CHAPTER 1

INTRODUCTION

Chapter Outline

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1.1. BACKGROUND & NEED

The City of Dayton owns and operates the wastewater utility serving the City. The system currently serves a population of approximately 2550 people. The system consists of a gravity collection system with four pump stations and a facultative lagoon treatment plant operated in a summer-hold, winter-discharge configuration. The City currently operates the wastewater utility under a NPDES permit issued by the Oregon Department of Environmental Quality (DEQ). For the most part, the City has been able to meet the permit requirements. However, due to the age and condition of the facility, permit violations are likely to occur early in the planning period.

The City does not have a current planning document for the wastewater utility. The most recent planning documents were prepared in the 1970's. The existing treatment plant was constructed in 1968 and subsequently upgraded in 1980. With the exception of a dechlorination system, the plant has not been significantly altered since 1980. Therefore, the City anticipates the need to perform significant upgrades during the next planning cycle. In addition to the age of the facilities, the potential for rapid residential growth exists in Dayton due to the proximity to the Portland and McMinnville metro areas and the relatively low cost of living. For these reasons, the City is in need of a new Facilities Plan for the wastewater utility. Based on this need, the City authorized Westech Engineering to proceed with the preparation of this Facilities Plan in the November of 2007. This Facilities Plan is intended to meet the current requirements of the regulatory and funding agencies and to serve as a roadmap for the development of the wastewater utility during the next planning cycle.

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 nearby waterways.
- Delineate the boundaries of the major sewer drainage basins 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 Facilities 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.

1.2.1 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, Stabilization Treatment Pond Expansion & Modifications, City of Dayton, Oregon, by Consultants Northwest, June, 1980.

- Sewerage Facilities Planning Report, City of Dayton, Oregon, by Westech Engineering, March 1976

- Sewerage Report, City of Dayton, Oregon, by Robert E. Myer Engineers, Inc., January 1973.

- Sewer System Evaluation Study, City of Dayton, Oregon, by Westech Engineering, Inc., May 1977.

- Wastewater Treatment Plan Preliminary Operation and Maintenance Manual, Dayton, Oregon, by Consultants Northwest, April 1982

- Dayton Comprehensive Plan, updated 2008 (revised 3/21/2011).

- Draft Water System Master Plan, City of Dayton, Oregon, by Westech Engineering, March 2009

- Intertie for Municipalities in Yamhill County Study, by Economic and Engineering Services, Inc., December 3, 1998.

- Soil Survey of Yamhill County Area, Oregon, by USDA Soil Conservation Service, September 1987.

- 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.

- City of Dayton Mixing Zone Study, Dayton, Oregon, by Department of Environmental Quality, January 12, 2011

1.3. 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 plant was examined to determine impacts to present and future operation of wastewater facilities. Alternatives were identified for collection, treatment, and effluent disposal/reuse.

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 cost estimates, recommended staging of improvements, anticipated project schedule, and a potential financing plan.

1.4. 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 5**.

- 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.

- 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 lagoon based 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 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 pipe trenches, especially trenches 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).