Section 1

INTRODUCTION

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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).