.75 mgd | | | | | | | | | |
| | | River temperature of 12 deg C and effluent temperature of 14 deg C | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Effluent Ammonia Conc. (mg/l) | | | | Chlorine Residual Conc. (mg/l) | | | | |
| Distance | Regulatory | CORMIX | | | | | | | | | |
| from Outfall | Zone | Dilution * | | 8 mg/l | 12 mg/l | 20 mg/l | | 0.05 mg/l | 0.2 mg/l | 0.5 mg/l | 1.2 mg/l |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 0 ft | | 1.0 | | 8.0 | 12.0 | 20.0 | | 0.050 | 0.200 | 0.500 | 1.200 |
| 10 ft | ZID | 3.1 | | 2.6 | 3.9 | 6.5 | | 0.016 | 0.065 | 0.161 | 0.387 |
| 50 ft | | 19.9 | | 0.4 | 0.6 | 1.0 | | 0.003 | 0.010 | 0.025 | 0.060 |
| 100 ft | RMZ | 35.3 | | 0.2 | 0.3 | 0.6 | | 0.001 | 0.006 | 0.014 | 0.034 |
| 200 ft | | 42.6 | | 0.2 | 0.3 | 0.5 | | 0.001 | 0.005 | 0.012 | 0.028 |
| | | | | | | | | | | | |
| Meets ZID Requirement? | | | 14.9 mg/l | YES | YES | YES | .019 mg/l | YES | NO | NO | NO |
| Meets RMZ Requirement? | | | 2.2 mg/l | YES | YES | YES | .011 mg/l | YES | YES | NO | NO |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| * CORMIX calculates dilution along the centerline of the plume and is the most conservation measurement within the plume. | | | | | | | | | | | |
| | | | | | | | | | | | |

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REVISIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DSN.
DRN. TMT
CKD. JLY
DATE:AUG 2001

REGISTERED PROFESSIONAL ENGINEER #14,211 OREGON JOHN L. YARNALL SEPT. 27, 1996
CERT. EXP. JUNE 30, 2002


WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com


CITY OF PHILOMATH
WWTP OUTFALL

# MARYS RIVER MIXING ZONE STUDY MARCH 20, 2001 DATA

SHEET 1 OF 2

JOB NUMBER 960.310.0

Aug 28, 2001 - 8:47am
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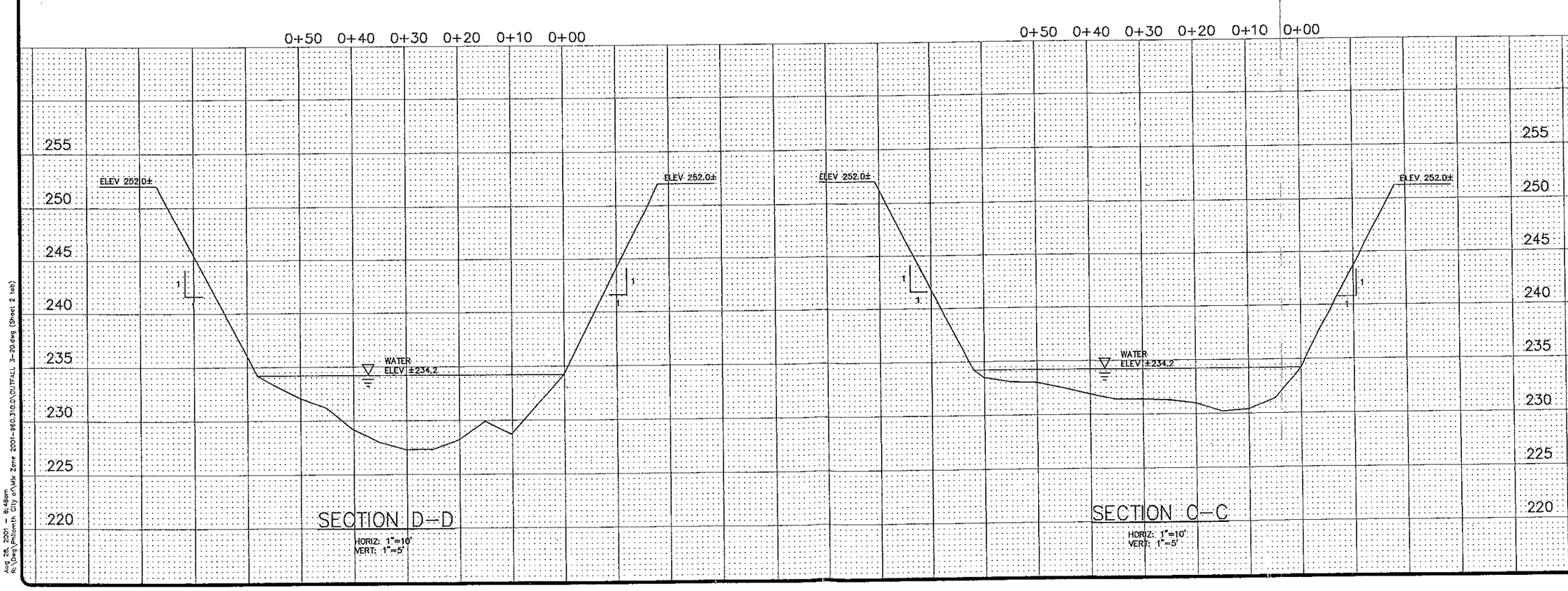


Aug 28, 2001 - 8:48am
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REVISIONS

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DRN. TMT
CKD. JLY
DATE:AUG 2001

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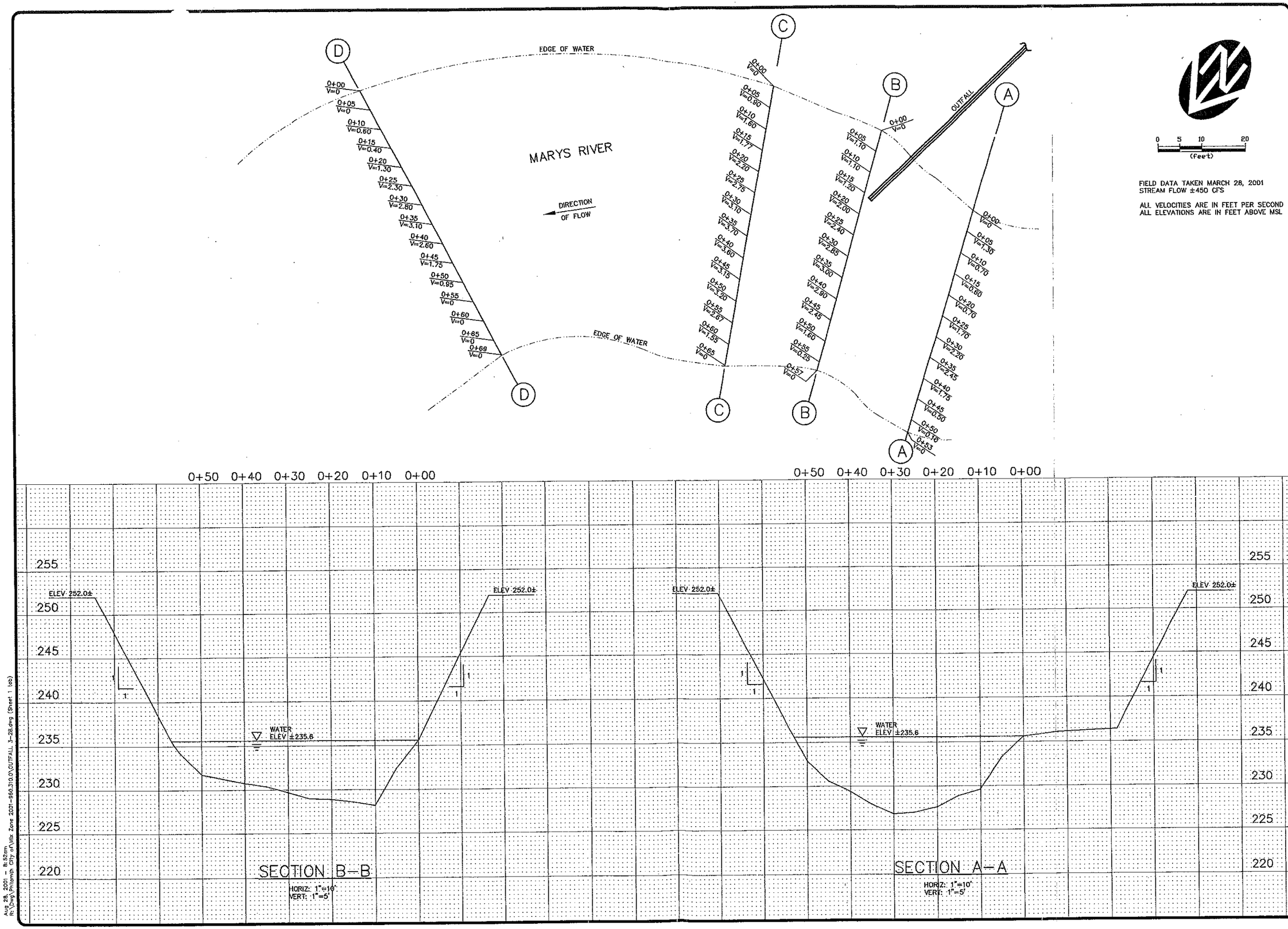
CITY OF PHILOMATH
WWTP OUTFALL

MARYS RIVER
MIXING ZONE STUDY
MARCH 20, 2001 DATA

SHEET
2 OF 2

JOB NUMBER
960.310.0

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DSN.
DRN. TMT
CKD. JLY
DATE: AUG 2001

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CITY OF PHILOMATH
WWTP OUTFALL

MARYS RIVER
MIXING ZONE STUDY
MARCH 28, 2001 DATA

SHEET 1 OF 2

JOB NUMBER
960.310.0

Aug 28, 2001 - 8:52am
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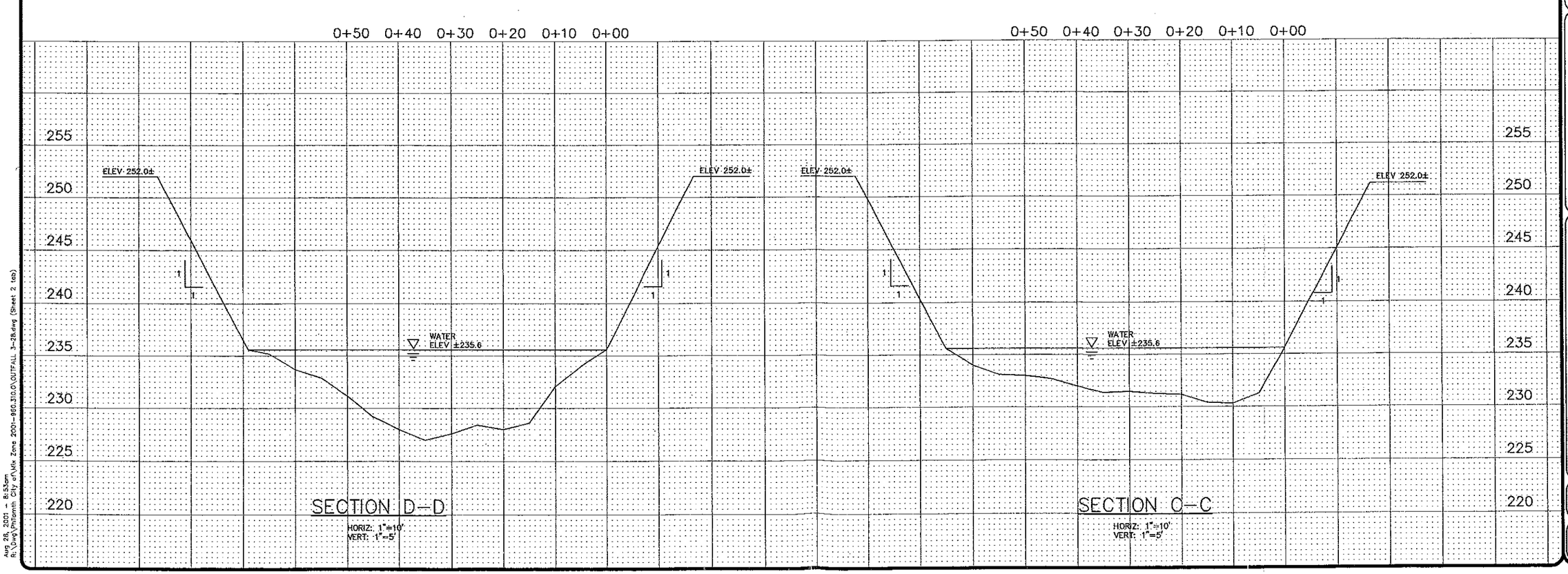


SECTION D–D

HORIZ: 1"=10'
VERT: 1"=5'



SECTION C–C

HORIZ: 1"=10'
VERT: 1"=5'

VERIFY SCALE
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DSN.
DRN. TMT
CKD. JLY
DATE:AUG 2001

| NO. | DATE | DESCRIPTION | BY |
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REVISIONS

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CITY OF PHILOMATH
WWTP OUTFALL

MARYS RIVER
MIXING ZONE STUDY
MARCH 28, 2001 DATA

SHEET
2 OF 2

JOB NUMBER
960.310.0

Aug 28, 2001 – 8:53am
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Philomath Sewer Ordinance No. 624
Philomath SDC Ordinance No. 601

# Appendix D

# ORDINANCE NO. 624

**AN ORDINANCE PRESCRIBING RULES AND REGULATIONS FOR THE USE AND BENEFITS OF THE SEWERAGE FACILITY OF THE CITY; PROVIDING FOR THE METHODS OF CHARGES FOR SEWERAGE SERVICES; THE INSTALLATION AND CONNECTION OF SEWERS AND THE DISCHARGE OF WATER AND WASTE INTO THE PUBLIC SEWER SYSTEM; PROVIDING PENALTIES FOR VIOLATIONS THEREOF; PROVIDING FOR THE DISPOSITION OF FUNDS COLLECTED FROM THE MONTHLY SEWER USE CHARGES; AND REPEALING ORDINANCES #500,540, AND 541, AS AMENDED.**

**THE CITY OF PHILOMATH ORDAINS AS FOLLOWS:**

**Section 1.** COMPANION ORDINANCE. This ordinance is a companion ordinance to the City of Philomath ordinance(s) that provide for System Development Charges.

**Section 2.** DEFINITION OF TERMS. Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

**APPLICANT:** A person, corporation, association or agency applying for sewer service.

**BOD (Biochemical Oxygen Demand):** The quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures in five (5) days at 20 degrees Celsius, expressed in milligrams per liter.

**BUILDING DRAIN:** That part of the lowest horizontal piping of a building drainage system which receives the discharge from soil, waste, and other drainage pipes within or adjoining the building or structures, and conveys the same to the building sanitary sewer.

**BUILDING SANITARY SEWER:** That part of the horizontal piping of a wastewater drainage system beginning five (5) feet or more from any building or structure, and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, individual sewage disposal system or other point of disposal.

**BUILDING STORM SEWER:** That part of the piping of a stormwater drainage system which begins at the connection to the building storm drain at a point five feet outside the established line of the building or structure, and conveys stormwater, surface water, and other unpolluted water to the public storm sewer, stream or other point of disposal.

**CITY or CITY OF PHILOMATH:** City of Philomath, a municipal corporation of the State of Oregon.

**CITY ENGINEER:** The City Engineer shall be the City's duly authorized agent as designated by the City Manager.

**COLLECTION SYSTEM:** Facilities maintained by the City of Philomath for collecting, pumping, conveying and controlling wastewater.

**COMBINED SEWER:** A sewer that is designed as both a sanitary sewer and a storm sewer.

**COMMERCIAL SERVICE/USER:** All buildings or premises used for any purpose other than a dwelling unit, having a sewage discharge of a kind, type and volume similar to a single-family dwelling unit or multi-unit residential structure, but not an industrial waste contributor.

**COUNCIL:** The City Council of the City of Philomath.

**CUSTOMER:** A property owner of record, agent of the owner, or tenant who receives service from the City is responsible for payment of charges/fees.

**DOMESTIC SEWAGE:** Wastewater of the type commonly introduced into a treatment works by residential users.

**DWELLING UNIT:** Includes each single-family dwelling unit used for human habitation.

**GARBAGE:** Solid wastes from the preparation, cooking and dispensing of food, and from the handling, storage and sale of produce.

**GRAB SAMPLE:** A wastewater sample which is taken from a waste stream on a one-time basis without regard to the flow in the waste stream and without consideration of time.

**INDUSTRIAL USER:** Any customer who discharges industrial wastewaters directly or indirectly into the City sewer system or discharges a significantly larger volume of wastewater than a single-family residence as determined by the City.

**INDUSTRIAL WASTEWATER:** Any non-domestic liquid, gaseous substance or semi-solid from any producing, manufacturing business or trade, or processing operation of whatever nature (as distinct from sanitary sewage), and the contents of chemical toilets, septic tanks, and wasteholding tanks.

**INFILTRATION:** Water that enters the sewerage system from the surrounding soil. Although generally limited to sewers laid below the normal groundwater level, infiltration also occurs as a result of rain or irrigation water soaking into the ground and entering sewers with defective pipes or joints.

**INFLOW:** Stormwater runoff that enters the sewerage system only during or immediately after rainfall.

**LATERAL SEWER:** Any side lateral off a sewer main line which is in the public right-of-way or easement, operated and maintained by the City and to which a building sewer connects or may connect.

**NATURAL OUTLET:** Any outlet into a watercourse, pond, ditch, lake, or other body of surface or groundwater.

**OPERATION AND MAINTENANCE:** Activities required to assure the dependable and economical function of treatment works.

1. Operation: Control of the unit processes and equipment which make up the treatment records, laboratory control, process control, safety and emergency operation planning.
2. Maintenance: Preservation of functional integrity and efficiency of equipment and structures. This includes preventive maintenance, corrective maintenance, and replacement of equipment.

**PERSON:** Any individual, company, enterprise, partnership, corporation, association, society or group; the singular term shall include the plural.

**pH:** The negative logarithm (base 10) of the hydrogen ion concentration. The concentration is the weight of hydrogen ions in moles per liter of solution. It is a measure of the acidity or alkalinity of the wastewater. Neutral water, for example, has a pH of 7 and a hydrogen concentration of 10.

**POLLUTANT:** Any spoil, waste, residue, sewage, garbage, sludge, munitions, chemicals, biological materials, radioactive materials, heat, rock, sand, dirt, soil, agricultural municipal, or industrial material discharged into water.

**POLLUTION:** The degradation of the chemical, physical, biological or radiological quality of ground, surface, subsurface, or storm drainage waters by man, or the activities thereof.

**PRIVATE COLLECTION SYSTEM:** A privately owned and maintained lateral sewer system installed to serve multi-unit structures on single ownership properties which cannot legally be further divided, such as apartments, mobile home parks, and schools. A single family residence with a detached garage or shop with sanitary facilities is exempt from this definition.

**PROPERLY SHREDDED GARBAGE:** The wastes from the preparation, cooking and dispensing of food that have been shredded to such degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than 1/2 inch in any dimension.

**PUBLIC SEWER:** Any sewer in the public right-of-way or easement operated and maintained by the City.

**PUBLIC WORKS DIRECTOR:** The Public Works Director for the City of Philomath or the City's authorized representative.

**RATE SCHEDULES:** The entire body of effective rates, rentals, charges and fees as established by the City Council.

**REPLACEMENT:** Obtaining and installing equipment, accessories, or appurtenances which are necessary during the design or useful life of the treatment works, whichever Is longer, to maintain the capacity and performance for which such works were designed and constructed.

**RESIDENTIAL USER:** The owner or leasee of a dwelling unit as defined in this ordinance. Said dwelling unit may be a single family dwelling, or a portion of a multi-family dwelling.

**SANITARY SEWER:** A conduit intended to carry liquid and water-carried wastes from residences, commercial buildings, industrial plants and institutions together with minor quantities of ground, storm and surface waters that are not admitted intentionally.

**SERVICE CHARGE (User Charge):** A charge levied on users of a treatment works for the user's proportionate share of the cost of operation and maintenance (including replacement) of such works.

**SEWAGE:** A combination of water-carried wastes from residences, business buildings, institutions and industrial establishments, together with such ground, surface and storm waters as may be present.

**SEWER:** A pipe or conduit for carrying either sewage and industrial wastewater, or storm and surface waters and drainage.

**SEWERAGE SYSTEM:** The entire sewage collection and treatment system, exclusive of building sewers. This includes all conduits, pumps, treatment equipment and any other components involved in the collection, transportation, treatment, and disposal of sanitary and industrial wastewater and sludge.

**SHALL:** is mandatory; **MAY** is permissive.

**SIDE SEWERS:** The City sewer between the property line and main or trunk sewer of the sewer system; also called a lateral sewer.

**STORM DRAIN:** That portion of the storm drainage system that is within the public right-of-way or easement operated and maintained by the City. This may include, but is not limited to pipes, culverts, ditches, waterways or any other appurtenances used for the removal or transportation of rainwater or other unpolluted water.

**STORM SEWER:** A sewer which carries storm and surface waters and drainage, but excludes sewage and industrial wastewater.

**SUSPENDED SOLIDS (SS):** The total suspended matter that either floats on the surface or is in suspension in water or wastewater, and that is removable by laboratory filtering.

**WASTEWATER:** Liquid or water-carried pollutants including any groundwater, surface water, and stormwater that may be present, whether treated or untreated, which is contributed into or permitted to enter the publicly owned treatment works.

**WATER USER:** Any person using water through the facilities of the municipal water systems.

**WATER COURSE:** A channel in which a flow of water occurs, either continuously or intermittently.

**Section 3.** SERVICE AREA: The area in which service may be furnished at the City's option includes all that territory within the corporate limits of the City and certain areas adjacent to or in reasonable proximity thereto.

**Section 4. DESCRIPTION OF SERVICE:**

**(A) CLASSES OF SERVICE:** All services installed by the City will be classified as follows:

(1) Residential - Single-family and multi-family units.

(2) Commercial - Industrial

(a) Standard Discharge Strength - all non-residential users with discharge strengths (BOD or SS) not exceeding 240 mg/liter of discharge flow.

(b) Non-Standard Discharge Strength - All non-residential users with discharge strengths (BOD or SS) in excess of 240 mg/liter.

(c) Industrial - Establishments discharging industrial wastewater, as defined in this ordinance.

**(B) SERVICE CHARGES:** A service (user) charge shall be set by the City Council upon all customers using the City sewer system.

**(C) FINANCIAL SELF-SUFFICIENCY:** The user charges shall be fixed at such amounts to assure the financial self-sufficiency of the sewerage system, and thereafter amended as necessary by resolution of the City Council.

**(D) RATE AND FEE STRUCTURE:** Sewer service rates for each of the respective customer classifications enumerated in Subsection (D) of this section shall be derived and calculated in accordance with the following standards and fixed by resolution of the City Council:

1) Residential - A monthly base fee plus a use charge based upon residential water consumption during winter months; during the summer months, the average monthly winter water consumption.
2) Standard Discharge Strength - The monthly base fee plus a unit charge per 100 cubic feet (748 gallons) of estimated sewage contribution based upon water consumption. Where the customer in this class can demonstrate to the satisfaction of the City that the volume of sewer discharge does not equal the water volume use because some or all of the water used is not being discharged into the sewer system, the City may determine the appropriate amount of charges based upon the City's estimate or actual amount of sewer discharge.
3) Non-Standard Discharge Strength - A monthly charge calculated in the same manner as for users in the Standard Discharge Strength class, plus an extra strength fee per unit of discharge based on measured or estimated sewage parameters as established by the City.
4) Industrial - A monthly charge calculated in the same manner as for users in the Non-Standard Discharge Strength class.

**(E) REVIEW AND REVISION OF RATES:** The sewer user charges established in Section 4(B) of this ordinance shall, as a minimum, be reviewed annually by the City Council of the City of Philomath, and shall be revised periodically to reflect actual costs of operation, maintenance, and replacement of the treatment works, and to maintain the equitability of the user charge with respect to distribution of the costs of operation and maintenance proportional to each user's contribution to the total wastewater loading of the treatment works. In conjunction with annual review of sewer user charges, the Public Works Director shall review and revise as appropriate the schedule of measured or estimated sewage parameters applicable to the Non-Standard Discharge Strength customer class.

**(F) NOTIFICATION:** Every customer will be notified, at least annually, in conjunction with a regular bill, of the rate and that portion of the user charges which are attributable to wastewater treatment services. On or before November 15th of each year, the City Manager shall post for public review at City Hall a listing of the sewage parameters and corresponding categories of business which serve as the basis for the derivation of extra strength fees for users in the Non-Standard Discharge Strength customer class as specified in Subsections (D) and (E) of this section.

**(G) APPEALS:** Any customer, regardless of customer classification, who believes their sewer user charge as applied to their premises is not within the intent of the foregoing provisions, may make written application to the Public Works Director within twenty (20) days of the date of billing requesting a review of their user charge. The written request shall, where necessary, show the actual or estimated average flow of the user's wastewater in comparison with the values upon which the charge is based, including how the measurements or estimates were made.

Review of the request shall be made by the Public Works Director. The Public Works Director shall respond within forty-five (45) days of the receipt of the appeal. If the customer desires to appeal further, they shall request in writing that the City place their appeal on the agenda of the next regular City Council meeting. The decision of the City Council shall be final. If the City Council determines that the user's charges shall be recomputed, based on approved revised flow and/or strength data, the new charges thus recomputed may be applied retroactively for a period of up to six (6) months.

**(J) ADJUSTMENTS OF SEWER CHARGES:** In the event of an underground leak in the waterline during a time when sewer charges are based on water usage, the Public Works Director may remove the portion of sewer charges appropriate if the customer demonstrates some or all the excess charges resulted from water that did not enter the sewage system. In this circumstance, the winter average water usage shall be appropriately adjusted.

**Section 5. APPLICATION FOR SERVICE:**

**(A) APPLICATION:** Each applicant for sewer service shall be required to complete and sign a form provided by the City.

**(B) INDIVIDUAL LIABILITY FOR JOINT SERVICE:** Two or more Customers who join to make application for service shall be jointly and individually liable and shall be sent a single periodic bill.

**(C) SPECIAL CONTRACTS:** Contracts, other than applications, may be required prior to service where, in the opinion of the City, special circumstances warrant special consideration.

**(D) CHANGES IN CUSTOMER'S EQUIPMENT:** Customers making any material change in size, character or extent of the equipment or operation utilizing sewer service shall immediately give the City written notice of the nature of the change.

**(E) SECURITY DEPOSIT.** A deposit in an amount deemed sufficient by the City Manager may be required of any person desiring service. A security deposit need not be made if the applicant has promptly paid all accounts due the City for a reasonable time in the past.

**(F) SEWER SERVICE ACCOUNT FEE.** Any new application for a sewer service account shall be charged a nonrefundable new account fee in an amount specified in the Rate Schedule in effect at the time of the application for service.

**(G) SEWER PERMITS.**

1) Permit Required. Before commencement of construction of building a sanitary sewer, the sewer user shall first obtain a written permit issued by the City Manager. The application for such permit shall be made on a form furnished by the City which shall be supplemented by any plans, specifications and other information as are deemed necessary by the City. A permit and inspection fee as set forth in this section shall be paid to the City at the time the application is filed.

2) Fees Set by Council. The permit and inspection fees shall be just and equitable charges that are set by resolution of the City Council.

3) Issue Subject to Approval of City Manager. The issuance of sewer permits is subject to the approval of the City Manager or his authorized representatives. Sewer permits may not be issued if the City Manager has determined that the nature of the wastewater can have detrimental effects on the treatment works.

**Section 6. PUBLIC POLICY.**

**(A) NO USE OUTSIDE CITY WITHOUT CONTRACT.** No use or benefits of the sewer system or sewage treatment plant of the City shall be extended to or made available to any property not within the corporate limits of the City, except under a contractual agreement.

1) Charges To Customers Outside The City: Any person having connection to the City sewerage system for property which is outside the corporate boundaries of the City of Philomath shall, in addition to the fees and charges for service called for in Section 4(B) of this ordinance, be charged monthly fees derived and calculated in accordance with the following standard and fixed by resolution of the City Council:
   - Fee In Lieu: A fee in lieu of property tax payments supporting principle and interest for the retirement of indebtedness associated with investment in capital facilities necessary to the sewerage system.
2) Application and Rates. The City reserves the right to act on each application for outside-the-city services on its merits without regard to any other past or present application or service. No application for sewer service will be allowed unless the recipient property owner agrees in writing to the annexation of the subject property to the City at such time as the City shall determine that such annexation is in the best interest of the City, unless the applicant applies in writing to the City Council for a waiver of this requirement and the application is granted. Such consent to annex shall be an irrevocable covenant running with the title to the land and shall be binding upon all heirs and assigns. If service is approved, the charge for service connections will be in accordance with the rate schedule for service connections in effect at the time of the application for outside-the-city services.

**(B) USE OF PUBLIC SEWERS REQUIRED.**

1) It shall be unlawful to discharge to any natural outlet within the City of Philomath, or in any area under the jurisdiction of said City, any sanitary sewage, industrial wastes or other polluted waters.

2) Except as hereinafter provided, it shall be unlawful to construct or maintain any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage.

3) The owner of all houses, buildings or properties used for human occupancy, employment, or other purposes situated within the City and abutting on any street, alley (easement), or right-of-way in which there is now located a sewer line of the City is hereby required to connect directly to the sewer line in accordance with the provisions of this ordinance at their expense within thirty (30) days after the date of official notice to do so, provided that said public sewer is within 170 feet of the property line.

4) Where a public sewer line is not available as specified in Section 6(B)3, a private sewage disposal system may be used if approved and installed in accordance with the State of Oregon Department of Environmental Quality or the authorized state department that has controlling jurisdiction. At such time as a public sewer becomes available, the private sewage disposal system shall be abandoned and filled in with fill material, and the sewer users sewer service connection shall be connected to the public sewer line.

5) All sewer lines, service laterals and Customer sewer service shall be installed in accordance with the provisions established by the Oregon State Department of Environmental Quality or the authorized state department that has controlling jurisdiction. In addition, all installations must be done in accordance with the City's standards.

**(C) WHEN USE IS NOT REQUIRED.** When charges are made in those instances where sewer service is not in fact furnished, but the service is available or abutting the property charged, said charges may be waived by the City. Application for such a waiver shall be made by the property owner to the Public Works Director stating fully the grounds for the application. Before a waiver of the sewer charge may be granted, the Public Works Director shall first determine:

1) that special topographical conditions affecting the property exist that are not common to all property in the area;

2) that such special topographical conditions would necessitate the installation and maintenance of pumps or other special equipment which will thereby increase the cost to other property owners in the area.

3) that the waiver of the sewer service complies with the spirit of these regulations and will not be detrimental to the public health, safety or welfare, or injurious to other properties in the vicinity;

The City shall act upon the application for waiver of sewer service charges within thirty (30) days after the filing thereof. If the City disapproves the application, it shall mail a notice of its action to the applicant forthwith.

Any person aggrieved shall have the right to appeal the decision of the Public Works Director to the City Council. The appeal shall be filed within ten (10) days after the decision of the Public Works Director. The appeal shall be considered at the next regularly scheduled City Council meeting. The decision of the City Council shall be final.

**Section 7. BILLS AND PAYMENTS.**

**(A) RESPONSIBILITY FOR PAYMENT.** The customer who signed the application for service shall be responsible for payment of all charges prescribed in this ordinance and set in the Rate Schedule. All sewer service charges shall be mailed to the premises where sewer service is furnished unless the customer requests, in writing, that the bill be submitted to another address.

**(B) RENDERING OF BILLS.**

1. Bills for sewer service will be rendered at the intervals provided in the Rate and Fee Schedule.

**(C) PAYMENT OF BILLS.**

1. All bills shall be due and payable on presentation. An account becomes delinquent if unpaid fifteen (15) days after date of billing. Payment may be made at the City's office or to an authorized collector. Interest may be charged and collected on delinquent accounts at a rate to be set by Council resolution.

2. Closing bills will be collected at the time of discontinuance of service.

3. When bills are delinquent, the City will follow the procedure outlined in Section 8 of this ordinance.

4. Any change in sewer user shall result in the new user paying the sewer use charges commencing from the date of change. Any new sewer service user shall commence paying the sewer use charges from the time of connection. The sewer base charges shall be pro-rated on a daily basis.

**Section 8. DELINQUENT ACCOUNTS.**

**(A) NOTICES TO CUSTOMERS.** All customer charges levied in accordance with this ordinance shall be a debt due the City. A notice of delinquent account shall be sent to each account which has not been paid by the 45th day after presentation of bill. All delinquent accounts may be collected in any lawful manner. Reasonable costs of collection may be added to the delinquent account.

**(B) DISPUTED BILLING.** If the customer disputes the accuracy of the billing, the customer shall present the objection within fifteen (15) days after the date of presentation of the bill. If the bill is found to be correct, payment must be made by the 15th day after notice to that effect is presented. Failure to file a notice of objection to the billing as specified above shall constitute a waiver of any defects in the bill and of the Customer's right to object.

**Section 9. NOTICES.**

**(A) NOTICES TO CUSTOMERS.** Notices required to be given by the City to a customer will be given in writing and may be either delivered or mailed to the customer personally, or delivered or mailed to the address at which service is rendered unless the customer has requested in writing that notices be mailed to a different address.

**(B) NOTICE FROM CUSTOMERS.** Notice from a customer to the City shall be given by the customer or their authorized representative in writing at the office of the City Finance Department.

**Section 10. DISCONTINUANCE OF SERVICE.**

**(A) NONPAYMENT OF BILLS.** A Customer's sewer service may be discontinued if the service bill is not paid in accordance with the procedures as listed in Section 8 of this ordinance.

**(B) FRAUD AND ABUSE.** The City shall have the right to refuse or to discontinue service to any premises to protect itself against fraud and abuse.

**(C) NONCOMPLIANCE.** The City may, unless otherwise provided, discontinue service to a customer for noncompliance with any of these regulations if the customer fails to comply with said regulations within seven (7) days after the City delivers written notice of the City's intention to discontinue service. If such noncompliance affects matters of health or safety or other conditions that warrant such action, the City may discontinue service immediately. The expense of such discontinuance, as well as the expense of restoring service, shall be a debt due the City and may be recovered by any lawful means.

**(D) CUSTOMER'S REQUEST FOR SERVICE DISCONTINUANCE.**

1) A customer may have the service discontinued by notifying the City at least five (5) days in advance of the desired date of discontinuance. The customer will be required to pay all sewer charges until the date of such discontinuance.

2) If notice is not given, the customer will be required to pay for service until the date the City has learned that the customer has vacated the premises or otherwise has discontinued service.

**(E) RECONNECTION CHARGE.** In all instances where service has been discontinued because of a delinquent account, a reconnection fee shall be charged in accordance with the rate and fee schedule for the restoration of service. In cases of extreme hardship, the City Manager shall have the discretion of waiving the reconnection fee or renewing service to a delinquent account upon receipt of a plan for the payment of back-due amounts in installments, or both.

**Section 11. SEWER CONNECTIONS.**

(A) No customer shall uncover, make any connections with, use, alter or disturb any public sewer or appurtenances without first obtaining a written permit from the City Manager. The written permit will not be issued until the Systems Development Charge has been paid to the City in accordance with the ordinances relating to a Systems Development Charge.

(B) All costs and expenses incident to the installation and connection of the building sanitary sewer shall be borne by the applicant for sewer service. The applicant shall indemnify the City from any loss or damage that may directly or indirectly be occasioned by the installation.

(C) Existing building sanitary sewers that connect to a Customer's building drain may be used in connection with new buildings only when they are found to meet all the requirements of this ordinance, when tested and examined by the City or its representative. A Systems Development Charge shall be charged in accordance with the City ordinance(s) relating to Systems Development Charges.

(D) The size and scope of the building sanitary sewer shall be subject to the approval of the City or its representative, but in no event shall the diameter be less than 4 inches. The slope of such 4 inch pipe shall not be less than 1/8 inch per foot.

(E) The connection of the service lateral into the public sewer line shall be made at a "Y" branch, if such a branch is available at a suitable location. If a "Y" branch is unavailable, the sewer user shall, at his expense, install a "Y" branch in the public sewer at the location specified by the City. A section of the sewer line shall be removed and a new section shall be installed with a tight seal being made between the existing sewer lines and the new section with the use of Calder couplings. In lieu of a "Y" branch and Calder couplings, the connection may be made utilizing an approved type of saddle.

The saddle shall be a Geneco Saddle or an approved equivalent. If PVC or Truss pipe is present in the existing system, a neat hole may be cut into the sewer line and a "Y" branch attached with glue may be utilized. The invert of the Customer's sewer service connection at the point of connection shall be at a higher elevation than the invert of the public sewer.

(F) The sewer user shall notify the City when the building sanitary sewer is ready for inspection and connection to the public sewer. The connection and installation shall be made in accordance with the City's standards and shall be inspected and approved by a State certified plumbing inspector.

(G) Whenever possible, the building sanitary sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any Customer's building drain is too low to permit gravity flow to the sewer line, sanitary sewage carried by such building drain connection shall be lifted and discharged to the building sanitary sewer by a method approved by the City.

(H) All installations of sewer lines and service laterals shall be adequately guarded with barricades and lights so as to protect the public from hazards. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the City.

(I) Once the sewer user is ready to discharge sewage into the sewer system, the sewer user shall pay all deposits and monthly sewer user fees as established by the City of Philomath resolution(s) that relate to monthly sewer user charges.

(J) All service lateral renovations or new installations shall be in accordance with City standards:

1) Utilize pipe and fittings meeting the following specifications:

   Cast iron, Class 150, ANSI 21.1
   Ductile iron, Class 50, ANSI 21.51
   PVC, SDR 35, ASTM 3034
   PVC, SDR 41, ASTM F789/D3212

2) Have a 4 inch cleanout readily accessible to City crews and conforming to City standard service lateral cleanout details.

Utilize no bends greater than 1/16 bends (22 1/2 degrees), unless a cleanout is installed immediately upstream.

**Section 12. SEWER RENOVATION.** Any Customer's building sanitary sewer connected to the sewer system outside of the City's right-of-way and within the bounds of the Customer's property which may be determined by the City to be causing infiltration of surface, storm or groundwater into the sewer system shall be repaired within sixty (60) days after the date of official notice to the legal property owner to do so. All costs for said repair shall be borne by the customer.

Before being covered, each repair must be inspected and approved in writing by a State certified plumbing inspector and by the City.

All storm sewers, including building storm sewers, which are on private property that connect directly to the building sanitary sewer shall be disconnected and properly capped upon receiving a thirty (30) day notice from the City.

The City reserves the right to enter private property for the purpose of testing the building sanitary sewer and/or building drain outside of the City's right-of-way. Damage to landscaping, etc., that is caused during the testing of the building sanitary sewer and building drain shall be repaired by the City at the City's expense.

If the customer fails to correct such infiltration, be it surface, storm or groundwater, within the prescribed time limit, the building sanitary sewer and/or building drain pipe shall be declared non-conforming and five (5) times the monthly user charge shall be assessed until the building sanitary sewer and/or building drain piping is brought into compliance. The City may also elect to enter such property and make the necessary repair or correction and cause such expenses to become a lien upon the property, which lien shall become due and payable upon entry in the lien docket. It shall be the duty of the City to attempt to serve, by certified or registered mail, a written notice upon the owner of the property at the time said lien is entered on the City lien docket, which notice shall state the amount of the lien and give the property owner notice that said lien will be deemed delinquent if not paid within sixty (60) days after the date the lien was entered on the City lien docket. If the owner fails to pay the lien within sixty (60) days after entry of the lien on the lien docket, the City shall have the right to enforce or foreclose the lien in the manner prescribed for by ORS 223.510, ORS 223.610, or in any other manner provided by law or City ordinance.

**Section 13. THE USE OF THE PUBLIC SEWERS.**

(A) No sewer user shall discharge or cause to be discharged any stormwater, surface water, groundwater, roof runoff, cooling water or unpolluted industrial process waters into any sanitary sewer.

(B) Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers, or to a natural outlet approved by the City.

(C) Except as hereinafter provided, no customer shall discharge or cause to be discharged any of the following discharge waters or wastes into any public sewer:

1) Any liquid vapor having a temperature higher than 150 degrees F.

2) Any water or waste which may contain more than 200 parts per million, by weight, fat, oil, or grease.

3) Any gasoline, benzene, naphtha, fuel oil or other flammable or other explosive liquid, solid or gas.

4) Any garbage that has not been properly shredded.

5) Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure, or any other solid or viscous substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works.

6) Any waters or wastes having a pH lower than 5.5 or higher than 9.0 or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the sewage system.

7) Any waters or wastes containing toxic or poisonous solids, liquids, or gases in sufficient quantity, either singly or by interaction with other wastes to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, create a public nuisance, or create any hazard in the receiving waters of the sewage treatment plant.

8) Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant.

9) Any noxious or malodorous gas or substance capable of creating a public nuisance.

10) Any solids, liquids or ashes which may, by themselves, or by interaction with other substances, cause fire or explosive hazards, or in any other way be injurious to person, property or the operation of the plant sewage system or sewage disposal plant.

11) Any waters or wastes having a five day biochemical oxygen demand greater than 240 mg/1.

(D) To insure that industrial wastes are not discharged to the City's sewer system that may produce an unusual or deleterious effect on the sewer system or sewer treatment plant, review and approval by the City of Philomath shall be obtained prior to the discharge to the sewer system of said wastes by an industrial user.

(E) When required by the City, the sewer users served by the City's sewer system whose building sanitary sewer carries industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances in the building sanitary sewer to facilitate observation, sampling and measurement of the wastes. Such manhole, when required, shall be accessibly and safely located, and shall be constructed in accordance with plans approved by the City. The manhole shall be installed by the sewer user at his expense, and shall be maintained by him so as to be safe and accessible at all times.

(F) All measurements, tests, and analyses of the characteristics of waters and wastes to which reference is made in this ordinance shall be determined in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association, and shall be determined at the control manhole provided, or upon suitable samples taken at said control manhole.

In the event that no special manhole has been required, the control manhole shall be considered to be the nearest downstream manhole in the public sewer to the point at which the service lateral is connected.

(G) If any waters or wastes are discharged, or are proposed to be discharged to the sewer system, which waters contain the substances or possess the characteristics enumerated in subsection (C) of this section and which in the judgment of the City may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters, or which otherwise create a hazard to life or constitute a public nuisance, the City may:

1) Reject the wastes;
2) Require pretreatment to an acceptable condition of discharge to the public sewers;
3) Require control over the quantities and rates of discharge; and/or,
4) Require additional sewer use charges to cover the added cost of handling and treating the wastes not covered by the sewer use charges established by the City.

If the City permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the City, and subject to the requirements of all applicable codes, ordinances and laws.

(H) Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation by the sewer user at his expense.

(I) No statement contained in this section shall be construed as preventing any special agreement or arrangement between the City and an industrial concern whereby an industrial waste of unusual strength or character may be accepted by the City for treatment, subject to payment therefore, by the industrial concern.

**Section 14. POWERS AND AUTHORITY OF INSPECTOR.**

(A) Duly authorized employees of the City shall be permitted to enter all properties for the purpose of inspection, observation, measurement, sampling and testing and enforcement in accordance with the provisions of this ordinance.

(B) All entry and subsequent work, if any, shall be done observing all safety rules applicable to the individual situation and shall not infringe upon the rights or privileges of a person, corporation, firm, association, or partnership which owns the property which uses and receives the benefit of the City's sewer system.

**Section 15. PENALTIES.**

(A) Any person violating any provision of this ordinance shall be served by the City with written notice stating the nature of the violation and providing a reasonable time limit for satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violations.

(B) Any customer who shall continue any violation beyond the time limit provided for in subsection (A) shall be guilty of a misdemeanor and, upon conviction thereof, shall be fined in an amount not exceeding $2,500 for each violation. Each day in which any such violation shall continue shall be deemed a separate offense.

(C) Any sewer user violating any of the provisions of this ordinance shall become liable to the City for any expense, loss or damage occasioned the City by reason of such violation.

**Section 16. SEVERABILITY.** It is hereby declared to be the legislative intent of the City Council that if any provision, sentence, clause, section or part of this ordinance is held illegal, invalid or unconstitutional or inapplicable to any person or circumstance, such illegality, invalidity, unconstitutionality or inapplicability shall not affect or impair any of the remaining provisions, sentences, clauses, sections or parts of this ordinance or their application to other persons and circumstances.

**Section 17. REPEAL.** Ordinances # 500, 540 and 541, as amended, are repealed.

**Section 18. SAVINGS CLAUSE.** The repeal of ordinances by Section 17 of this ordinance shall not preclude collection of costs or fees charged under those ordinances, nor shall it preclude any action against a person who violated those ordinances prior to the effective date of this ordinance.

PASSED by the City Council this 8th day of August, 1994.

APPROVED by the Mayor this 8th day of August, 1994.

Van O. Hunsaker

Van O. Hunsaker, Mayor

ATTEST: Terri J. Phillips

Terri J. Phillips, City Recorder

# ATTACHMENT B
# City of Philomath
# UTILITY FEES
## Multi-Residential / Commercial / Industrial
### Effective July 1, 2002

**Water Rates:**

- Base charge:
  - Multi-Residential — $ 12.00 x # of units x 50% discount
  - Commercial / Industrial:
    - 5/8" / 3/4" meter — $ 13.10
    - 1" meter — $ 18.65
    - 1 1/2" meter — $ 31.60
    - 2" meter — $ 50.65
    - 3" meter — $102.40
- Volume charge per unit of water consumed:
  - Multi-Family — $ 1.60
  - Commercial — $ 2.12
  - Industrial — $ 1.45

**Sewer Rates:**

- Base charge:
  - Standard — $ 10.00
  - Multi-unit residential — $ 10.00 x # of units x 50% discount
- Volume charge per unit of water consumed:
  - Multi-Residential — $ 1.80
  - Commercial and Industrial — $ 1.91
  - Customers without metered water — $ 14.40

Sewer unit charges for commercial, industrial, and multi-residential customers are billed based on actual water usage. Customers who irrigate may request summer averaging.

**Storm Drain Fee**

All customers within the City limits are charged a monthly fee for maintenance and repair of storm sewer facilities. Commercial, industrial and multi-residential rates are calculated based on the square footage of impervious surface.

| Square feet of impervious surface | Monthly Fee |
|---|---|
| 0-3000 | $ 1.50 |
| 3,001-6,000 | $ 3.00 |
| 6001-9,000 or Triplex | $ 4.50 |
| 9,001-12,000 | $ 6.00 |
| 12,001-15,000 | $ 7.50 |
| 15,001-18,000 | $ 9.00 |
| 18,001-28,000 | $ 10.50 |
| 28,001-38,000 | $ 12.00 |
| 38,001-48,000 | $ 13.50 |
| 48,001-70,000 | $ 15.00 |
| 70,001-100,000 | $ 16.50 |
| 100,001-200,000 | $ 25.00 |
| 200,001-500,000 | $ 48.00 |
| 500,001-1,000,000 | $ 75.00 |
| 1,000,001-2,000,000 | $100.00 |

***One (1) unit = 100 cubic feet = 748 gallon***

# SCHEDULE A

2003

| Water Meter Size | Sewer SDC | | Water SDC | |
|---|---|---|---|---|
| | Improvement | Reimbursement | Improvement | Reimbursement |
| ¾" | $942 | $404 | $1,224 | $525 |
| 1" | $1,338 | $574 | $1,737 | $744 |
| 1½" | $2,270 | $973 | $2,949 | $1,282 |
| 2" | $3,636 | $1,558 | $4,723 | $2,024 |
| 3" | $7,348 | $3,149 | $9,542 | $4,090 |

| Street SDC | | Storm SDC | Park SDC |
|---|---|---|---|
| Improvement | Reimbursement | $902 | $571 |
| $1,503 | $741 | | |

ORDINANCE #601

AN ORDINANCE ESTABLISHING SYSTEMS DEVELOPMENT CHARGES, REPEALING ORDINANCES #556 AND #570, AND DECLARING AN EMERGENCY.

THE CITY OF PHILOMATH ORDAINS AS FOLLOWS:

Section 1. Findings. The Council hereby finds:

A. The Systems Development Charge established herein is intended to be a charge upon the act of development by whomever seeks the development. It is a fee for service because it contemplates the development will receive essential municipal services based upon the nature of the development. It is within the control and discretion of the developer to determine the extent of the development and when it occurs.

B. The Systems Development Charge imposed by this ordinance is not intended to be a tax on property or on a property owner as a direct consequence of ownership of property within the meaning of Section 11b, Article XI of the Oregon Constitution or the legislation implementing that section.

C. Even if the Systems Development Charge herein imposed is viewed under Section 11b, Article XI of the Oregon Constitution as a tax against property or against a property owner as a direct consequence of ownership of that property, it is an incurred charge within the meaning of that section and the statutes implementing it because:

1. It allows the owner to control the quantity of the service by determining the extent of development to occur upon the property.

2. It allows the owner to determine when the service is to be initiated or increased by controlling when the development occurs.

3. State law and the ordinances of this city require the owner to provide certain basic utility services to the property when it is developed for human occupancy. The provision of these basic utility services are a routine obligation of the owner of the affected property and essential to the health and safety of the community.

4. Among the basic utility services required of every property with a structure designed for human occupancy, except ancillary buildings, are water and sanitary sewer services.

5. The Systems Development Charge imposed by this ordinance is based upon the actual costs of providing existing or planned-for capital improvements and does not impose charges on persons not receiving a service and imposing a burden upon the city's existing capital improvements.

D. The size and geography of the city are such that the community is to be considered as an integrated whole. Improvements to the sewer, water, drainage and parks systems will benefit new development wherever it occurs. Development is not limited to one section of town, but may occur anywhere. Improvements are best dealt with on a priority basis, rather than regionally.

Section 2. Definitions. As used in this ordinance, except where the context otherwise requires, the words and phrases have the following meaning:

Capital Improvements: Facilities or assets used for any of the following:

1. Water supply, treatment, and distribution, including storage;
2. Sanitary sewers, including collection, transmission, treatment and disposal;
3. Storm sewers, including drainage and flood control;
4. Transportation, including, but not limited to, streets, sidewalks, bike paths, street lights, traffic control devices, street trees, public transportation, vehicle parking, and bridges;
5. Parks and recreation, including, but not limited to, mini-neighborhood parks, neighborhood parks, community parks, metropolitan parks, and other recreational facilities.

Development: The act of conducting a building or mining operation, or making a physical change in the use or appearance of a structure or land, which increases the usage of any capital improvements or which creates the need for additional capital improvements.

Improvement Fee: A fee for costs associated with capital improvements to be constructed after the date this ordinance becomes effective.

Qualified Public Improvements: A capital improvement that is:

1. Required as a condition of residential development approval;
2. Identified in the plan adopted pursuant to subsection 6.2; and
3. Not located on or contiguous to a parcel of land that is the subject of the development approval. As used in this definition, "contiguous" means in a public way which abuts.

Reimbursement Fee: A fee for costs associated with capital improvements constructed or under construction on the effective date of this ordinance.

Systems Development Charge: A reimbursement fee, an improvement fee, or a combination thereof assessed or collected at any of the times specified in Section 7 hereof. It shall also include that portion of a water or sanitary sewer connection charge that is greater than the amount necessary to reimburse the city for its average cost of inspecting and installing connections with the water system or the sanitary sewer system. "Systems Development Charge" does not include:

1. any fees assessed or collected as part of a local improvement district;
2. a charge in lieu of a local improvement district assessment; or
3. the cost of complying with requirements or conditions imposed upon a land use decision.

Section 3. Purpose. The purpose of the Systems Development Charge is to impose a portion of the public cost of capital improvements upon those developments that create the need for or increase the demands on capital improvements.

Section 4. Scope. The Systems Development Charge imposed by this ordinance is separate from and in addition to any applicable tax, assessment, charge, fee in lieu of assessment, or fee otherwise provided by law or imposed as a condition of development. A Systems Development Charge is to be considered in the nature of a charge for service to be rendered or a service hookup charge.

Section 5. Systems Development Charge Established.

A. Unless otherwise exempted by the provisions of this ordinance or other local or state law, effective July 1, 1991, a Systems Development Charge is hereby imposed upon all new development within the city, and all development outside the boundary of the city that connects to or otherwise uses the water or sanitary sewer systems of the city.

B. When the Council determines to establish a Systems Development Charge for any capital improvements, it shall do so by Council resolution.

Section 6. Compliance with State Law.

A. The revenues received from the Systems Development Charges shall be deposited to the Systems Development Fund, budgeted and expended as provided by State law. The accounting of such revenues and expenditures required by State law shall be included in the City's annual financial audit required by ORS Chapter 294.

B. The capital improvement plans required by State law as the basis for expending revenues from the improvement fee of the Systems Development Charge shall be the Plan for Capital Improvements to the Sanitary Sewer System of the City of Philomath; the Plan for Capital Improvements to the Water System of the City of Philomath; the Plan for Capital Improvements to the Parks and Recreation System of the City of Philomath; the Plan for Capital Improvements to the Surface Water Drainage System of the City of Philomath; and the Plan for Capital Improvements to the Transportation System of the City of Philomath.

Section 7. Collection of Charge.

A. The Systems Development Charge is payable upon issuance of a permit which allows connection to the water or sanitary sewer systems or which will cause or allow increased usage of any capital improvements.

B. If development is commenced or connection is made to the water system or sanitary sewer system without an appropriate permit, the Systems Development Charge is immediately payable upon the earliest date that a permit was required.

C. The City Manager or the City Manager's designee shall collect the Systems Development Charge from the person responsible for or receiving the benefit of the development. The City Manager or the City Manager's designee shall not issue any permit or allow connection described in subsection 7.A until the charge has been paid in full or until provision for installment payments has been made within the limits prescribed in subsection 7.D.

D. The unpaid Systems Development Charge and interest thereon shall constitute a lien against the parcel of land with the same priority as a local improvement lien and subject to collection and foreclosure as a local improvement lien. An applicant for installment payments as provided for by Council resolution shall have the burden of demonstrating the applicant's authority to assent to the imposition of the lien on the parcel of land.

Section 8. Credits.

A. When development occurs that must pay a Systems Development Charge under Section 5 herein, the Systems Development Charge for the existing use shall be calculated and if it is less than the Systems Development Charge for the proposed use, the difference between the Systems Development Charge for the existing use and the Systems Development Charge for the proposed use shall be the Systems Development Charge required under Section 5. If the change in use results in the Systems Development Charge for the proposed use being less than the Systems Development Charge for the existing use, no Systems Development Charge shall be required; however, no refund or credit shall be given.

B. The limitations on the use of credits contained in this subsection shall not apply when credits are given under subsection (C) of this section. A credit shall be given for the cost of a qualified public improvement associated with a residential development. If a qualified public improvement is located partially on and partially off the parcel of land that is the subject of the approval, the credit shall be given only for the cost of the portion of the improvement not located on or wholly contiguous to the parcel of land. The credit provided for by this subsection shall be only for the improvement fee charged for the type of improvement being constructed and shall not exceed the improvement fee even if the cost of the capital improvement exceeds the applicable improvement fee.

C. When establishing the methodology, the Council may provide for a credit against the improvement fee, the reimbursement fee, or both, for a capital improvement constructed as part of the development that reduces the development's demand upon existing public capital improvements or the need for future public capital improvements or that would otherwise have to be constructed at City expense under the then-existing Council policies.

D. Credit shall not be transferable from one type of capital improvement to another.

Section 9. Appeal Procedures.

A. A person aggrieved by a decision made by the City Manager or the City Manager's designee under Sections 5 through 8 or a person challenging the propriety of an expenditure of Systems Development Charge revenues may appeal the decision or the expenditure by filing a written request with the City Recorder's office for consideration by the City Council. Such appeal shall describe with particularlity the decision or the expenditure from which the person appeals and shall comply with subsection (C) of this section.

B. An appeal of an expenditure must be filed within two years of the date of alleged improper expenditure. Appeals of any other decision must be filed within fifteen (15) days of the date of the decision.

C. The appeal shall state:

(a) the name and address of the appellant;
(b) the nature of the determination being appealed;
(c) the reason the determination is incorrect; and
(d) what the correct determination of the appeal should be.

An appellant who fails to file such a statement within the time permitted waives his/her objections, and his/her appeal shall be dismissed.

D. Unless the appellant and the City agree to a longer period, an appeal shall be heard within twenty-one (21) days of the receipt of the notice of intent to appeal. At least seven (7) days prior to the hearing, the City shall mail notice of the time and location thereof to the appellant.

E. The City Council shall hear and determine the appeal on the basis of the appellant's written statement and any additional evidence the Council deems appropriate. At the hearing the appellant may present testimony and oral argument personally or by counsel. The rules of evidence as used by courts of law do not apply.

F. The appellant shall carry the burden of proving that the determination being appealed is incorrect and what the correct determination should be.

G. The City Council shall issue a written decision within twenty (20) days after the hearing date and that decision shall be final.

Section 10. Prohibited Connection. No person may connect to the sanitary sewer, the water system, or storm sewer system of the City unless the appropriate Systems Development Charge has been paid or the installment payment method has been applied for and approved.

Section 11. Repeal. Ordinances #556 and #570 are hereby repealed.

Section 12. Emergency. Whereas the peace, health, and safety of the people of the City of Philomath require that this ordinance shall become effective July 1, 1991; therefore, an emergency is declared to exist and this ordinance shall become efective July 1, 1991 upon its final passage by the Council and approval by the Mayor.

PASSED by the Council this 24 day of June, 1991.

APPROVED by the Mayor this 25 day of June, 1991.

Van O. Hunsaker
Van O. Hunsaker, Mayor

ATTEST: Terri J. Phillips
Terri J. Phillips, City Recorder

**CITY OF PHILOMATH**
**Wastewater System Facilities Plan,**
**Philomath, Oregon**

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**Philomath WWTP DMR Summary**

# Appendix E

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Appendix E: Philomath WWTP DMR Summary

Philomath Sanitary Sewer Facitilities Plan
JO 960.3130.0

8-May-03

| | Influent | | | | | | | Total Evap. | Rainfall at CVO | Total Rainfall at Plant | Misc Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average Daily Flow (mgd) | Peak Daily Flow (mgd) | Minimum Daily Flow (mgd) | Average Temp (deg. C) | Average pH | Average TSS (mg/L) | Average TSS (ppd) | nches) | (inches) | (inches) | |
| Jan-97 | 1.555 | 4.464 | 0.714 | | | 19.500 | 252.890 | | 9.080 | 8.210 | |
| Feb-97 | 0.883 | 1.600 | 0.713 | | | 217.000 | 1598.036 | | 2.200 | 2.150 | |
| Mar-97 | 1.353 | 2.614 | 0.718 | | | 98.700 | 1113.733 | | 6.430 | 6.260 | |
| Apr-97 | 0.824 | 2.044 | 0.556 | | | 181.000 | 1243.861 | | 3.600 | 3.530 | |
| May-97 | 0.558 | 0.910 | 0.408 | | | 188.000 | 874.899 | 4.482 | 2.200 | 2.902 | |
| Jun-97 | 0.485 | 0.728 | 0.391 | | | 168.000 | 679.543 | 5.530 | 2.420 | 1.291 | |
| Jul-97 | 0.400 | 0.607 | 0.226 | | | 198.500 | 662.196 | 9.320 | 0.380 | 0.260 | |
| Aug-97 | 0.410 | 0.575 | 0.267 | | | 247.000 | 844.592 | 8.690 | 1.250 | 1.300 | |
| Sep-97 | 0.479 | 0.853 | 0.329 | | | 189.000 | 755.029 | 2.080 | 3.390 | 3.420 | |
| Oct-97 | 0.680 | 1.700 | 0.348 | | | 148.000 | 839.338 | | 5.500 | 6.400 | |
| Nov-97 | 0.942 | 2.366 | 0.366 | 16.542 | 7.150 | 144.000 | 1131.385 | 0.000 | 5.180 | 5.410 | |
| Dec-97 | 1.040 | 3.148 | 0.502 | 14.429 | 7.143 | 113.000 | 980.360 | 0.000 | 3.020 | 4.450 | |
| Jan-98 | 1.546 | 2.658 | 0.624 | 13.400 | 6.946 | 114.000 | 1470.120 | 0.000 | 9.050 | 10.040 | |
| Feb-98 | 1.520 | 3.610 | 0.830 | 14.200 | 6.860 | 112.000 | 1419.802 | 0.000 | 7.700 | 8.100 | |
| Mar-98 | 1.210 | 3.140 | 0.580 | 14.400 | 6.970 | 109.000 | 1099.963 | 0.000 | 6.690 | 5.940 | |
| Apr-98 | 0.650 | 1.010 | 0.420 | 15.310 | 7.090 | 201.500 | 1092.332 | 0.000 | 1.830 | 1.460 | |
| May-98 | 0.770 | 1.440 | 0.450 | 17.700 | 6.930 | 195.000 | 1252.251 | 1.050 | 5.800 | 4.710 | |
| Jun-98 | 0.470 | 0.670 | 0.310 | 19.680 | 6.980 | 117.000 | 458.617 | 5.230 | 0.970 | 0.790 | |
| Jul-98 | 0.380 | 0.500 | 0.300 | 22.260 | 6.890 | 184.000 | 583.133 | 1.090 | 0.100 | 0.000 | |
| Aug-98 | 0.370 | 0.530 | 0.280 | 23.080 | 6.930 | 184.000 | 567.787 | 3.460 | 0.000 | 0.000 | |
| Sep-98 | 0.350 | 0.450 | 0.250 | 22.120 | 6.990 | 186.000 | 542.934 | 5.580 | 0.880 | 0.920 | |
| Oct-98 | 0.380 | 0.520 | 0.260 | 19.320 | 7.020 | 224.000 | 709.901 | 1.740 | 3.790 | 2.050 | |
| Nov-98 | 1.310 | 3.390 | 0.380 | 16.070 | 6.820 | 181.000 | 1977.497 | 0.000 | 12.800 | 12.410 | |
| Dec-98 | 1.470 | 4.160 | 0.510 | 13.610 | 6.730 | 92.000 | 1127.902 | 0.000 | 10.400 | 9.370 | |
| Jan-99 | 1.550 | 3.130 | 0.600 | 12.780 | 6.530 | 62.500 | 807.938 | 0.000 | 9.670 | 10.040 | |
| Feb-99 | 2.000 | 4.030 | 0.770 | 11.950 | 6.420 | 249.500 | 4161.660 | 0.000 | 12.610 | 12.470 | |
| Mar-99 | 1.230 | 2.470 | 0.560 | 13.490 | 6.720 | 105.000 | 1077.111 | 0.000 | 5.310 | 4.790 | |
| Apr-99 | 0.740 | 1.270 | 0.430 | 14.740 | 6.690 | 170.000 | 1049.172 | 2.300 | 1.070 | 0.790 | |
| May-99 | 0.550 | 0.830 | 0.330 | 17.230 | 7.030 | 191.000 | 876.117 | 5.230 | 1.990 | 1.940 | |
| Jun-99 | 0.390 | 0.630 | 0.230 | 20.090 | 6.820 | 168.000 | 546.437 | 5.390 | 0.820 | 0.830 | |
| Jul-99 | 0.420 | 0.550 | 0.310 | 21.480 | 6.550 | 247.000 | 865.192 | 3.080 | 0.060 | 0.100 | |
| Aug-99 | 0.430 | 0.560 | 0.290 | 22.590 | 6.680 | 194.000 | 695.723 | 5.270 | 0.350 | 0.530 | |
| Sep-99 | 0.390 | 0.530 | 0.260 | 22.180 | 6.950 | 256.000 | 832.666 | 3.170 | 0.070 | 0.010 | |
| Oct-99 | 0.430 | 1.390 | 0.240 | 8.230 | 7.173 | 235.000 | 842.757 | 2.260 | 2.920 | 2.410 | |
| Nov-99 | 0.930 | 3.530 | 0.370 | 16.220 | 7.150 | 197.000 | 1527.971 | 0.000 | 8.990 | 7.810 | |
| Dec-99 | 1.390 | 2.970 | 0.500 | 13.260 | 6.730 | 114.500 | 1327.353 | 0.000 | 5.940 | 7.150 | |
| Jan-00 | 1.530 | 3.280 | 0.790 | 11.410 | 6.780 | 86.500 | 1103.757 | 0.000 | 8.130 | 8.770 | |
| Feb-00 | 1.370 | 2.470 | 0.840 | 12.230 | 6.690 | 76.500 | 874.074 | 0.000 | 6.340 | 5.950 | |
| Mar-00 | 0.960 | 2.020 | 0.390 | 13.510 | 6.890 | 145.700 | 1166.532 | 0.000 | 3.640 | 2.830 | |
| Apr-00 | 0.580 | 0.740 | 0.410 | 16.780 | 7.170 | 198.500 | 960.184 | 5.300 | 1.630 | 1.460 | |
| May-00 | 0.660 | 1.640 | 0.450 | 17.760 | 7.180 | 166.000 | 913.730 | 4.890 | 2.990 | 2.520 | |
| Jun-00 | 0.500 | 0.850 | 0.340 | 20.800 | 7.280 | 276.000 | 1150.920 | 7.690 | 1.220 | 1.170 | |
| Jul-00 | 0.400 | 0.530 | 0.290 | 21.880 | 7.040 | 208.000 | 693.888 | 7.950 | 0.160 | 0.170 | |
| Aug-00 | 0.380 | 0.460 | 0.240 | 22.860 | 6.930 | 214.000 | 678.209 | 7.250 | 0.020 | 0.010 | |
| Sep-00 | 0.400 | 0.640 | 0.250 | 22.280 | 6.970 | 219.000 | 730.584 | 5.220 | 0.640 | 1.390 | |
| Oct-00 | 0.450 | 0.670 | 0.230 | 20.070 | 7.140 | 255.000 | 957.015 | 2.130 | 2.970 | 2.490 | |
| Nov-00 | 0.450 | 1.030 | 0.240 | 16.570 | 7.360 | 270.000 | 1013.310 | 0.210 | 2.770 | 2.500 | |
| Dec-00 | 0.730 | 1.940 | 0.280 | 13.460 | 7.080 | 202.000 | 1229.816 | 0.000 | 4.410 | 4.980 | |
| Jan-01 | 0.620 | 0.990 | 0.310 | 13.310 | 7.360 | 202.000 | 1044.502 | 0.000 | 1.600 | 2.570 | |
| Feb-01 | 0.650 | 1.020 | 0.420 | 13.120 | 7.620 | 228.000 | 1235.988 | 0.000 | 1.200 | 1.760 | |
| Feb-01 | 0.680 | 1.460 | 0.450 | 13.250 | 7.080 | 195.000 | 1105.884 | 1.750 | 2.850 | 3.090 | |
| Mar-01 | 0.540 | 0.730 | 0.380 | 15.360 | 7.630 | 206.000 | 927.742 | 2.800 | 2.330 | 1.810 | |
| May-01 | 0.470 | 0.880 | 0.300 | 18.350 | 7.460 | 194.000 | 760.441 | 3.190 | 1.110 | 1.030 | |
| Jun-01 | 0.420 | 0.910 | 0.270 | 19.750 | 7.300 | 272.000 | 952.762 | 3.080 | 2.020 | 1.730 | |
| Jul-01 | 0.390 | 0.540 | 0.250 | 21.840 | 7.410 | 228.000 | 741.593 | 3.390 | 0.280 | 0.250 | |
| Aug-01 | 0.340 | 0.470 | 0.200 | 22.070 | 7.060 | 233.000 | 660.695 | 7.460 | 0.960 | 0.640 | |
| Sep-01 | 0.340 | 0.480 | 0.240 | 21.420 | 7.170 | 230.000 | 652.188 | 3.700 | 0.540 | 0.620 | |
| Oct-01 | 0.540 | 1.250 | 0.240 | 19.890 | 7.290 | 267.000 | 1202.461 | 2.230 | 3.090 | 3.380 | |
| Nov-01 | 1.200 | 3.620 | 0.350 | 16.260 | 7.350 | 167.000 | 1671.336 | 0.220 | 8.230 | 9.530 | |
| Dec-01 | 1.550 | 3.600 | 0.660 | 12.250 | 7.100 | 70.000 | 904.890 | 0.000 | 9.340 | 8.830 | |
| Jan-02 | 1.600 | 3.420 | 0.670 | 11.420 | 7.190 | 100.500 | 1341.072 | 0.000 | 9.180 | 9.610 | |
| Feb-02 | 1.100 | 2.970 | 0.640 | 13.450 | 7.330 | 141.000 | 1293.534 | 0.000 | 3.770 | 3.250 | |
| Mar-02 | 1.320 | 2.750 | 0.620 | 12.770 | 7.160 | 157.000 | 1728.382 | 0.060 | 5.640 | 6.060 | |
| Apr-02 | 0.570 | 1.000 | 0.340 | 14.890 | 7.600 | 122.000 | 579.964 | 1.920 | 1.850 | 1.920 | |

Citizens Guide to 4(d) Rule for Threatened Salmon & Steelhead Trout of the West Coast (EAS 4(d) Rules for Pacific Salmon)

# Appendix F

# A Citizen's Guide to the 4(d) Rule

# For

# Threatened Salmon and Steelhead on the West Coast

National Marine Fisheries Service
Northwest and Southwest Regions
June 20, 2000

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# Introduction

In June 2000, the National Marine Fisheries Service (NMFS) adopted a rule prohibiting the "take" of 14 groups of salmon and steelhead listed as threatened under the Endangered Species Act (ESA). NMFS adopted the take rule under section 4(d) of the ESA. This rule prohibits anyone from taking a listed salmon or steelhead, *except* in cases where the take is associated with an approved program. The 4(d) rule approves some specific existing state and local programs, and create a means for NMFS to approve additional programs if they meet certain standards set out in the rule.

State and local governments, tribes and others throughout the Northwest have stepped forward and assumed leadership roles in saving these species. Efforts include the Oregon Plan for Salmon and Watersheds, the State of Washington's Extinction is Not an Option Plan, Metro's Functional Plan, the Puget Sound Tri-County Initiative, the Lower Columbia Fish Recovery Board, the Eugene, Oregon-area Metro ESA Coordinating Team, and the Willamette Restoration Initiative. NMFS believes it is these local efforts that will ultimately save the salmon. A central goal of this 4(d) rule is to encourage such state and local efforts by providing the means for NMFS to approve local efforts and limit liability under the ESA.

# Background

## Purpose of this Guide

This *Citizen's Guide to the 4(d) Rule* introduces and explains the rule. It complements the final rule published in the *Federal Register* in June of 2000 by providing a more user-friendly description of why the rule is needed, what it contains, how it will affect citizens, and how to get more information. This Guide is not binding Federal language or regulation. Individuals should refer to the Federal register notice for the regulatory language governing activities under the rule.

## Salmon in Decline

In 1994, in response to growing concerns about salmon health on the West Coast, NMFS began the most thorough scientific review of Pacific salmon ever undertaken. The review looked at salmon and steelhead from desert-like areas in California to coastal rain forests, and from the high mountains of central Idaho to lowland basins within sight of the Pacific Ocean. The review identified 52 distinct populations, known as Evolutionarily Significant Units (or ESUs) of Pacific salmon in Oregon, Washington, Idaho, and California. Of these populations, 26 have been listed as threatened or endangered under the ESA and most others are in decline or at very low levels.

These populations of salmon and steelhead are likely to become endangered species within the foreseeable future and their current threatened status cannot be explained by ocean cycles or other natural events. NMFS has concluded that these species are at risk of extinction primarily due to human activities. Salmon and steelhead populations have been depleted by over-fishing, past and ongoing habitat destruction, hydropower development, hatchery practices, degraded water quality and other causes.

**Chum Salmon:** Populations are down throughout Oregon and Washington. Summer-run chum have disappeared from many Hood Canal streams, and numbers in the Columbia Basin have declined to less than one percent of their former abundance.

**Chinook Salmon:** Only two of 13 different stocks in Puget Sound are considered healthy. Only slightly more an 1,000 fish return annually to the entire Willamette Basin. Recent returns of spring-run Chinook to the Upper Columbia have averaged only 5,000 naturally-produced fish and are the lowest on record.

**Steelhead:** Willamette River fish are in steep decline and returns during 1995 were the lowest in 30 years of record keeping. Returns have dropped to as low as 500 fish in the middle Columbia rivers like the Yakima and Umatilla, and steelhead are extinct in the Crooked and Metolius rivers in Oregon.

A species is considered *endangered* when it is "in danger of extinction throughout all or a significant portion of its range" and *threatened* when it is "likely to become endangered within the foreseeable future throughout all or a significant portion of its range." Copies of these studies are available to the public and can be obtained by calling any of the NMFS offices listed at the end of this Guide, or one of our websites at www.nwr.noaa.gov or swr.ucsd.edu.

## Saving the Salmon

The ESA provides a variety of tools for saving species threatened with extinction. Under section 7 of the ESA, no Federal agency may fund, permit or carry out any activity that will jeopardize their continued existence. In many cases, this restriction on Federal activity is not enough by itself to recover threatened species. When the activities of state and local governments and private citizens harm listed species, section 4(d) of the ESA requires that harm be controlled so it does not lead to extinction.

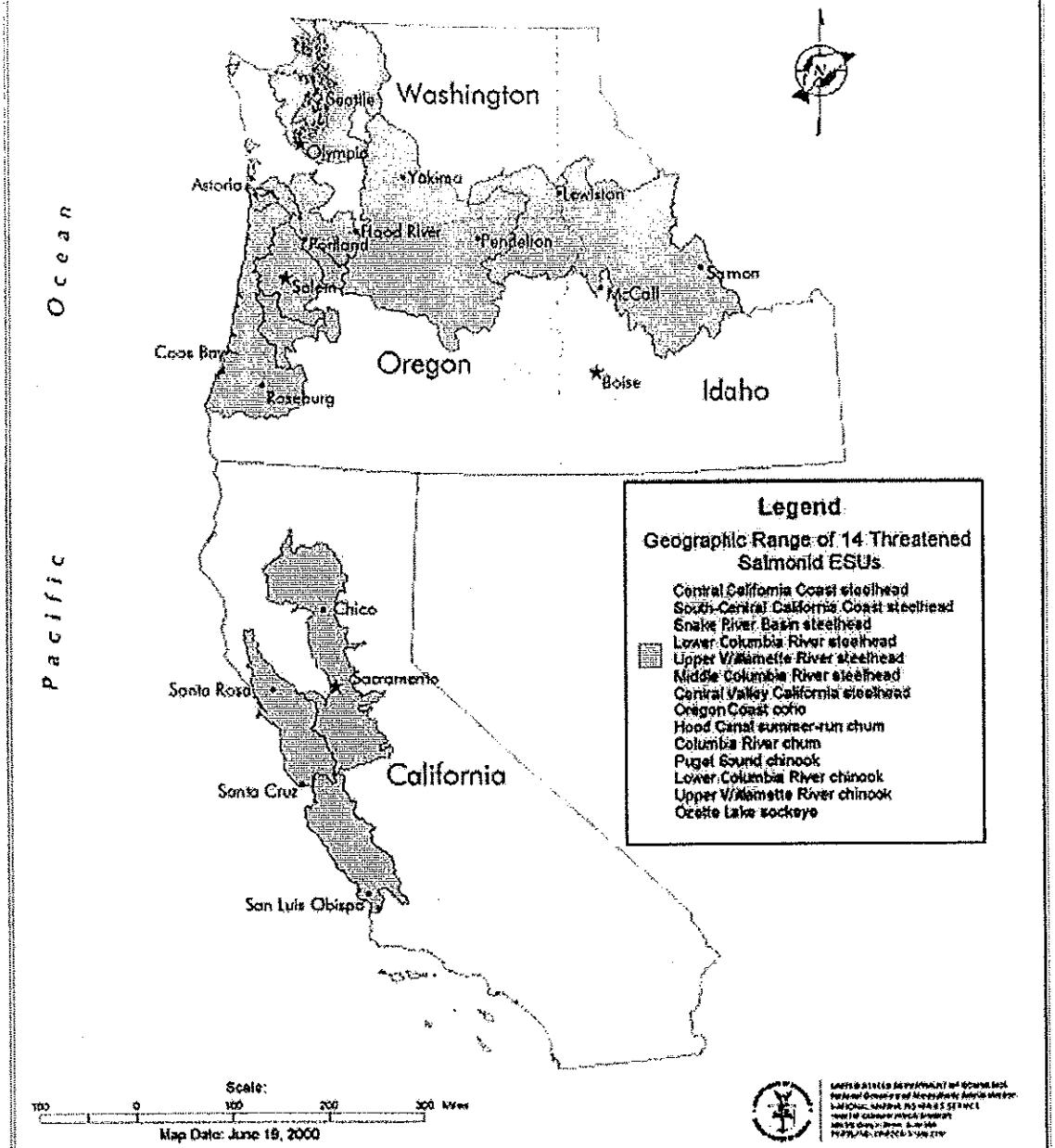
Section 4(d) requires NMFS to issue regulations deemed "necessary and advisable to provide for the conservation of the species." NMFS must establish protective rules for all species now listed as threatened under the ESA. These protective rules for threatened species may apply any or all of the ESA section 9 protections that automatically prohibit take of species listed as endangered. The rules need not prohibit all take. There may be an "exception" from the prohibitions on take so long as the take occurs as the result of a program that adequately protects the listed species and its habitat. In other words, the 4(d) rule can "limit" the situations to which the take prohibitions apply.

Incorporating such "limits" into a 4(d) rule can be good for NMFS, state agencies, government entities, private citizens, and the fish. Activities carried out in accordance with 4(d) rule limits can help protect threatened species and their habitats while relieving state agencies, government entities, tribes and others from liability for take that results from those activities. By providing limitation from take liability, NMFS encourages governments and private citizens to adjust their programs and activities to be "salmon safe." NMFS anticipates that programs and activities included as a 4(d) rule limit will ultimately be incorporated into ESA Recovery Plans for listed salmon and steelhead.

## What does the 4(d) Rule do?

This rule protects 14 ESUs of salmon and steelhead in Idaho, Washington, Oregon, and California (depicted in the map on the following page). The rule follows the standard practice of prohibiting the killing or injuring of a threatened species (i.e. "take") without specific written authorization; that is its principal function.

# Final 4(d) Rule for 14 Salmon and Steelhead ESUs




* An Evolutionarily Significant unit or "ESU" is a distinctive group of Pacific salmon or steelhead

The rule applies to ocean and inland areas, and to any authority, agency, or private individual subject to U. S. jurisdiction. Activities or development not likely to kill or harm protected species will not be affected by the rule. The rule does not prohibit actions or programs—it prohibits illegal take. Activities that do not kill or injure protected salmon and steelhead do not require any special authorization. Limits can be thought of as "exceptions" to the take prohibitions. These limits represent programs or activities, or criteria for future programs or activities, for which NMFS will not apply the take prohibitions. This is because NMFS has determined that these programs or activities minimize impacts on threatened salmon and steelhead enough so that additional Federal protections are not needed to conserve the ESU. NMFS will monitor the activities that have been granted a limit to make certain there is no unexpected take or harm.

### What is Take?

The ESA makes it illegal for any person subject to the jurisdiction of the United States to take any species of fish or wildlife that is listed as endangered (ESA section 9[a][1]) without specific authorization. The final 4(d) rule puts in place the same take prohibitions for threatened salmon and steelhead, except for certain limits that apply to the activities specified in the rule. This prohibitions applies within the United States and its territorial waters as well as on the high seas.

"Take" is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (ESA section 3[19]). It is also illegal under ESA section 9 to possess, sell, deliver, carry, transport, or ship any species that has been taken illegally (ESA section 9[a][1]). Violating the take prohibitions may result in civil or criminal penalties.

"Harass" is defined as an intentional or negligent act that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering (50 CFR 17.3).

"Harm" is defined as an act that actually kills or injures a protected species (50 CFR 222.102 (64FR 60727)). Harm can arise from significant habitat modification or degradation where it actually kills or injures protected species by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering.

## Take Guidance

The likelihood that an action will take a listed species must be evaluated on a case-by-case basis. NMFS has described the kinds of activities (e.g., blocking fish from reaching spawning and rearing areas, illegal fishing etc.), that are likely to injure or kill threatened salmon and steelhead in a "Take Guidance" section in the Federal Register Notice. ***This guidance is not regulatory.*** Rather it provides guidance on what actions are very likely to take threatened species and identifies where NMFS will focus its enforcement actions. This is not a list of prohibited activities.

Based on available information, NMFS believes the categories of activities listed below are those activities that, as a general rule, are most likely to harm listed fish. NMFS wishes to

emphasize at the outset that the potential for these activities to harm listed salmon and steelhead depends entirely upon the facts and circumstances of each case. The mere fact that an activity may fall within one of these categories does not automatically mean that it causes harm. These types of activities are, however, those most likely to cause harm and thereby violate this rule. NMFS' ESA enforcement will focus on these categories of activities.

A. Constructing or maintaining structures like culverts, berms, or dams that eliminate or impede a listed species' ability to migrate or gain access to habitat.

B. Discharging pollutants, such as oil, toxic chemicals, radioactivity, carcinogens, mutagens, teratogens, or organic nutrient-laden water (including sewage water) into a listed species' habitat.

C. Removing, poisoning, or contaminating plants, fish, wildlife, or other biota that the listed species requires for feeding, sheltering, or other essential behavioral patterns.

D. Removing or altering rocks, soil, gravel, vegetation or other physical structures that are essential to the integrity and function of a listed species' habitat.

E. Removing water or otherwise altering streamflow in a manner that significantly impairs spawning, migration, feeding, or other essential behavioral patterns.

F. Releasing non-indigenous or artificially propagated species into a listed species' habitat or into areas where they may gain access to that habitat.

G. Constructing or operating dams or water diversion structures with inadequate fish screens or passage facilities.

H. Constructing, maintaining, or using inadequate bridges, roads, or trails on stream banks or unstable hill slopes adjacent to or above a listed species' habitat.

I. Conducting timber harvest, grazing, mining, earth-moving, or other operations that substantially increase the amount of sediment going into streams.

J. Conducting land-use activities that may disturb soil and increase sediment delivery to streams—such as logging, grazing, farming, and road construction—in riparian areas and areas susceptible to mass wasting and surface erosion.

K. Illegal fishing. Harvest that violates fishing regulations will be a top enforcement concern.

L. Various streambed disturbances may trample eggs or trap adult fish preparing to spawn. The disturbance could be mechanical disruption caused by constructing push-up dams, removing gravel, mining, or other work in a stream channel. It may also take the form of egg trampling or smothering by livestock in the streambed or by vehicles or equipment being driven across or down the streambed (as well as any similar physical disruptions).

M. Illegal interstate and foreign commerce dealing in, imports, or exports listed salmon or steelhead.

N. Altering lands or waters in a manner that promotes unusual concentrations of predators.

O. Shoreline and riparian disturbances (whether in the river, estuary, marine, or floodplain environment) may retard or prevent the development of certain habitat characteristics upon which the fish depend (e.g., removing riparian trees reduces vital shade and cover, floodplain gravel mining, development, and armoring shorelines reduces the input of critical spawning substrates, and bulkhead construction can eliminate shallow water rearing areas).

P. Filling or isolating side channels, ponds, and intermittent waters (e.g., installing tide gates and impassable culverts) can destroy habitats that the fish depend upon for refuge during high flows.

This list is not exhaustive. It is simply intended to help people avoid violating the ESA and to encourage efforts to save the species. Determining whether take has actually occurred depends on the circumstances of a particular case. Many activities that may kill or injure salmon are regulated by state or Federal rules such as fill and removal authorities, National Pollutant Discharge Elimination System or other water quality permitting, pesticide use, and the like. For those types of activities, NMFS would not tend to focus enforcement efforts on those who operate in conformity with current permits. Rather, if the regulatory program does not provide adequate protection, NMFS will work with the responsible agency to make necessary changes in the program.

For example, concentrations of pesticides may affect salmon behavior and reproduction. Current EPA label requirements were developed without information about some of these subtle but real impacts on aquatic species such as salmon. And they were not developed with the intent of protecting or recovering threatened salmon. Where new information indicates that label requirements do not adequately protect salmon, NMFS will work with EPA through the section 7 consultation process to develop more protective use restrictions, and thereby provide the best possible guidance to all users. Similarly, where water quality standards or state authorizations lead to pollution levels that may cause take, NMFS intends to work with the state water quality agencies and EPA to bring those standards (or permitting programs) to a point that does protect salmon.

Those who believe their activities are likely to injure or kill salmon are encouraged to immediately change that activity to avoid take (or adequately limit any impacts on the species) and seek NMFS' authorization for incidental take under either (a) an ESA section 10 incidental take permit; (b) an ESA section 7 consultation; or (c) a limit on the take prohibitions provided in this rule. The public is encouraged to contact NMFS (see contact list) for help in determining whether circumstances at a particular location (involving these activities or any others) constitute a take in violation of the 4(d) rule.

Take of listed fish resulting from actions in compliance with a permit issued by NMFS under section 10 of the ESA do not violate this rule. Section 10 permits may be issued for research activities, activities that enhance a species' survival, or to authorize incidental take occurring in the course of an otherwise lawful activity. In addition, NMFS consults—under section 7 of the ESA—on a broad range of activities conducted, funded, or authorized by Federal agencies. These include fish harvest, hatchery operations, silviculture activities, grazing, mining, road construction, dam construction and operation, fill material discharge, and stream channelization and diversion. Federally funded or approved activities for which ESA section 7 consultations have been completed will not constitute violations of this rule—provided the activities are conducted in accord with all reasonable and prudent measures and the terms and conditions stated in the incidental take statement.

## Evaluating Potential ESA Take Liability

The June, 2000 4(d) rule's prohibitions on take applies to the activities of everyone—every state, city, and county government, every business, and every citizen. The Take Guidance provides information about what types of activities may be most likely to cause harm and thus violate the 4(d) rule. However, each activity and circumstance must be evaluated on a case by case basis to determine if it is likely to cause a take. After reviewing the take guidance, many governmental entities, businesses, and individuals may question how the 4(d) rule and its take guidance affects them. Any governmental entity, business or individual can use the following risk assessment evaluation steps:

(1) Identify the program or activity (for state and local governments, this may include activities it funds, authorizes, or carries out);
(2) Evaluate whether the program or activity is likely to take or harm listed fish;
(3) If the program or activity is not likely to take or harm listed fish, then there is no need to modify the activity, or to contact NMFS;
(4) If, however, after reviewing the program or activity, it seems likely it will take or harm listed fish, or there is uncertainty about whether take or harm may occur, the acting agency, entity, or individual should contact NMFS to seek more information on evaluating the activity's impacts and determining ways to avoid harming the fish and violating the ESA.

There are many sources of information on improved best management practices to avoid take or harm and to reduce ESA liabilities. In addition, professional associations, state and Federal resource management agencies that provide technical information to landowners and others, watershed councils and non-governmental organization can be important sources of information about how to modify activities to avoid or reduce impacts on threatened salmon and steelhead.

## Effective Dates

State, tribal, and local governments, stakeholder groups, and citizens across four states need to familiarize themselves with the guidance provided in the rule, assess the consequences of their individual authorities and activities, and make any necessary adjustments to protect the fish. After sufficient time to review the new rule, NMFS will hold a number of public forums in rural and metropolitan communities to engage interested parties in constructive discussion about salmon recovery. For these reasons, the 4(d) rule for chinook, coho, chum, and sockeye salmon will take effect 180 days after it is published in the *Federal Register*. Those in the range of threatened steelhead have had more notice that efforts to save the fish are needed, so the 4(d) rule for steelhead will take effect 60 days after publication.

A 1997 interim 4(d) rule (published in 1997) remains in place for the Southern Oregon/Northern California Coast (SONCC) coho ESU. The SONCC 4(d) rule included several limitations based on adequately protective state programs in Oregon and provided a model for developing the three 4(d) rules proposed in January of 2000. The final 4(d) rule for 14 additional threatened ESUs does not affect this earlier rule.

## Useful Concepts for Understanding the Limits

The final rule incorporates two scientific concepts NMFS will use when determining whether particular programs may receive limits on the take protections. The first applies primarily to harvest and hatchery activities, and is described in a scientific paper entitled *"Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units"* (NMFS 2000). The Viable Salmonid Population (VSP) paper describes the importance of identifying individual populations within an ESU, and the importance of identifying abundance levels and other characteristics that may be considered "critical" (where abundance is so low the population requires special protections) or "viable" (where abundance is high enough the population may be considered healthy). Generally, programs and activities will receive a 4(d) limit only if they do not increase the risks to critical populations, and if they do not preclude populations from attaining or maintaining viability.

The second concept applies to programs and activities that affect salmon habitat. For habitat, NMFS uses the concept of Proper Functioning Condition (PFC). Properly functioning habitat is habitat that provides for the biological requirements of the fish. PFC is defined in terms of the natural processes and functions that lead to habitat conditions that will

meet the biological requirements of the fish. NMFS offers 4(d) limits only for those programs or activities that will not impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or will not retard the long-term progress of impaired habitat toward PFC.

The concepts of VSP and PFC are described in more detail at the end of this guide.

## The 13 Limits

When the final 4(d) rule becomes effective, the take prohibitions will apply to actions carried out by state, tribal, and local governments and private parties that take listed salmon and steelhead, except take that is associated with those activities that come under one of the 4(d) limits and those already permitted under other sections of the ESA. The take prohibitions would be limited for the programs and activities identified in the 4(d) rule because NMFS has determined that they impacts on threatened fish sufficiently that additional Federal protections are not needed.

The final rule describes two types of limits on the take prohibitions. One type includes specific programs NMFS has already reviewed and determined will minimize harm to threatened fish or contribute to their conservation. The other type includes general categories of programs that NMFS may evaluate in the future. For this second type of limit, the 4(d) rule sets out the standards NMFS will use when it reviews activities and programs for inclusion in the rule, how the public will be given notice in the *Federal Register* of the opportunity to review the program being submitted and, if the limit is determined to sufficiently conserve the listed species, how it will be approved by the Northwest or Southwest Regional Administrator, whichever is appropriate. NMFS has also established a process for periodically evaluating the limits, making recommendations for adjusting the programs, and alerting the public in cases when the limit would be withdrawn and take prohibitions re-applied.

Some of the broad categories of activities covered by limits in the final rule are:

- Scientific research conducted or supervised by, or coordinated with, state fishery agencies
- Fish harvest activities
- Artificial propagation programs
- Habitat restoration based on watershed plans
- Properly screened water diversions
- Routine road maintenance
- Municipal, residential, commercial, and industrial development and redevelopment
- Forest management practices in the State of Washington

NMFS is not requiring states, local governments or private parties to change their practices to conform to any of the take limits described in the final rule. The limits provide one way to be sure an activity or program does not risk violating the take prohibitions. Simply because a program is not within a limit *does not* mean that it automatically violates the ESA or the 4(d) rule. However, it *does* mean that any program or jurisdiction would risk ESA penalties if the activity in question takes a listed fish. By receiving a limit, governments and individuals receive assurance that their activities do not violate the take prohibitions and will not be subject to enforcement.

### Description of the Limits

#### Limit No. 1 – ESA Permits

This limit recognizes that those holding permits under section 10 of the ESA (or receiving other exemptions under the ESA) are free of the take prohibitions so long as they act in accordance with the permit or applicable law. Land management activities associated with a habitat conservation plan and scientific research are examples of activities for which a section 10 permit may be issued.

**Limit No. 2 – Ongoing Scientific Research**

This final rule does not restrict ongoing scientific research that affects threatened ESUs for up to eight months (i.e., through February 2001) provided an application for a research or enhancement permit reaches the Assistant Administrator for Fisheries, NOAA, within 90 days after the rule is published. The take prohibitions will extend to these activities if the Assistant Administrator rejects an application as insufficient, if a permit is denied, or if six months have elapsed since the effective date of the final rule, whichever occurs earliest. It is in the interest of conservation to not disrupt ongoing research and conservation projects, some of which are of long duration. This limit on the take prohibitions ensures there will be no unnecessary disruption of those activities yet provides NMFS with the ability to halt the activity if it will have unacceptable impacts on a listed ESU.

**Limit No. 3 – Rescue and Salvage Actions**

This limit relieves certain agency and official personnel (or their designees) from the take prohibitions when they are acting to aid an injured or stranded fish or salvage a dead fish for scientific study. Each agency acting under this limit is to report the numbers of fish handled and their status on an annual basis. This limit on the take prohibitions will conserve the listed species by preserving life or furthering our understanding of the species' biology.

**Limit No. 4 – Fishery Management**

NMFS believes recreational, commercial, and tribal fisheries can be managed to protect salmon and steelhead listed under the ESA and allow them to recover. The 4(d) rule provides a way to permit the "take" of listed fish in fisheries. A fishery management agency can develop a Fisheries Management and Evaluation Plan (FMEP) and seek NMFS' approval for it. Some of the benefits of the FMEP approach are long-term management planning, more public involvement, less government paperwork, and more certainty that there will be fishing opportunities in the future.

NMFS will use the same standard to evaluate FMEPs as those used for section 10 permits: the fisheries must not jeopardize listed salmon and steelhead, nor lessen the protection they receive. In the FMEPs, fisheries will be managed according to the listed fishes' status. This will be determined by using the concept of "Viable Salmonid Populations." Fisheries will be scaled to the degree of risk the listed fish face. When a listed population is at a "critically" low level, harvest impacts will be strictly controlled. Once a population achieves a "viable" level, fisheries could be less restrictive.

An FMEP must address the specific criteria outlined in the 4(d) rule. An FMEP must (1) define its objectives and management area, (2) define the populations within the affected ESUs, (3) establish the populations' "critical" and "viable" threshold levels, (4) set escapement objectives or maximum harvest rates, (5) demonstrate that the fisheries will not jeopardize listed fish, (6) establish the monitoring and evaluation process to assess how the FMEP is working and set conditions for revising management, and (7) be consistent with tribal trust obligations. All of these criteria were developed to answer the following questions: Where and how should the fisheries occur? What are their impacts on listed fish? How can it be demonstrated that an FMEP conserves listed fish and allows their recovery?

FMEPs are developed and approved in the following manner: A fish management agency, such as a state department of fish and wildlife, develops an FMEP that meets the 4(d) rule criteria. They send it to NMFS who then requests public review and comment. The public input is used to revise the FMEP, if necessary. Once the FMEP is deemed sufficient, NMFS writes a letter of approval to the agency that developed the FMEP. The FMEP is then implemented and the fisheries addressed in the FMEP will be covered under the ESA. NMFS then monitors and evaluates the FMEP to ensure that the listed fish are recovering.

**Limit No. 5 – Artificial Propagation**

NMFS believes hatcheries can be managed in a manner that conserves and recovers salmon and steelhead listed under the ESA. Therefore, the 4(d) rule provides a way to permit the "take" of listed fish for a variety of hatchery purposes. A state or Federal hatchery management agency can develop a Hatchery and Genetics Management Plan (HGMP) and seek NMFS' approval. Some of the benefits of the HGMP approach are long-term management planning, more public involvement, and less government paperwork.

NMFS will use the same standard to evaluate HGMPs as those used for section 10 permits: the hatchery program must not jeopardize listed salmon and steelhead, nor lessen the protection they receive. In the HGMPs, hatcheries will be managed according to the listed fishes' status. This will be determined using the concept of "Viable Salmonid Populations." Hatchery activities will be scaled to the degree of risk the listed fish face. When a listed population is at a "critical" level, broodstock collection will be strictly controlled. Once a population achieves a "viable" level, broodstock collection could be less restrictive.

An HGMP must address the specific criteria outlined in the 4(d) rule. An HGMP must (1) specify the goals and objectives for the hatchery program, (2) the donor population's "critical" and "viable" threshold levels, (3) prioritize broodstock collection programs in a manner that benefits listed fish, (4) specify the protocols that will be used for spawning and raising the fish in the hatchery, (5) determine the genetic and ecological effects arising from the hatchery program, (6) describe how the hatchery operation relates to fisheries management, (7) ensure that the hatchery facilities can adequately accommodate listed fish if they are collected for the program, (8) monitor and evaluate the HGMP to ensure that it accomplishes its objectives, and (9) be consistent with tribal trust obligations.

HGMPs are developed and approved in the following manner: A fish management agency, such as a state department of fish and wildlife, develops an HGMP that meets the 4(d) rule criteria. They send it to NMFS who then requests public review and comment. The public input is used to revise the HGMP, if necessary. Once the HGMP is deemed sufficient, NMFS writes a letter of approval to the agency that developed the HGMP. The HGMP is then implemented and the hatchery program addressed in the FMEP will be covered under the ESA. NMFS then monitors and evaluates the HGMP to ensure that the listed fish are recovering.

**Limit No. 6 – Joint Tribal/State Plans Developed under the *United States v. Washington* or *United States v. Oregon* Settlement Processes**

Non-tribal salmonid management in the Puget Sound and Columbia River areas is profoundly influenced by the fishing rights of numerous Indian tribes and must be responsive to the court proceedings that interpret and define those tribal rights. Various orders of the *United States v. Washington* court, such as the Puget Sound Salmon Management Plan (originally approved by the court in 1977; recently amended in *United States v. Washington*, 626 F. Supp. 1405, 1527 (1985, W.D. Wash.)), mandate that many aspects of fishery management, including but not limited to harvest and artificial production actions, be jointly coordinated by the State of Washington and the Western Washington Treaty tribes. The State of Washington, affected tribes, other interests, and Federal agencies are all working toward an integrated set of management strategies and strictures that respond to the biological, legal, and practical realities of salmon management in Puget Sound. Similar principles apply in the Columbia River basin where the States of Oregon, Washington, and Idaho and five treaty tribes work within the framework and jurisdiction of *United States v. Oregon*.

NMFS includes this limit on the take prohibitions to accommodate any resource management plan developed jointly by the States and the Tribes (joint plan) under the jurisdiction of *United States v. Washington* or *United States v. Oregon*. Such a plan would be developed and reviewed under the government-

to-government processes outlined in the final 4(d) rule for Tribal Resource Management Plans. Before any joint plan receives a limit on the take prohibitions, the Secretary must, after taking into account any public comment on the plan, determine that it will not appreciably reduce the likelihood of the listed species' survival and recovery. The Secretary shall publish in the Federal Register notice of any determination regarding a joint plan; the notice will include a discussion of the biological analysis underlying the determination.

NMFS will evaluate joint plans on a regular basis to determine if they sufficiently protect and conserve the listed fish.

**Limit No. 7 – Scientific Research**

In carrying out their responsibilities, state fishery management agencies in Washington, Oregon, Idaho, and California conduct or permit a wide range of scientific research activities on various fisheries. These include monitoring programs and other studies of the 14 ESUs affected by the final rule. In general, NMFS finds that such activities will help conserve the listed species by furthering our understanding of the species' status, risks, life history, and biological requirements, and that state biologists and cooperating agencies carefully consider the benefits and risks entailed in proposed research before approving or undertaking such projects. NMFS concludes it is not necessary and advisable to impose additional protections on such research by imposing of Federal take prohibitions, and NMFS will not apply take prohibitions to scientific research activities that have received written approval from NMFS' Northwest or Southwest Regional Administrator.

**Limit No. 8 – Habitat Restoration Limits on the Take Prohibitions**

Habitat restoration activities are likely to help conserve listed fish without incurring significant risks, and NMFS concludes it is not necessary and advisable to impose take prohibitions on those activities provided the activity is part of a watershed conservation plan. NMFS considers a "habitat restoration activity" to be an activity whose primary purpose is to restore natural aquatic or riparian habitat processes or conditions; it is an activity that would not be undertaken but for its restoration purpose. Projects planned and carried out based on at least a watershed-scale analysis and conservation plan and, where practicable, a sub-basin or basin-scale analysis and plan, are likely to be the most beneficial. NMFS strongly encourages those involved in watershed restoration to conduct assessments that identify the factors impairing watershed function, and to plan watershed restoration and conservation activities based on those assessments. Without the overview a watershed-level approach provides, habitat efforts are likely to focus on "fixes" that may prove short-lived (or even detrimental) because the underlying processes causing a particular problem may not be addressed.

The final rule provides that take prohibitions will not apply to habitat restoration activities found to be part of, and conducted pursuant to, a watershed conservation plan that the state of Washington, Oregon, Idaho, or California has certified to be consistent with the state's watershed conservation plan guidelines. The state in which the activity occurs must certify in writing whether a watershed plan has been formulated in accordance with NMFS-approved state watershed conservation plan guidelines. NMFS will periodically review state Watershed Conservation Plan certifications to ensure that the Plans adhere to approved watershed conservation plan guidelines.

For this limit to apply, NMFS must find that the state's watershed conservation plan guidelines generate plans that: (1) Take into account the proposed activities' potential direct, indirect, and cumulative impacts in terms of their effect on listed species and populations; (2) will not reduce the likelihood of either survival or recovery of listed species in the wild; (3) ensure that any taking will be incidental; (4) minimize and mitigate any adverse impacts; (5) put in place effective monitoring and adaptive management programs; (6) use the best available science and technology, including watershed analysis; (7) provide for public and scientific

review and input; (8) include any measures that NMFS determines are necessary or appropriate; (9) include provisions that clearly identify those activities that are part of plan implementation; and (10) control risk to listed species by ensuring that the plan components are funded and implemented.

Before approving watershed conservation plan guidelines, NMFS will publish notification in the Federal Register announcing the availability of the proposed guidelines for public review and comment. Such an announcement will provide for a comment period of no less than 30 days.

The proposed 4(d) rules identified interim provisions for habitat restoration activity categories to which the take prohibitions would not be applied for two years while watershed conservation plans were being developed. Based on the misunderstandings generated by that proposal, the interim provisions were dropped from the final rule.

NMFS strongly encourages jurisdictions, entities, and citizens to use the habitat restoration guidelines and technical manuals listed below as readily available techniques to reduce the risks of harming or injuring the listed stocks.

Applicable state guidance includes:

- *Oregon Road/Stream Crossing Restoration Guide*, Spring 1999, selected portions of *the Oregon Aquatic Habitat Restoration and Enhancement Guide* (1999);
- Oregon Department of Forestry and Department of Fish and Wildlife's *A Guide to Placing Large Wood in Streams*, May 1995;
- Washington Department of Fish and Wildlife, (WDFW) Habitat and Lands Environmental Engineering Division's *Fish Passage Design at Road Culverts*, March 3, 1999;
- Washington Administrative Code rules for Hydraulic Project Approval; and Washington's *Integrated Streambank Protection Guidelines*, June, 1998;
- *Stream Corridor Restoration, Principles, Processes and Practices* by the Federal Interagency Stream Restoration Working Group, October, 1998; and,
- *California Salmonid Stream Habitat Restoration Manual*, January, 1998.

These documents are available through the NMFS web page or directly from the relevant agencies.

**Limit No. 9 – Water Diversion Screening**

Operating water diversions without adequate screening is a widely recognized cause of mortality among salmon and steelhead. Juveniles may be sucked or attracted into diversion ditches where they later die from a variety of causes, including stranding. Adult and juvenile migration may be blocked by diversion structures such as push-up dams. Juveniles are often injured and killed when caught in pumping facilities or forced against screens.

State laws and Federal programs have long recognized these problems in varying ways, and encouraged or required adequate screening of diversion ditches and structures. Nonetheless, large numbers of diversions are not adequately screened and remain a threat, particularly to juvenile fish. Eliminating that source of injury or death is vital to conserving listed stocks.

The final rule encourages all diverters to move quickly to provide adequate screening or other protections for their diversions. The rule does not apply take prohibitions provided that NMFS' engineering staff—or any resource agency or tribal representative NMFS designates as an authorized officer—has agreed in writing that the diversion facility is screened, maintained, and operated in compliance with NMFS' Juvenile Fish Screening Criteria (NMFS 1996) or, in California, in compliance with NMFS Southwest Region's Fish Screening Criteria for Anadromous Salmonids (NMFS 1997) or any subsequent revision. If a diversion is screened, operated, and maintained in a manner consistent with those criteria, adequate safeguards will be in place and no additional Federal protection is necessary or advisable for conserving listed fish.

The final rule also provides that NMFS or its authorized officer may review and approve for a take limit a proposed juvenile fish screen design and construction plan. The plan must describe interim operation measures that will avoid taking threatened fish.

**Limit No. 10 – Routine Road Maintenance**

NMFS does not find it necessary or advisable to apply take prohibitions to routine road maintenance activities provided that: (1) The activity constitutes routine road maintenance conducted by Oregon Department of Transportation (ODOT) employees or agents that complies with ODOT's *Transportation Maintenance Management System Water Quality and Habitat Guide* (July, 1999); or (2) it is conducted by employees or agents of a state, county, city, or port under a program that complies substantially with that contained in the ODOT Guide and has been determined to meet or exceed the protections provided by the ODOT Guide; or (3) by employees or agents of a state, county, city, or port that complies with a routine road maintenance program that maintains or attains proper functioning condition (PFC).

The ODOT's maintenance and environmental staff have worked with NMFS in developing a routine road maintenance program that works well within the mandates of the ESA and the Clean Water Act, while carrying out the agency's fundamental mission to provide a safe and effective transportation system. That work has resulted in a program that greatly improves protections for listed fish that might be affected by a range of routine maintenance activities by minimizing the activities' impacts on streams.

For a state, city, county or port program that is equivalent to the ODOT program (or any of its amendments) to receive a limit it must get written approval from the NMFS Northwest or Southwest Regional Administrator, whichever is appropriate. Any jurisdiction desiring its routine road maintenance activities to be within this limit must first commit in writing to apply management practices that provide protection equivalent to or better than those provided by the ODOT Guide.

**Limit No. 11 – Portland Parks Integrated Pest Management**

The City of Portland, Oregon, Parks and Recreation Department (PP&R) operates a diverse system of city parks representing a full spectrum of urban habitat from intensively managed recreation, sport, golf, and garden sites to largely natural, unmanaged parks, including the several thousand acre, wooded, Forest Park. The PP&R has been operating and refining an integrated pest management program for 10 years, with a goal of reducing its use of pesticides. The program's "decision tree" places first priority on preventing pests (weeds, insects, disease) through policy, planning, and avoidance measures (design and plant selection). Cultural and mechanical practices, trapping, and biological controls form the second priority. The use of biological products and, finally, chemical products, is to be considered last. The overall program affects only a small proportion of the land base and waterways in Portland, and serves to minimize any impacts on listed fish from chemical applications associated with that specific, limited land base. NMFS believes it would help conserve listed fish if jurisdictions would broadly adopt a similar approach to eliminating and limiting chemical use in their parks and in other areas.

After carefully analyzing PP&R's integrated program for pest management, NMFS concludes that it addresses potential impacts and provides adequate protection for listed fish with respect to the limited use the program may make of the listed chemicals. NMFS does not find it necessary or advisable to apply additional Federal protections in the form of take prohibitions to PP&R activities conducted under the Pest Management Program. Take prohibitions would not meaningfully increase the level of protection the listed fish receive.

Confining the limit on take prohibitions to a specified list of chemicals does not mean NMFS has determined that other chemicals PP&R employs will necessarily harm salmon and steelhead. NMFS intends to continue working with PP&R on the use of any other herbicide or pesticide.

The PP&R program includes a variety of monitoring commitments and a yearly

assessment schedule. If, at any time, monitoring information, new scientific studies, or new techniques cause PP&R to amend its program or if PP&R and NMFS wish to change the list of chemicals receiving limits on take prohibitions, PP&R must provide NMFS with a copy of the proposed change(s) for review. NMFS will publish notification in the *Federal Register* requesting public comment on the proposed changes. The comment period will be no less than 30 days; at its conclusion, NMFS will make a final determination on whether the changes will conserve listed salmon and steelhead.

**Limit No. 12 – Municipal, Residential, Commercial and Industrial Development and Redevelopment (MRCI)**

As a general matter, MRCI development (and redevelopment) have a significant potential to degrade habitat and injure or kill salmon and steelhead in a variety of ways. With appropriate safeguards, MRCI development can be specifically tailored to minimize impacts on listed fish to the extent that additional Federal protections would not be needed to conserve the listed ESU. Through the final rule, NMFS identifies a mechanism whereby cities, counties, and regional governments can ensure that MRCI development and redevelopment authorized within those areas are consistent with ESA requirements. Developers and their authorizing jurisdictions alike would benefit from the assurance that their actions conserve listed salmon and steelhead.

One example of an authorizing entity working toward the sort of plan envisioned in this limit is found in the fact that urban development in the Portland, Oregon metropolitan area may not occur outside of an adopted urban growth boundary (UGB). Metro, the regional governing body, is in the process of bringing some large areas currently designated as urban reserve areas into the UGB. Before development may commence in these newly included areas, the jurisdiction within which the area lies must prepare and adopt comprehensive plan amendments for urban reserve areas consistent with all provisions of the Metro Urban Growth Management Functional Plan. The amendments must show what development will be allowed and the conditions to be placed upon development.

NMFS will not apply take prohibitions to (1) MRCI development or redevelopment governed by and conducted in accordance with city, county, or regional government ordinances or plans that NMFS has found to adequately protect listed species; or (2) once NMFS has determined that Metro's Functional Plan is adequately protective, activities conducted under Metro's jurisdiction that are pursuant to ordinances that Metro has found comply with its Urban Growth Management Functional Plan. NMFS must agree in writing that the MRCI development ordinances and plans, including the Functional Plan, ensure that the plans and the development activities complying with them will conserve listed salmon and steelhead. NMFS will individually apply the following 12 evaluation considerations when determining whether MRCI development ordinances or plans adequately conserve listed fish:

(1) An MRCI development ordinance or plan ensures that development will avoid inappropriate areas such as unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites. Activities such as development, timber harvest, or other soil disturbance should be sited in appropriate areas—avoiding unstable slopes, wetlands, areas already in a proper functioning condition, areas that are more functional than neighboring sites, and areas with the potential to be fully restored. A description of particularly sensitive areas is included in the Fish and Forest Report cited elsewhere in this guidance. Those sites include but are not limited to soils perennially saturated from a headwall or a sideslope seep or spring, the permanent initiation point of perennial flow of a stream, an alluvial fan, and the intersection of two perennial streams.

(2) An MRCI development ordinance or plan adequately prevents stormwater discharge impacts on water quality and quantity and stream flow patterns in the watershed—including peak and base flows in perennial streams. Stormwater management programs

must require development activities to avoid impairing water quality and quantity. These activities must preserve or enhance stream flow patterns so they are as close as possible to the historic peak flows, base flows, durations, volumes, and velocities. This can be accomplished by reducing impervious surfaces and maintaining forest cover and natural soils. These conditions will, in turn, maintain essential habitat processes such as natural water infiltration rates, transpiration rates, stormwater run-off rates, sediment filtering, and provide hydrographic conditions that maintain and sustain aquatic life.

(3) An MRCI development ordinance or plan protects riparian areas well enough to attain or maintain PFC around all rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Compensatory mitigation is provided, where necessary, to offset unavoidable damage to PFC in riparian management areas. Activities should be quite limited in areas adjacent to all perennial and intermittent streams and waters supporting listed salmon and steelhead in order to avoid soil disturbance and maintain vegetated riparian corridors. The existence of native vegetation along stream corridors is a condition that can support essential habitat processes such as temperature control, bank stability, stream complexity over time, the filtering of pollutants, or contributions of large logs and other woody debris to a stream.

Limiting activities in riparian areas helps protect or restore the condition and quality of soil and ensure that a diversity of plants and trees of all ages is well-distributed across a riparian area. Such conditions on the landscape contribute to the natural succession of riparian forest trees and protect the water quality and flow conditions necessary to meet salmonid habitat needs downstream. In urban areas, the riparian areas often face the added challenge of intercepting large amounts of nutrients, pesticides and sediment so that they do not directly enter a stream.

NMFS' determinations are significantly influenced by science indicating that essential habitat functions are affected to varying (but significant) degrees by streamside activities conducted within a distance equal to the height of the tallest tree that can grow on that site (known as the site potential tree height). The distance is measured not from the stream itself, but from the edge of the area within which a stream naturally migrates back and forth over time (the channel migration zone).

When the scope of an activity includes modifying a riparian site that has existing, non-native vegetation, it may be important to restore native vegetation on the site in order to recover the essential habitat functions discussed above.

(4) An MRCI development ordinance or plan avoids stream crossings—whether by roads, utilities, or other linear development—wherever possible and, where crossings must be provided, minimize impacts. One method of minimizing stream crossings and their associated disturbances is to optimize transit opportunities to and within newly developing urban areas. A plan should consider whether potential stream crossings can be avoided by redesigning the access. Where a crossing is unavoidable, the plan or ordinance should minimize its affect by preferring bridges over culverts; sizing bridges to a minimum width; designing bridges and culverts to pass at least the 100-year flood (and associated debris), and meet Oregon Department of Fish and Wildlife or Washington Department of Fish and Wildlife criteria (*ODFW's Oregon Road/Stream Crossing Restoration Guide, Spring, 1999 and WDFW's Fish Passage Design at Road Culverts, March 3, 1999*). In addition, all crossings must be regularly monitored and maintained and intermittent and perennial streams should not be closed over.

(5) An MRCI development ordinance or plan adequately protects historic stream meander patterns and channel migration zones and avoids hardening stream banks and shorelines. Any MRCI development should be designed to allow streams to meander in historic patterns of channel migration. Activities on the landscape must protect conditions that allow gradual bank erosion, flooding, and channel meandering in the zone within which it would naturally occur. This natural channel migration promotes gravel recruitment, geomorphic diversity, and habitat development. If an adequate number of riparian

management areas are linked to the channel migration zone, there should be no need for bank erosion control in all but the most unusual situations. In most circumstances, activities that call for hardening stream banks are not consistent with PFC.

If unusual circumstances require bank erosion to be controlled, it should be accomplished through vegetation or carefully bioengineered solutions. Rip-rap blankets or similar hardening techniques would not be allowed, unless particular site constraints made bioengineered solutions impossible. NMFS finds that the Washington Department of Fish and Wildlife's publication, "*Integrated Streambank Protection Guidelines*" (June, 1998) can provide sound guidance, particularly regarding mitigation for gravel recruitment.

The Fish and Forest Report, cited elsewhere in this guidance, includes a detailed description of the types of channel migration zones found in most geomorphic settings. Further, the Washington State Forest Practices Board has published its *Standard Method for Measuring Physical Parameters of Streams and Channel Migration Zones (March, 2000).* Though it is designed for the forested environment, NMFS finds the document a useful aid in determining channel migration zones in any setting.

(6) An MRCI development ordinance or plan adequately protects wetlands, wetland buffers, and wetland function—including isolated wetlands. Activities on the landscape must protect wetlands and the vegetation surrounding them to avoid disturbing soils, vegetation, and local hydrology. Such conditions on the landscape contribute to the natural succession of wetlands, and protect wetland functions necessary to meet salmonid habitat needs such as food chain support, shoreline protection, water purification, storm and flood storage, and groundwater recharge. These conditions are also necessary to protect the freshwater, marine, and estuarine wetland systems that provide specialized habitat for rearing and migrating salmon and steelhead.

(7) An MRCI development ordinance or plan adequately preserves permanent and intermittent streams' ability to pass peak flows. Activities that decrease a stream's hydrologic capacity by filling in its channel for road crossings or other development will increase water velocities, flood potential, and channel erosion, as well as degrade water quality, disturb soils, and groundwater flows, and harm vegetation adjacent to the stream. Preserving hydrologic capacity will provide conditions on the landscape necessary for maintaining essential habitat processes such as water quantity and quality, streambank and channel stability, groundwater flows, and succession of riparian vegetation. In combination with the riparian management areas or set-back provisions described above, this means that dredge and fill should be avoided unless they are conducted in conjunction with a necessary stream crossing whose impacts are mitigated to the greatest extent possible.

(8) An MRCI development ordinance or plan stresses landscaping with native vegetation to reduce the need to water and apply herbicides, pesticides, and fertilizer. Plans must describe the techniques local governments will use to encourage planting with native vegetation, reducing lawn area, and lowering water use. These provisions will maintain essential habitat processes by helping conserve water and reduce flow demands that compete with fish needs. They will also reduce applications of chemicals that contribute to water pollution in streams and other water bodies supporting salmon and steelhead.

(9) An MRCI development ordinance or plan contains provisions to prevent erosion and sediment run-off during (and after) construction and thus prevent sediment and pollutant discharge to streams, wetlands and other water bodies that support listed fish. These provisions, at a minimum, should include detaining flows, stabilizing soils, protecting slopes, stabilizing channels and outlets, protecting drain inlets, maintaining best management practices (BMPs), and controlling pollutants. These goals can be accomplished by applying seasonal work limits, phasing land clearing activities, maintaining undisturbed native top soil and vegetation, etc.

These stipulations will help maintain natural runoff rates and protect water quality.

(10) An MRCI development ordinance or plan ensures that demands on the water supply can be met without affecting—either directly or through groundwater withdrawals—the flows salmon need. A plan must ensure that any new water diversions are positioned and screened in a way that does not injure or kill fish.

(11) An MRCI development ordinance or plan provides mechanisms for monitoring, enforcing, funding, reporting, and implementing its program. Moreover, formal plan evaluations should take place at least once every five years. The plan should make a commitment to (and assign responsibility for) regular monitoring and maintenance activities for any detention basins, erosion and sediment control measures, and other management tools over the long term. Practices should be adopted as needed based on monitoring results. In addition, to ensure that development activities comply with the ordinance or plan and that PFC is attained or maintained, commitments must be made for regular funding, enforcement, reporting, implementation, and plan evaluations. These commitments are necessary to lead to conditions that will maintain the whole suite of essential habitat processes for salmon and steelhead.

(12) An MRCI development ordinance or plan complies with all other state and Federal environmental and natural resource laws and permits.

NMFS concludes that development governed by ordinances or plans that fulfill the listed considerations will address the potential negative impacts on salmon and steelhead associated with development and redevelopment. In such circumstances adequate safeguards will be in place that NMFS does not find it necessary or advisable to impose additional Federal protections through the take prohibitions.

**Limit No. 13 – Forest Management in Washington**

In the State of Washington, NMFS has worked with timber industry representatives, tribes, state and Federal agencies, and various interest groups for many months. The purpose of these discussions was to develop a set of forest practices that could be included in Washington Governor Locke's salmon recovery plan. The product of those discussions is the April 29, 1999, Forests and Fish Report (FFR) to Governor Locke. It provides important improvements in forest practice regulation which, if approved by the Washington Forest Practices Board in a form at least as protective as it is laid out in the FFR, will substantially protect and conserve listed fish in that state. The FFR also mandates that all existing forest roads be inventoried for their potential to affect salmon and steelhead and that all needed improvements be completed within 15 years. The impacts that inadequately sited, constructed, or maintained forest roads have on salmonid habitat are well-documented. This feature alone will help a great deal in conserving listed ESUs in Washington.

After carefully considering the above features—as well as others described in greater detail below—NMFS has determined it is not necessary to apply take prohibitions to non-Federal forest management activities conducted in the State of Washington. These activities may go forward provided that: (1) The action complies with forest practice regulations the Washington Forest Practices Board has adopted and implemented and that NMFS has found to protect habitat functions at least as well as the regulatory elements of the FFR; and (2) the activity also implements all non-regulatory elements of the FFR. It should also be noted that actions taken under alternative plans may be included under this limit provided the Washington Department of Natural Resources (WDNR) finds the alternate plans protect physical and biological processes at least as well as the state forest practices rules and that NMFS, or any resource agency or tribe NMFS designates, has the opportunity to review each alternate plan at every stage of its development and implementation. Given these conditions,

NMFS concludes that the FFR package conserves salmon and their habitat well enough that it is neither necessary nor advisable to impose take prohibitions.

NMFS believes that to conserve listed fish, it is important to rapidly adopt and implement improved forest practice regulations such as those found in the FFR. NMFS will provide an opportunity for the public to review and comment on all regulations developed to implement the FFR before making any determinations about how well they conserve listed fish.

Although NMFS will continue working with Washington (and other states) on broadening this limit, at this time NMFS lacks information to determine that pesticide provisions in the FFR package, sufficiently protect and conserve listed fish. Therefore, this limit does not extend to the use of herbicides, pesticides, or fungicides.

Elements of the FFR that protect and conserve listed salmon and steelhead are summarized below:

(1) It accurately classifies water bodies and makes stream typing information broadly available. It is tailored to protect and reinforce the functions and roles of different stream classes in the continuum of the aquatic ecosystem. These include fish-bearing streams—which may have either perennial or seasonal flow; perennial, non-fish-bearing streams—which include spatially intermittent streams; and seasonal, non-fish-bearing streams—which have a defined channel that contains flow at some time during the year.

(2) It lays out a plan for properly designing, maintaining, and upgrading existing and new forest roads. As stated previously, this is an important means of maintaining and improving water quality and instream habitats. The FFR provisions address: Road construction and reconstruction in riparian areas and on potentially unstable slopes; the potential for new and reconstructed roads to affect hydrologic connections between stream channels, ground water, and wetlands, and to add sediment to aquatic systems; the ability for road structures (e.g., culverts and bridges) to pass fish, 100-year flows, and instream debris; a plan to assess (within 5 years) the condition of all forest roads and to determine the need to repair, reconstruct, maintain, control access, abandon or obliterate them with work to be completed within 15 years; and BMPs for all other aspects of forest road operation.

(3) It protects unstable slopes from increased failure rates and volume.

(4) It allows properly functioning condition to be achieved in riparian areas along fish-bearing waters. Proper function refers to the suite of riparian and instream functions that affect both instream habitat conditions and the vigor and succession of riparian forest ecosystems. The functions include stream bank stability, shade, litterfall and nutrient input, large woody debris recruitment, and microclimate factors such as air and soil temperature, windspeed, and relative humidity. The FFR ensures properly functioning condition by establishing variable-width management zones within which silvicultural treatments are allowed. These treatments are prescribed through forestry guidelines that NMFS has determined will set a riparian forest stand on a growth and succession pathway toward a desired future condition (DFC) of a mature riparian forest. Once the stand is on the proper trajectory toward DFC, it must remain there without further harvest or silvicultural treatment. Riparian management includes the following provisions:

- Continuous riparian management zones along all fish-bearing streams.
- A core zone at least 50 ft (15 m) wide west of the Cascades and 30 ft (9 m) on the east side, within which no harvest or salvage occurs. This width is measured horizontally from edge of the bankfull channel, or where channel migration occurs, from the outer edge of the channel migration zone.
- An inner zone that varies in width depending on the timber harvest strategy.
- An outer zone extending to a site tree height (100 year base) that provides a

minimum of 20 conifer trees per acre that are greater than 12 inches (0.30m) in diameter at breast height.

- Overstory canopy disturbance along a stream is limited to 20% for roads and yarding corridors and ground disturbance is limited to 10%.
- A mature riparian forest is the DFC. Generally, mature riparian forest conditions are achieved after 80 to 200 years. Once this DFC trajectory has been achieved the riparian stand will be allowed to grow without further harvest or treatment.
- A method for applying riparian prescriptions in the field so that DFC will be achieved.
- Riparian conservation zone widths that provide bank stability, litterfall and nutrients, shade, large woody debris, sediment filtering, and microclimate functions in the near and long-term.
- Mitigation for the effects permanent road systems near stream channels have on riparian function, water quality, and fluvial (floodplain) processes.
- Treatment guidelines—by tree species, stand age and condition, and region—that address stocking levels, tree selection, spacing, and other common forest metrics needed to achieve DFC.
- Guidelines for converting certain hardwood-dominated riparian areas to forest stands that can achieve the pathway toward DFC.
- A strategy for conserving fluvial processes and fish habitats in the channel migration zone.
- Guidelines for salvaging dead or downed timber in the inner and outer riparian zones.
- Provisions for managing riparian areas along perennial and seasonal non-fish-bearing streams to achieve a large measure of riparian function.

(5) It sets up a process for evaluating the effects of multiple forest practices on the watershed scale.

(6) It ensures that any alternative plan would provide a functionally equivalent level of conservation.

(7) It includes a monitoring and adaptive management process that managers will use to determine how well the practices are being implemented, how well they comply with regulation, and how effective the regulations themselves are to assess implementation compliance with, and effectiveness of, current regulations, measured against a baseline data set. Over time, some forest practices will likely need to be replaced or adjusted as new information comes in. Whenever new information leads the state forest practice agency to amend a program under this limit, NMFS will publish a notification in the *Federal Register* announcing the availability of those changes for review and comment. Such a notice will provide for a comment period of not less than 30 days, after which NMFS will make a final determination on how well the changes conserve listed fish and thus whether they may be included under this limit on the take prohibitions.

## Regular Evaluation of Limits on Take Prohibitions

In determining that it is neither necessary nor advisable to impose take prohibitions on certain programs or activities described in the final rule, NMFS is mindful that new information may require that conclusion to be reevaluated at some future point. NMFS will evaluate all of the limits on the take prohibitions described in the final rule on a regular basis to determine the program's effectiveness in protecting and conserving the listed fish. If the program is not sufficiently protective, NMFS will identify ways in which it needs to be altered or strengthened. Changes may be identified if the program does not protect desired habitat functions or, even if the program supports the originally targeted habitat characteristics and functions, the habitat does not uphold population productivity levels needed to conserve the ESU.

If any jurisdiction conducting activities that fall under a given limit does not make changes to respond adequately to the new

information in the shortest amount of time feasible—and in no case taking more than one year—NMFS will publish notification in the Federal Register announcing its intention to withdraw the limit and apply the take prohibitions to the program. Such an announcement would provide a comment period of at least 30 days, after which NMFS would make a final determination whether to subject the activities to the ESA section 9(a)(1) take prohibitions.

## Other ESA Mechanisms

Section 10 of the ESA provides another mechanism for NMFS to permit take when it is the incidental result of carrying out an otherwise lawful activity. Applicants for an Incidental Take Permit must submit a Conservation Plan (CP) that identifies (a) the impacts expected from any take associated with activities covered by the plan, and (b) the steps that will be taken to monitor, minimize, and mitigate those impacts. For more information on CPs, see the publication entitled "*A Habitat Conservation Plans and the Incidental Take Permitting Process*," available on the U.S. Fish and Wildlife Service web site, at http://www.fws.gov/r9endspp/hcp/hcpplan.html, or speak with one of the NMFS contact people listed below.

Section 7 of the ESA requires that Federal agencies consult with NMFS on activities they authorize, fund, or carry out to ensure they are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of their critical habitat. This includes Federally funded projects such as road construction, stormwater management, rural and urban development, and many other activities conducted, permitted, or funded by Federal agencies.

## How NMFS Decides What May Be Included In a 4(d) Rule Limit

Whether take prohibitions or other protective regulations are necessary and advisable depends largely upon the biological status of the species and the potential impacts of various activities on it. If programs contribute to conserving the species or adequately limit the impacts on the species, NMFS may find it is not necessary or advisable to impose the Federal take prohibitions. NMFS expects to continue to work with various entities after the final rule is published, and we will continue to incorporate other conservation efforts in future amendments or through other ESA mechanisms.

In assessing the impacts of a proposed action or program on a species= freshwater or estuarine habitat, NMFS considers the following factors:

- Will the action or program degrade existing habitat processes or functions?
- Will the action or program help restore degraded habitat processes or functions?

The limits in the current rule provide examples of how activities that may harm salmon and steelhead can be adequately controlled to minimize impacts and contribute to the conservation of salmon and steelhead.

All development activities need adequate funding and legal mechanisms for implementing, monitoring, maintenance, enforcement, and reporting in order to ensure that they comply with approved policies, ordinances, and permitting procedures. NMFS expects that programs proposed for a limit will be sufficiently described, guided, or governed by an applicable authority (other than just the ESA itself). These authorities could include state laws, county regulations, metropolitan master plans, local ordinances, official operating manuals, or other regulating mechanisms. In order to qualify for a limit, these mechanisms and the entities implementing them must provide a high degree of assurance that covered activities are being conducted in compliance with the specifications NMFS has analyzed and approved.

To be approved for a limit from ESA take prohibitions, a program must conserve salmon and meet their biological requirements. This criterion is the same for any program. These species span the entire West Coast, from coastal rainforests to arid inland areas to high

mountain regions nearly a thousand miles from the ocean. Specific requirements will differ from place to place. Some jurisdictions have asked for NMFS' help in learning how to avoid or limit adverse impacts on these species. In response, we have created this Guide and amended the final rule to make clear what must be done to protect and conserve listed fish.

## Submitting a Program for 4(d) Limit

Any activity or program seeking a limit under a 4(d) rule should contain the following features.

- Descriptions of the activity or program being proposed, the geographic area within which the proposed action/program will apply or be carried out, and the jurisdiction or entity responsible for overseeing the action/program.
- A description of the listed species and habitat that will be affected by the action. This information should include fish distribution and abundance in the affected area and a description of the type, quantity, and quality of habitat in the affected area.
- A description of the environmental baseline. This information should describe existing habitat conditions in terms of water quality, access, riparian areas, stream channels, flow, and watershed health indicators such as total impervious area and any existing high quality habitat areas.
- A description of the anticipated short-term and long-term impacts the action is expected to have on the species (including all life-cycle stages) and its habitat. This description should include both positive and negative impacts and describe how any adverse impacts will be avoided, mitigated, or minimized.
- A discussion of the likelihood that the program or action will be implemented as described. Some questions that would need to be answered are: What commitment has been made to carry out the action or program? Are the legal authorities needed to carry out the program in place? Is implementation funding available and adequate? Is staffing available and adequate? What is the schedule for implementation? If the program is currently being implemented, what is its record of implementation and effectiveness to date?
- A program for monitoring both the action's implementation and effectiveness; it should include a schedule for conducting monitoring and submitting reports.
- A method for using monitoring information to change actions when needed—adaptive management.

## Contact Information

The table below identifies the appropriate division and individual staff member at NMFS to contact regarding inquiries about initiating the process to receive a 4(d) limit or to identify other ESA permitting options:

| TOPIC/TYPE OF ACTIVITY | NMFS DIVISION | FOR MORE INFORMATION |
|---|---|---|
| Ongoing Scientific Research Permit | Protected Resources | Leslie Schaeffer (503/230-5433) |
| Fishery Management | Sustainable Fisheries | http://www.nwr.noaa.gov/1fmep/index.html or Stephen Smith (503/230-5427) or Peter Dygert (206/526-6734) |
| Hatchery and Genetic Management Programs | Sustainable Fisheries | http://www.nwr.noaa.gov/1hgmp/hgmptmpl.htm or Stephen Smith (503/230-5427) |
| Scientific Research Conducted by States | Protected Resources | Leslie Schaeffer (503/230-5433) |
| Screened Water Diversions | Hydropower Program | http://www.nwr.noaa.gov/1hydroweb/ferc.htm or Bryan Nordlund (503/231-6816) |
| • Joint Tribal/State Plans<br>• Routine Road Maintenance Activities<br>• City of Portland Integrated Pest Management<br>• Municipal, Residential, Commercial and Industrial Development (and Redevelopment)<br>• Section 10 Incidental Take Permit<br>• Section 7 Consultation | Habitat Conservation | **State of Washington** – Steve Landino (360/753-6054)<br><br>**State of Oregon, but not including Snake River Basin** – Michael Tehan (503/231-2224)<br><br>**State of Idaho, and the Snake River Watershed in Oregon** – Ted Meyers (208/378-5698)<br><br>**State of California** – Craig Wingert (562/980-4021) |

## Additional Information on the Final 4(d) Rule

Please visit the NMFS Northwest Region Web Site at http://www.nwr.noaa.gov or the Southwest Region Web Site http://swr.ucsd.edu for additional information on the final 4(d) rule for salmon and steelhead. The sites contain the *Federal Register* notice, fact sheets, maps of threatened salmon and steelhead ESUs, press releases, copies of question and answer fact sheets, and documents referenced in the rule. The sites also contain a great deal of information on listed species in general: *Federal Register* notices, species maps, status reviews, fact sheets, and more. In addition, the following NMFS staff members can provide information on the final rule:

| TOPIC/GEOGRAPHIC AREA | CONTACT |
|---|---|
| **Final 4(d) Rule** | Rosemary Furfey (503/231-2149)<br>Rosemary.Furfey@noaa.gov |
| **Puget Sound** | Elizabeth Babcock (206/526-4505)<br>Elizabeth.Babcock@noaa.gov |
| **Upper Columbia Basin** | Mike Grady (206/526-4645)<br>Michael.Grady@noaa.gov |
| **Mid-Columbia Basin** | Kate Vandemoer (503/230-5422)<br>Kate.Vandemoer@noaa.gov |
| **Lower Columbia Basin** | Rob Jones (503/230-5429)<br>Rob.Jones@noaa.gov |
| **Willamette Basin or Oregon Coast** | Patty Dornbusch (503/230-5430)<br>Patty.Dornbusch@noaa.gov |
| **California Coast** | Greg Bryant (707/825-5162)<br>Greg.Bryant@noaa.gov |

### Effective Dates of Final 4(d) Rule

| Species | Effective Date of 4(d) Rule |
|---|---|
| Threatened Steelhead ESUs | 60 days after the final 4(d) rule is published |
| Threatened Salmon ESUs | 180 days after the final 4(d) rule is published |

## Finding Your Way Around the 4(d) Rule

The proposed 4(d) rule included a preamble in which NMFS provided technical guidance, descriptions of the scientific principles upon which the limits were based, and descriptions of the limits' background and content. The proposed regulatory language was in a separate Code of Federal Regulation (CFR) section.

The final 4(d) rule for salmon and steelhead is divided into two sections—the preamble and the CFR language. The preamble includes the following sections:

- A summary of the final rule and its effective dates
- Supplementary Information—including the rule's background and a description of its content
- A list of the threatened ESUs affected by the final rule
- Notice of availability of documents referenced in the final rule
- A summary of the comments received in response to the proposed rules
- A section identifying the changes to the proposed 4(d) rule made in response to public comment
- Take Guidance
- A section detailing how the rule complies with the Regulatory Flexibility Act and various Executive Orders

The last section of the final rule includes the regulatory language that applies the section 9 take prohibitions to the 14 threatened ESUs listed below and creates 13 limits on those prohibitions. The regulations section describes each limit.

**The following is a list of the 14 threatened ESUs covered in the final 4(d) rule:**

**Threatened Steelhead ESUs**
- Central California Coast
- South-Central California Coast
- Snake River Basin
- Lower Columbia River
- Central Valley, California
- Upper Willamette River
- Middle Columbia River

**Threatened Chum ESUs**
- Hood Canal summer-run
- Columbia River

**Threatened Chinook ESUs**
- Puget Sound
- Lower Columbia River
- Upper Willamette River

**Threatened Coho ESUs**
- Oregon Coast

**Threatened Sockeye ESUs**
- Ozette Lake

## Technical Issues: Aids for Understanding the 13 Limits in the 4(d) Rule

### Viable Salmonid Populations

NMFS uses the Viable Salmonid Population (VSP) concept primarily in evaluating hatchery and harvest activities. NMFS defines populations following Ricker's (1972) definition of a "stock." Thus, a population is a group of fish of the same species spawning in a particular lake or stream (or portion thereof) at a particular season which to a substantial degree does not interbreed with fish from any other group spawning in a different place or in the same place at a different season. This definition is widely accepted and applied in the field of fishery management.

An independent population is an aggregation of one or more local breeding units that are closely linked by exchange of individuals among themselves, but are sufficiently isolated from other independent populations that exchanges of individuals among populations do not appreciably affect the population dynamics or extinction risk of the populations over a 100-year time frame. Such

populations are generally smaller than their entire ESU, and they generally inhabit geographic ranges on the scale of whole river basins or major sub-basins that are relatively free of outside migration. For several reasons, NMFS believes it important to identify population units within established ESUs and individually evaluate their extinction risk. First, many of the biological processes that can drive a species to extinction operate at the population level, so it is appropriate to manage at that scale. In addition, by identifying and assessing impacts at the population level, managers can gain a better understanding of the important biological diversity contained within each ESU—a factor considered in NMFS' ESU policy (Waples 1991). Further, given an ESU's scale and complexity, it is typically a more practical undertaking to assess impacts at the population level. Finally, assessing impacts at the population level helps ensure that listed salmon and steelhead are treated consistently across a diverse geographic and jurisdictional range.

NMFS will use four primary biological parameters to evaluate population status: (1) Abundance, (2) population growth rate, (3) population spatial structure, and (4) diversity. The relevance of these parameters to salmonid population status is discussed in a variety of scientific documents (e.g., Nehlsen et al. 1991; Burgman et al. 1993; Huntington et al. 1996; Caughley and Gunn 1996; Myers et al.,1998). Population abundance is important to evaluate because smaller populations experience relatively greater genetic, environmental, and demographic risks. Genetic risks associated with low population size include inbreeding depression, harmful mutation accumulation, and loss of genetic diversity. Demographic risks associated with low population size include random effects associated with environmental events.

Population productivity may be thought of as the population's ability to increase or maintain its abundance. It is important to assess productivity because negative trends in productivity over sustained periods may lead to the genetic and demographic impacts associated with small population sizes. Population spatial structure reflects the number, size, and distribution of habitat patches and the condition of the migration corridors that provide linkages among these patches. Population structure affects demographic processes and extinction risk in ways that may not be readily apparent from studies of abundance and population growth rate. In addition, spatial structure affects evolutionary processes and may affect a population's ability to respond to environmental changes or stochastic events.

Population diversity is important because it helps buffer a species against short-term environmental change and stochastic events. Population diversity may be assessed by examining life history traits such as age, and run and spawn timing distributions. Also, DNA analysis may provide an indication of diversity.

In applying the concepts discussed here to harvest and hatchery actions, NMFS relies on two functional thresholds of population status: (1) Critical population threshold, and (2) viable population threshold. The critical population threshold refers to a minimal functional level below which a population's risk of extinction increases exponentially in response to any additional genetic or demographic risks. The viable population threshold refers to a condition where the population is self-sustaining and not at risk of becoming endangered in the foreseeable future. This threshold reflects the desired condition for individual populations and encompasses their contribution to recovering the ESU as a whole. Proposed actions must not preclude populations from attaining this condition.

**Properly Functioning Condition**

The final rule limits the take prohibitions for certain land and water management activities that NMFS has determined will conserve listed salmonids' habitat even though they may incidentally take individual listed fish. To make these determinations, NMFS evaluated whether the activities would allow properly functioning habitat condition to be attained and persist. The NMFS defines properly functioning condition (PFC) as the sustained presence of natural habitat-forming processes (e.g., hydraulic runoff, bedload transport, channel migration,

riparian vegetation succession) that are necessary for the long-term survival and recovery of the species (*The Habitat Approach*, NMFS, 1999). Thus, PFC constitutes a species' habitat-based biological requirements—the essential physical features that support spawning, incubation, rearing, feeding, sheltering, migration, and other behaviors. Such features include adequate instream flow, appropriate water temperature, loose gravel for spawning, unimpeded fish passage, deep pools, and abundant large tree trunks and root wads.

There is more than one scientifically credible analytical framework for determining an activity's effects. However, NMFS has developed a default analytical method (*Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale*, NMFS, 1996). It is often referred to as the "Matrix of Pathways and Indicators," or MPI. In the MPI framework, the pathways for determining the effect of an action are represented as six conceptual groupings (e.g., water quality, channel condition) of 18 habitat condition indicators (e.g., temperature, width/depth ratio). Indicator criteria (mostly numeric, though some are narrative) are provided for three levels of environmental baseline condition: properly functioning, at risk, and not properly functioning. The effect of the action upon each indicator is classified by whether it will restore, maintain, or degrade the indicator.

Although the indicators used to assess habitat condition may entail instantaneous measurements, they are chosen, using the best available science, to detect the health of underlying processes, not static characteristics. "Best available science" advances through time, thus allowing PFC indicators to be refined, new threats to be assessed, and species status and trends to be better understood. Aquatic habitats are inherently dynamic, and the PFC concept recognizes that natural patterns of habitat disturbance will continue to occur. Floods, landslides, windstorms, and fires result in spatial and temporal variability in habitat characteristics, as do human activities. Indicators of PFC vary between different landscapes based on unique physiographic and geologic features. For example, aquatic habitats on timberlands in glacial mountain valleys are controlled by natural processes operating at different scales and rates than are habitats on low-elevation coastal rivers. The MPI provides a consistent but geographically adaptable framework for making effect determinations. The pathways and indicators, as well as the ranges of their associated criteria, are amenable to alteration through the process of watershed analysis.

Regardless of the analytical method used, if a proposed action is likely to impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward PFC, it cannot be found to be consistent with the conservation of the species. If a program preserves existing habitat function levels and allows natural progression towards PFC where habitat is impaired, NMFS may determine that it qualifies for a limit on the take prohibitions. The NMFS has added language to the limits for road maintenance, pesticide management, municipal, residential, commercial and industrial (MRCI) development, and forestry that defines PFC and identifies how NMFS will evaluate programs with regard to meeting this biological standard. Specific criteria for applying this conservation standard are listed in each habitat-related limit.

The scope of any given activity is important to NMFS' effects analysis. The scope of the activity may be such that only a portion of the habitat forming processes in a watershed are affected by it. For NMFS to find that an activity is consistent with conserving listed fish, only the effects on habitat functions that are within the scope of that activity will be evaluated. For example, an integrated pest management program may affect habitat forming processes related to clean water, but have no effect on physical barriers that prevent fish from gaining access to a stream.

National Wetlands Inventory – Corvallis Quadrangle

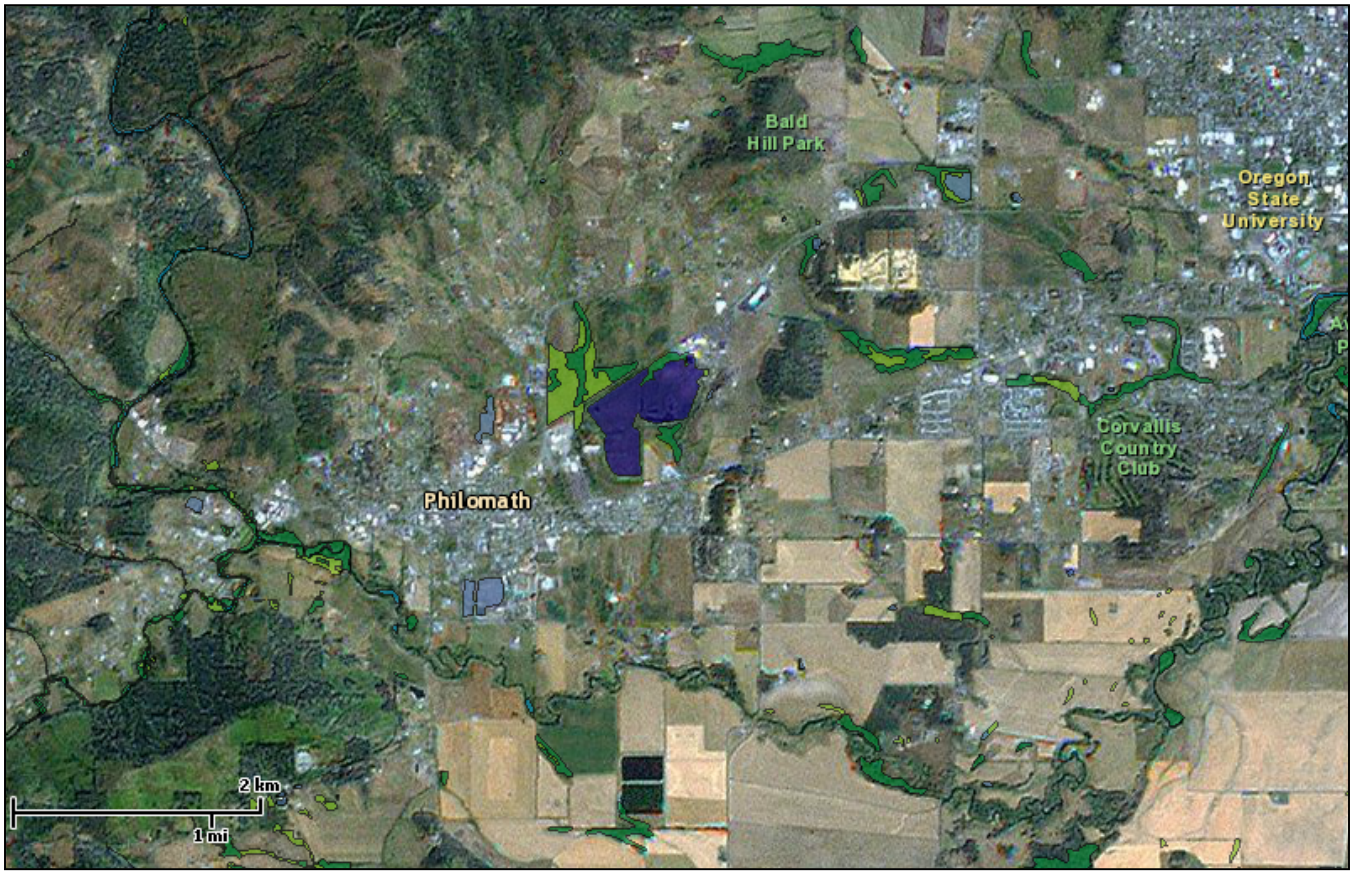
# Appendix G

U.S. Fish and Wildlife Service

# National Wetlands Inventory

**National Wetlands Inv-Philomath**

**May 21, 2012**




## Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

## User Remarks:

http://107.20.228.18/Wetlands/WetlandsMapper.html#

CITY OF PHILOMATH
Wastewater System Facilities Plan,
Philomath, Oregon

Flow Routing Calculation Summary Spreadsheet

# Appendix H

**Appendix H**
**Table H-1: Gravity Sewer Capacity Analysis at Buildout with A2 Overflow Structure & N8A Basin Transfer**

Philmath Wastewater System Facilities Plan
960.3130.0

Refer to Figure 6-2 for Flow Routing and Abbreviations

| | | |
|---|---|---|
| UGB Area | 2560 | |
| City Limits Area | 806 | |
| Sewered Area | 719 | |
| Peaking Factor | 3 | |
| Population at buildout | 15170 | |
| Population at Buildout | 15170 | |
| | | |
| Flow to PSA | 4.611 | 31% |
| Flow to NCPS | 9.475 | 64% |
| Flow to TEPS | 0.102 | 1% |
| Total Flow to WWTP | 14.766 | 100% |

| Sewer Capacities | | |
|---|---|---|
| Size | Slope | Capacity (MGD) |
| 8" | 0.40% | 0.495 |
| 10" | 0.28% | 0.752 |
| 12" | 0.22% | 1.084 |
| 15" | 0.15% | 1.623 |
| 18" | 0.12% | 2.360 |
| 21" | 0.10% | 3.245 |
| 24" | 0.09% | 4.395 |

| Basin | | Existing Peak Contribution from Basin (MGD) | Additional Peak Contribution From Basin Associated with Growth at Buildout (MGD) | Total Flow Contribution From Buildout at 2027 (MGD) | Total Routed Discharge From Basin at Buildout (MGD) | Capacity of Outlet (MGD) | Adequate Capacity to Convey Buildout Peak Flow ? |
|---|---|---|---|---|---|---|---|
| A1 | | 0.362 | 0.000 | 0.362 | 0.362 | 0.495 | YES |
| A2 | | 0.120 | 0.403 | 0.523 | 0.523 | 0.8 | YES |
| A3 | | 0.194 | 0.000 | 0.194 | 0.194 | 0.495 | YES |
| A4A | | 0.700 | 0.122 | 0.822 | 4.055 | 1.084 | NO |
| A4B | | 0.475 | 0.039 | 0.514 | 1.366 | 0.495 | NO |
| A5A | | 0.150 | 0.228 | 0.378 | 0.645 | 0.495 | NO |
| A5B | | 0.000 | 0.268 | 0.268 | 0.268 | | New Sewer |
| A5C | | 0.185 | 0.022 | 0.207 | 0.207 | 0.495 | YES |
| A6 | | 0.977 | 0.009 | 0.986 | 1.694 | 0.752 | NO |
| A7A | | 0.000 | 0.224 | 0.224 | 0.224 | | New Sewer |
| A7B | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer |
| N1A | | 0.000 | 0.360 | 0.360 | 0.660 | 0.752 | YES |
| N1B | | 0.000 | 0.299 | 0.299 | 0.299 | | New Sewer |
| N2 | | 0.000 | 0.208 | 0.208 | 0.208 | | New Sewer |
| N3AA | | 0.829 | 0.077 | 0.906 | 1.256 | 0.495 | NO |
| N3AB | | 0.434 | 0.000 | 0.434 | 1.690 | 1.084 | NO |
| N3B | | 0.432 | 0.011 | 0.443 | 1.370 | 0.495 | NO |
| N3CA | | 0.549 | 0.017 | 0.566 | 0.927 | 0.752 | NO |
| N3CB | | 0.082 | 0.000 | 0.082 | 0.082 | 0.495 | YES |
| N3D | | 0.262 | 0.016 | 0.278 | 0.278 | 0.495 | YES |
| N4 | | 0.000 | 0.481 | 0.481 | 5.548 | 4.395 | NO |
| N5 | | 0.000 | 1.342 | 1.342 | 1.342 | | New Sewer |
| N6A | | 0.000 | 1.044 | 1.044 | 3.724 | | New Sewer |
| N6B | | 0.000 | 0.998 | 0.998 | 0.998 | | New Sewer |
| N7 | | 0.000 | 0.213 | 0.213 | 0.213 | | New Sewer |
| N8A | | 0.297 | 0.284 | 0.581 | 1.468 | | New Sewer |
| N8B | | 0.000 | 0.740 | 0.740 | 0.740 | | New Sewer |
| N8C | | 0.000 | 0.147 | 0.147 | 0.147 | | New Sewer |
| P1A | | 0.088 | 0.013 | 0.102 | 0.102 | 0.495 | YES |
| P1B | | 0.000 | 0.578 | 0.578 | 0.578 | | New Sewer |
| P2A | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer |
| P2B | | 0.000 | 0.267 | 0.267 | 0.267 | | New Sewer |
| PSATS | | | | | 4.611 | 1.084 | NO |
| NCTS | | | | | 8.815 | 6.649 | NO |
| Totals | | 6.138 | 8.628 | 14.766 | | | |

## Appendix H
## Table H-1: Gravity Sewer Capacity Analysis at Buildout with A2 Overflow Structure & N8A Basin Transfer

Philmath Wastewater System Facilities Plan
960.3130.0

Refer to Figure 6-2 for Flow Routing and Abbreviations

| | | |
|---|---|---|
| UGB Area | 2560 | |
| City Limits Area | 806 | |
| Sewered Area | 719 | |
| Peaking Factor | 3 | |
| Population at buildout | 15170 | |
| Population at Buildout | 15170 | |
| | | |
| Flow to PSA | 4.611 | 31% |
| Flow to NCPS | 9.475 | 64% |
| Flow to TEPS | 0.102 | 1% |
| Total Flow to WWTP | 14.766 | 100% |

| Sewer Capacities | | |
|---|---|---|
| Size | Slope | Capacity (MGD) |
| 8" | 0.40% | 0.495 |
| 10" | 0.28% | 0.752 |
| 12" | 0.22% | 1.084 |
| 15" | 0.15% | 1.623 |
| 18" | 0.12% | 2.360 |
| 21" | 0.10% | 3.245 |
| 24" | 0.09% | 4.395 |

| Basin | | Existing Peak Contribution from Basin (MGD) | Additional Peak Contribution From Basin Associated with Growth at Buildout (MGD) | Total Flow Contribution From Buildout at 2027 (MGD) | Total Routed Discharge From Basin at Buildout (MGD) [1] | Capacity of Outlet (MGD) | Adequate Capacity to Convey Buildout Peak Flow ? | Recommended Trunk Sewer Size and Slope [2] |
|---|---|---|---|---|---|---|---|---|
| A1 | | 0.362 | 0.000 | 0.362 | 0.362 | 0.495 | YES | NA |
| A2 | | 0.120 | 0.403 | 0.523 | 0.523 | 0.8 | YES | NA |
| A3 | | 0.194 | 0.000 | 0.194 | 0.194 | 0.495 | YES | NA |
| A4A | | 0.700 | 0.122 | 0.822 | 4.055 | 1.084 | NO | 21" @ 0.22 % |
| A4B | | 0.475 | 0.039 | 0.514 | 1.366 | 0.495 | NO | 12" @ 0.40% |
| A5A | | 0.150 | 0.228 | 0.378 | 0.645 | 0.495 | NO | 10" @ 0.40 % |
| A5B | | 0.000 | 0.268 | 0.268 | 0.268 | | New Sewer | 8" @ 0.40 % |
| A5C | | 0.185 | 0.022 | 0.207 | 0.207 | 0.495 | YES | NA |
| A6 | | 0.977 | 0.009 | 0.986 | 1.694 | 0.752 | NO | 15" @ 0.28% |
| A7A | | 0.000 | 0.224 | 0.224 | 0.224 | | New Sewer | 8" @ 0.40 % |
| A7B | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer | 8" @ 0.40 % |
| N1A | | 0.000 | 0.360 | 0.360 | 0.660 | 0.752 | YES | NA |
| N1B | | 0.000 | 0.299 | 0.299 | 0.299 | | New Sewer | 8" @ 0.40 % |
| N2 | | 0.000 | 0.208 | 0.208 | 0.208 | | New Sewer | 8" @ 0.40 % |
| N3AA | | 0.829 | 0.077 | 0.906 | 1.256 | 0.495 | NO | 12" @ 0.40% |
| N3AB | | 0.434 | 0.000 | 0.434 | 1.690 | 1.084 | NO | 15" @ 0.22% |
| N3B | | 0.432 | 0.011 | 0.443 | 1.370 | 0.495 | NO | 15" @ 0.18% |
| N3CA | | 0.549 | 0.017 | 0.566 | 0.927 | 0.752 | NO | 12" @ 0.18% |
| N3CB | | 0.082 | 0.000 | 0.082 | 0.082 | 0.495 | YES | NA |
| N3D | | 0.262 | 0.016 | 0.278 | 0.278 | 0.495 | YES | NA |
| N4 | | 0.000 | 0.481 | 0.481 | 5.548 | 4.395 | NO | 24" @ 0.12% |
| N5 | | 0.000 | 1.342 | 1.342 | 1.342 | | New Sewer | 15" @ 0.15% |
| N6A | | 0.000 | 1.044 | 1.044 | 3.724 | | New Sewer | 24" @ 0.12% |
| N6B | | 0.000 | 0.998 | 0.998 | 0.998 | | New Sewer | 12" @ 0.22% |
| N7 | | 0.000 | 0.213 | 0.213 | 0.213 | | New Sewer | 8" @ 0.40% |
| N8A | | 0.297 | 0.284 | 0.581 | 1.468 | | New Sewer | 15" @ 0.15% |
| N8B | | 0.000 | 0.740 | 0.740 | 0.740 | | New Sewer | 10" @ 0.28% |
| N8C | | 0.000 | 0.147 | 0.147 | 0.147 | | New Sewer | 8" @ 0.40 % |
| P1A | | 0.088 | 0.013 | 0.102 | 0.102 | 0.495 | YES | NA |
| P1B | | 0.000 | 0.578 | 0.578 | 0.578 | | New Sewer | 10" @ 0.28% |
| P2A | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer | 8" @ 0.40 % |
| P2B | | 0.000 | 0.267 | 0.267 | 0.267 | | New Sewer | 8" @ 0.40 % |
| PSATS | | | | | 4.611 | 1.084 | NO | 21" @ 0.22% |
| NCTS | | | | | 8.815 | 6.649 | NO | 24" @ 0.42% |
| Totals | | 6.138 | 8.628 | 14.766 | | | | |

(1) See Figure 6-2 for schematic representation of recommended flow routing.
(2) See Figure 6-1 for layout of sewer lines. Where new trunk sewers are to replace existing sewers, the recommended slope is that of the existing line. Where new trunk sewers are installed to serve undeveloped areas, the recommended slope is the minimum slope required to provide adequate scouring velocity for the recommended pipe size.

## Appendix H
## Table H-1: Gravity Sewer Capacity Analysis at Buildout with A2 Overflow Structure & N8A Basin Transfer

Philomath Wastewater System Facilities Plan
960.3130.0

Refer to Figure 6-2 for Flow Routing and Abbreviations

| | | |
|---|---|---|
| UGB Area | 2560 | |
| City Limits Area | 806 | |
| Sewered Area | 719 | |
| Peaking Factor | 3 | |
| Population at buildout | 15170 | |
| Population at Buildout | 15170 | |
| | | |
| Flow to PSA | 4.611 | 31% |
| Flow to NCPS | 9.475 | 64% |
| Flow to TEPS | 0.102 | 1% |
| Total Flow to WWTP | 14.766 | 100% |

Sewer Capacities

| Size | Slope | Capacity (MGD) |
|---|---|---|
| 8" | 0.40% | 0.495 |
| 10" | 0.28% | 0.752 |
| 12" | 0.22% | 1.084 |
| 15" | 0.15% | 1.623 |
| 18" | 0.12% | 2.360 |
| 21" | 0.10% | 3.245 |
| 24" | 0.09% | 4.395 |

| Basin | | Existing Peak Contribution from Basin (MGD) | Additional Peak Contribution From Basin Associated with Growth at Buildout (MGD) | Total Flow Contribution From Buildout at 2027 (MGD) | Total Routed Discharge From Basin at Buildout (MGD) [1] | Capacity of Outlet (MGD) | Adequate Capacity to Convey Buildout Peak Flow ? | Recommended Trunk Sewer Size and Slope [2] |
|---|---|---|---|---|---|---|---|---|
| A1 | | 0.362 | 0.000 | 0.362 | 0.362 | 0.495 | YES | NA |
| A2 | | 0.120 | 0.403 | 0.523 | 0.523 | 0.8 | YES | NA |
| A3 | | 0.194 | 0.000 | 0.194 | 0.194 | 0.495 | YES | NA |
| A4A | | 0.700 | 0.122 | 0.822 | 4.055 | 1.084 | NO | 21" @ 0.22 % |
| A4B | | 0.475 | 0.039 | 0.514 | 1.366 | 0.495 | NO | 12" @ 0.40% |
| A5A | | 0.150 | 0.228 | 0.378 | 0.645 | 0.495 | NO | 10" @ 0.40 % |
| A5B | | 0.000 | 0.268 | 0.268 | 0.268 | | New Sewer | 8" @ 0.40 % |
| A5C | | 0.185 | 0.022 | 0.207 | 0.207 | 0.495 | YES | NA |
| A6 | | 0.977 | 0.009 | 0.986 | 1.694 | 0.752 | NO | 15" @ 0.28% |
| A7A | | 0.000 | 0.224 | 0.224 | 0.224 | | New Sewer | 8" @ 0.40 % |
| A7B | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer | 8" @ 0.40 % |
| N1A | | 0.000 | 0.360 | 0.360 | 0.660 | 0.752 | YES | NA |
| N1B | | 0.000 | 0.299 | 0.299 | 0.299 | | New Sewer | 8" @ 0.40 % |
| N2 | | 0.000 | 0.208 | 0.208 | 0.208 | | New Sewer | 8" @ 0.40 % |
| N3AA | | 0.829 | 0.077 | 0.906 | 1.256 | 0.495 | NO | 12" @ 0.40% |
| N3AB | | 0.434 | 0.000 | 0.434 | 1.690 | 1.084 | NO | 15" @ 0.22% |
| N3B | | 0.432 | 0.011 | 0.443 | 1.370 | 0.495 | NO | 15" @ 0.18% |
| N3CA | | 0.549 | 0.017 | 0.566 | 0.927 | 0.752 | NO | 12" @ 0.18% |
| N3CB | | 0.082 | 0.000 | 0.082 | 0.082 | 0.495 | YES | NA |
| N3D | | 0.262 | 0.016 | 0.278 | 0.278 | 0.495 | YES | NA |
| N4 | | 0.000 | 0.481 | 0.481 | 5.548 | 4.395 | NO | 24" @ 0.12% |
| N5 | | 0.000 | 1.342 | 1.342 | 1.342 | | New Sewer | 15" @ 0.15% |
| N6A | | 0.000 | 1.044 | 1.044 | 3.724 | | New Sewer | 24" @ 0.12% |
| N6B | | 0.000 | 0.998 | 0.998 | 0.998 | | New Sewer | 12" @ 0.22% |
| N7 | | 0.000 | 0.213 | 0.213 | 0.213 | | New Sewer | 8" @ 0.40% |
| N8A | | 0.297 | 0.284 | 0.581 | 1.468 | | New Sewer | 15" @ 0.15% |
| N8B | | 0.000 | 0.740 | 0.740 | 0.740 | | New Sewer | 10" @ 0.28% |
| N8C | | 0.000 | 0.147 | 0.147 | 0.147 | | New Sewer | 8" @ 0.40 % |
| P1A | | 0.088 | 0.013 | 0.102 | 0.102 | 0.495 | YES | NA |
| P1B | | 0.000 | 0.578 | 0.578 | 0.578 | | New Sewer | 10" @ 0.28% |
| P2A | | 0.000 | 0.108 | 0.108 | 0.108 | | New Sewer | 8" @ 0.40 % |
| P2B | | 0.000 | 0.267 | 0.267 | 0.267 | | New Sewer | 8" @ 0.40 % |
| PSATS | | | | | 4.611 | 1.084 | NO | 21" @ 0.22% |
| NCTS | | | | | 8.815 | 6.649 | NO | 24" @ 0.42% |
| Totals | | 6.138 | 8.628 | 14.766 | | | | |

(1) See Figure 6-2 for schematic representation of recommended flow routing.
(2) See Figure 6-1 for layout of sewer lines. Where new trunk sewers are to replace existing sewers, the recommended slope is that of the existing line. Where new trunk sewers are installed to serve undeveloped areas, the recommended slope is the minimum slope required to provide adequate scouring velocity for the recommended pipe size.

CITY OF PHILOMATH
Wastewater System Facilities Plan,
Philomath, Oregon

Recommended Collection System Improvements Cost Estimates
Recommended Treatment System Improvements Cost Estimates

# Appendix I

# Appendix I

Preliminary Collection System Cost Estimates
Philomath Wastewater Facilities Plan
960.3130.0

8/6/2003

1= priority 1A
1.5= priority 1B
2= priority 2
3= priority 3

| Priority | Project Number | Project & Location(s) | Size (in) | ($/in-dia) 8" - 10" $7.75 Length (ft) | ($/in-dia) 12" - 15" $7.00 Length (ft) | ($/in-dia) 18" - 24" $6.25 Length (ft) | $3,500 # Manholes | $2,000 # Services | $1,500 # Manhole Rehabs | Other Costs | Constr Cost | 20% Constr Contingency | 20% Eng | 10% Legal, Permits Easement, Admin | Total Project | Rounded Total | *Total project costs rounded to nearest $100* Prior 1A | Prior 1B | Prior 2 | Prior 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Trunk Collection System** | | | | | | | | | | | | | | | | | | | | |
| 1 | | **Pump Station A (16th & Cedar)** | | | | | | | | $ 750,000.00 | $750,000 | $150,000 | $150,000 | $75,000 | $1,125,000 | $1,125,000 | $1,125,000 | $0 | $0 | $0 |
| 1 | | **Overflow Structure (15th & College)** | | | | | | | | $ 7,500.00 | $7,500 | $750 | $1,500 | $750 | $10,500 | $11,000 | $11,000 | $0 | $0 | $0 |
| 1 | | **Buried Fuel Tank at Newton Creek Pump Station** | | | | | | | | $ 10,000.00 | $10,000 | $1,000 | $2,000 | $1,000 | $14,000 | $14,000 | $14,000 | $0 | $0 | $0 |
| | | **Pump Station A Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 1 | | Cedar Street (MH 200 to MH 29) | 21 | | | 1200 | 6 | 10 | | | $198,500 | $19,850 | $39,700 | $19,850 | $277,900 | $278,000 | $278,000 | $0 | $0 | $0 |
| 1 | | 13th Street (MH 29 to MH 31) | 21 | | | 840 | 2 | 18 | | | $153,250 | $15,325 | $30,650 | $15,325 | $214,550 | $215,000 | $215,000 | $0 | $0 | $0 |
| 1 | | Applegate Street (MH 31 to MH 32) | 21 | | | 390 | 1 | 6 | | | $66,688 | $6,669 | $13,338 | $6,669 | $93,363 | $93,000 | $93,000 | $0 | $0 | $0 |
| | | **Basin N3A Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 1 | | Applegate Street (MH 1 to MH 2) | 12 | | 430 | | 2 | 6 | | | $55,120 | $5,512 | $11,024 | $5,512 | $77,168 | $77,000 | $77,000 | $0 | $0 | $0 |
| 1 | | 20th Street (MH 2 to MH 6) | 12 | | 740 | | 2 | 11 | | | $91,160 | $9,116 | $18,232 | $9,116 | $127,624 | $128,000 | $128,000 | $0 | $0 | $0 |
| 1 | | College Street (MH 6 to MH 9) | 12 | | 400 | | 2 | 5 | | | $50,600 | $5,060 | $10,120 | $5,060 | $70,840 | $71,000 | $71,000 | $0 | $0 | $0 |
| | | **12th Street Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 1 | | 12th Street (MH 32 to MH 71) | 12 | | 1150 | | 4 | 12 | | | $134,600 | $13,460 | $26,920 | $13,460 | $188,440 | $188,000 | $188,000 | $0 | $0 | $0 |
| | | **Basin A6 Trunk Sewer Imps. Phase I** | | | | | | | | | | | | | | | | | | |
| 1 | | Applegate Street (MH 32 to MH 34) | 15 | | 820 | | 2 | 12 | | | $117,100 | $11,710 | $23,420 | $11,710 | $163,940 | $164,000 | $164,000 | $0 | $0 | $0 |
| 1 | | Applegate Street (MH 34 to MH 35) | 12 | | 400 | | 1 | 4 | | | $45,100 | $4,510 | $9,020 | $4,510 | $63,140 | $63,000 | $63,000 | $0 | $0 | $0 |
| 1 | | 10th Street (MH 34 to MH 45) | 12 | | 420 | | 2 | 5 | | $ 5,000.00 | $57,280 | $5,728 | $11,456 | $5,728 | $80,192 | $80,000 | $80,000 | $0 | $0 | $0 |
| 1 | | Main Street (MH 45 to MH 46) | 12 | | 400 | | 1 | 4 | | $ 10,000.00 | $55,100 | $5,510 | $11,020 | $5,510 | $77,140 | $77,000 | $77,000 | $0 | $0 | $0 |
| | | **Basin N3B Trunk Sewer Improvements** | | | | 7190 | | | | | | | | | | | | | | |
| 2 | | Applegate Street (MH 203 to MH 205) | 15 | | 390 | | 2 | 8 | | | $63,950 | $6,395 | $12,790 | $6,395 | $89,530 | $90,000 | $0 | $0 | $90,000 | $0 |
| 2 | | Applegate Street (MH 205 to MH 208) | 12 | | 1280 | | 3 | 22 | | | $162,020 | $16,202 | $32,404 | $16,202 | $226,828 | $227,000 | $0 | $0 | $227,000 | $0 |
| | | **Basin A6 Trunk Sewer Imps. Phase II** | | | | | | | | | | | | | | | | | | |
| 2 | | 9th Street (MH 35 to MH 36) | 10 | 200 | | | 1 | 2 | | | $23,000 | $2,300 | $4,600 | $2,300 | $32,200 | $32,000 | $0 | $0 | $32,000 | $0 |
| 2 | | Alley (MH 36 to MH 38) | 10 | 770 | | | 2 | 11 | | | $88,675 | $8,868 | $17,735 | $8,868 | $124,145 | $124,000 | $0 | $0 | $124,000 | $0 |
| 2 | | Main Street (MH 46 to MH 52) | 10 | 400 | | | 1 | 4 | | $ 10,000.00 | $52,500 | $5,250 | $10,500 | $5,250 | $73,500 | $74,000 | $0 | $0 | $74,000 | $0 |
| 2 | | 8th Street (MH 52 to MH 53) | 10 | 330 | | | 1 | 5 | | | $39,075 | $3,908 | $7,815 | $3,908 | $54,705 | $55,000 | $0 | $0 | $55,000 | $0 |
| 2 | | **Timber Estates Pump Station Imps** | | | | | | | | $ 75,000.00 | $75,000 | $15,000 | $15,000 | $7,500 | $112,500 | $113,000 | $0 | $0 | $113,000 | $0 |
| | | **Newton Creek Pump Station Capacity Imps** | | | | | | | | | | | | | | | | | | |
| 2 | | New Forcemain to WWTP (5400 ft @ $110/ft) | | | | | | | | $ 594,000.00 | $594,000 | $59,400 | $118,800 | $59,400 | $831,600 | $832,000 | $0 | $0 | $832,000 | $0 |
| 2 | | Pump Station Improvements | | | | | | | | $ 200,000.00 | $200,000 | $40,000 | $40,000 | $20,000 | $300,000 | $300,000 | $0 | $0 | $300,000 | $0 |
| | | **Basin A6 Trunk Sewer Imps. Phase III** | | | | | | | | | | | | | | | | | | |
| 3 | | 7th Street (MH 38 to MH 39) | 10 | 220 | | | 1 | 3 | | | $26,550 | $2,655 | $5,310 | $2,655 | $37,170 | $37,000 | $0 | $0 | $0 | $37,000 |
| 3 | | Main Street (MH 39 to MH 40) | 10 | 230 | | | 1 | 2 | | $ 7,500.00 | $32,825 | $3,283 | $6,565 | $3,283 | $45,955 | $46,000 | $0 | $0 | $0 | $46,000 |
| 3 | | College Street (MH 53 to MH 56) | 10 | 400 | | | 1 | 5 | | | $44,500 | $4,450 | $8,900 | $4,450 | $62,300 | $62,000 | $0 | $0 | $0 | $62,000 |
| | | **Basin A4B Trunk Sewer Imps. Phase II** | | | | | | | | | | | | | | | | | | |
| 3 | | Pioneer Street (MH 71 to MH 73) | 10 | 400 | | | 1 | 8 | | | $50,500 | $5,050 | $10,100 | $5,050 | $70,700 | $71,000 | $0 | $0 | $0 | $71,000 |
| 3 | | 11th Street (MH 73 to MH 74) | 10 | 375 | | | 1 | 6 | | | $44,563 | $4,456 | $8,913 | $4,456 | $62,388 | $62,000 | $0 | $0 | $0 | $62,000 |
| | | **15th Street Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 3 | | 15th Street (MH 27 to MH 288) | 12 | | 1630 | | 3 | 32 | | | $211,420 | $21,142 | $42,284 | $21,142 | $295,988 | $296,000 | $0 | $0 | $0 | $296,000 |
| | | **Basin N3AA Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 3 | | Applegate Street (MH 202A to MH 1) | 15 | | 875 | | 3 | 19 | | | $140,375 | $14,038 | $28,075 | $14,038 | $196,525 | $197,000 | $0 | $0 | $0 | $197,000 |
| | | **Newton Creek Trunk Sewer Improvements** | | | | | | | | | | | | | | | | | | |
| 3 | | Newton Creek (MH 202A to NCPS) | 24 | | | 2660 | 7 | 0 | | | $423,500 | $42,350 | $84,700 | $42,350 | $592,900 | $593,000 | $0 | $0 | $0 | $593,000 |
| 3 | | **Benton View Drive Sewer Improvements** | 8 | 1150 | | | 4 | 17 | | | $119,300 | $11,930 | $23,860 | $11,930 | $167,020 | $167,000 | $0 | $0 | $0 | $167,000 |
| | | **East Highway 20 Trunk Sewer** | | | | | | | | | | | | | | | | | | |
| 3 | | From 24" Stub to Basin N4/N5 Boundary | 15 | | | 1650 | 4 | 5 | | | $178,688 | $17,869 | $35,738 | $17,869 | $250,163 | $250,000 | $0 | $0 | $0 | $250,000 |
| 3 | | From Basin N4/N5 Boundary to End 15" | 15 | | | 1600 | 4 | 5 | | | $174,000 | $17,400 | $34,800 | $17,400 | $243,600 | $244,000 | $0 | $0 | $0 | $244,000 |
| 3 | | From End 15" to End of Trunk Sewer | 12 | | | 1050 | 3 | 5 | | | $99,250 | $9,925 | $19,850 | $9,925 | $138,950 | $139,000 | $0 | $0 | $0 | $139,000 |
| | | **20th Place Trunk Sewer** | | | | | | | | | | | | | | | | | | |
| 3 | | From 24" Stub to 20th Pl./Hwy 20 Intersection | 24 | | | 680 | 2 | 5 | | | $119,000 | $11,900 | $23,800 | $11,900 | $166,600 | $167,000 | $0 | $0 | $0 | $167,000 |
| 3 | | From 20th Pl./Hwy 20 Intersection to SPRR | 24 | | | 2100 | 4 | 10 | | | $349,000 | $34,900 | $69,800 | $34,900 | $488,600 | $489,000 | $0 | $0 | $0 | $489,000 |
| 3 | | Railroad Bore (Length = 100 ft) | 24 | | | | 2 | | | $ 30,000.00 | $37,000 | $3,700 | $7,400 | $3,700 | $51,800 | $52,000 | $0 | $0 | $0 | $52,000 |
| | | **Railroad Trunk Sewer** | 15 | | 1600 | | 4 | | | $ 45,000.00 | $227,000 | $22,700 | $45,400 | $22,700 | $317,800 | $318,000 | $0 | $0 | $0 | $0 |
| | | **Green Road Trunk Sewer Phase I** | | | | | | | | | | | | | | | | | | |
| 3 | | From SPRR to Industrial Way | 21 | | | 1100 | 3 | 4 | | | $162,875 | $16,288 | $32,575 | $16,288 | $228,025 | $228,000 | $0 | $0 | $0 | $228,000 |
| | | **Green Road Trunk Sewer Phase II** | | | | | | | | | | | | | | | | | | |
| 3 | | From Industrial Way to West Hills Rd. | 15 | | 1700 | | 4 | 6 | | | $204,500 | $20,450 | $40,900 | $20,450 | $286,300 | $286,000 | $0 | $0 | $0 | $286,000 |
| 3 | | From West Hills Rd. to End | 12 | | 900 | | 2 | 6 | | | $94,600 | $9,460 | $18,920 | $9,460 | $132,440 | $132,000 | $0 | $0 | $0 | $132,000 |
| | | **Industrial Way Trunk Sewer** | | | | | | | | | | | | | | | | | | |
| 3 | | From Green Rd. to MH 134 | 12 | | 1300 | | 4 | 8 | | | $139,200 | $13,920 | $27,840 | $13,920 | $194,880 | $195,000 | $0 | $0 | $0 | $195,000 |
| 3 | | From MH 134 to End | 10 | 2000 | | | 4 | 12 | | | $193,000 | $19,300 | $38,600 | $19,300 | $270,200 | $270,000 | $0 | $0 | $0 | $270,000 |
| | | **Applegate Street Pump Station (185 GPM)** | | | | | | | | | | | | | | | | | | |
| 3 | | Pump Station | | | | | | | | $ 350,000.00 | $350,000 | $70,000 | $70,000 | $35,000 | $525,000 | $525,000 | $0 | $0 | $0 | $525,000 |
| 3 | | Force main (800 ft @ $60/ft) | | | | | | | | $ 48,000.00 | $48,000 | $4,800 | $9,600 | $4,800 | $67,200 | $67,000 | $0 | $0 | $0 | $67,000 |
| | | **13th Street Pump Station (400 GPM)** | | | | | | | | | | | | | | | | | | |
| 3 | | Pump Station | | | | | | | | $ 385,000.00 | $385,000 | $77,000 | $77,000 | $38,500 | $577,500 | $578,000 | $0 | $0 | $0 | $578,000 |
| 3 | | Force main (1150 ft @ $60/ft) | | | | | | | | $ 69,000.00 | $69,000 | $6,900 | $13,800 | $6,900 | $96,600 | $97,000 | $0 | $0 | $0 | $97,000 |
| | | | | | | | | | Totals | | $7,013,863 | $877,386 | $1,402,773 | $701,386 | $9,995,408 | $9,999,000 | $2,584,000 | $0 | $1,847,000 | $5,250,000 |

## Appendix I

City of Philomath, Oregon
Wastewater Facilities Plan

COST ESTIMATE
Level of Detail - Planning

Evaluation of Wastewater Treatment Alternatives
Comparison of Capital Costs
**Alternative**

| Item | Qty | Unit | Unit Cost | Construction Cost | 15% Contingency | 20% Engineering | 10% Legal & Admin | Total Project Cost |
|---|---|---|---|---|---|---|---|---|
| **1. Lined Faculative Lagoon/Summer Effluent Reuse** | | | | | | | | |
| New headworks | ALL | LS | Lump Sum | $100,000 | $15,000 | $20,000 | $10,000 | $145,000 |
| New influent flow and rainfall measurement equipment | ALL | LS | Lump Sum | $8,500 | $1,275 | $1,700 | $850 | $12,325 |
| New refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New faculative lagoon with synthetic liner | 24 | acre | $45,000 | $1,080,000 | $162,000 | $216,000 | $108,000 | $1,566,000 |
| New distribution piping (from new headworks to new lagoon) | 1,800 | LF | $90 | $162,000 | $24,300 | $32,400 | $16,200 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | 1,400 | LF | $100 | $140,000 | $21,000 | $28,000 | $14,000 | $203,000 |
| Lagoon dike rip-rap protection | ALL | LS | Lump Sum | $150,000 | $22,500 | $30,000 | $15,000 | $217,500 |
| Lagoon dike roadway rehabilitation | ALL | LS | Lump Sum | $40,000 | $6,000 | $8,000 | $4,000 | $58,000 |
| New 3-phase power service | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Irrigation booster pump station & forcemain | ALL | LS | Lump Sum | $200,000 | $30,000 | $40,000 | $20,000 | $290,000 |
| Irrigation control building | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| New effluent flow measurement equipment | ALL | LS | Lump Sum | $6,000 | $900 | $1,200 | $600 | $8,700 |
| New effluent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New SCADA system for Wastewater Utility | ALL | LS | Lump Sum | $69,000 | $10,350 | $13,800 | $6,900 | $100,050 |
| **Alternative 1 Totals** | | | | **$2,079,500** | **$311,925** | **$415,900** | **$207,950** | **$3,015,275** |
| **2. Unlined Faculative Lagoon/Summer Effluent Reuse** | | | | | | | | |
| New headworks | ALL | LS | Lump Sum | $100,000 | $15,000 | $20,000 | $10,000 | $145,000 |
| New influent flow and rainfall measurement equipment | ALL | LS | Lump Sum | $8,500 | $1,275 | $1,700 | $850 | $12,325 |
| New refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New faculative lagoon with native clay liner | 24 | acre | $30,000 | $720,000 | $108,000 | $144,000 | $72,000 | $1,044,000 |
| New distribution piping (from new headworks to new lagoon) | 1,800 | LF | $90 | $162,000 | $24,300 | $32,400 | $16,200 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | 1,400 | LF | $100 | $140,000 | $21,000 | $28,000 | $14,000 | $203,000 |
| New 3-phase power service | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Lagoon dike rip-rap protection | ALL | LS | Lump Sum | $150,000 | $22,500 | $30,000 | $15,000 | $217,500 |
| Lagoon dike roadway rehabilitation | ALL | LS | Lump Sum | $40,000 | $6,000 | $8,000 | $4,000 | $58,000 |
| Irrigation booster pump station & forcemain | ALL | LS | Lump Sum | $200,000 | $30,000 | $40,000 | $20,000 | $290,000 |
| Irrigation control building | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| New effluent flow measurement equipment | ALL | LS | Lump Sum | $6,000 | $900 | $1,200 | $600 | $8,700 |
| New effluent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New SCADA system for Wastewater Utility | ALL | LS | Lump Sum | $69,000 | $10,350 | $13,800 | $6,900 | $100,050 |
| **Alternative 2 Totals** | | | | **$1,719,500** | **$257,925** | **$343,900** | **$171,950** | **$2,493,275** |

**Appendix I**

| City of Philomath, Oregon<br>Wastewater Facilities Plan | COST ESTIMATE<br>Level of Detail - Planning |
|---|---|

Evaluation of Wastewater Treatment Alternatives
Comparison of Capital Costs
**Alternative**

| Item | Qty | Unit | Unit Cost | Construction Cost | 15% Contingency | 20% Engineering | 10% Legal & Admin | Total Project Cost |
|---|---|---|---|---|---|---|---|---|
| **3. Lined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | | | | | | |
| New headworks | ALL | LS | Lump Sum | $100,000 | $15,000 | $20,000 | $10,000 | $145,000 |
| New influent flow and rainfall measurement equipment | ALL | LS | Lump Sum | $8,500 | $1,275 | $1,700 | $850 | $12,325 |
| New refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New faculative lagoon with synthetic liner | 24 | acre | $45,000 | $1,080,000 | $162,000 | $216,000 | $108,000 | $1,566,000 |
| New distribution piping (from new headworks to new lagoon) | 1,800 | LF | $90 | $162,000 | $24,300 | $32,400 | $16,200 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | 1,400 | LF | $100 | $140,000 | $21,000 | $28,000 | $14,000 | $203,000 |
| Lagoon dike rip-rap protection | ALL | LS | Lump Sum | $150,000 | $22,500 | $30,000 | $15,000 | $217,500 |
| Lagoon dike roadway rehabilitation | ALL | LS | Lump Sum | $40,000 | $6,000 | $8,000 | $4,000 | $58,000 |
| Lagoon outlet piping modifications | ALL | LS | Lump Sum | $35,000 | $5,250 | $7,000 | $3,500 | $50,750 |
| New 3-phase power service | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Effluent lift station & controls | ALL | LS | Lump Sum | $225,000 | $33,750 | $45,000 | $22,500 | $326,250 |
| Effluent polishing equipment & controls | ALL | LS | Lump Sum | $900,000 | $135,000 | $180,000 | $90,000 | $1,305,000 |
| Effluent polishing equipment building & sitework | ALL | LS | Lump Sum | $125,000 | $18,750 | $25,000 | $12,500 | $181,250 |
| Yard piping modifications | ALL | LS | Lump Sum | $20,000 | $3,000 | $4,000 | $2,000 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | ALL | LS | Lump Sum | $58,000 | $8,700 | $11,600 | $5,800 | $84,100 |
| New effluent flow measurement equipment | ALL | LS | Lump Sum | $6,000 | $900 | $1,200 | $600 | $8,700 |
| New effluent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New SCADA system for Wastewater Utility | ALL | LS | Lump Sum | $69,000 | $10,350 | $13,800 | $6,900 | $100,050 |
| **Alternative 3 Totals** | | | | **$3,192,500** | **$478,875** | **$638,500** | **$319,250** | **$4,629,125** |
| **4. Unlined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | | | | | | |
| New headworks | ALL | LS | Lump Sum | $100,000 | $15,000 | $20,000 | $10,000 | $145,000 |
| New influent flow and rainfall measurement equipment | ALL | LS | Lump Sum | $8,500 | $1,275 | $1,700 | $850 | $12,325 |
| New refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New faculative lagoon with native clay liner | 24 | acre | $30,000 | $720,000 | $108,000 | $144,000 | $72,000 | $1,044,000 |
| New distribution piping (from new headworks to new lagoon) | 1,800 | LF | $90 | $162,000 | $24,300 | $32,400 | $16,200 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | 1,400 | LF | $100 | $140,000 | $21,000 | $28,000 | $14,000 | $203,000 |
| Lagoon dike rip-rap protection (existing lagoons) | ALL | LS | Lump Sum | $150,000 | $22,500 | $30,000 | $15,000 | $217,500 |
| Existing dike roadway rehabilitation | ALL | LS | Lump Sum | $40,000 | $6,000 | $8,000 | $4,000 | $58,000 |
| Lagoon outlet piping modifications (existing secondary lagoon) | ALL | LS | Lump Sum | $60,000 | $9,000 | $12,000 | $6,000 | $87,000 |
| New 3-phase power service | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Effluent lift station & controls | ALL | LS | Lump Sum | $225,000 | $33,750 | $45,000 | $22,500 | $326,250 |
| Effluent polishing equipment & controls | ALL | LS | Lump Sum | $600,000 | $90,000 | $120,000 | $60,000 | $870,000 |
| Effluent polishing equipment building & sitework | ALL | LS | Lump Sum | $125,000 | $18,750 | $25,000 | $12,500 | $181,250 |
| Yard piping modifications | ALL | LS | Lump Sum | $20,000 | $3,000 | $4,000 | $2,000 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | ALL | LS | Lump Sum | $58,000 | $8,700 | $11,600 | $5,800 | $84,100 |
| New effluent flow measurement equipment | ALL | LS | Lump Sum | $6,000 | $900 | $1,200 | $600 | $8,700 |
| New effluent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New SCADA system for Wastewater Utility | ALL | LS | Lump Sum | $69,000 | $10,350 | $13,800 | $6,900 | $100,050 |
| **Alternative 4 Totals** | | | | **$2,557,500** | **$383,625** | **$511,500** | **$255,750** | **$3,708,375** |

**Appendix I**

| City of Philomath, Oregon<br>Wastewater Facilities Plan | COST ESTIMATE<br>Level of Detail - Planning |
|---|---|

Evaluation of Wastewater Treatment Alternatives
Comparison of Capital Costs
**Alternative**

| Item | Qty | Unit | Unit Cost | Construction Cost | 15% Contingency | 20% Engineering | 10% Legal & Admin | Total Project Cost |
|---|---|---|---|---|---|---|---|---|
| **5. Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse** | | | | | | | | |
| New headworks | ALL | LS | Lump Sum | $100,000 | $15,000 | $20,000 | $10,000 | $145,000 |
| Relief pipe from new headworks to first lagoon | ALL | LS | Lump Sum | $20,000 | $3,000 | $4,000 | $2,000 | $29,000 |
| New influent flow and rainfall measurement equipment | ALL | LS | Lump Sum | $8,500 | $1,275 | $1,700 | $850 | $12,325 |
| New influent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| Solar powered mechanical mixing equipment, installed | ALL | LS | Lump Sum | $320,000 | $48,000 | $64,000 | $32,000 | $464,000 |
| Power distribution for backup power to mixers | 3,550 | LF | $18 | $63,900 | $9,585 | $12,780 | $6,390 | $92,655 |
| New Auxiliary power unit with automatic transfer switch | ALL | LS | Lump Sum | $20,000 | $3,000 | $4,000 | $2,000 | $29,000 |
| New 3-phase power service | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Lagoon dike rip-rap protection | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| Lagoon dike roadway rehabilitation | ALL | LS | Lump Sum | $40,000 | $6,000 | $8,000 | $4,000 | $58,000 |
| Irrigation booster pump station & forcemain | ALL | LS | Lump Sum | $200,000 | $30,000 | $40,000 | $20,000 | $290,000 |
| Irrigation control building | ALL | LS | Lump Sum | $50,000 | $7,500 | $10,000 | $5,000 | $72,500 |
| New effluent flow measurement equipment | ALL | LS | Lump Sum | $6,000 | $900 | $1,200 | $600 | $8,700 |
| New effluent refrigerated wastewater sampler | ALL | LS | Lump Sum | $12,000 | $1,800 | $2,400 | $1,200 | $17,400 |
| New SCADA system for Wastewater Utility | ALL | LS | Lump Sum | $69,000 | $10,350 | $13,800 | $6,900 | $100,050 |
| **Alternative 5 Totals** | | | | **$1,021,400** | **$153,210** | **$204,280** | **$102,140** | **$1,481,030** |

## Appendix I

| City of Philomath, Oregon<br>Wastewater Facilities Plan | Level of Detail - Planning |
|---|---|

| Evaluation of Wastewater Treatment Alternatives | Years | 20 |
|---|---|---|
| Present Worth Analysis | Disount rate | 5% |

**Alternative**

| Item | Project Cost (Capital Cost) | Annual Cost | Present Worth |
|---|---|---|---|
| **1. Lined Faculative Lagoon/Summer Effluent Reuse** | | | |
| | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New faculative lagoon with synthetic liner | $1,566,000 | $5,000 | $1,628,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Irrigation booster pump station & forcemain | $290,000 | $20,000 | $539,244 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for Wastewater Utility | $100,050 | $2,500 | $131,206 |
| **Alternative 1 Totals** | **$3,015,275** | **$34,000** | **$3,438,990** |
| **2. Unlined Faculative Lagoon/Summer Effluent Reuse** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New faculative lagoon with native clay liner | $1,044,000 | $5,000 | $1,106,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Irrigation booster pump station & forcemain | $290,000 | $20,000 | $539,244 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $1,000 | $21,162 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for Wastewater Utility | $100,050 | $2,500 | $131,206 |
| **Alternative 2 Totals** | **$2,493,275** | **$34,750** | **$2,926,337** |
| **3. Lined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New faculative lagoon with synthetic liner | $1,566,000 | $5,000 | $1,628,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection | $217,500 | $0 | $217,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Lagoon outlet piping modifications | $50,750 | $0 | $50,750 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Effluent lift station & controls | $326,250 | $15,000 | $513,183 |
| Effluent polishing equipment & controls | $1,305,000 | $20,000 | $1,554,244 |
| Effluent polishing equipment building & sitework | $181,250 | $1,000 | $193,712 |
| Yard piping modifications | $29,000 | $0 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | $84,100 | $2,000 | $109,024 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for Wastewater Utility | $100,050 | $2,500 | $131,206 |
| **Alternative 3 Totals** | **$4,629,125** | **$51,000** | **$5,264,698** |

**Appendix I**

City of Philomath, Oregon
Wastewater Facilities Plan

Level of Detail - Planning

| | | |
|---|---|---|
| Evaluation of Wastewater Treatment Alternatives | Years | 20 |
| Present Worth Analysis | Disount rate | 5% |

**Alternative**

| Item | Project Cost (Capital Cost) | Annual Cost | Present Worth |
|---|---|---|---|
| **4. Unlined Facultative Lagoon/Continue Summer-Holding Winter Discharge** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New faculative lagoon with native clay liner | $1,044,000 | $5,000 | $1,106,311 |
| New distribution piping (from new headworks to new lagoon) | $234,900 | $0 | $234,900 |
| New transfer piping (from new lagoon to existing primary lagoon) | $203,000 | $0 | $203,000 |
| Lagoon dike rip-rap protection (existing lagoons) | $217,500 | $0 | $217,500 |
| Existing dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Lagoon outlet piping modifications (existing secondary lagoon) | $87,000 | $0 | $87,000 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Effluent lift station & controls | $326,250 | $15,000 | $513,183 |
| Effluent polishing equipment & controls | $870,000 | $20,000 | $1,119,244 |
| Effluent polishing equipment building & sitework | $181,250 | $1,000 | $193,712 |
| Yard piping modifications | $29,000 | $0 | $29,000 |
| New Auxiliary power unit with automatic transfer switch | $84,100 | $2,000 | $109,024 |
| New effluent flow measurement equipment | $8,700 | $250 | $11,816 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for Wastewater Utility | $100,050 | $2,500 | $131,206 |
| **Alternative 4 Totals** | **$3,708,375** | **$51,000** | **$4,343,948** |
| **5. Convert Existing Lagoons to Partially Mixed Lagoons/Summer Effluent Reuse** | | | |
| New headworks | $145,000 | $500 | $151,231 |
| Relief pipe from new headworks to first lagoon | $29,000 | $0 | $29,000 |
| New influent flow and rainfall measurement equipment | $12,325 | $250 | $15,441 |
| New influent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| Solar powered mechanical mixing equipment, installed | $464,000 | $12,000 | $613,547 |
| Power distribution for backup power to mixers | $92,655 | $0 | $92,655 |
| New Auxiliary power unit with automatic transfer switch | $29,000 | $2,000 | $53,924 |
| New 3-phase power service | $72,500 | $0 | $72,500 |
| Lagoon dike rip-rap protection | $72,500 | $0 | $72,500 |
| Lagoon dike roadway rehabilitation | $58,000 | $2,500 | $89,156 |
| Irrigation booster pump station & forcemain | $290,000 | $25,000 | $601,555 |
| Irrigation control building | $72,500 | $1,000 | $84,962 |
| New effluent flow measurement equipment | $8,700 | $1,000 | $21,162 |
| New effluent refrigerated wastewater sampler | $17,400 | $1,000 | $29,862 |
| New SCADA system for Wastewater Utility | $100,050 | $2,500 | $131,206 |
| **Alternative 5 Totals** | **$1,481,030** | **$48,750** | **$2,088,563** |

Census 2000 Data for the City of Philomath

# Appendix J

## Table DP-1. Profile of General Demographic Characteristics: 2000

Geographic Area: Philomath city, Oregon

[For information on confidentiality protection, nonsampling error, and definitions, see text]

| Subject | Number | Percent |
|---|---|---|
| **Total population** | 3,838 | 100.0 |
| **SEX AND AGE** | | |
| Male | 1,908 | 49.7 |
| Female | 1,930 | 50.3 |
| Under 5 years | 289 | 7.5 |
| 5 to 9 years | 360 | 9.4 |
| 10 to 14 years | 420 | 10.9 |
| 15 to 19 years | 331 | 8.6 |
| 20 to 24 years | 190 | 5.0 |
| 25 to 34 years | 550 | 14.3 |
| 35 to 44 years | 681 | 17.7 |
| 45 to 54 years | 538 | 14.0 |
| 55 to 59 years | 132 | 3.4 |
| 60 to 64 years | 83 | 2.2 |
| 65 to 74 years | 146 | 3.8 |
| 75 to 84 years | 97 | 2.5 |
| 85 years and over | 21 | 0.5 |
| Median age (years) | 31.6 | (X) |
| 18 years and over | 2,520 | 65.7 |
| Male | 1,229 | 32.0 |
| Female | 1,291 | 33.6 |
| 21 years and over | 2,398 | 62.5 |
| 62 years and over | 308 | 8.0 |
| 65 years and over | 264 | 6.9 |
| Male | 112 | 2.9 |
| Female | 152 | 4.0 |
| **RACE** | | |
| One race | 3,751 | 97.7 |
| White | 3,579 | 93.3 |
| Black or African American | 6 | 0.2 |
| American Indian and Alaska Native | 63 | 1.6 |
| Asian | 46 | 1.2 |
| Asian Indian | 12 | 0.3 |
| Chinese | 4 | 0.1 |
| Filipino | 10 | 0.3 |
| Japanese | 7 | 0.2 |
| Korean | 5 | 0.1 |
| Vietnamese | 3 | 0.1 |
| Other Asian [1] | 5 | 0.1 |
| Native Hawaiian and Other Pacific Islander | 9 | 0.2 |
| Native Hawaiian | 3 | 0.1 |
| Guamanian or Chamorro | - | - |
| Samoan | 1 | - |
| Other Pacific Islander [2] | 5 | 0.1 |
| Some other race | 48 | 1.3 |
| Two or more races | 87 | 2.3 |
| ***Race alone or in combination with one or more other races:*** [3] | | |
| White | 3,663 | 95.4 |
| Black or African American | 10 | 0.3 |
| American Indian and Alaska Native | 111 | 2.9 |
| Asian | 73 | 1.9 |
| Native Hawaiian and Other Pacific Islander | 15 | 0.4 |
| Some other race | 58 | 1.5 |

| Subject | Number | Percent |
|---|---|---|
| **HISPANIC OR LATINO AND RACE** | | |
| **Total population** | 3,838 | 100.0 |
| Hispanic or Latino (of any race) | 151 | 3.9 |
| Mexican | 123 | 3.2 |
| Puerto Rican | - | - |
| Cuban | 1 | - |
| Other Hispanic or Latino | 27 | 0.7 |
| Not Hispanic or Latino | 3,687 | 96.1 |
| White alone | 3,481 | 90.7 |
| **RELATIONSHIP** | | |
| **Total population** | 3,838 | 100.0 |
| In households | 3,836 | 99.9 |
| Householder | 1,346 | 35.1 |
| Spouse | 751 | 19.6 |
| Child | 1,403 | 36.6 |
| Own child under 18 years | 1,249 | 32.5 |
| Other relatives | 104 | 2.7 |
| Under 18 years | 34 | 0.9 |
| Nonrelatives | 232 | 6.0 |
| Unmarried partner | 104 | 2.7 |
| In group quarters | 2 | 0.1 |
| Institutionalized population | - | - |
| Noninstitutionalized population | 2 | 0.1 |
| **HOUSEHOLD BY TYPE** | | |
| **Total households** | 1,346 | 100.0 |
| Family households (families) | 1,017 | 75.6 |
| With own children under 18 years | 636 | 47.3 |
| Married-couple family | 751 | 55.8 |
| With own children under 18 years | 433 | 32.2 |
| Female householder, no husband present | 203 | 15.1 |
| With own children under 18 years | 155 | 11.5 |
| Nonfamily households | 329 | 24.4 |
| Householder living alone | 250 | 18.6 |
| Householder 65 years and over | 68 | 5.1 |
| Households with individuals under 18 years | 669 | 49.7 |
| Households with individuals 65 years and over | 188 | 14.0 |
| Average household size | 2.85 | (X) |
| Average family size | 3.22 | (X) |
| **HOUSING OCCUPANCY** | | |
| **Total housing units** | 1,434 | 100.0 |
| Occupied housing units | 1,346 | 93.9 |
| Vacant housing units | 88 | 6.1 |
| For seasonal, recreational, or occasional use | 1 | 0.1 |
| Homeowner vacancy rate (percent) | 2.6 | (X) |
| Rental vacancy rate (percent) | 7.6 | (X) |
| **HOUSING TENURE** | | |
| **Occupied housing units** | 1,346 | 100.0 |
| Owner-occupied housing units | 814 | 60.5 |
| Renter-occupied housing units | 532 | 39.5 |
| Average household size of owner-occupied units | 3.02 | (X) |
| Average household size of renter-occupied units | 2.59 | (X) |

- Represents zero or rounds to zero. (X) Not applicable.

[1] Other Asian alone, or two or more Asian categories.

[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

## Table DP-2. Profile of Selected Social Characteristics: 2000

Geographic area: Philomath city, Oregon

[Data based on a sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see text]

| Subject | Number | Percent |
|---|---|---|
| **SCHOOL ENROLLMENT** | | |
| **Population 3 years and over enrolled in school** | **1,409** | **100.0** |
| Nursery school, preschool | 61 | 4.3 |
| Kindergarten | 38 | 2.7 |
| Elementary school (grades 1-8) | 716 | 50.8 |
| High school (grades 9-12) | 304 | 21.6 |
| College or graduate school | 290 | 20.6 |
| **EDUCATIONAL ATTAINMENT** | | |
| **Population 25 years and over** | **2,256** | **100.0** |
| Less than 9th grade | 70 | 3.1 |
| 9th to 12th grade, no diploma | 172 | 7.6 |
| High school graduate (includes equivalency) | 468 | 20.7 |
| Some college, no degree | 649 | 28.8 |
| Associate degree | 183 | 8.1 |
| Bachelor's degree | 445 | 19.7 |
| Graduate or professional degree | 269 | 11.9 |
| Percent high school graduate or higher | 89.3 | (X) |
| Percent bachelor's degree or higher | 31.6 | (X) |
| **MARITAL STATUS** | | |
| **Population 15 years and over** | **2,818** | **100.0** |
| Never married | 657 | 23.3 |
| Now married, except separated | 1,609 | 57.1 |
| Separated | 77 | 2.7 |
| Widowed | 153 | 5.4 |
| Female | 126 | 4.5 |
| Divorced | 322 | 11.4 |
| Female | 172 | 6.1 |
| **GRANDPARENTS AS CAREGIVERS** | | |
| **Grandparent living in household with one or more own grandchildren under 18 years** | **37** | **100.0** |
| Grandparent responsible for grandchildren | 12 | 32.4 |
| **VETERAN STATUS** | | |
| **Civilian population 18 years and over** | **2,587** | **100.0** |
| Civilian veterans | 288 | 11.1 |
| **DISABILITY STATUS OF THE CIVILIAN NONINSTITUTIONALIZED POPULATION** | | |
| **Population 5 to 20 years** | **1,185** | **100.0** |
| With a disability | 47 | 4.0 |
| **Population 21 to 64 years** | **2,160** | **100.0** |
| With a disability | 300 | 13.9 |
| Percent employed | 66.0 | (X) |
| No disability | 1,860 | 86.1 |
| Percent employed | 81.9 | (X) |
| **Population 65 years and over** | **283** | **100.0** |
| With a disability | 147 | 51.9 |
| **RESIDENCE IN 1995** | | |
| **Population 5 years and over** | **3,628** | **100.0** |
| Same house in 1995 | 1,436 | 39.6 |
| Different house in the U.S. in 1995 | 2,170 | 59.8 |
| Same county | 1,340 | 36.9 |
| Different county | 830 | 22.9 |
| Same state | 445 | 12.3 |
| Different state | 385 | 10.6 |
| Elsewhere in 1995 | 22 | 0.6 |

| Subject | Number | Percent |
|---|---|---|
| **NATIVITY AND PLACE OF BIRTH** | | |
| **Total population** | **4,021** | **100.0** |
| Native | 3,891 | 96.8 |
| Born in United States | 3,868 | 96.2 |
| State of residence | 2,138 | 53.2 |
| Different state | 1,730 | 43.0 |
| Born outside United States | 23 | 0.6 |
| Foreign born | 130 | 3.2 |
| Entered 1990 to March 2000 | 55 | 1.4 |
| Naturalized citizen | 39 | 1.0 |
| Not a citizen | 91 | 2.3 |
| **REGION OF BIRTH OF FOREIGN BORN** | | |
| **Total (excluding born at sea)** | **130** | **100.0** |
| Europe | 62 | 47.7 |
| Asia | 19 | 14.6 |
| Africa | - | - |
| Oceania | 4 | 3.1 |
| Latin America | 40 | 30.8 |
| Northern America | 5 | 3.8 |
| **LANGUAGE SPOKEN AT HOME** | | |
| **Population 5 years and over** | **3,628** | **100.0** |
| English only | 3,380 | 93.2 |
| Language other than English | 248 | 6.8 |
| Speak English less than "very well" | 64 | 1.8 |
| Spanish | 140 | 3.9 |
| Speak English less than "very well" | 41 | 1.1 |
| Other Indo-European languages | 67 | 1.8 |
| Speak English less than "very well" | 16 | 0.4 |
| Asian and Pacific Island languages | 15 | 0.4 |
| Speak English less than "very well" | 7 | 0.2 |
| **ANCESTRY (single or multiple)** | | |
| **Total population** | **4,021** | **100.0** |
| *Total ancestries reported* | *4,685* | *116.5* |
| Arab | - | - |
| Czech[1] | 33 | 0.8 |
| Danish | 13 | 0.3 |
| Dutch | 172 | 4.3 |
| English | 743 | 18.5 |
| French (except Basque)[1] | 97 | 2.4 |
| French Canadian[1] | 13 | 0.3 |
| German | 993 | 24.7 |
| Greek | 8 | 0.2 |
| Hungarian | - | - |
| Irish[1] | 493 | 12.3 |
| Italian | 116 | 2.9 |
| Lithuanian | - | - |
| Norwegian | 207 | 5.1 |
| Polish | 139 | 3.5 |
| Portuguese | 53 | 1.3 |
| Russian | 37 | 0.9 |
| Scotch-Irish | 89 | 2.2 |
| Scottish | 166 | 4.1 |
| Slovak | - | - |
| Subsaharan African | 4 | 0.1 |
| Swedish | 120 | 3.0 |
| Swiss | 30 | 0.7 |
| Ukrainian | - | - |
| United States or American | 344 | 8.6 |
| Welsh | 73 | 1.8 |
| West Indian (excluding Hispanic groups) | - | - |
| Other ancestries | 742 | 18.5 |

-Represents zero or rounds to zero. (X) Not applicable.

[1]The data represent a combination of two ancestries shown separately in Summary File 3. Czech includes Czechoslovakian. French includes Alsatian. French Canadian includes Acadian/Cajun. Irish includes Celtic.

Source: U.S. Bureau of the Census, Census 2000.

## Table DP-3. Profile of Selected Economic Characteristics: 2000

Geographic area: Philomath city, Oregon

[Data based on a sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see text]

| Subject | Number | Percent |
|---|---|---|
| **EMPLOYMENT STATUS** | | |
| **Population 16 years and over** | **2,763** | **100.0** |
| In labor force | 1,966 | 71.2 |
| Civilian labor force | 1,966 | 71.2 |
| Employed | 1,885 | 68.2 |
| Unemployed | 81 | 2.9 |
| Percent of civilian labor force | 4.1 | (X) |
| Armed Forces | - | - |
| Not in labor force | 797 | 28.8 |
| **Females 16 years and over** | **1,397** | **100.0** |
| In labor force | 881 | 63.1 |
| Civilian labor force | 881 | 63.1 |
| Employed | 853 | 61.1 |
| **Own children under 6 years** | **454** | **100.0** |
| All parents in family in labor force | 243 | 53.5 |
| **COMMUTING TO WORK** | | |
| **Workers 16 years and over** | **1,877** | **100.0** |
| Car, truck, or van - - drove alone | 1,422 | 75.8 |
| Car, truck, or van - - carpooled | 265 | 14.1 |
| Public transportation (including taxicab) | - | - |
| Walked | 77 | 4.1 |
| Other means | 46 | 2.5 |
| Worked at home | 67 | 3.6 |
| Mean travel time to work (minutes)[1] | 16.9 | (X) |
| **Employed civilian population 16 years and over** | **1,885** | **100.0** |
| **OCCUPATION** | | |
| Management, professional, and related occupations | 591 | 31.4 |
| Service occupations | 316 | 16.8 |
| Sales and office occupations | 467 | 24.8 |
| Farming, fishing, and forestry occupations | 19 | 1.0 |
| Construction, extraction, and maintenance occupations | 166 | 8.8 |
| Production, transportation, and material moving occupations | 326 | 17.3 |
| **INDUSTRY** | | |
| Agriculture, forestry, fishing and hunting, and mining | 62 | 3.3 |
| Construction | 85 | 4.5 |
| Manufacturing | 394 | 20.9 |
| Wholesale trade | 30 | 1.6 |
| Retail trade | 221 | 11.7 |
| Transportation and warehousing, and utilities | 40 | 2.1 |
| Information | 40 | 2.1 |
| Finance, insurance, real estate, and rental and leasing | 61 | 3.2 |
| Professional, scientific, management, administrative, and waste management services | 164 | 8.7 |
| Educational, health and social services | 422 | 22.4 |
| Arts, entertainment, recreation, accommodation and food services | 188 | 10.0 |
| Other services (except public administration) | 148 | 7.9 |
| Public administration | 30 | 1.6 |
| **CLASS OF WORKER** | | |
| Private wage and salary workers | 1,369 | 72.6 |
| Government workers | 388 | 20.6 |
| Self-employed workers in own not incorporated business | 128 | 6.8 |
| Unpaid family workers | - | - |

| Subject | Number | Percent |
|---|---|---|
| **INCOME IN 1999** | | |
| **Households** | **1,375** | **100.0** |
| Less than $10,000 | 45 | 3.3 |
| $10,000 to $14,999 | 97 | 7.1 |
| $15,000 to $24,999 | 157 | 11.4 |
| $25,000 to $34,999 | 247 | 18.0 |
| $35,000 to $49,999 | 342 | 24.9 |
| $50,000 to $74,999 | 267 | 19.4 |
| $75,000 to $99,999 | 134 | 9.7 |
| $100,000 to $149,999 | 53 | 3.9 |
| $150,000 to $199,999 | 9 | 0.7 |
| $200,000 or more | 24 | 1.7 |
| Median household income (dollars) | 41,461 | (X) |
| With earnings | 1,246 | 90.6 |
| Mean earnings (dollars)[1] | 46,200 | (X) |
| With Social Security income | 273 | 19.9 |
| Mean Social Security income (dollars)[1] | 10,998 | (X) |
| With Supplemental Security Income | 21 | 1.5 |
| Mean Supplemental Security Income (dollars)[1] | 2,276 | (X) |
| With public assistance income | 44 | 3.2 |
| Mean public assistance income (dollars)[1] | 3,943 | (X) |
| With retirement income | 156 | 11.3 |
| Mean retirement income (dollars)[1] | 16,209 | (X) |
| **Families** | **1,039** | **100.0** |
| Less than $10,000 | 32 | 3.1 |
| $10,000 to $14,999 | 89 | 8.6 |
| $15,000 to $24,999 | 85 | 8.2 |
| $25,000 to $34,999 | 178 | 17.1 |
| $35,000 to $49,999 | 256 | 24.6 |
| $50,000 to $74,999 | 216 | 20.8 |
| $75,000 to $99,999 | 113 | 10.9 |
| $100,000 to $149,999 | 37 | 3.6 |
| $150,000 to $199,999 | 9 | 0.9 |
| $200,000 or more | 24 | 2.3 |
| Median family income (dollars) | 42,578 | (X) |
| Per capita income (dollars)[1] | 16,620 | (X) |
| ***Median earnings (dollars):*** | | |
| Male full-time, year-round workers | 36,104 | (X) |
| Female full-time, year-round workers | 25,281 | (X) |

| Subject | Number below poverty level | Percent below poverty level |
|---|---|---|
| **POVERTY STATUS IN 1999** | | |
| **Families** | **68** | **6.5** |
| With related children under 18 years | 64 | 9.0 |
| With related children under 5 years | 37 | 13.1 |
| **Families with female householder, no husband present** | **58** | **31.9** |
| With related children under 18 years | 54 | 34.4 |
| With related children under 5 years | 27 | 58.7 |
| **Individuals** | **328** | **8.2** |
| 18 years and over | 183 | 7.1 |
| 65 years and over | 29 | 10.2 |
| Related children under 18 years | 130 | 9.2 |
| Related children 5 to 17 years | 70 | 6.8 |
| Unrelated individuals 15 years and over | 110 | 19.2 |

-Represents zero or rounds to zero. (X) Not applicable.

[1]If the denominator of a mean value or per capita value is less than 30, then that value is calculated using a rounded aggregate in the numerator. See text.

Source: U.S. Bureau of the Census, Census 2000.

## Table DP-4. Profile of Selected Housing Characteristics: 2000

Geographic area: Philomath city, Oregon

[Data based on a sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see text]

| Subject | Number | Percent |
|---|---|---|
| **Total housing units** | **1,472** | **100.0** |
| **UNITS IN STRUCTURE** | | |
| 1-unit, detached | 921 | 62.6 |
| 1-unit, attached | 94 | 6.4 |
| 2 units | 119 | 8.1 |
| 3 or 4 units | 149 | 10.1 |
| 5 to 9 units | 85 | 5.8 |
| 10 to 19 units | 13 | 0.9 |
| 20 or more units | 12 | 0.8 |
| Mobile home | 79 | 5.4 |
| Boat, RV, van, etc | - | - |
| **YEAR STRUCTURE BUILT** | | |
| 1999 to March 2000 | 84 | 5.7 |
| 1995 to 1998 | 145 | 9.9 |
| 1990 to 1994 | 164 | 11.1 |
| 1980 to 1989 | 186 | 12.6 |
| 1970 to 1979 | 440 | 29.9 |
| 1960 to 1969 | 129 | 8.8 |
| 1940 to 1959 | 238 | 16.2 |
| 1939 or earlier | 86 | 5.8 |
| **ROOMS** | | |
| 1 room | 23 | 1.6 |
| 2 rooms | 12 | 0.8 |
| 3 rooms | 98 | 6.7 |
| 4 rooms | 261 | 17.7 |
| 5 rooms | 458 | 31.1 |
| 6 rooms | 253 | 17.2 |
| 7 rooms | 183 | 12.4 |
| 8 rooms | 79 | 5.4 |
| 9 or more rooms | 105 | 7.1 |
| Median (rooms) | 5.2 | (X) |
| **Occupied housing units** | **1,383** | **100.0** |
| **YEAR HOUSEHOLDER MOVED INTO UNIT** | | |
| 1999 to March 2000 | 432 | 31.2 |
| 1995 to 1998 | 424 | 30.7 |
| 1990 to 1994 | 220 | 15.9 |
| 1980 to 1989 | 183 | 13.2 |
| 1970 to 1979 | 98 | 7.1 |
| 1969 or earlier | 26 | 1.9 |
| **VEHICLES AVAILABLE** | | |
| None | 37 | 2.7 |
| 1 | 394 | 28.5 |
| 2 | 673 | 48.7 |
| 3 or more | 279 | 20.2 |
| **HOUSE HEATING FUEL** | | |
| Utility gas | 531 | 38.4 |
| Bottled, tank, or LP gas | - | - |
| Electricity | 788 | 57.0 |
| Fuel oil, kerosene, etc | - | - |
| Coal or coke | - | - |
| Wood | 64 | 4.6 |
| Solar energy | - | - |
| Other fuel | - | - |
| No fuel used | - | - |
| **SELECTED CHARACTERISTICS** | | |
| Lacking complete plumbing facilities | - | - |
| Lacking complete kitchen facilities | 7 | 0.5 |
| No telephone service | - | - |

| Subject | Number | Percent |
|---|---|---|
| **OCCUPANTS PER ROOM** | | |
| **Occupied housing units** | **1,383** | **100.0** |
| 1.00 or less | 1,334 | 96.5 |
| 1.01 to 1.50 | 34 | 2.5 |
| 1.51 or more | 15 | 1.1 |
| **Specified owner-occupied units** | **726** | **100.0** |
| **VALUE** | | |
| Less than $50,000 | 8 | 1.1 |
| $50,000 to $99,999 | 70 | 9.6 |
| $100,000 to $149,999 | 388 | 53.4 |
| $150,000 to $199,999 | 116 | 16.0 |
| $200,000 to $299,999 | 139 | 19.1 |
| $300,000 to $499,999 | 5 | 0.7 |
| $500,000 to $999,999 | - | - |
| $1,000,000 or more | - | - |
| Median (dollars) | 136,100 | (X) |
| **MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS** | | |
| With a mortgage | 607 | 83.6 |
| Less than $300 | 8 | 1.1 |
| $300 to $499 | 18 | 2.5 |
| $500 to $699 | 58 | 8.0 |
| $700 to $999 | 197 | 27.1 |
| $1,000 to $1,499 | 237 | 32.6 |
| $1,500 to $1,999 | 60 | 8.3 |
| $2,000 or more | 29 | 4.0 |
| Median (dollars) | 1,050 | (X) |
| Not mortgaged | 119 | 16.4 |
| Median (dollars) | 370 | (X) |
| **SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999** | | |
| Less than 15.0 percent | 184 | 25.3 |
| 15.0 to 19.9 percent | 132 | 18.2 |
| 20.0 to 24.9 percent | 116 | 16.0 |
| 25.0 to 29.9 percent | 109 | 15.0 |
| 30.0 to 34.9 percent | 53 | 7.3 |
| 35.0 percent or more | 132 | 18.2 |
| Not computed | - | - |
| **Specified renter-occupied units** | **552** | **100.0** |
| **GROSS RENT** | | |
| Less than $200 | - | - |
| $200 to $299 | 18 | 3.3 |
| $300 to $499 | 125 | 22.6 |
| $500 to $749 | 249 | 45.1 |
| $750 to $999 | 67 | 12.1 |
| $1,000 to $1,499 | 52 | 9.4 |
| $1,500 or more | 15 | 2.7 |
| No cash rent | 26 | 4.7 |
| Median (dollars) | 595 | (X) |
| **GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999** | | |
| Less than 15.0 percent | 79 | 14.3 |
| 15.0 to 19.9 percent | 96 | 17.4 |
| 20.0 to 24.9 percent | 73 | 13.2 |
| 25.0 to 29.9 percent | 54 | 9.8 |
| 30.0 to 34.9 percent | 66 | 12.0 |
| 35.0 percent or more | 158 | 28.6 |
| Not computed | 26 | 4.7 |

-Represents zero or rounds to zero. (X) Not applicable.

Source: U.S. Bureau of the Census, Census 2000.