City of Scio
Linn County, Oregon

WASTEWATER FACILITIES PLAN

JANUARY 2020

The Dyer Partnership
Engineers & Planners, Inc.

Project No. 202.01

1330 Teakwood Avenue
Coos Bay, Oregon 97420
(541) 269-0732
www.dyerpart.com

759 West Central Avenue
Sutherlin, Oregon 97479
(541) 459-4619

481 South Main Street
Lebanon, Oregon 97355
(541) 405-4520

City of Scio
Linn County, Oregon

Wastewater Facilities Plan

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REGISTERED PROFESSIONAL
ENGINEER
69394
OREGON
July 11, 2006
RYAN H. QUIGLEY
EXPIRES: 12-31-20

The Dyer Partnership
Engineers & Planners, Inc.

481 S. Main St.
Lebanon, OR 97355
(541) 405-4520
www.dyerpart.com

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SECTION ES:

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The following provides a summary of the analysis, conclusions and recommendations contained in this Wastewater Facility Plan (WWFP). In particular, the following components of the report are summarized in this section:

- Background and Purpose
- Project Selection
- Population and Flow Projections
- Collection System
- Wastewater Treatment System
- Recommendations and Costs
- Financing

ES.1 Background and Purpose

The purpose of this Wastewater Facility Plan (Plan) is to provide the City of Scio (City) with a comprehensive wastewater utility planning document. The City's most recent Wastewater Facility Plan (WWFP) was prepared in 1996. Since that time, the City's population has increased, and the City's wastewater collection, treatment, and effluent disposal systems have aged and evolved. The scope and purpose of this WWFP (Plan) is to provide the City of Scio with an updated and comprehensive wastewater facilities plan for the next twenty years.

The City's original Wastewater Treatment Plant (WWTP) was constructed in 1962 after a large part of the existing collection system was established. The facultative lagoon cells have served the community since then, and were expanded in the 1980s. Prior to construction of the facultative lagoons, the City utilized a community septic tank and drain field to dispose of waste.

The City's existing wastewater collection system consists of approximately 23,554 lineal feet of gravity collection pipes, 4,650 lineal feet of pressure sewer mains, 80 manholes, and two pump stations. The City's existing wastewater treatment plant is comprised of a comminutor, facultative/storage lagoons, and disinfection.

The City operates its wastewater system under National Pollutant Discharge Elimination System (NPDES) Permit No. 101503, issued December 27, 2011 by the Oregon Department of Environmental Quality (DEQ). There is one permitted outfall (Outfall 001) located on Thomas Creek at approximately River Mile 7.9. Discharge is only permitted to the Thomas Creek Outfall 001 from November 1 to April 30. The City cannot discharge to Waters of the State from May 1 to October 31.

Several deficiencies are present throughout the City's wastewater collection system; it is aged and suffers from poor construction practices. The collection system experiences excessive Infiltration and Inflow (I/I). Excessive flows inundate gravity sewers, stress pump stations, and can potentially hydraulically overload the WWTP.

The facultative lagoons are the main biological process used for treatment of the City's wastewater. The lagoon cells have adequate hydraulic storage capacity and are not organically overloaded; the City does not have issues in meeting the NPDES discharge requirements. Biosolids have never been removed from the lagoon cells and continue to accumulate, and can adversely impact biological treatment.

ES.2 Project Selection

The recommendations summarized within this WWFP are the culmination of an evaluation of alternatives developed for the wastewater collection system, treatment system, and disposal systems. Alternatives were evaluated based on their technical feasibility, life-cycle costs, and other factors.

The projected project life, based on DEQ State Revolving Fund requirements, is for a 20-year project life. The anticipated time needed to complete this WWFP, secure financing, and complete design and construction is approximately five years. Referenced from the base year of 2019, the recommended planning year is 2044.

The WWFP process includes the following steps:

- Analyze influent wastewater characteristics and flows at the WWTP.
- Utilize historical and future population projections to estimate future wastewater flows and loads.
- Evaluate capacity needs and deficiencies in the collection system; and at the WWTP to be able to convey and treat the wastewater through the planning period.
- Evaluate treatment processes alternatives with regard to regulatory requirements.
- Develop planning level life-cycle costs estimates for each alternative.
- Creating a recommended Capital Improvement Plan for the planning period.
- Identify preliminary financing options.

ES.3 Population and Flow Projections

Population

The City of Scio has seen a small population Annual Average Growth Rate (AAGR) of 1.5% from 1980 to 2010. This thirty year period incorporates times of slow growth, as is seen from 1980 to 1990 (0.75%) and times of more rapid growth as seen from 2006 to 2010 (3.4%). More recently the growth has leveled off and even declined. Based off of historical and projected data, the City of Scio's population projection for the year 2044 is 1,046.

Wastewater Flows and Load

Recent WWTP Daily Monitoring Report (DMR) records were analyzed to provide the existing wastewater flows and loads. The DEQ guidelines were used to extrapolate the future projected flows and loads. The results are further elaborated on in Section 3. Existing users are estimated to have an average higher per capita flow than newer users due to higher infiltration. Projected flows and loads for 2044 exceed the Beech St. Pump Station's hydraulic capacity; but do not hydraulically or organically exceed the treatment system's capacity. Tables ES.3.1 and ES.3.2, provided below, summarize the existing and projected flows and loads for the City's wastewater system.

TABLE ES.3.1
WASTEWATER FLOWS AND LOADS

Parameter	2017		Projected (2044)			
Population	938		1,046			
Base Sewage	0.036	MGD	38	gpcd	0.04	MGD
Base Infiltration	0.010	MGD	11	gpcd	0.01	MGD
AAF	0.091	MGD	97	gpcd	0.10	MGD
ADWF	0.054	MGD	58	gpcd	0.06	MGD
AWWF	0.128	MGD	136	gpcd	0.14	MGD
$MMDWF_{10}$	0.117	MGD	125	gpcd	0.13	MGD
$MMWWF_5$	0.228	MGD	254	gpcd	0.27	MGD
Peak Avg. Week	0.320	MGD	385	gpcd	0.40	MGD
$PDAF_5$	0.471	MGD	558	gpcd	0.58	MGD
PIF	0.846	MGD	849	gpcd	0.89	MGD

TABLE ES.3.2
WASTEWATER TREATMENT DESIGN VALUES (2044)

	Flow MGD	BOD_5		TSS	
		mg/L	ppd	mg/L	ppd
AAF	0.10	194	160	220	180
$MMDWF_{10}$	0.13	120	130	135	150
$MMWWF_5$	0.27	93	210	106	240
PDAF	0.58	n/a	n/a	n/a	n/a
PIF	0.89	n/a	n/a	n/a	n/a

ES.4 Collection System

Collection System Inventory

The City's collection system consists of approximately 23,554 linear feet of gravity collection pipes, 4,650 linear feet of pressure sewer mains, 80 manholes, and two pump stations. An inventory of the existing collection system is provided in Table ES.4.1.

TABLE ES.4.1
WASTEWATER COLLECTION SYSTEM INVENTORY

Item	Item Description	Unit	Quantity
1	3" Pressure Line	FT	1,239
2	6" Sanitary Sewer Line	FT	273
3	6" Pressure Line	FT	1,874
4	8" Sanitary Sewer Line	FT	16,398
5	10" Sanitary Sewer Line	FT	5,346
6	12" Sanitary Sewer Line	FT	305
7	4" Pressure Line	FT	1,537
8	Manholes	EA	80
9	Mainline Cleanouts	EA	18
10	Pump Stations	EA	2

Smoke Testing and Flow Mapping

Smoke testing was performed from September 12 through September 13, 2018. The smoke testing was successful in identifying several areas of potential I/I. Through smoke testing efforts, over two-hundred deficiencies were identified, including: leaking service laterals, leaking main lines, catch basin connections, leaking manholes, open cleanouts, plugged house vents, and connected roof drains.

Flow mapping was performed during a winter dry period on January 24, 2019 and amidst significant rainfall events on February 13, 2019 to determine the quantity and sources of extraneous water entering the City of Scio's sewer collection system. Flow measurements consisted of instantaneous water depth recording using flow poke equipment at incoming pipe segments within manholes as well as general observations. The flow poking indicated a number of deficiencies that need to be addressed. Problem areas included several sewers located within two basins.

The City's wastewater collection system infrastructure is old, and has considerable infiltration and inflow. As infrastructure ages, it becomes more susceptible to deterioration, clogging, and collapse. Infiltration and inflow can become progressively worse, ultimately manifesting in sanitary sewer overflows and overloading the collection system and wastewater treatment plant. Reduction of I/I is critical to maintain the performance of the collection system, release trapped capacity currently occupied by I/I, and minimize peak flows conveyed to the WWTP. Any flows identified and mitigated in the collection system will translate to reductions in capital and operational expenditures at the WWTP. Currently, I/I is approximately 140 gallons per capita per day (gpcd), which exceeds the Environmental Protection Agency (EPA) guidelines. Decreases in I/I will not only relinquish capacity in the collection system, but also decrease future WWTP improvement projects, as well as reduce future WWTP operational expenditures.

Based on the evaluation of the collection system summarized herein, and the principal objective of minimizing the total cost of wastewater service to the City, the City should continue to pursue the reduction of the I/I flow contributions throughout the collection system. The City should identify and allocate funding for additional I/I construction projects in a phased and prioritized approach. Addressing the most severe deficiencies first, generally provides the highest return on investment. After collection system improvements to reduce I/I, reassessment of the influent wastewater flows resulting from the I/I improvements should be performed. Eventual amendments to the WWFP flow projections is recommended after high-priority I/I abatement projects are completed and peak flows subsequently subside.

Collection System Improvement Projects

Recommended collection system improvement projects, separated into three priority levels based off of flow poking measurements and city concerns, are summarized below. A map depicting the location of the collection system improvement projects is provided in Section 4.

- **Priority Level I**
    - **Project 1.** *Replace/Rehabilitate existing 10-inch sewer along SW 2nd St. from MH 39 to MH 43.*
    - **Project 2.** *Replace/Rehabilitate existing 8-inch sewer along SW Beech St. from MH 37 to MH 39.*
    - **Project 3.** *Replace/Rehabilitate existing 10-inch sewer along SW Beech St. from MH 39 to MH 41.*
    - **Project 4.** *Rehabilitate existing dual 6-inch sewer running underneath Thomas Creek from MH 41 to MH 49.*
    -
- **Priority Level II**
    - **Project 5.** *Replace/Rehabilitate existing 10-inch sewer along Main St. from MH 72 to MH 76.*
    - **Project 6.** *Replace/Rehabilitate existing 8-inch sewer between NE Ash and Main St. from MH 68 to clean-out on NE 1st Ave.*
    - **Project 7.** *Replace /Rehabilitate existing 8-inch sewer on SE 1st Ave. from clean-out to MH 48.*
    - **Project 8.** *Replace/Rehabilitate existing 8-inch sewer between SE Ash St. and Main St. from MH 32 to MH 48, and from MH 48 to the eastern clean-out.*

- **Priority Level III**
    - **Project 9.** *Replace/Rehabilitate existing 8-inch sewer along SE Ash St. from MH 22 to MH 30.*
    - **Project 10.** *Replace/Rehabilitate existing 8-inch sewer along SE Birch St. from MH 23 to MH 24.*
    - **Project 11.** *Replace/Rehabilitate existing 10-inch sewer along NW Cherry St. from MH 55 to MH 57.*
    - **Project 12.** *Replace/Rehabilitate existing 8-inch sewer along NE Ash St. from MH 69 to clean-out just south of MH 70.*

Pump Stations

The collection system includes two pump stations, listed below. An analysis of each pump station was conducted to identify deficiencies and recommend improvements, if necessary, during the planning period.

- Beech St. Pump Station
- Thomas Creek Estates Pump Station

The pump station analysis concluded that the Beech St. Pump Station will require upgrades during the planning period. The Beech St. Pump Station requires frequent oversight, and is overloaded during large rain events. It exhibits visible signs of infiltration and needs a reliable telemetry system. Continuing to operate the pump station in its current state presents excessive risk of failure and sewage overflows. Repairing the pump station wet well and replacing the two submersible pumps with those of greater capacity is recommended. Beech St. Pump Station upgrades are considered to be the City's number one priority, and should take place as soon as funding becomes available.

ES.5 Wastewater Treatment System

Raw wastewater is conveyed through force mains to the existing lagoon system comprised of two cells. The wastewater passes through a grinder before entering Cell No. 1 (Primary Lagoon Cell). Cell No. 1 receives the wastewater at the north end via header with four influent flow lines, and a gravity transfer pipeline at the south end conveys wastewater to Cell No. 2 (Secondary Lagoon Cell). Solids settle to the bottom of the lagoons where anaerobic digestion occurs over time, breaking down the organic matter. Water circulating through the Secondary Lagoon Cell flows over v-notch weirs at the outlet structure and flows to a Parshall flume for flow measurements and into the chorine contact chamber. The effluent undergoes disinfection using sodium hypochlorite solution and is then de-chlorinated with sodium sulfite tablets.

Existing WWTP Condition

The primary objective of the WWTP is to produce water quality in accordance with the NPDES Permit. The existing WWTP serves the community well and the City does not have difficulties in meeting the NPDES Permit requirements. The existing wastewater treatment plant appears to have adequate capacity for future growth within the planning period. High concentrations of algae are generated in the facultative lagoons. Two lagoon baffles located in the Secondary Lagoon Cell appear to be in disrepair and need replacement. Solids continue to accumulate at the bottom of lagoon cells, as there is no mechanism that removes solids from the liquid waste stream prior to entering the Primary Lagoon Cell. Table ES.5.1 summarizes the main deficiencies of the WWTP.

TABLE ES.5.1
SUMMARY OF WWTP DEFICIENCIES

Component	Deficiency
Facultative Lagoon Cells	Sludge Buildup
	Deteriorated Baffles
	Algae Blooms
Headworks	Lack of Solids Removal from Influent

WWTP Improvements

The existing WWTP does not need to be altered drastically since the City continuously meets treatment requirements, and the population is not projected to increase by very much over the planning period. Each major wastewater process area was reviewed, and alternatives were considered that include capital costs, Operation and Maintenance (O&M) expenditures, short term assets and salvage value. A summary of the WWTP improvement and expansion projects is provided in Table ES.5.2.

TABLE ES.5.2
SUMMARY OF WWTP IMPROVEMENTS

Item	Description
Influent Fine Screen	Construct a 1/4” fine screen just north of Cell No. 1 with a capacity of 0.89 MGD.
Lagoon Dredging, Dewatering & Disposal	Solids within the lagoon cells will be dredged, dewatered, and disposed of properly.
Baffle Replacement	The existing baffles are to be replaced to ensure adequate detention time.
Floating Mixers	Two solar floating mixers with adjustable intake hoses are recommended to be incorporated into the facultative lagoons to provide additional treatment capacity and improve lagoon health.

ES.6 Recommendations and Costs

The recommended capital improvement projects, relative to the existing collection system and WWTP, are summarized in this section.

Collection System Improvements

Based on the financial capacity of the City and severity of deficiencies, the projects are prioritized and separated into three priority levels. Conservatively, all costs assume complete pipe and manhole replacement. Replacement versus rehabilitation should be evaluated on a case-by-case basis, early in the design phase. Cost estimates are presented in Table ES.6.1.

TABLE ES.6.1
COST ESTIMATES FOR SEWER MAIN REPLACEMENT/REHABILITATION PROJECTS

Project No.	Phase	Length (ft)	Construction Cost	Total Project Cost
1	1	340	167,600	230,600
2	1	265	136,450	187,750
3	1	290	150,550	207,150
4	1	300	243,500	334,900
		Subtotal Level I	**698,100**	**960,400**
5	2	725	316,400	435,200
6	2	250	108,400	149,200
7	2	150	69,700	96,000
8	2	260	161,200	221,800
		Subtotal Level II	**655,700**	**902,200**
9	3	295	133,450	183,650
10	3	520	202,600	278,700
11	3	720	285,900	393,200
12	3	495	184,300	253,600
		Subtotal Level III	**806,250**	**1,109,150**
		Total	**2,160,050**	**2,971,750**

Annual costs for implementing a CCTV program for the entire collection system over a five-year period (20% per year) are included in Table ES.6.2.

TABLE ES.6.2
ANNUAL TV PROGRAM COST ESTIMATE

Item	Total Cost
Annual CCTV Program	$11,000
Total	**$55,000**

Cost estimates for the proposed pump station improvement project is summarized in Table ES.6.3. The Beech St. Pump Station improvement project is considered to be the City's highest priority and should take place before all other projects.

TABLE ES.6.3
PUMP STATION IMPROVEMENTS COST ESTIMATES

Item	Cost Estimate
Pump Station Upgrade	$473,900

WWTP Improvements and Expansion

Capital costs for the recommended projects are summarized in Table ES.6.4. The construction cost estimate is approximately $639,000. Total project costs are estimated at approximately $891,000.

TABLE ES.6.4
WWTP IMPROVEMENTS COST ESTIMATE

Item	Total Cost
Influent Screen	$514,200
Lagoon Desludging & Disposal	$95,400
Baffle Replacement	$51,500
Aeration / Mixing	$229,900
WWTP Total Project Estimate	**$891,000**

Total Project Costs

The total project cost, in 2019 dollars, for all recommended treatment and collection system improvements are provided in Table ES.6.5.

TABLE ES.6.5
TOTAL PROJECT COSTS (2019 DOLLARS)

Item	Total Cost
Collection System Improvements	$3,189,150
Pump Station Improvements	$473,900
WWTP Total Project Cost Estimate	$891,000
Total Project Cost Estimate	**$4,554,100**

Since funding acquisition and design of improvements will generally require time to complete, the total project cost is conservatively calculated for two years into the future assuming a 3.5% annual inflation rate. A total of approximately $4.9 million for 2021 (2021 Dollars) includes all recommended wastewater collection and treatment system improvement projects.

ES.7 Financing

Some level of outside funding assistance in the form of grants or low-interest loans will likely be necessary to make the proposed improvement projects affordable for the City of Scio and its citizens. In evaluating loans, grants, and local programs, the primary objective is to select a program, or a combination of programs, that are most applicable and available for the intended project. It is recommended that the City undertake efforts to secure funding in the form of grants, if available, and low interest loans. To achieve this goal, a “One-Stop” meeting with the funding agencies is recommended as soon as the City establishes a firm commitment as to the schedule and the extent of capital improvements. A brief description of the major federal and state funding programs that are typically utilized to assist qualifying communities in the financing of infrastructure improvement programs is provided in Section 6. The primary funders of wastewater infrastructure in Oregon are the State Revolving Fund and United States Department of Agriculture (USDA) Rural Development (RD).

Most state and federal grant programs, with which the supply is constantly diminishing, require that the project address a chronic DEQ issued violation or order and meet or exceed a predetermined user fee before the project is eligible for grant funding. Among other evaluation methods, USDA Rural

Development evaluates sewer user rates and expects local rates to be at or above that of similar communities before the project is grant eligible. The City's median household income is also a factor, as grants are typically only available for low income communities.

Understanding the City's existing rate structure, the additional costs incurred resulting from future incurred debt retirement, and O&M expenditures associated with impending improvements is necessary. Existing wastewater rates are derived based on a base rate and water consumption. Based on a winter water consumption of 141 gallons per day (gpd) per Equivalent Dwelling Unit (EDU), or approximately 565 cubic feet of monthly water use, the average residential sewer bill is approximately $35.06/month. The average wastewater rate (residential) as a percentage of the Median Household Income (MHI) $52,174 is 0.84%. Based on a Single Family Residence (SFR) usage rate, the City has 408 EDUs. Changes to the City's rate structure will be required, and a sewer rate study will be prepared to establish rates to sufficiently fund future capital replacement and improvement needs, provide sufficient revenues for O&M, and maintain an adequate reserve fund.

SECTION 1:

PROJECT PLANNING

SECTION 1: **PROJECT PLANNING**

1.1 Introduction and Location

Purpose

The purpose of this Wastewater Facilities Plan (WWFP) is to provide the City of Scio (City) with a comprehensive wastewater utility planning document. This WWFP provides guidance for the following:

- Identifying potential improvements and management options.
- Repairing aging infrastructure.
- Addressing current sizing needs.
- Identifying and addressing regulatory requirements.
- Serving as a planning document to meet reasonable long-term growth within the City.
- Addressing regulatory requirements for health, sanitation and security.
- Assisting the City in evaluating available funding for financing improvements.

Objectives

In order to protect the public health and welfare within the planning area and to improve water quality, the overall objectives of this WWFP are to:

- Evaluate the condition of the existing collection system and assess its capacity, identifying current system deficiencies.
- Estimate current and projected wastewater flows and loads from within the current City Urban Growth Boundary (UGB).
- Develop potential wastewater collection system improvements to correct existing problems and to serve existing and future development within the City Limits consistent with Oregon Department of Environmental Quality (DEQ) regulations and requirements.
- Fulfill the engineering planning document requirements of the DEQ Clean Water State Revolving Fund (CWSRF), Business Oregon Infrastructure Finance Authority (IFA), and United States Department of Agriculture (USDA) Rural Development (RD).
- Provide cost estimates and phasing recommendations for the recommended improvements.
- Provide recommendations for improvements to the wastewater treatment facility that will (once in operation) meet the conditions of the National Pollutant Discharge Elimination System (NPDES) waste discharge permit, comply with Total Maximum Daily Load (TMDL), and provide treatment capacity for future growth. The planning period for this study will be through the year 2044 for these objectives. Municipal treatment and pumping equipment is typically designed for a 20-year life. A longer planning period allows additional time for planning, securing funding, design, and construction, to the facilities before becoming operational. Many improvements last well beyond the 20-year design life.

Previous Studies and Information

The following studies, reports and other sources of information have been used in preparation of this WWFP:

- Comprehensive Plan, City of Scio, (2017)
- Water Management, Conservation, & System Master Plan, City of Scio (Erwin Consulting Engineering, LLC, 2015)
- Sewerage System Master Plan Update, City of Scio (Bryan A Stirrat & Associated, Inc., 1996)
- Wastewater Lagoon Emergency Upgrade and Rehabilitation Design Plans, City of Scio (Bryan A Stirrat & Associated, 1996)
- Lagoon Cell No. 1 Rip Rap Plan, City of Scio, (Russ Fetrow Engineering, Inc., 1987)

Scope of Study

The scope of the City of Scio WWFP is intended to address problems and deficiencies within the collection system and at the Wastewater Treatment Plant (WWTP), and to comply with the applicable requirements of the DEQ.

This report is developed in accordance with the guidelines set forth in "*Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities Financed by Infrastructure Finance Authority, Oregon Department of Environmental Quality, Rural Community Assistance Corporation, and United States Department of Agriculture*." A brief summary of the scope of this study is outlined below:

- **Study Area Characteristics.** Study Area characteristics were identified; they include both physical and socioeconomic conditions. City population and land use are addressed and projected into the future.

- **Basis of Planning.** Applicable regulatory requirements were identified and addressed, including management plans, current and future treatment criteria, and discharge standards. The present design capacity of the City's conveyance system and WWTP was estimated to assess the present and future operation of wastewater facilities.

- **Future Design Conditions and Considerations.** Wastewater characteristics were identified in terms of loads, flows, and strength during various times of 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.

- **Existing System Evaluation.** Existing wastewater facilities were investigated in detail. Data was collected on the existing wastewater collection and treatment systems from such sources as operating records, conversations with City Staff, onsite investigation, 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 facilities could be utilized in the future. The Infiltration and Inflow (I/I) contribution to the wastewater flow was evaluated based on past and recent I/I investigations and historic plant operating data.

- **Evaluate Improvement Alternatives.** Alternatives were identified for conveyance and treatment. Options that were not feasible were dismissed, and a limited number of selected alternatives were established and evaluated in detail.

- **Recommendations and Capital Improvement Plan.** A recommended plan was formulated which will enable the City to meet the present and future demands and requirements of their wastewater facilities. This plan includes preliminary design data, capital improvement and operational costs, and a preliminary financing strategy.

Authorization

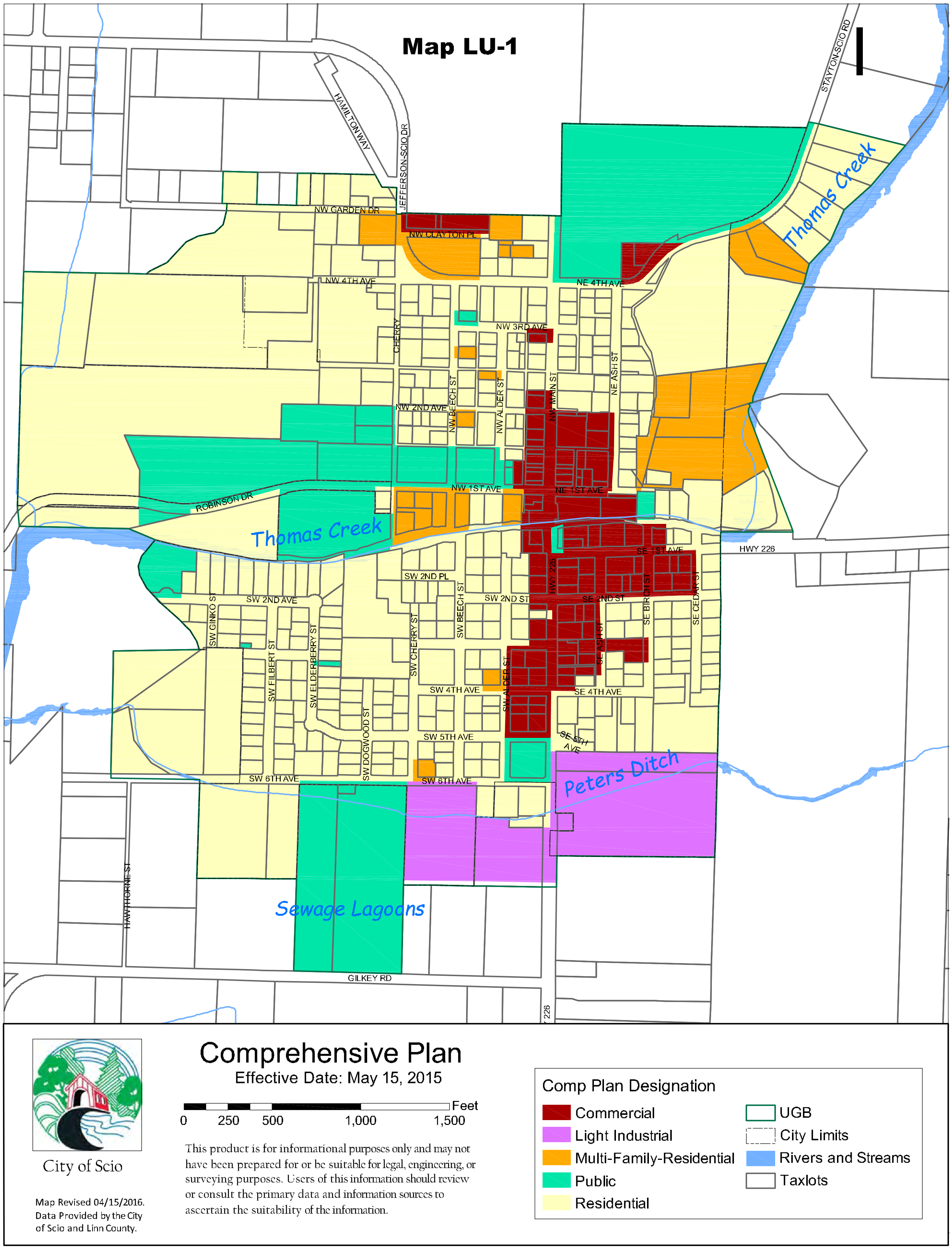
The City of Scio authorized The Dyer Partnership Engineers and Planners, Inc. to proceed with this Wastewater Facilitates Plan in July, 2018.

Location and Limits

The City of Scio is a small town located in the upper region of Linn County. The City is approximately 12 miles southwest of Stayton, Oregon via Stayton-Scio road, approximately 24 miles southeast of Salem, and approximately 18 miles northeast of Albany. The land surrounding the City of Scio is primarily used for agricultural purposes.

Highway 226 begins at the north end of the City of Scio, and runs north-south through the City, almost bisecting it. Thomas Creek flows from east-west through the mid-section of the City, and is the recipient of treated effluent discharge. Figure 1.1.1 illustrates the location of the City.

FIGURE 1.1.1
CITY LOCATION



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	*CITY OF SCIO* *WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN*	FIGURE NO.
DATE: AUGUST 2019	*CITY ZONING MAP*	*1.1.2*
PROJECT NO.: 202.01		

Land Use

The City of Scio's most recent Comprehensive Plan was updated in 2018. A copy of the City's zoning map was used to illustrate the planning area in Figure 1.1.2, and is also included in Appendix B. The City is primarily zoned residential, with a downtown commercial center and light industrial area to the south.

1.2 Environmental Resources

The following provides information about the environmental resources in and around the City of Scio.

Climate

The Study Area is located on the lower slopes of the west side of the Cascade Mountain Range within the Willamette Valley. The weather is characterized by warm, relatively dry summers and cool wet winters. The City of Scio has a temperate maritime climate with dry, moderately warm summers and wet, mild winters.

Extreme temperatures in the Willamette Valley are rare. Days with maximum temperatures above 90°F occur only 5 to 15 times per year on average, and below zero temperatures occur only about once every 25 years. Mean high temperatures range from the low 80's in the summer to the low 40's in the coldest months. The average annual high temperature is 62°F, and the average annual low temperature is 41°F (US Climate Data, 2018). The average annual precipitation is 57 inches, with an average annual snowfall of one inch.

Topography

The City of Scio is situated in the Willamette Valley at elevations ranging from 300 to 325 feet. A large portion of the City lies within the 100-year flood plain as Thomas Creek flows year round through the center of the City.

Soils

A web soil survey was conducted through the Natural Resources Conservation Service (NRCS) website to determine the predominant soil type within the City of Scio and surrounding the proposed service area. The soil is mostly made up of silty clay loams, which generally have a saturated hydraulic conductivity of 0.19 to 0.59 inches/hour. The NRCS soil map and soil characteristics of the Area of Interest (AOI) are shown as Figure 1.1.3.

FIGURE 1.1.3
SOIL MAP

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21	Chehalis silty clay loam	33.8	14.3%
23	Clackamas gravelly silt loam	4.5	1.9%
25	Cloquato silt loam	49.9	21.2%
26	Coburg silty clay loam	34.3	14.6%
28	Conser silty clay loam	18.3	7.8%
67	McBee silty clay loam	56.1	23.8%
72D	Nekia silty clay loam, 12 to 20% slopes	0.6	0.2%
73	Newberg fine sandy loam	14.6	6.2%
99	Wapato silty clay loam	9.8	4.1%
106A	Woodburn silt loam, 0 to 3% slopes	0	0.0%
W	Water	13.6	5.8%
Totals for Area of Interest:		**235.4**	**100.0%**

Water Resources

The City relies on groundwater wells as their source of drinking water and is not connected to any other local water system for source water or for the distribution of their water. The City of Scio has four designated well sites but relies on only two of the wells for the City's water supply needs at this time.

- Well #1 is located at the east end of NW 1st Ave. between NW 1st Ave. and Thomas Creek. Well #1 was constructed in 1948 at a depth of 207 feet. Well #1 had its yield reduced by mineral deposits and was valved off in the mid-1980s and sealed in 1999. Well #1 is covered by Water Right Claim Registration No. GR-2624.

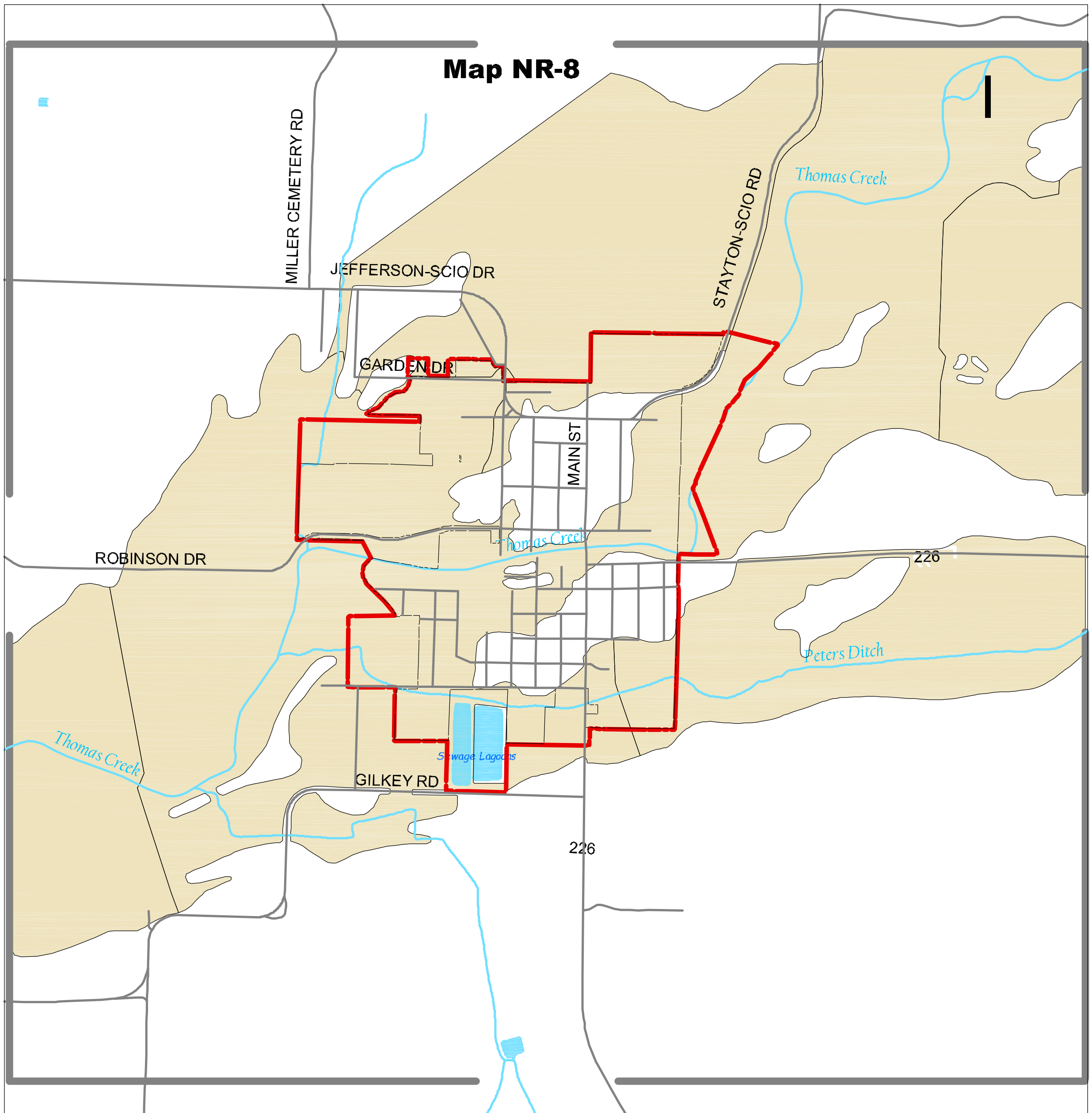
- Well #2 is located just south of NW 4th Avenue, approximately 150 feet west of the intersection of N Cherry Street. Well #2 was constructed in 1939 at a depth of 203 feet. Well # 2 has not been used for many years but could be reconnected to the system if the needed. Well #2 is covered by Water Right Claim Registration No. GR-2625.

- Well #3 is located on the west side of N Cherry Street, approximately 185 feet south of the intersection of NW 1st Avenue. Well #3 was constructed in 1970 at a depth of 210 feet. The current pumping capacity of Well #3 is estimated to be 360 gallons per minute (gpm) (0.80 Cubic Feet per Second (CFS)). Well #3 is covered by Certificate of Water Right Permit No. G5354 (Certificate No. 50300) for 1.33 CFS (597 gpm).
    - Oregon Drinking Water Services considers Well #3 to be "inadequately constructed" because it is not sealed into confining layers. This causes Well #3 to allow mixing of water between aquitards and puts the well at a high risk of contamination.
- Well #4 is located off of Stayton-Scio Road on the northeast corner of the Scio High School property. Well #4 was constructed in 1995 at a depth of 210 feet with an estimated flow rate of 700 gpm (1.56 CFS) and a water right of 1.78 CFS (798 gpm). The current pumping capacity is 430 gpm (0.96 CFS). Well #4 is covered by Certificate of Water Right Permit No. G-12694 for 1.78 CFS (799 gm), however, the final order (issued June 20, 2014) approving the Extension of Time for Permit G-12694 limits the diversion of water to no more than 0.95 CFS (426 gpm).

The City of Scio has a total water production capacity of 790 gpm. The total capacity is the Well #3 capacity (360 gpm) plus the Well #4 capacity (430 gpm). Well #4 is designated as the City's primary water source with Well #3 and Well #2 used as backups. Well #3 is currently used periodically to assistance in water production while Well #2 has been left in place only as an emergency back-up.

Flooding

Most of the City lies within a 100-year floodplain stemming from Thomas Creek. There is a gauge located at the crossing of Highway 226 and Thomas Creek that measures the discharge rate of Thomas Creek. This gauge is used in tandem with the City's early flood warning system. A map of the special flood hazard area can be found as Figure 1.1.4, and in Appendix B.



Special Flood Hazard Area

0 500 1,000 2,000 3,000 4,000 5,000 Feet

City of Scio

Map Revised 11/01/2014.
Data Provided by the City of Scio and Linn County.

This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the suitability of the information.

Legend

- 100 Year Flood Plain
- Roads
- City Limits
- UGB
- Rivers, Streams, Ponds
- Planning Area

THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	CITY OF SCIO WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN	FIGURE NO.
DATE: AUGUST 2019	SPECIAL FLOOD HAZARD AREA	1.1.4
PROJECT NO.: 202.01		

Seismic and Fault Hazards

Oregon is located within the circum-Pacific belt of crustal instability along with California, Washington, British Columbia and Alaska. All of these states and provinces, which border the Pacific Ocean, have received violent earthquake shocks in recent years. Since 1841, the State of Oregon has experienced 167 earthquakes and of these, 47 were centered in the Portland vicinity.

Economic Conditions

The City of Scio's economy has primarily relied on logging and agriculture in the past. Today, the surrounding area is still heavily farmed.

The 2013to 2017 American Community Survey 5-Year Median Household Income (MHI) estimate for the City is $52,174 (± $11,026). The 5-Year Mean Household Income Estimate is $58,071 (± $7,570). The MHI for the State of Oregon is $56,119 (± $370).

Energy Production and Consumption

No major energy resources have been identified in the Study Area. Energy consumption is expected to increase within the Study Area due to population growth during the planning period. Consumers Power Inc. and Pacific Power provide electrical energy to the City of Scio.

1.3 Population Trends

City Population

An accurate population forecast is required to determine wastewater flow projections through the end of the 20-year study period. Population forecasts are important in that they influence infrastructure sizing requirements. If the 20-year population forecast is severely underestimated or overestimated, the wastewater system will struggle to perform in compliance with permit requirements. Oversized systems result in excess spending, higher operational costs, and increased oversight requirements. Undersized systems create hydraulic and biological limitations.

Projections are generally based upon the extrapolation of past trends from an area or region. While history may not repeat itself, it serves as an initial basis for population projections. Key factors that influence population projections include: growth in surrounding communities, available developable land, and job opportunities. The City of Scio experienced an average annual growth rate of approximately 1.5% from 1980 to 2010. This thirty year period incorporates times of slow growth, as is seen from 1980 to 1990 (0.75%) and times of more rapid growth as seen from 2006 to 2010 (3.4%). More recently the growth has leveled off and even declined. The certified population in 2011 was 840 (excluding residents outside of City Limits) but dropped to and stayed at 830 in 2012 and 2013.

The anticipated time needed to complete the facilities plan, secure financing, and complete design and construction is 25 years. Referenced from the base year of 2019, the recommended planning year is 2044. Based off of historical and projected data, the City of Scio's population projection for the year 2044 is 1,046. This population estimate was derived from a coordinated population forecast for Linn County, conducted by Portland State University's Population Research Center in 2017. Projected Annual Average Growth Rates (AAGR) were used to plot population trend lines to predict the future population of the City of Scio, as shown in Figure 1.3.1.

FIGURE 1.3.1
HISTORICAL AND PROJECTED CITY POPULATION

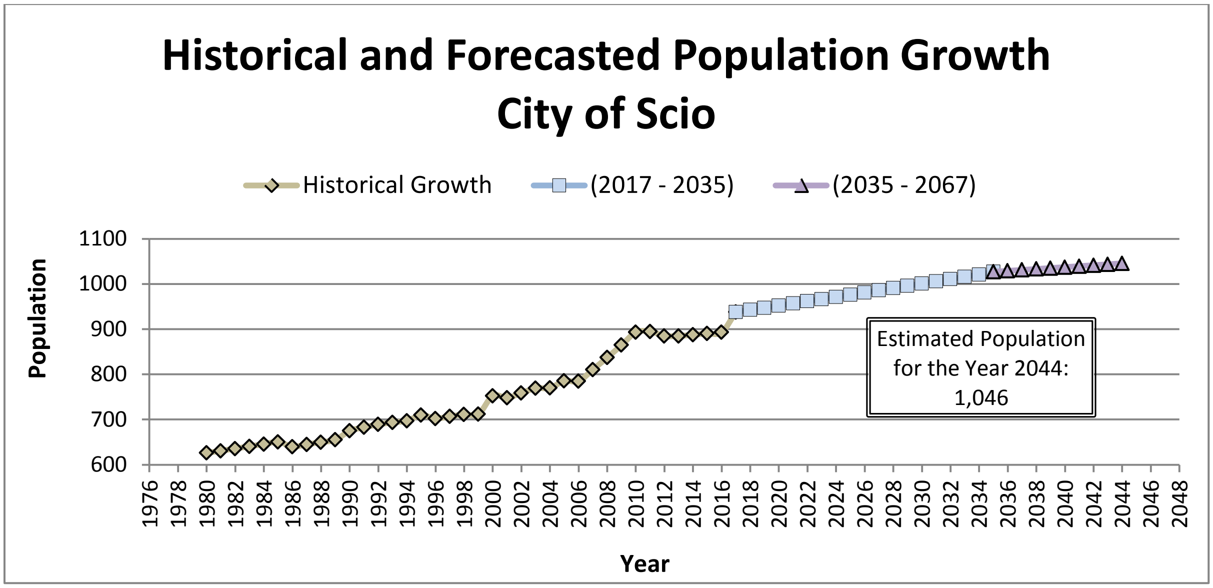


TABLE 1.3.1
PSU POPULATION FORECAST

Year	Population[1]	AAGR[2]
2020	952	0.5%
2025	976	0.5%
2030	1001	0.5%
2035	1027	0.2%
2040	1037	0.2%
2044	1046	0.2%

Notes:
1. City of Scio population forecast prepared by Population Research Center, PSU, June 30, 2017.
2. Average Annual Growth Rate (projected).

1.4 Community Engagement

Community engagement provides the opportunity for the system owners (local citizens) to meaningfully participate in development and to provide guidance on implementation and management of their wastewater system.

Goals of community engagement include: 1) develop an understanding of the environmental issues; 2) define regulatory requirements; 3) present design development information; 4) collaborate in developing solutions; and 4) review funding/revenue strategies for a recommended plan.

Various community engagement opportunities occur during the planning process to inform and receive feedback about the project from the public, regulatory agencies and stakeholders. Goals are to identify community issues of concern, and share information utilized to develop recommendations. Feasible feedbacks from the stakeholders are incorporated into the management of the wastewater system. The community engagement opportunities include:

- Local agency and jurisdictional briefings.
- News releases in the local newspaper.
- Project fliers distributed during a monthly utility billing cycle.
- Articles posted on the City's web page.
- Hosting a public stakeholders meeting.
- Adoption of the WWFP through a public City Council meeting.

SECTION 2:

EXISTING FACILITIES

SECTION 2: **EXISTING FACILITIES**

2.1 Location Map

The location of the City's major wastewater collection system components, including pump stations and force mains, are shown on Figure 2.3.1 on the following pages. The City's collection system consists of approximately 24,200 linear feet of gravity collection pipes, 4,650 linear feet of pressure sewer mains, 80 manholes and two pump stations.

2.2 History

The City of Scio was incorporated in 1866. Before the first major attempt at building a unified sewer system infrastructure, the City of Scio utilized a community septic tank and drain field to dispose of waste before the 1950s. The original collection system was constructed in 1950 to cover the area of North Main to North Beech St. As the population grew, the City expanded upon their collection system, with most of the construction taking place around 1962. Two-cell stabilization ponds were constructed at this time to serve as the primary sewage treatment system, and were expanded in the 1980s. Newer developments took place in the southwest portion of the City in 2004 and 2005, and a new pump station was built to serve that specific area. Table 2.2.1 summarized the treatment system components with approximate installation dates and estimated useful life left.

TABLE 2.2.1
CITY OF SCIO WWTP COMPONENT AGE AND EXPECTED LIFE

Facility	Component	Year Installed	Age (years)	Expected Useful Life (years)
Lagoon Cells	Primary Cell	1962	57	n/a
	Secondary Cell	1962	57	n/a
	Lagoon Baffles	1980	39	0
Chlorine Contact Basin	Structure	1962	57	20
	Mechanical Equipment	Unknown	n/a	20
	Electrical	Unknown	n/a	20
	Sodium Hypochlorite System	2019	-	20
Dechlorination	Flow-Splitting Manhole	1962	57	20
	Bio-dynamic Tablet Feeders	2017	2	20
Headworks	Influent Grinder	2019	0	10
	Influent Laterals	2006-2010	9-13	20

The following sections include more detailed descriptions and analyses of each component of the wastewater system, including capacity, performance, and operation and maintenance issues.

2.3 Condition of Existing Facilities

Existing Collection System

Collection System Summary

The majority of the City's wastewater collection system exists as concrete bell and spigot pipe connections and was constructed within the time period 1950 through1962. With the exception of the Thomas Creek Subdivision, the collection system conveys wastewater to the Beech St. Pump Station. Flows from the north basin are transferred to the pump station via an inverted siphon under Thomas Creek. The south basin flows by gravity directly to the pump station. The Thomas Creek Estates Subdivision has incorporated PVC and piping into the area collection system and flows are directed to the Thomas Creek Estates Pump Station. Both pump stations pump wastewater directly to the wastewater treatment plant.

Approximately ten units located within the northwest corner of the City utilize Septic Tank Effluent Pump Systems (STEP), and are tied into the collection system. This STEP system allows for these units to pump liquid wastewater to the City's collection system, while solid waste retained in the septic tanks are pumped out every five years. The City is unaware of any occurrences of sanitary sewer overflows (SSO's) within the last fifteen years. There has been one instance in which untreated water from the lagoons was mistakenly irrigated on a nearby spot of land, and with DEQ's assistance, the City took corrective measures. As far as the rest of the collection system is concerned, no SSO's have been observed.

Existing Collection System Inventory

Most of the collection system consists of standard gravity sewers. An inventory of the existing collection system is provided in Table 2.3.1. Historical records of the collection system are not entirely accurate and up to date. The current collection system infrastructure as it exists today is best represented by Figure 2.3.1 on the following page. Table 2.3.1 identifies line sizes and approximate linear footage of each size.

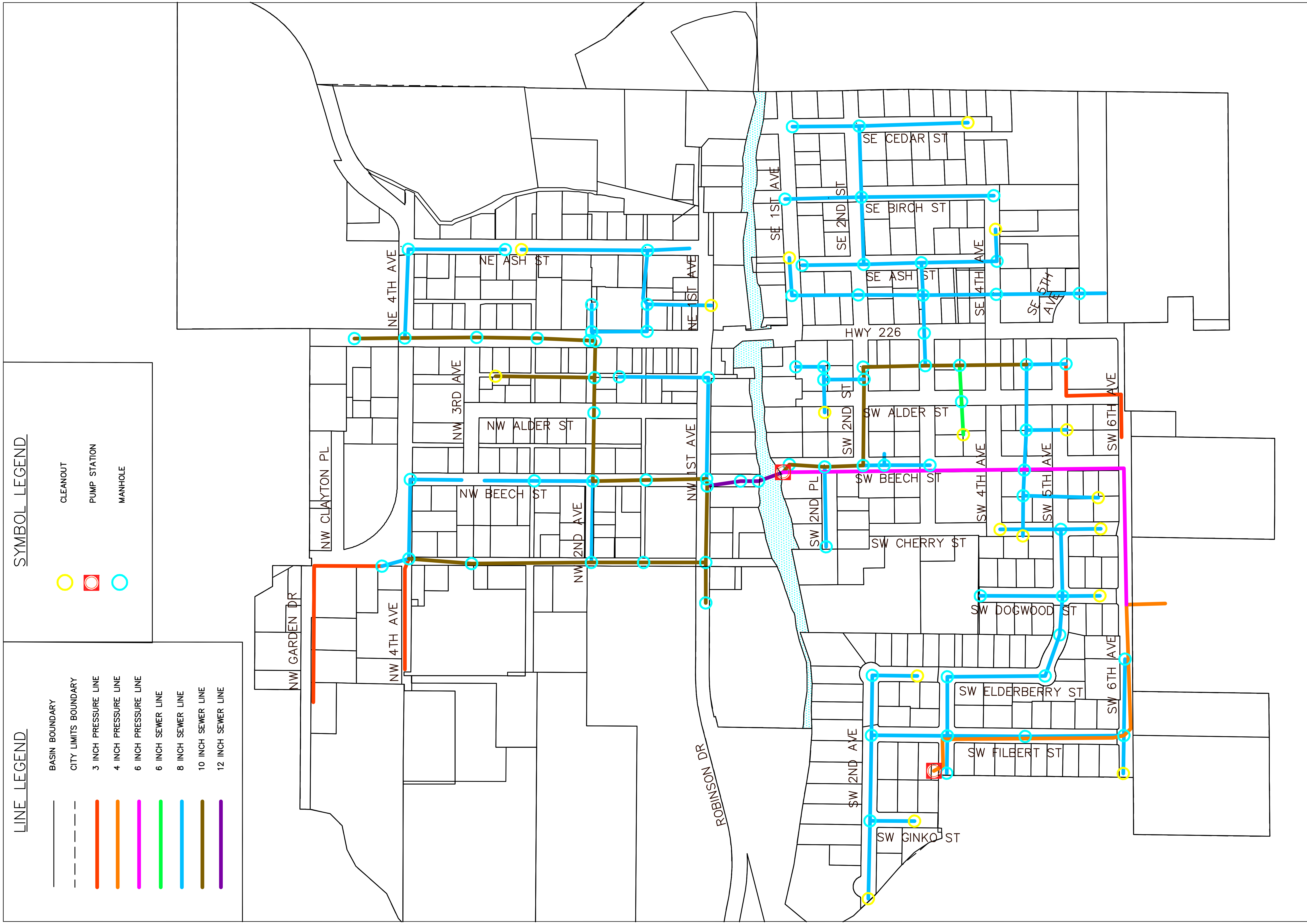


FIGURE NO. 2.3.1

CITY OF SCIO
LINN COUNTY, OREGON
WASTEWATER COLLECTION SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS
DATE: AUGUST, 2019
PROJECT NO.: 202.01

TABLE 2.3.1
WASTEWATER COLLECTION SYSTEM INVENTORY

Item	Item Description	Unit	Quantity
1	3" Pressure Line	FT	1,239
2	6" Sanitary Sewer Line	FT	273
3	6” Pressure Line	FT	1,874
4	8" Sanitary Sewer Line	FT	16,398
5	10" Sanitary Sewer Line	FT	5,346
6	12" Sanitary Sewer Line	FT	305
7	4" Pressure Line	FT	1,537
8	Manholes	EA	80
9	Mainline Cleanouts	EA	18
10	Pump Stations	EA	2

The age of existing sanitary sewer lines within the City mostly falls within the range of 57 to 69 years old, except for the Thomas Creek Estates development area was built around 2004 to 2005. Most mains outside of the newer development area are comprised of concrete pipes that range from 6 to 12 inches in diameter.

Collection System Basins

The collection system for the City can be divided into three basins with respect to Thomas Creek and the newer development of Thomas Creek Estates. The creek runs through the middle portion of town from east to west. The basin north of Thomas Creek (North Basin) contains mostly gravity fed sewer lines, with a septic tank system serving a small residential development located in the northwest portion of town. The basin south of Thomas Creek (South Basin) contains mostly gravity fed sewer lines, with step system set up to serve a small industrial zone near Peter’s Ditch southeast of town. Thomas Creek Estates Basin, though it technically lies within the South Basin, will be considered as separate since it is served by a different pump station. Table 2.3.2 outlines each basin with their respective size and number of manholes/cleanouts.

TABLE 2.3.2
WASTEWATER COLLECTION SYSTEM BASIN DATA

Basin ID	Manhole Count	Cleanout Count	Acres Served
North	32	3	93
South	34	8	77
Thomas Creek Estates	14	7	22
Total	**80**	**18**	**192**

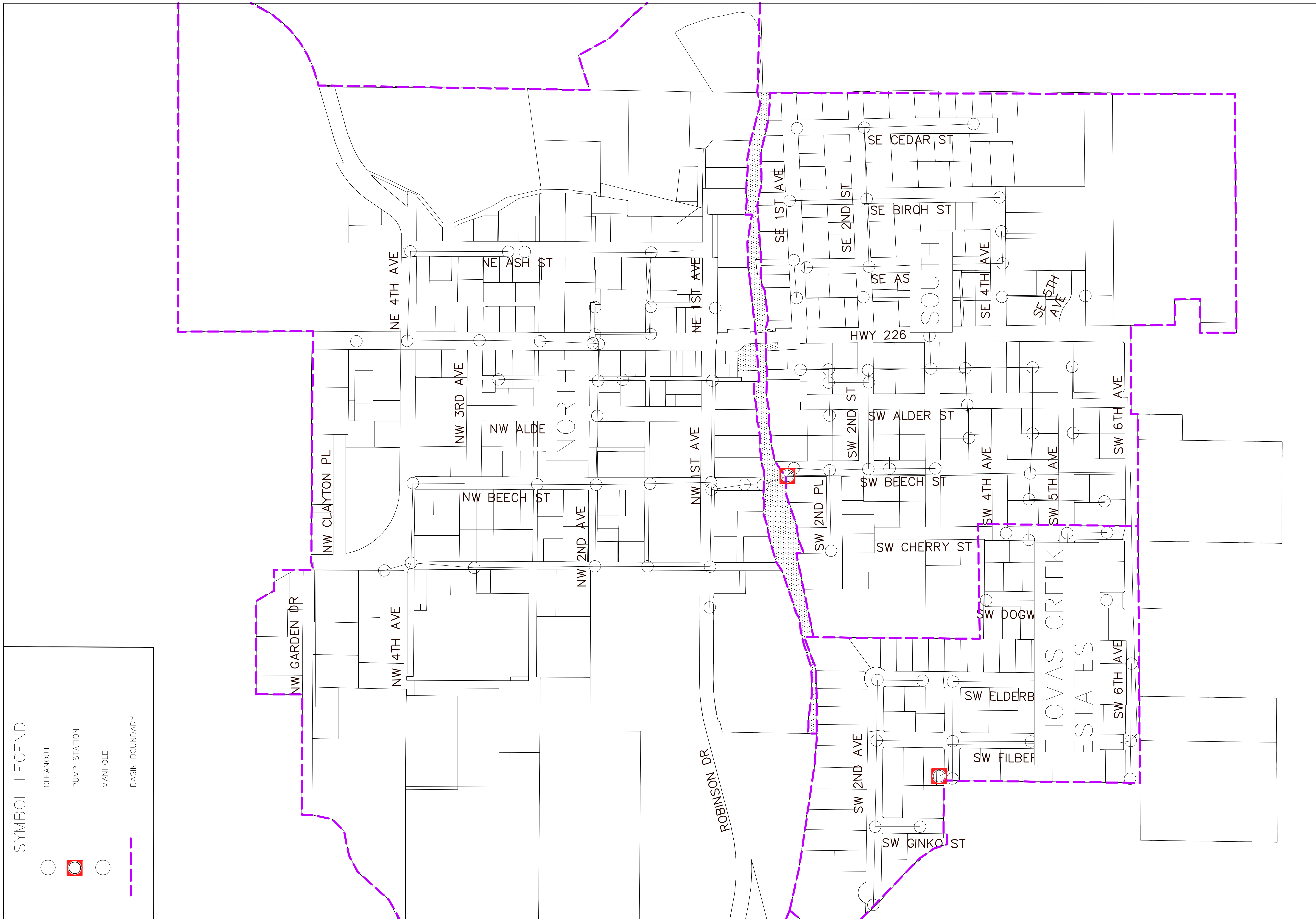


FIGURE NO.
2.3.2

CITY OF SCIO
LINN COUNTY, OREGON
WASTEWATER COLLECTION SYSTEM BASIN MAP

THE DYER PARTNERSHIP
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Infiltration and Inflow

Infiltration and Inflow (I/I) is a problem affecting many sanitary sewer systems. Infiltration and inflow is defined as groundwater and rainwater that enters a sanitary sewer collection system that creates many wastewater related problems.

Infiltration and inflow can cause flows to exceed the capacity of pipes, thereby compromising the collection system. Excess flows can wash out soil from around pipes, erode larger holes in the pipe walls, generate sinkholes, create rodent dens, precipitate line collapses, and cause service line backflow problems. Sand and rock washed into a collection system with I/I exacerbates collection system hydraulic problems by further reducing line capacities, creating line blockages, and increasing the wear on pumps that are relied upon to convey sewage to the treatment plant.

If left unchecked over time, infiltration and inflow can be an escalating problem that will generate increasingly higher sewer flows. Eventually I/I can become so severe that lower system piping, pump stations, and treatment plants cannot adequately convey or handle the rainfall induced flows. Ultimately, raw wastewater is either exfiltrated or bypassed into the surrounding environment.

A comprehensive I/I identification program was performed to determine the quantities and sources of extraneous water that exists in the wastewater collection system. This task consisted of a review of existing WWTP influent flow records and existing television video recordings, and include flow mapping and smoke testing of the City’s collection system. These items are discussed in more detail below.

Smoke Testing

Smoke testing was performed by The Dyer Partnership Engineers & Planners, Inc. (September, 2018) to identify potential deficiencies that allow I/I into the collection system. A copy of the *Smoke Test Report* (September, 2018) is provided under separate cover. Smoke testing identifies several deficiencies that can contribute significantly to I/I rates, including: catch basins and roof drains tied to the sewer system, leaks in main and lateral sewer lines, leaky cleanouts, and faulty manholes. These inflow sources provide a direct link to the collection system and are typically the most cost effective to eliminate. Instant reductions of extraneous flows are typically observed during rainfall events after these sources are eliminated.

Detailed, individual smoke test reports were developed to document each instance of smoke exiting from abnormal areas. Each smoke test report includes a photograph of the observed smoke, a hand drawn map of the location of the smoke, a written description of the source of the smoke, and other pertinent information. The ultimate and intended purpose of smoke testing is to assist the City in establishing prioritized repairs in problem areas that provide a high rate of return relative to I/I removal.

A summary of the smoke testing results can be found in the following tables and figures. The complete smoke testing report is provided in Appendix B.

TABLE 2.3.3
SMOKE TESTING NUMBER AND TYPE OF DEFICIENCIES

Deficiency	Total
Open Cleanout (OCO)	14
Catch Basin (CB)	4
Leaking Service Lateral (LSL)	9
Leaking Main Line LML)	1
Other	4
TOTAL DEFICIENCIES:	32

FIGURE 2.3.3
SMOKE TESTING RESULTS SUMMARY
NUMBER OF VIOLATIONS BY TYPE

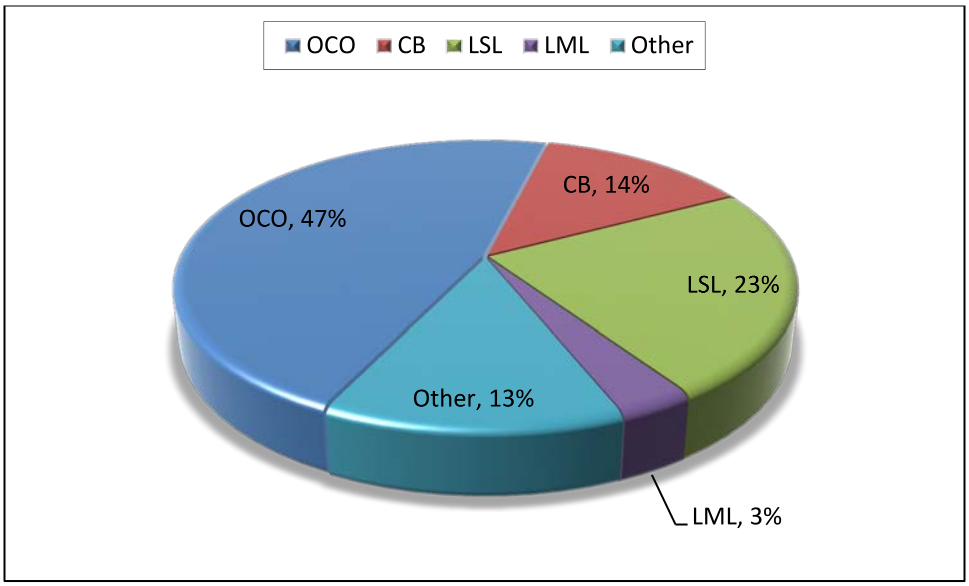


TABLE 2.3.4
REPORT NUMBERS ACCORDING TO DEFICIENCY TYPE

Deficiency Type	Deficiency Code	Smoke Test Report Number		
Catch Basin	CB	1-2		
		1-9		
Leaking Main Line	LML	2-12		
Leaking Manhole	LMH	1-1	1-6	2-13
		1-4	2-8	2-14
		1-5	2-10	
Leaking Service Lateral	LSL	1-3	2-1	2-15
		1-10	2-3	2-17
		1-12	2-10	
Open Cleanout	OCO	1-3	2-2	2-7
		1-7	2-3	2-11
		1-8	2-4	2-12
		1-11	2-5	2-16
		2-1	2-6	

Other deficiencies, outside of the above categories, are summarized below:

- 2-9. Smoke was exiting from a leaking septic tank near 38938 Jefferson-Scio Drive.
- 2-10. A floor drain in Centennial Elementary School was leaking smoke.
- The following locations within the City called during the smoke test or came outside to indicate smoke coming from inside:
  - Scio Youth Club (39001 NE 4th Ave.)
  - 38604 SW Alder St. (Bathroom)
  - 38885 Main St. (Sink)
  - 38829 SW 2nd Ave. (Laundry Room)
- It is important to note that other households can potentially have similar problems, as not all residents were home at the time of smoke testing. Some deficiencies could have gone unnoticed. It is suggested that the City inform residents about potential health concerns caused by these deficiencies and recommend testing for sewer gases in homes.
- Difficulties arose in determining how some manholes near Clevenger's Automotive Tire on SW 2nd St. were connected to the adjacent properties. It is recommended that the City TV the main lines in this area to better understand the existing layout.
- The majority of the manholes in the City seem to be in need of repair. A select few manholes are covered in this report, but the condition of all manholes should be re-evaluated for potential grouting.

Flow Mapping

Flow mapping was performed during winter dry period on January 24, 2019 and amidst significant rainfall events on February 13, 2019 to determine the quantity and sources of extraneous water that enters the City of Scio's sewer collection system. The purpose of the winter dry period mapping was to establish a base line on extraneous flows while the water table and rainfall had minimal contribution to flows. Potential sources of infiltration include: manhole joint failure, manhole channel defects, cracks in pipes, pipe joint failures, leaking pipe penetrations, and root intrusions. Potential sources of inflow include: storm drains, roof drains, and contributions from manhole lids or open clean-outs.

Flow measurements consisted of instantaneous water depth recording using "Flow Poke" equipment at incoming pipe segments within manholes as well as general observations. Flow Poke equipment is generally used for pipes that are less than 12 inches in diameter. If pipes are greater than 15 inches in diameter, estimations based on liquid levels in the incoming pipe segments and pipe slope are utilized. The City does not have pipes greater than 15 inches in diameter, so the Flow Poke equipment was adequate for all flow mapping measurements.

Flow measurements were taken at strategically selected manholes with portable Flow Poke equipment. These meters allowed the flow mapping team to take instantaneous measurements without physically entering the manhole. The flow meter measures water depth across a V-notch weir, with an accuracy of plus or minus five percent for flows up to 640 gallons per minute (gpm). This accuracy is considerably higher than having to physically measure the water depth, as was done prior to the invention of the portable flow meter. When significantly low flows were encountered, no further investigation was performed in the collection system upstream of these small flows.

By determining the relative increases in measured flow between manhole sections, problem areas were identified and prioritized. The flow poking indicated a number of deficiencies that need to be addressed. Flow mapping results are provided in Appendix B. The findings are summarized as follows:

<u>Flow Poking Findings</u>

- Excess flow of 23 gpm along SW Beech St., between SW 2nd Place and 3rd St. Extraneous flows to the Beech St. Pump Station could be coming from this area, as well as the area on SW 2nd St. west of Highway 226.
- Excess flow of 15 gpm on SE Ash St., between SE 4th Ave. and manhole 30, where it tees across Highway 226.
- Excess flow of 12 gpm on SE Birch St., between SE 4th Ave. and SE 2nd St. The pipe or Manhole 23 could both be contributing to excess load, and both should be investigated further.
- Excess flow of 11 gpm between SE 1st Ave. and SE 2nd St., where the 8-inch sewer main cuts through existing properties to Manhole 32.
- Excess flow of 13 gpm on NW Cherry St., between NW 4th Ave. and NW 2nd Ave.
- Excess flow of 20 gpm in the section of main line/inverted siphon crossing Thomas Creek. The excess flow may be lower, depending on the amount of flow exiting the siphon through the drop down leg in the receiving manhole, which was not able to be measured at the time of flow poking. It is recommended that the City investigate this further to confirm if infiltration is coming from Thomas Creek.
- Manhole 40 has apparent backflow in the 8-inch line extending west to Manhole 42. There is also a dead end stub coming from the east side of Manhole 40.
- Manhole 44 has minor seepage at manhole joints.
- Manhole 43 has minor seepage at the manhole ring. It is recommended that the City investigate

this manhole and the lines around it to further identify potential areas of concern.
- Manhole 38 has possible backflow from downstream.
- Minor seepage is present in Manhole 51.
- Minor seepage is present in Manhole 36.
- Considerable seepage was found in Manhole 16.
- Major seepage from the bottom of Manhole 19 causes an estimated additional 3 gpm to the current flow through the manhole.
- Major seepage contributed an estimated additional 2 to 3 gpm in Manhole 21.
- Manhole 30 contained seepage at the base.
- Manhole 29 contained seepage at the base.
- Manhole 54 contained significant seepage that caused an estimated additional 2 gpm.

Approximately 33% of all manholes examined during flow poking exhibited visible signs of seepage from ground water or rainfall. It is recommended that the City adopt a manhole rehabilitation program to repair its manholes to eliminate excess infiltration. High infiltration rates, as enumerated above, will likely require subsequent investigations performed by the City (i.e. television inspection), and possibly additional smoke testing of the system to refine the I/I repair projects scope of work. Appendix B contains a flow poking map and notes taken during the study.

Collection System Maintenance

The City of Scio has historically taken some steps to reduce infiltration and inflow. Flow measurements have been taken in 1979 and 1990 during the wet season, and it was determined that the collection system south of Thomas Creek (South Basin) was contributing approximately 70% of the excess I/I flows. In 1980, the City used funds to seal some manholes that exhibited signs of seepage. Additional studies have taken place since then, but no major repairs have taken place to date.

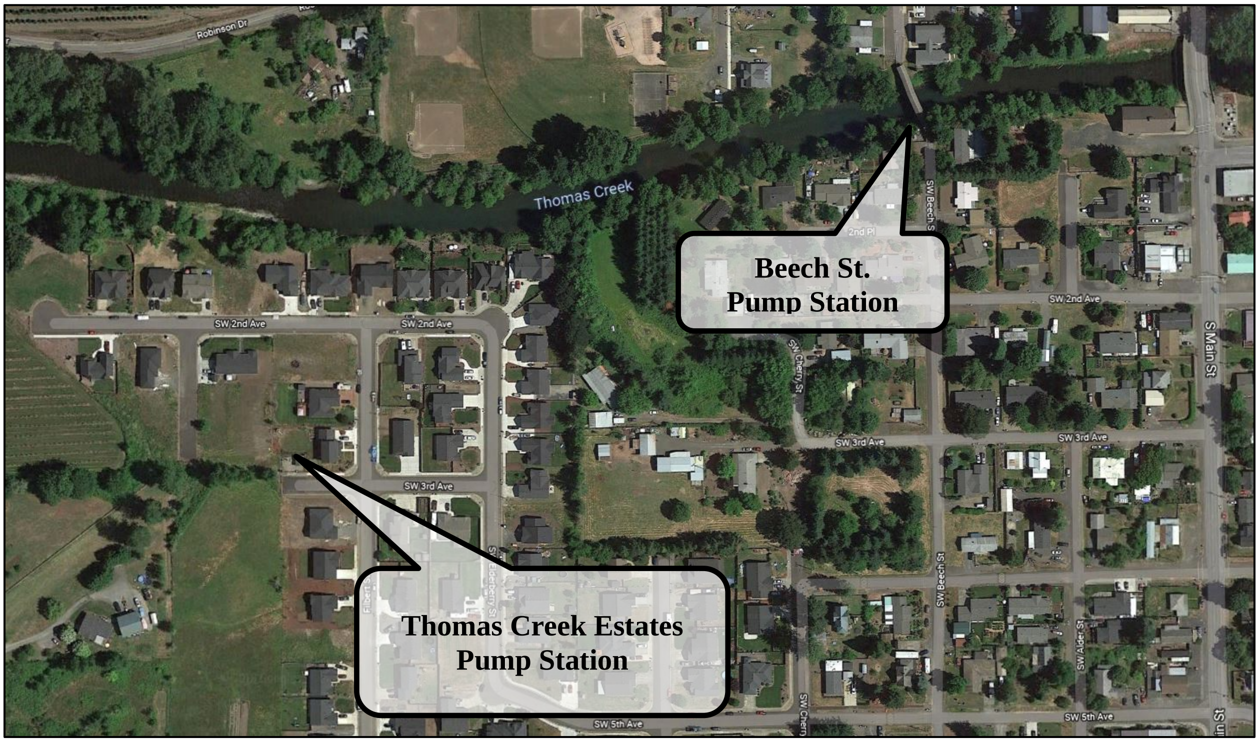
Recently, the City discovered a severe root problem clogging the main line in the northern half of Main St. Residents were notifying the City of sewer problems, and assistance from the City of Lebanon was required to provide the necessary equipment for resolving the problem. TV inspections of the main line were performed to confirm suspicion of tree root clogs, and a root cutter was deployed to clear any blockages. The City of Scio does not own any of this equipment, and does not have the means to obtain it. Providing an annual or semi-annual program in which the City pays a specialized company to perform main line and lateral inspections, as well as clearing blockages, is highly recommended. This will alleviate overflow concerns, locate sewer lateral locations that are currently unknown, and help identify more lines that may need to be replaced.

The City of Scio has updated their annual budget for the 2018 to 2019 fiscal year that includes $293,504 for sewer rehabilitation projects. Adopting a manhole repair program can help limit a good portion of infiltration found during flow poking. TV inspections by the City in lines that suggest high I/I is also a recommended investment to pursue, as eliminating problem areas in pipes will reduce WWTP loading rates.

Pump Stations

The collection system includes two pump stations; Beech St. and Thomas Creek Estates. This section provides an overview of each pump station, and summary of deficiencies, if present. Pump station locations are shown on the preceding collection system map, Figure 2.3.1, as well as Figure 2.3.4.

FIGURE 2.3.4
PUMP STATION LOCATIONS



<u>Beech St. Pump Station</u>

Beech St. Pump Station is located on Beech Street, just south of a covered pedestrian bridge crossing Thomas Creek. The pump station delivers all flow from the City's collection system, aside from the Thomas Creek Estates area, to the WWTP. Wastewater flows to the pump station via an inverted siphon from the north, and a gravity line from the south. It operates with two pumps to convey wastewater through a 6-inch force main to the wastewater treatment plant. Pump No. 1 and Pump No. 2 average 1.9 hours per day and 1.5 hours per day of operation, respectively.

A drawdown test was performed on October 22, 2018 to determine the available capacity that the pump station can operate at. Both pumps were manually shut off by the Public Works Department, and the wet well was allowed to fill before one of the pumps was turned on to operate individually. Water level was measured incrementally as operation time went on to determine flow rates for each pump. It was concluded that Pump No. 1 and Pump No. 2 currently have capacities at 212 gpm and 273 gpm, respectively.

Pump No. 1 in the Beech St. lift station was rebuilt after failing in early March, 2019. The original pump going out of commission did not trip any breakers at the treatment plant, and the float sensors were the only thing that kept the wet well from overflowing. Pump No. 2 had a significantly long run time. After Pump No. 1 was rebuilt, it showed improved capacity; similar to the capacity of Pump No. 2. However, the telemetry system installed at this lift station has proved to be unreliable, and requires replacement.

FIGURE 2.3.5
BEECH STREET PUMP STATION

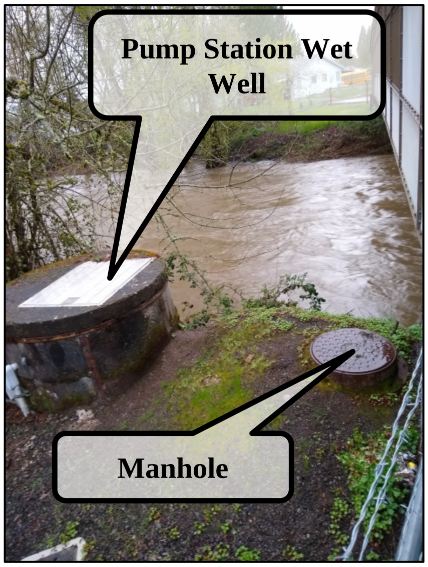


Figure 2.3.5 shows the Beech St. Pump Station near Thomas Creek. The first photo shows the manhole that receives influent from the two 6-inch ductile iron pipes that lie within protective casing and run north to south on the bottom of Thomas Creek, functioning as an inverted siphon or depressed sewer. In general, wastewater flows should be at least 3 ft/s and should not exceed 12 ft/s to avoid potential wear and tear due to erosion and abrasion. Based on a maximum flow of 12 ft/s and a 6-inch diameter pipe, capacity through one siphon line is 2.3 ft^3/s, or 1,032 gpm. The inverted siphon has a total capacity of 2,064 gpm since it is comprised of two 6-inch lines. During I/I testing, the inverted siphon appeared to be operating within this capacity. Wastewater is conveyed by the siphon westward to the nearby wet well housing the two pumps and float controls. In the past, the City has utilized pump trucks to isolate the inverted siphon and wet well to perform debris removal. Periodic debris removal will help to increase the useful lifespan of the inverted siphon, wet well, and pumps; The City will look to incorporate a debris removal plan as part of the pump maintenance schedules once they are developed.

TABLE 2.3.5
BEECH STREET PUMP STATION AND FORCE MAIN

Beech Street Pump Station and Force Main	
Location	Beech St. immediately south of Thomas Creek
Date Built	1974
Type	Duplex Submersible
Manufacturer	Flygt
Wet Well	Precast Concrete, 5 ft. Diameter, 26 ft. Depth
Pump hp	2 @ 10 hp
Level Control	Float only
Standby Generator	Yes (Generac)
Flow Measurement	270 gpm (Pump 1) and 273 gpm (Pump 2)
Force Main	1,874 LF of 6” PVC
Discharge Location	South of Dogwood St. and S.W. 6th Ave. (WWTP)

Thomas Creek Estates Pump Station

Thomas Creek Estates Pump Station is located at the west end of SW 3rd Avenue, approximately 130 ft. from the intersection with Filbert Street. This relatively new pump station was constructed to accommodate new developments, and was completed in February of 2005. The basin it serves is approximately 45 acres in size. It is a duplex, submersible pumping station equipped with a Hydrogen Sulfide (H_2S) control air injection system. The ultimate pump capacity was designed for approximately 167 single family houses, and is intended to serve the remainder of the property within the City's Urban Growth Boundary to the south and west.
A drawdown test was performed on October 22, 2018 to determine the available capacity that the pump station can operate at. Both pumps were manually shut off by the Public Works Department, and the wet well was allowed to fill before one of the pumps was turned on to operate individually. Water level was measured incrementally as operation time went on to determine flow rates for each pump. Finally, both pumps were run simultaneously. It was concluded that Pump No. 1 and Pump No. 2 currently have capacities at 250 gpm each.

FIGURE 2.3.6
THOMAS CREEK ESTATES PUMP STATION


TABLE 2.3.6
THOMAS CREEK ESTATES PUMP STATION AND FORCE MAIN

South Molalla Pump Station and Force Main	
Location	SW 3rd Avenue and Filbert
Date Built	2005
Type	Duplex Submersible
Manufacturer	Flygt
Wet Well	Precast Concrete, 6 ft. Diameter, 19.81 ft. Depth
Pump hp	2 @ 10 hp
Level Control	MultiTrode MT2PC controller, probes, bypass alarm
Standby Generator	Yes
Flow Measurement	290 gpm (2 pumps), 250 gpm (1 pump)
Force Main	1,537 LF of 4" PVC
Discharge Location	South of Dogwood St. and S.W. 6th Ave. (WWTP)

Existing Treatment Facilities

History

The City's original wastewater collection system was comprised of one community septic tank, and a drain field. In 1962 the two-cell facultative lagoons were constructed, and expanded upon in 1980. Old wastewater treatment plant plans and specifications do not necessarily pertain to the existing infrastructure; some components were never built. It is important to understand the existing treatment system as it is currently, and continue to work with Operators to obtain new information of the existing system and address areas of concern. Figure 2.3.7 shows the existing location of the treatment lagoons.

FIGURE 2.3.7
WASTEWATER COLLECTION SYSTEM LAGOON MAP

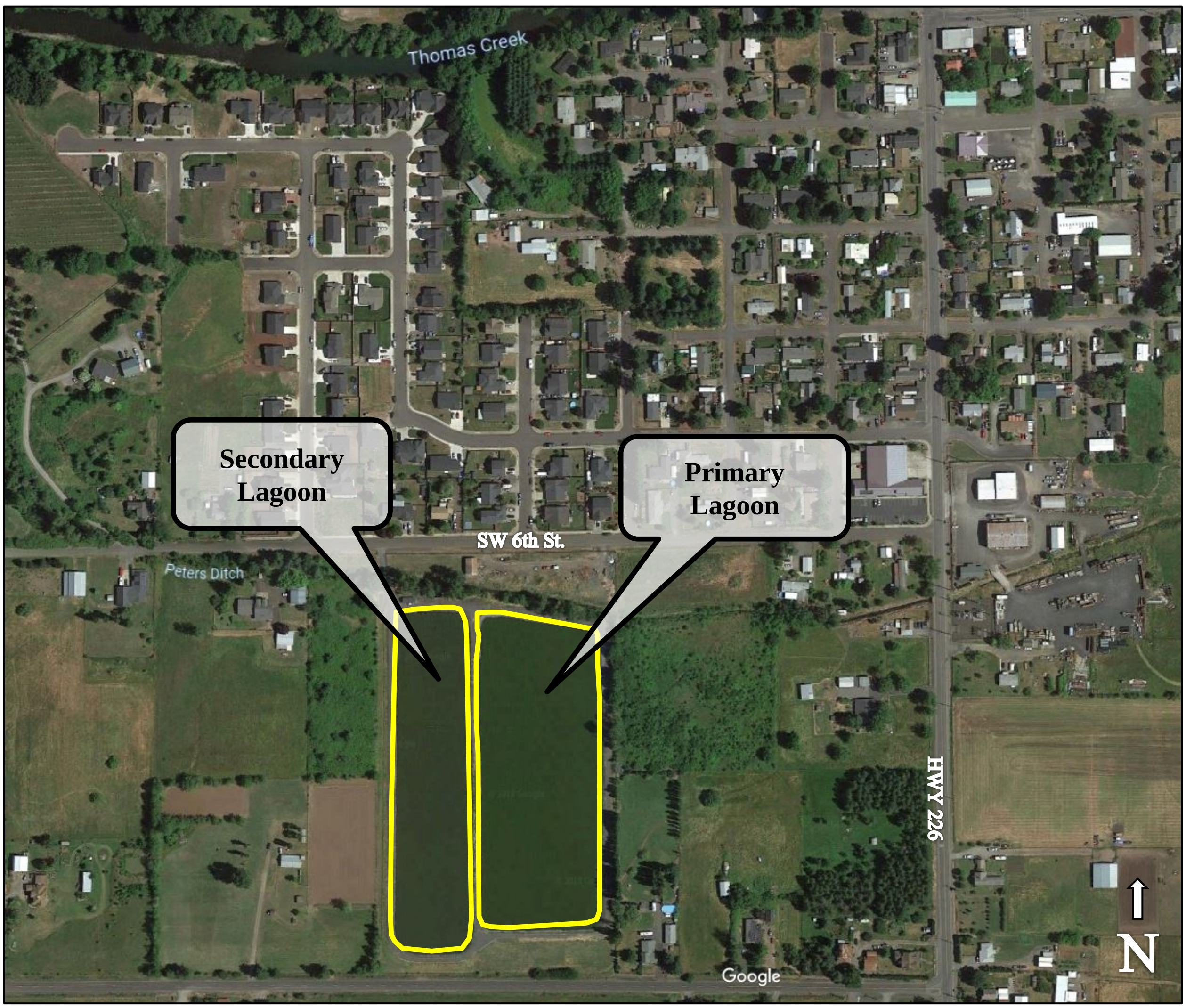
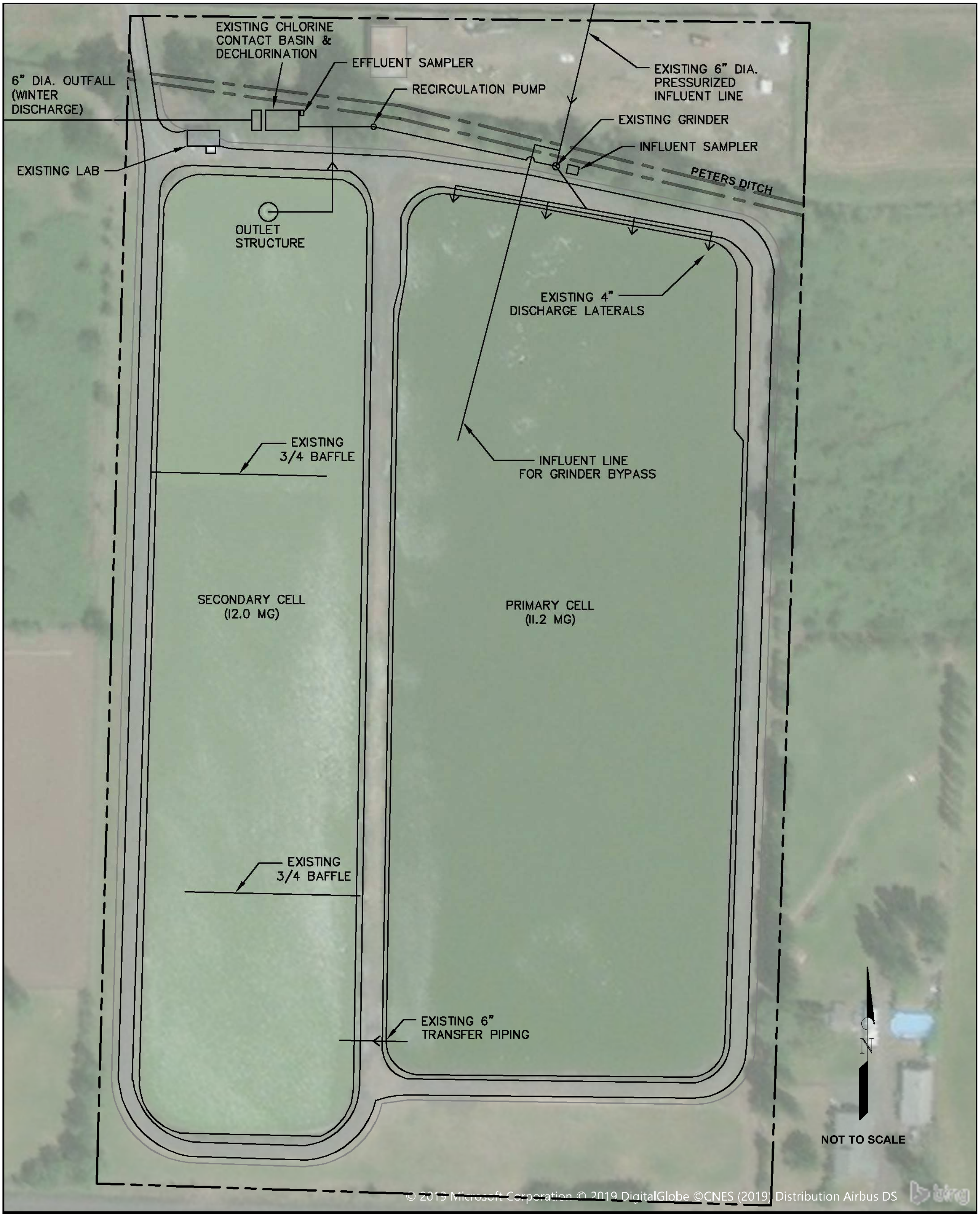


TABLE 2.3.7
CITY OF SCIO WWTP COMPONENT DESIGN SPECIFICATIONS

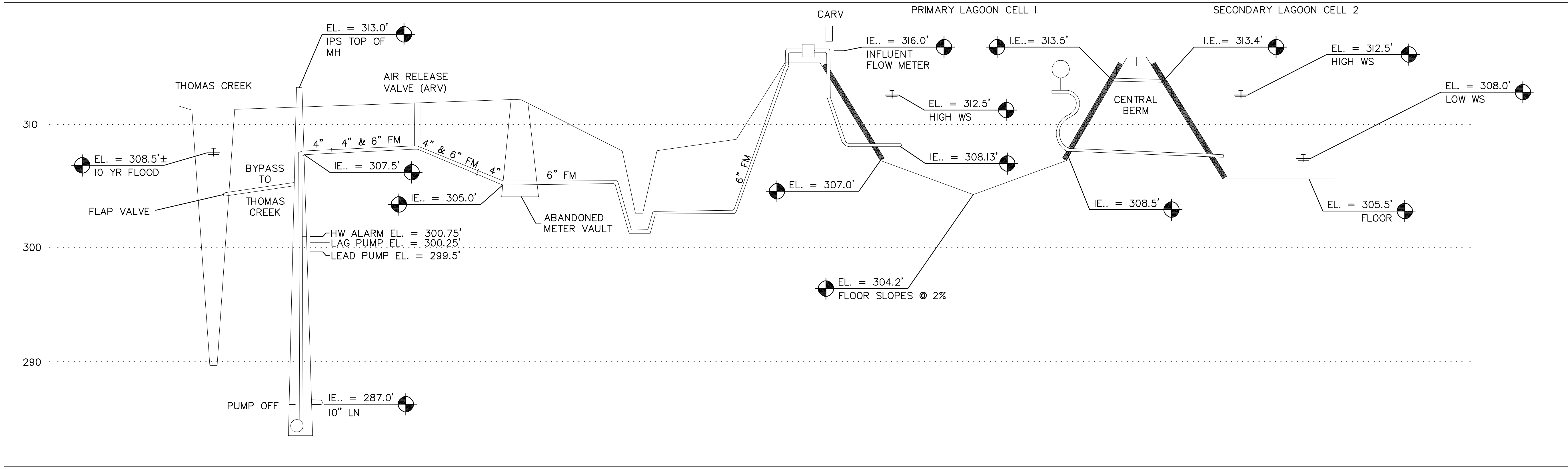
Item	Description / Design Data	
Primary Lagoon Cell	Dimensions	
	Surface Area	5.56 acres at high water level
	Maximum Depth	10.8 ft with 2% floor slope
	Working Depth	7-8 ft
	Volume	60 acre-feet (19.5 MG)
	Basin Liner	None
	Outlet	
	Size	12-inch
	Type	Transfer pipe located at south end
Secondary Lagoon Cell	Dimensions	
	Surface Area	3.9 acres at high water level
	Maximum Depth	9.5 ft
	Working Depth	7-8 ft
	Volume	37 acre-feet (12 MG)
	Basin Liner	None
	Outlet	
	Size	12-inch
	Type	Surface weir, fixed pipe on bottom
Disinfection	Type	Sodium Hypochlorite Solution
	Residual, Minimum	0.08 mg/L
	Chlorine Contact	
	Volume	12,200 gallons
	Length to Width Ratio	16
Comminutor	Model	30004T-1206
	Type	In Line
	Power	Single Phase (230V)
Influent Header	Size	6-inch, Ductile Iron
	Discharge Laterals	4
	Size	4-inch, Ductile Iron
	Diffuser Design	4-inch Duckbill Check Valve
Thomas Creek Outfall	Material	PVC
	Size	12-inch
	Diffuser Design	Open-ended



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SCIO*** ***WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN***	FIGURE NO.
DATE: AUGUST, 2019	***EXISTING TREATMENT FACILITY SITE PLAN***	***2.3.8***
PROJECT NO.: 202.01		

Existing Treatment Process Description (Liquid Stream)

Raw wastewater is conveyed through force mains to the existing lagoon system comprised of two cells. The wastewater passes through a grinder before entering Cell No. 1 (Primary Lagoon Cell). Cell No. 1 receives the wastewater at the north end via header with four influent flow lines, and a gravity transfer pipeline at the south end conveys wastewater to Cell No. 2 (Secondary Lagoon Cell). Solids settle to the bottom of the lagoons where anaerobic digestion occurs over time, breaking down the organic matter. Water circulating through the Secondary Lagoon Cell flows over v-notch weirs at the outlet structure and flows to a Parshall flume for flow measurements and into the chorine contact chamber. The effluent undergoes disinfection using sodium hypochlorite solution and is then de-chlorinated with sodium sulfite tablets. The effluent contents are measured prior to the chlorine contact chamber, just prior to exiting the chlorine contact chamber, and after de-chlorination. Upon meeting the effluent discharge permit requirements set forth by NPDES, it is discharged to Thomas Creek. A hydraulic profile of the WWTP is provided in Figure 2.3.9.



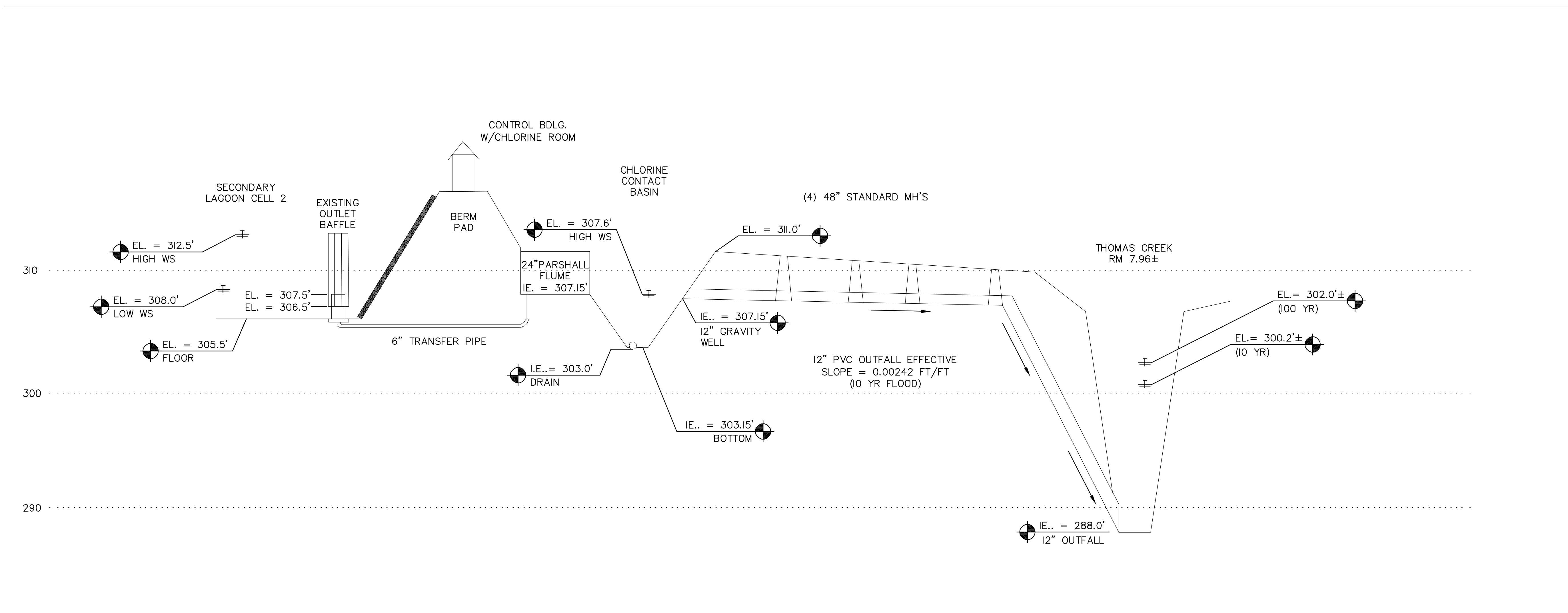


FIGURE NO.
2.3.9

CITY OF SCIO
WASTEWATER FACILITY AND COLLECTION SYSTEM MASTER PLAN

WASTEWATER TREATMENT HYDRAULIC PROFILE

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS
DATE: AUGUST 2019
PROJECT NO.: 202.01

Existing Treatment Process Description (Solid Stream)

Solids are primarily stored, and undergo anaerobic digestion, at the inlet end of Lagoon No. 1. Sludge is kept within the process for years, and biosolids are infrequently wasted. The lagoons have adequate volume to store sludge for extended periods of time, but excess sludge accumulation in the lagoons contributes detrimentally to their biological and hydraulic performance.

Treatment and management of the solids stream is low maintenance, as the lagoon system allows for long periods of time between solids removal, but not without problems or expense. Wind and rain agitate solids, seasonal overturn, and other factors, cause resuspension and the transfer of solids to downstream processes. As solids accumulate in the lagoons, they also displace the aerobic capacity of the lagoon, limit liquid storage capacity, and can cause odors.

Current WWTP Design Flows

Design flows, based upon Discharge Monitoring Report (DMR) data analyzed from 2014 to 2017, are summarized in Table 2.3.8. Per capita flows are based upon the 2017 population of 938. Flows are further defined in Section 3.

TABLE 2.3.8
CITY OF SCIO WWTP EXISTING INFLUENT FLOW RATES

Parameter	Flow Values		Peaking Factor
Population	938		
Base Sewage	0.036 MGD	38 gpcd	
Base Infiltration	0.01 MGD	11 gpcd	
AAF	0.09 MGD	94 gpcd	1.6
ADWF	0.054 MGD	58 gpcd	1.0
AWWF	0.128 MGD	136 gpcd	2.4
$MMDWF_{10}$	0.117 MGD	125 gpcd	2.2
$MMWWF_5$	0.228 MGD	243 gpcd	4.2
Peak Average Week	0.320 MGD	341 gpcd	5.9
$PDAF_5$	0.471 MGD	502 gpcd	8.7
PIF	0.845 MGD	901 gpcd	15.6

WWTP Condition

The existing wastewater treatment plant appears to have adequate capacity for future growth within the planning period. The City's wastewater collection system has excessive infiltration and inflow. Due to I/I flow contributions during and immediately following storm events, the treatment system has more potential to become hydraulically overloaded. Surcharges that are too great may hinder the ability of the plant to equalize and experience sufficient detention time.

The facultative lagoons are low maintenance, but inherently have limited operational control. Lagoon performance is influenced by factors outside of Operator control, including: temperature, solar radiation, wind speed, loading, actual detention time, and other factors. High concentrations of algae are generated in the facultative lagoons. The bulk of suspended solids in the lagoon effluent are comprised of algae of various sizes, species, and concentration, depending on the season and other factors. Algal solids are difficult to effectively remove and manage, and are consequently continuously recycled within the system, and infrequently wasted. A leakage test was conducted in 2004 for the lagoons to determine if seepage rates into the ground from the lagoons were close to DEQs threshold. It was found that the lagoons posed no immediate concern regarding seepage rates into the surrounding soil at that time.

Complaints from nearby residents regarding lagoon odors were filed with DEQ and were subsequently brought to the City's attention in late August – early September. Excessive lagoon odors can be caused by a variety of issues such as excessive sludge accumulation (sludge thickness causing anaerobic sludge to produce hydrogen sulfide gas which is eventually released into the atmosphere), sludge loading, and short-circuiting. Excessive sludge accumulation results in thick layers of sludge, as shown in the sludge judge report located in Appendix B. The City's primary lagoon cell "flipped" on Labor Day weekend, preceded by algae blooms in weeks prior. The City worked with DEQ to break up the floating sludge layers responsible for the odors and resolved the issue in a timely manner. In addition, the City planted red cedar trees along the perimeter of the lagoons to help mitigate future odor problems and reduce northern wind speeds. The City is now better able to recognize warning signs within the lagoons and observe weather patterns that may prompt future lagoon turnovers.

Management of sludge depth plays an important factor in lagoon health, and timely sludge removal is an effective way to mitigate growing odor problems. Lagoons may also produce excessive amounts of odors when the dissolved oxygen level does not satisfy the organic loading. Incorporation of mixing or aeration technology can provide adequate amounts of dissolved oxygen and reduce unwanted odors. Short-circuiting occurs when untreated wastewater flows through the system in an inadequate amount of time that does not ensure proper breakdown of organic contaminants. Incorporation of lagoon baffling is an appropriate strategy for increasing detention time within lagoons, therefore reducing excessive odors. A biosolids management plan (BMP) is something the City is interested in developing in the near future.

A summary of the major WWTP deficiencies is provided in Table 2.3.9. More detailed explanations of each unit process at the WWTP are summarized throughout this section.

TABLE 2.3.9
SUMMARY OF WWTP DEFICIENCIES

Component	Deficiency
Facultative Lagoon Cells	Sludge Buildup
	Deteriorated Baffles
	Algae Blooms
Headworks	Lack of Solids Removal from Influent

Grinder

The City does not have a headworks system in place to screen large solids from the lagoon. A Model 30004T-1206-DI in line Muffin Monster Grinder is housed in a standard 48-inch manhole and runs on a single phase motor. The grinder was purchased and put into operation by the City in 2007 but was out of service for a short period of time in 2019. The grinder was replaced with the same model and hooked up to the existing controller. A month of bypassing was required while the grinder was being replaced, but it is now fully operational.

FIGURE 2.3.10
INFLUENT GRINDER

Influent/Effluent Sampler

Per the NPDES Permit, composite samples of the influent must be taken, prior to entering the Primary Lagoon Cell, once per month to determine Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) levels. Grab samples are performed twice per week to obtain pH levels. The influent sampler is an Issco auto sampler. No wastewater treatment plant recycle waters are introduced upstream of the influent composite sampler. Figure 2.3.11 shows the influent sampler (left).
Effluent samples for BOD_5 and TSS flow measurements are taken just after the Parshall flume but prior to the chlorine contact chamber with another Issco auto sampler. Other effluent measurements, such as residual chlorine and *E. coli*, are obtained through grab samples just prior to exiting the chlorine contact chamber, and immediately after dechlorinating. Figure 2.3.11 shows the effluent sampler (right).

FIGURE 2.3.11
INFLUENT AND EFFLUENT SAMPLER

Facultative/Storage Lagoons

Description

The facultative/storage lagoons operate in series. The lagoons provide additional treatment, flow equalization, storage, and long-term solids retention and digestion. The lagoons were designed to be lined to prevent leakage, but it is apparent that no liner is present in either lagoon cell.

FIGURE 2.3.12
FACULTATIVE LAGOONS

Both lagoons range from seven to eight feet deep. At maximum water depths, Lagoon No. 1 is approximately 5.4 acres and Lagoon No. 2 is 3.7 acres. The total lagoon area is 9.1 acres, but the plant normally operates at 7.9 acres (5 ft. operating depth). The total volume of the lagoon system is approximately 17 million gallons. During the summer, the flows are stored in the lagoons and no discharge occurs (May 1st through October 31st). When discharging is not permitted, the water is continuously cycled back through a 4-inch recirculation line from Lagoon No. 2 to the 4-inch influent flow lines which distribute treated effluent back to the primary cell. From November 1st through April 30th, the City may discharge treated effluent to Waters of the State.

Facultative/Storage Lagoon Sizing

The design of lagoons is perhaps the least well defined of all biological wastewater treatment processes. Numerous methods have been proposed in literature, but considerable variability exists. A conservative approach, as outlined in the Environmental Protection Agency's (EPA) "*Municipal Wastewater Stabilization Ponds Design Manual*," is based on the surface loading rate (lb BOD_5/acre/day). Surface loading rates of 20 to 40 lb BOD_5/acre/day are suggested. Based on an average influent BOD_5 load between 160 to 210 lb BOD_5/day, the surface area required, for current loads, is at least four acres. The existing lagoon is adequately sized for current loads; though the actual biological capacity of the lagoon is diminished considerably due to accumulated solids residing in the lagoons.

As solids accumulate, they occupy volume in the lagoon, and accumulate to the point that they become problematic. Solids are sometimes disturbed by wind and rain, causing downstream solids migration, ultimately compromising treatment performance. The City recently had the lagoons measured for sludge depth on November 6, 2018 by Oregon Association of Water Utilities (OAWU). Measurements of sludge depth were taken using lagoon profiling equipment for each cell. As stated in the report, "operational concerns may arise when sludge volumes reach 15% capacity." Approximate calculations based off of lagoon profiling measurements suggest that the primary cell is at 15.5% capacity, and the secondary cell is at 20% capacity. This only takes into account the current water level each cell is operating at. If both cells were operating at maximum water level, then Lagoon Cell No. 1 and Lagoon Cell No. 2 would be at 10% and 12.5% capacity, respectively. Typically, lagoons are designed to hold two feet of sludge at the bottom. Based off of the OAWU report, both lagoon cells have large areas with 10 to 15 inches of sludge accumulation, and the primary cell has specific areas exhibiting 16 to 20 inches of buildup. If sludge volumes are allowed to accumulate more over time without removal, the City could face difficulties in meeting NPDES Permit requirements, and the capacities of the lagoons will be drastically diminished. The full lagoon profiling report is located in Appendix B and should be examined carefully, as it contains inconsistencies with lagoon dimensions.

<u>Facultative/Storage Lagoon Performance</u>

Lagoon Cell No. 1 receives influent from four 4-inch discharge laterals after the influent passes through the grinder. Should the grinder need maintenance or replacing, the influent is bypassed through the old existing influent line to the middle of the lagoon cell. A lagoon balance study was conducted to predict surcharge volumes using average monthly precipitation data and lagoon cell sizes. Assuming no leakage through the lagoon cell bottoms and taking evaporation into account, it was determined that the existing lagoons have adequate hydraulic storage capacity in the dry months when no discharge is allowed to Thomas Creek. Influent flows to the lagoon system during the dry months are largely comprised of residential and commercial wastewater usage. Since population trends indicate little growth within the City over the planning period, lagoon expansion will not be required. The lagoon balance sheet is located in Appendix B.

<u>Facultative/Storage Lagoon Baffles</u>

Baffles are long fabricated barriers used to direct and slow flow through a basin to allow for adequate detention time. Detention time is important to allow for natural biological treatment processes to take place and break down organic matter before the water reaches the disinfection unit. Forcing flow through

a series of baffles prevents short circuiting of the lagoon system, a process in which untreated wastewater reaches the discharge point before biological contaminants are properly broken down. Baffles can also improve water circulation.

The existing baffles separate the Secondary Lagoon Cell approximately into thirds. Figure 2.3.13 shows both baffles in a state of disrepair. It is improbable that the baffles are providing sufficient performance, and it is apparent that both are in need of replacement. Recommended design criteria for facultative wastewater treatment ponds within the area set forth by the EPA specify an overall detention time of 40 to 60 days. Critical detention times arise during the winter months when inflows to the lagoon system are highest, and discharge into Thomas Creek decrease holding times. At the minimum operating depth of two feet, the volume of the primary and secondary cells are 3.5 Million Gallons (MG) and 2.4 MG, respectively. Combining these minimum operating volumes gives a total of 5.9 MG. To calculate overall detention time, the total cell volume is divided by the daily influent flow. For a worst case scenario, the Maximum Monthly Wet Weather Flow, calculated in Section 3, of 0.27 Million Gallons per Day (MGD) is used. This yields an overall detention time of 22 days, which is lower than EPAs lowest criteria of 40 days. However, it is important to note that this is the worst case scenario, and when the lagoon system reaches two feet of operating depth, it is during the summer months and that is where storage begins and discharge to Waters of the State is not allowed. At normal operating depths of approximately five feet, the overall detention time is 54 days, which falls within the design criteria set forth by the EPA.

FIGURE 2.3.13
FACULTATIVE LAGOON BAFFLES

<u>Facultative/Storage Lagoon Piping and Dikes</u>

Effluent is transferred from Lagoon No. 1 to Lagoon No. 2 through a transfer pipe located near the south end of the Primary Lagoon Cell. The normal mode of operation is to withdraw effluent from the surface of the secondary lagoon using an overflow weir.

A common problem with many facultative lagoons is erosion of interior slopes. Dike stability has likely been negatively affected by wind driven wave action, particularly when the lagoons are operated at maximum depth. Areas have been addressed with rip rap and large pieces of concrete. No major erosion concerns are apparent at this time.

Chlorine Contact Basin

The chlorine contact basin is an 8-foot deep concrete basin with three fabric baffles in place. Total detention time is defined as the lowest operating volume divided by the peak flow. Based off of the chlorine contact effluent invert elevation, the lowest operating volume is approximately 12,200 gallons. Dividing this volume by the future Peak Instantaneous Flow (PIF) of 0.845 MGD gives a total detention time of 21 minutes. The baffles within the basin force the flow of water to slow down to allow for adequate contact time between chlorine injection and bacteria. The total detention time is multiplied by a baffling factor of 0.7, which is derived from baffling tables using the length to width ratio of 16. The contact time is calculated to be 14.6 minutes. Recently, the City has started to record residual chlorine concentration just prior to exiting the chlorine contact basin.

Data was analyzed from November 1, 2018 through March 31, 2019. The smallest residual chlorine concentration recorded just prior to exiting the contact chamber in this time period was 0.08 milligrams per liter (mg/L). Multiplying the 0.08 mg/L by 14.6 minutes gives a calculated Contact Time (CT) value of 1.16 mg/L*min. On this day, the effluent temperature was 5°C. Based off of common design tables, a typical winter effluent temperature of 5°C requires an 8 mg/L*min CT value. To achieve a 4-log virus inactivation, the inactivation ratio must be multiplied by a factor of four. If this product is greater than four, then a chlorine contact basin can handle peak instantaneous flows. The inactivation ratio is found by dividing the calculated CT value of 1.16 mg/L*min by the required CT of 8 mg/L*min. The inactivation ratio is 0.145. Multiplying this inactivation ratio by four gives a value of 0.58, which is significantly less than four. This suggests that greater residual chlorine concentrations would have been needed to achieve a 4-log virus inactivation had the system experienced peak instantaneous flow. With all other variables remaining constant, a residual chlorine concentration of 0.55 mg/L would have been adequate to accommodate for the peak instantaneous flow.

Although the length to width ratio of the chlorine contact basin is 16:1, which does not meet the standard design criteria of 40:1, the chlorine contact basin is able to provide adequate treatment for the design period. Should the City need to upgrade the basin in the future, adding additional baffles or lengthening the structural walls would be ways in which the length to width ratio could be increased, thus increasing overall detention time and improving virus inactivation. A valve exists prior to the Parshall flume that can stop flow to the chlorine contact basin from Lagoon No. 2. If the lagoons have additional storage capacity, the peak instantaneous flow can be stored without the contact basin having to experience a sudden influx of water.

FIGURE 2.3.14
CHLORINE CONTACT BASIN

Dechlorination

Immediately after exiting the chlorine contact chamber, disinfected wastewater reacts with sodium sulfite tablets to dechlorinate the treated wastewater. The NPDES Permit for the City of Scio states that total residual chlorine "must not exceed 0.01 mg/L monthly average and 0.04 mg/L as a daily maximum… when the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level." Effluent from the chlorine contact basin is directed into a wet well, as shown in Figure 2.3.15 below, and split bi-directionally to isolated sodium sulfite biodynamic tablet feeders. The City has never had an issue with meeting permit requirements regarding final residual chlorine that is discharged into Thomas Creek.

FIGURE 2.3.15
SODIUM HYPOCHLORITE STATION

Flow Measurement

Flows are measured at two locations within the treatment facility. Influent flow is measured prior to entering the Primary Lagoon Cell. Effluent flows are measured at a 24-inch Parshall flume prior to the chlorination phase of treatment.

Effluent Disposal

The City cannot discharge to Waters of the State from May to October, and must store influent wastewater in the facultative lagoons until the NPDES Permit No. 101503 allows for discharge into Thomas Creek. Based on existing flows and lagoon capacity, the effluent disposal system is adequately sized to handle future growth.

Thomas Creek Outfall (Outfall 001). From November 1st to April 30th, effluent is discharged to Thomas Creek in accordance with the Permit requirements. An open-ended, 12-inch diameter PVC line conveys treated effluent west of the lagoon cells to the outfall location. The outfall is located approximately 800 feet west of the end of SW 6th Ave.

FIGURE 2.3.16
THOMAS CREEK OUTFALL (OUTFALL 001)

Biosolids Management

The City does not currently have a biosolids management program in place; the solids within both lagoon cells have never been removed. Typically, wastewater lagoon cells are designed to hold two feet of sludge at the bottom. As the actual depth approaches this number, biological capacity is reached and problems with meeting permit requirements will occur. Results from the sludge profile report provided in Appendix B indicate that the City should consider removal of solids in the near future to increase biological capacity.

2.4 Financial Status

Financial records for the wastewater collection and wastewater treatment system are included in Appendix D. These consist of detailed financial information extracted from the City's budget for 2018 to 2019. A summary of the resources and requirements for the wastewater system is shown below in Table 2.4.1.

The City is projected to end the year with a contingency of approximately $20,500. In general, a reserve level of 60 days of operating expenses is recommended. Current system operating expenses are estimated to be $453 per day. Using the contingency noted above, the City has a reserve level of approximately 45 days and does not satisfy the recommended level of 60 days.

TABLE 2.4.1
WASTEWATER RESOURCES AND REQUIREMENTS

Resources	**$ Amount**
Beginning Fund Balance	102,504
Fees, Licenses, Permits	191,000
Transfers In	-
All Other Resources	86,200
Total	379,704
Requirements	**$ Amount**
Personnel Service	125,455
Material & Services – Maintenance	71,420
Capital Outlay	76,000
Transfers Out	-
Contingencies	20,629
Total	293,504

Current Rate Schedule

Billings for customers include two components: a fixed rate (base charge) and a water use volumetric rate (overage charge). The base rates and additional charges for each user category are shown in Table 2.4.2. Per Resolution 18-08, the City will apply an automatic annual increase of three percent to base and overage charges that becomes effective on July 1st of each year. Out of town residential users are not connected to the City's sewer system and are not considered in this rate study.

TABLE 2.4.2
MONTHLY SEWER CHARGE BRACKETS

Charge Bracket	Usage (gallons)	In Town Residential ($ / gal)	Out of Town Residential ($ / gal)	Commercial ($ / gal)	Large Commercial ($ / gal)	School ($ / gal)
Base	2500	$24.18	-	$25.44	$27.64	$48.07
Next	2500	$0.00609	-	$0.00609	$0.00609	$0.00609
Next	2500	$0.00609	-	$0.00609	$0.00609	$0.00609
Over	7500	$0.00609	-	$0.00609	$0.00609	$0.00609

Individual monthly usage for single family in-town residential accounts analyzed in billing reports establishes a base consumption rate of $35.06 per Equivalent Dwelling Unit (EDU). Large commercial users and schools have water meters that differ in size, which necessitates the need to analyze each account individually. Table 2.4.3 shows the six school accounts (top) and the six large commercial accounts (bottom) along with their 12-month average water usage and monthly payment per Table 2.4.2. Comparing the monthly payments to the base residential consumption rate will more accurately depict the amount of wastewater each account is contributing to the City's collection system.

TABLE 2.4.3
SCHOOL AND LARGE COMMERCIAL SEWER RATES

User Group	Average Usage (gallons/month)	Average Monthly Payment
Middle School	38,958	$270.10
Centennial School	46,442	$315.68
High School	62,598	$414.07
Stadium	47,029	$319.25
Centennial Field	2,798	$49.88
Special Education Office	11,325	$101.81
Scio RFPD Station 91	355	$14.58
OSBC INC	2,713	$28.94
SMTA Headquarters	2,694	$28.82
R&R Loewen Leasing	22	$12.55
Harsukh Inc.	20,450	$136.96
Scio Baptist Church	11,483	$82.35

Based on a winter water consumption of 141 gpd/EDU, or approximately 565 cubic feet of monthly water use, the average residential sewer bill is approximately $35.06/month. The average wastewater rate (residential) as a percentage of the Median Household Income (MHI) $52,174 is 0.81%. This percentage is used as an affordability indicator for utilities, agencies, and other organizations. The EPA establishes the affordability capacity of utilities based on several factors. The EPAs affordability criteria, as a percentage of MHI, is typically between one and two percent.

Tabulation of Users by Category

The City currently has 377 services (water meters) inside the City Limits, which also receive sewer service. Based on a Single Family Residence (SFR) usage rate, the City has 408 EDUs. Business Oregon Infrastructure Finance Authority (IFA) EDUs are based on a usage rate of 7,500 gallons per month. The City has 225 EDUs based on IFA guidelines. Infrastructure Finance Authority EDUs are used to evaluate user rates at a national level. Table 2.4.4 lists the user type and EDUs.

TABLE 2.4.4
USER TYPES AND EQUIVALENT DWELLING UNITS (EDUs)

User Group	Number of Users	Total Usage (Gal./Year)	Usage Per User (Gal./Year)	EDUs (Per USDA - DEQ)	EDUs (Per IFA)
In Town Residential	337	17,320,020	51,422	337	193
Out of Town Residential	25	-	-	-	-
Commercial	28	1,060,420	38,216	20	12
Large Commercial	6	284,880	47,480	9	3
School	6	15,929,80	265,497	42	18
Total	402	21,232,900	441,618	408	225

SECTION 3:

NEED FOR PROJECT

SECTION 3: **NEED FOR PROJECT**

3.1 Health Sanitation and Security

This section discusses relevant state and federal regulations. The Clean Water Act (CWA) prohibits discharges of wastewater to Waters of the State without a National Pollutant Discharge Elimination System (NPDES) Permit. NPDES Permits contain effluent limits that are developed to protect the beneficial uses. NPDES Permits are generally renewed every five years, at which time any changes to the rules will be included in the renewed permit. The US Environmental Protection Agency (EPA) has delegated NPDES permitting authority for Oregon to the Oregon Department of Environmental Quality (DEQ).

A fundamental premise of the CWA is the maintenance and restoration of the chemical, physical, and biological integrity of the Nation's waters. The CWA requires states to develop water quality standards. Oregon Administrative Rules (OAR) Chapter 340 Division 41 contains Oregon's water quality standards. These standards are benchmarks established to assess whether the quality of Oregon's rivers and lakes are adequate for beneficial uses.

Water Quality Assessment

The City of Scio lies within the Thomas Creek Watershed, which covers 145 square miles in the Willamette sub-basin. Thomas Creek Watershed is primarily comprised of forested and agricultural land. The Bureau of Land Management possesses approximately twenty percent of the watershed, and the rest falls under private ownership. Thomas Creek feeds into the waters of the South Santiam River at River Mile 2.7. Two flow gauges (USGS #14188800 and USGS # 14188850) located near the City of Scio and Crabtree monitor Thomas Creek. The standard salmon rearing and migration temperature of 18°C was not being met by measurements taken from Thomas Creek. Total Maximum Daily Load (TMDL) for Thomas Creek was developed by DEQ in response to these measurements in 2006. Section 305(b) of the CWA requires DEQ to assess water quality in Oregon and publish a report on the overall condition of waters known as an Integrated Report. The DEQ assigns an assessment status category to each water body where data are available to evaluate. Water bodies that do not meet water quality standards are water quality limited and are assigned Category 4 or 5. Water bodies in Category 5 are issued Total Maximum Daily Loads (TMDLs), and comprise the Section 303(d) list. The DEQs assessment of the water quality in Thomas Creek in the vicinity of Thomas Creek Outfall 001, at River Mile 7.96, is summarized in Table 3.1.1.

TABLE 3.1.1
THOMAS CREEK 303D LIST

River Mile	Parameter	Season	Status	Assessment Action
0 to 40	Alkalinity	Year Round	Cat 3: Insufficient Data	No action
0 to 40	Ammonia	Year Round	Cat 3: Insufficient Data	No action
0 to 16.2	Atrazine	Year Round	Cat 2: Attaining some criteria/uses	No action
0 to 26.4	Biological Criteria	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	No action
26.4 to 40	Biological Criteria	Year Round	Cat 2: Attaining some criteria/uses	No action
0 to 40	Chloride	Year Round	Cat 3: Insufficient data	No action

River Mile	Parameter	Season	Status	Assessment Action
0 to 16.2	Cycloate	Year Round	Cat 2: Attaining some criteria/uses	No action
18.1 to 40	Dissolved Oxygen	Year Round (Non-spawning)	Cat 3: Insufficient data	No status change
0 to 40	*E. coli*	Fall, Winter, Spring	Cat 2: Attaining some criteria/uses	No action
0 to 40	*E. coli*	Summer	Cat 2: Attaining some criteria/uses	No action
0 to 16.2	Flow Modification	Undefined	Cat 3: Insufficient data	Status Modification
0 to 16.2	Habitat Modification	Undefined	Cat 3: Insufficient data	Status Modification
0 to 16.2	Hexazinone	Year Round	Cat 2: Attaining some criteria/uses	No action
0 to 16.2	Metolachlor	Year Round	Cat 2: Attaining some criteria/uses	No action
0 to 40	pH	Fall, Winter, Spring	Cat 3: Insufficient data	No action
0 to 40	pH	Summer	Cat 3: Insufficient data	No action
0 to 16.2	pH	Undefined	Cat 2: Attaining some criteria/uses	No action
0 to 40	Phosphate Phosphorus	Summer	Cat 3: Insufficient data	No action
0 to 16.2	Sedimentation	Undefined	Cat 3: Insufficient data	No action
0 to 16.2	Simazine	Year Round	Cat 2: Attaining some criteria/uses	No action
0 to 18.1	Temperature	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	No action
18.1 to 31.9	Temperature	September 1 – June 15	Cat 4A: Water quality limited, TMDL approved	No action
18.1 to 40	Temperature	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	No action
0 to 16.2	Terbacil	Year Round	Cat 2: Attaining some criteria/uses	No action

NOTES: https://www.deq.state.or.us/wq/wqpermit/docs/general/npdes700pm/WQlimit303dList.pdf
Category 1: All standards are met. (This category is not used.)
Category 2: Attaining - Some of the pollutant standards are met.
Category 3: Insufficient data to determine whether a standard is met.
3B: Potential concern - Some data indicate non-attainment of a criterion, but data are insufficient to assign another category.
Category 4: Water is water quality limited but a TMDL is not needed. This includes:
4A: TMDL approved - TMDLs needed to attain applicable water quality standards have been approved.
4B: Other pollution control requirements are expected to address all pollutants and will attain water quality standards.
4C: Impairment is not caused by a pollutant (e.g., flow or lack of flow is not considered a pollutant.)
Category 5: Water is water quality limited and a TMDL is needed, Section 303(d) list.

Basin Standards

For surface water discharge (Outfall 001), the City of Scio is required to comply with OAR 340-041 Sections 340, 344, and 345 which pertain to the Willamette Basin. Thomas Creek flows into the South Santiam River, with Neal Creek being its major tributary. Since DEQ has adopted a policy that allows for analyzing the potential for discharge to exceed the water quality standards set forth by OAR, permit limits can be set accordingly so as to not exceed these standards. Therefore, permit standards may vary slightly from basin standards, but will not be any less stringent.

- pH (hydrogen ion concentration). pH values may not fall outside 6.5 to 8.5;
- During the period of high stream flows (approximately November 1st to April 30th): A minimum of secondary treatment or equivalent control. Unless otherwise specifically authorized by the Department of Environmental Quality, operation of all waste treatment and control facilities should be at maximum practical efficiency and effectiveness so as to minimize waste discharges to public waters;
- Total Dissolved Solids. Guide concentrations listed may not be exceeded unless otherwise specifically authorized by DEQ upon such conditions as it may deem necessary to carry out the general intent of this plan and to protect the beneficial uses set forth in OAR 340-041-0340: Willamette River and Tributaries — 100 milligrams per liter (mg/l);
- Effluent Biochemical Oxygen Demand (BOD) concentrations in mg/l, divided by the dilution factor (ratio of receiving stream flow to effluent flow) may not exceed one unless otherwise approved;
- Sewage wastes must be disinfected, after treatment, equivalent to thorough mixing with sufficient chlorine to provide a residual of at least one (1) part per million after 60 minutes of contact time unless otherwise specifically authorized by permit;
- Positive protection must be provided to prevent bypassing raw or inadequately treated sewage to public waters unless otherwise approved by the Department of Environmental Quality where elimination of infiltration and inflow would be necessary but not presently practicable.

The City of Scio Wastewater Treatment Plant (WWTP) discharges to Thomas Creek (November 1st to April 30th). The designated beneficial uses for this area of the watershed, found under OAR 340-041-0345, are as follows:

- Public and private domestic water supply.
- Industrial water supply.
- Irrigation and livestock watering.
- Fish and aquatic life (including salmonid rearing and mitigation).
- Wildlife and hunting.
- Fishing and boating.

- Water contact recreation.
- Aesthetic quality.
- Hydropower.

Current NPDES Permit Requirements

The City of Scio operates its wastewater system under NPDES Permit No. 101503, issued December 27, 2011 by DEQ. This permit expired July 31, 2016. However, because the City submitted an application for permit renewal in 2016, this permit is administratively extended until a renewed permit is issued by DEQ. The treatment system is a Level 1. A summary of regulatory requirements within the NPDES Permit is provided below in Tables 3.1.3 and 3.1.4. A copy of the City's NPDES Permit is included in Appendix A.

Outfall 001 is located on Thomas Creek at approximately River Mile 7.9. Discharge is only permitted to Thomas Creek Outfall 001 from November 1st to April 30th. The City may not discharge to Waters of the State from May 1st through October 31st.

Thomas Creek Outfall 001

Between November 1st and April 30th, the effluent discharge to Thomas Creek must meet the effluent requirements in Tables 3.1.2 and 3.1.3. Mass load effluent limits for Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) are based on the winter effluent discharge rate of 0.13 Million Gallons per Day (MGD), which, as specified in the permit, "allows for disposal of summer accumulations of treated wastewater as well as winter Stormwater impacting [the] lagoon surface."

TABLE 3.1.2
NPDES PERMIT (101503) BOD_5 AND TSS LIMITS
OUTFALL 001 (NOV 1 – APR 30)

Parameter	Average Effluent Concentrations		Monthly Average	Weekly Average	Daily Maximum
	Monthly	**Weekly**	**lbs/day**	**lbs/day**	**lbs**
BOD_5	30 mg/L	45 mg/L	33	50	66
TSS	50 mg/L	80 mg/L	54	81	110

TABLE 3.1.3
NPDES PERMIT (101503) ADDITIONAL PARAMETERS
OUTFALL 001 (NOV 1 – APR 30)

Parameter	Limits
BOD_5 and TSS Removal Efficiency	BOD_5 monthly average may not be less than 85%, and TSS monthly average may not be less than 65%.
E. coli Bacteria	Monthly geometric mean shall not exceed 126 organisms per 100 mL. No single sample shall exceed 406 organisms per 100 mL (See Note 1).
pH	The pH must remain within the range of 6.0 – 9.0
Total Residual Chlorine	Must not exceed the daily maximum of 0.04 mg/L, and the monthly average of 0.01 mg/L (See note 2).

Parameter	**Limits**
Notes	1. If a single *E. coli* bacteria 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 of the *E. coli* bacteria standard is not to be triggered. 2. When the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level. Daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation.

Additional requirements for Outfall 001 are outlined below:

- **Regulatory Mixing Zone**. No wastes may be discharged or activities conducted that cause or contribute to a violation of water quality standards in OAR 340-041 applicable to the Willamette Basin except as provided for in OAR 340-045-0080 and the following regulatory mixing zone:

  The regulatory mixing zone is that portion of Thomas Creek contained within a band extending out fifteen (15) feet 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 regulatory mixing zone that is within ten (10) feet of the point of discharge.

- **Groundwater Protection**. The permittee may not conduct any activities that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals must be managed and disposed of in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR Chapter 340, Division 040)

Influent

Influent composite samples must be taken from the influent pipeline immediately prior to entering Cell No. 1 of the lagoon, and in accordance with the table below.

TABLE 3.1.4
NPDES PERMIT (101503) INFLUENT MONITORING REQUIREMENTS

Item or Parameter	**Minimum Frequency**	**Sample Type**
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
pH	2/week	Grab

Treated Effluent Outfall 001

Effluent sampling for BOD_5, TSS, and pH is required as part of the discharge permit. Flow measurements must be taken just after the Parshall flume but prior to the chlorine contact chamber. Residual chlorine and *E. coli* bacteria samples are collected just prior to exiting the chlorine contact chamber. A second residual chlorine sample is collected just after the injection of the sodium bi-sulfide and in accordance with the table below.

TABLE 3.1.5
NPDES PERMIT (101503) TREATED EFFLUENT MONITORING REQUIREMENTS
OUTFALL 001

Item or Parameter	Minimum Frequency	Sample Type
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
E. coli	2/month	Grab
Quantity Chlorine Used (lbs)	Daily	Measurement
Total Residual Chlorine (mg/L)	Daily	Grab
pH	2/week	Grab
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Pounds Discharged (BOD_5 and TSS)	Monthly	Calculation
Temperature	2/week	Measurement

Sludge Management (Lagoon No. 1)

Solids are collected and undergo digestion in the lagoons. As part of the NPDES Permit, the permittee must measure sludge depths in Cell No. 1 once prior to submittal of permit renewal application.

TABLE 3.1.6
NPDES PERMIT (101503) SLUDGE MANAGEMENT MONITORING REQUIREMENTS

Item or Parameter	Minimum Frequency	Sample Type
Sludge Depth in Cell No.1	Once prior to submittal of renewal application	Representative Measurement

Compliance with Current NPDES Permit Requirements

According to Section 3.2 of DEQs permit fact sheet, the City of Scio's WWTP was last inspected in April 2009. Two issues were addressed during the inspection. The first issue regarded one incident where the City failed to meet a mass load limit deadline, and the other issue was that the City had not been using proper methodology while conducting TSS, BOD_5, and pH tests. Within the time period of September 2012 to June 2018, the WWTP violated the current NPDES Permit only once. The Daily Monitoring Reports suggest that one minor violation occurred regarding BOD_5 removal. Under Section D of the NPDES Permit, the City is required to report a written notice to DEQ accompanied by a plan to prevent future reoccurrences of said violation by the WWTP. The City failed to report or notify DEQ and was promptly issued a warning as a result. Table 3.1.7 summarizes the violation of the discharge permit. Aside from this small Class III violation within the sizeable time frame, the WWTP operates without issue overall.

TABLE 3.1.7
DISCHARGE PERMIT VIOLATIONS

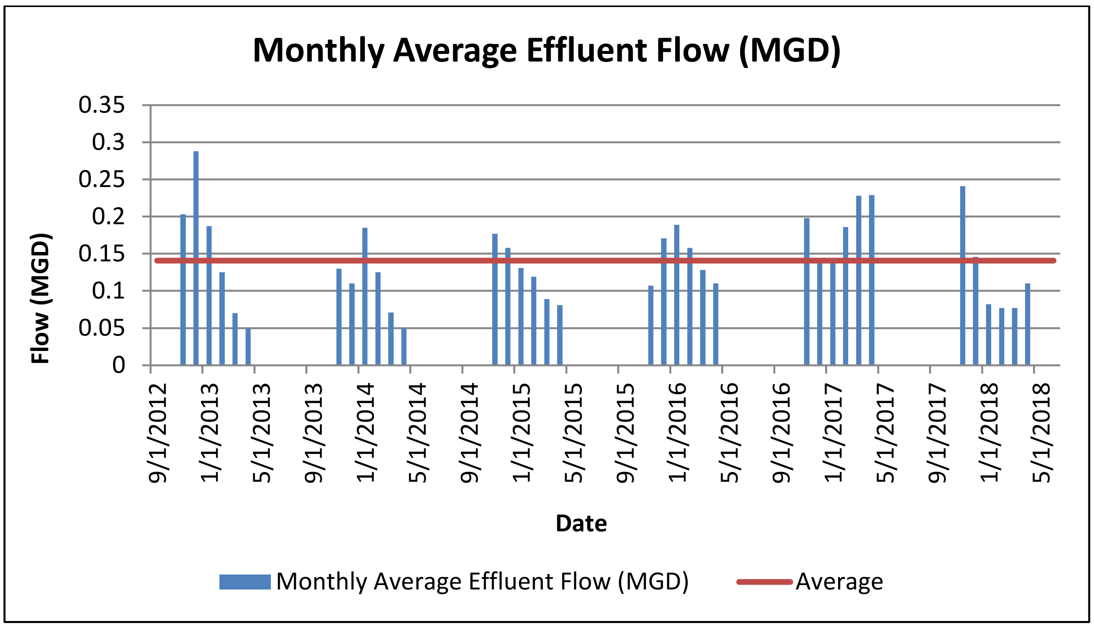
Date	Required BOD_5 Removal (%)	BOD_5 Removed (%)
February 28, 2017	85	82

Thomas Creek Outfall 001

Effluent Flows

The City of Scio's WWTP is prohibited from discharging to Thomas Creek outfall from May 1st to October 31st. The City has never had to discharge into the creek outside of the allowed time frame specified by the NPDES Permit (November 1st – April 30th). Figure 3.1.1 graphically displays the monthly average effluent flows from 2012 to 2018. The red line indicates the average effluent flow discharged into Thomas Creek throughout the seven years (0.14 MGD).

FIGURE 3.1.1
HISTORICAL EFFLUENT FLOWS (2012 - 2018)



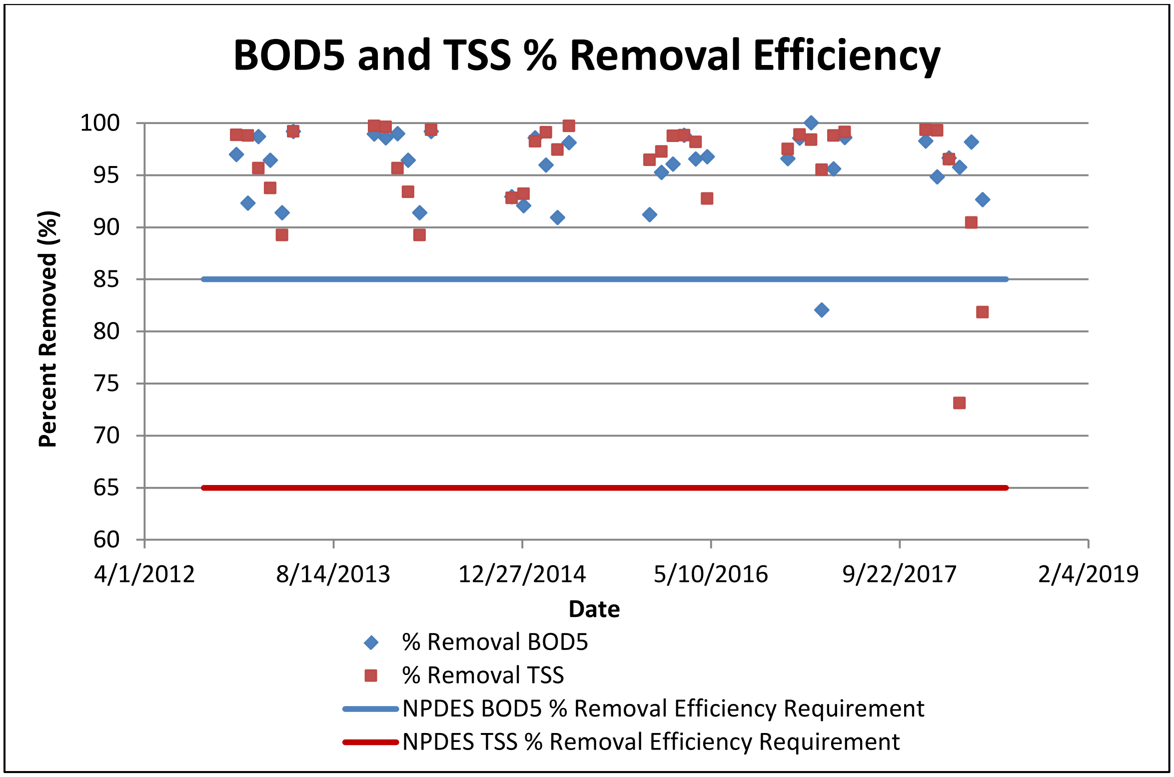
Residual Chlorine Performance

Per the NPDES requirements for the City of Scio, the City shall not exceed a monthly average of 0.01 mg/L for residual chlorine. In addition, a daily maximum of 0.04 mg/L is not to be exceeded. The City's WWTP has performed in compliance with the requirements of the NPDES Permit for residual chlorine.

Effluent BOD_5 and TSS Performance

A summary of the City's WWTP effluent BOD_5 and TSS concentration removal efficiency is provided in Figure 3.1.2. Measurements are recorded November through April when the City is allowed to discharge to Thomas Creek. Between 2012 to 2018, the WWTP violated the BOD_5 monthly average percent removal efficiency on February 28, 2017 by going below the required removal efficiency for BOD_5. Aside from that, the WWTP does not experience difficulties in complying with the permit limitations.

FIGURE 3.1.2
BOD_5 AND TSS REMOVAL EFFICIENCY (2012 – 2018)



<u>Effluent BOD_5 Performance</u>

A summary of the City of Scio's WWTP effluent performance, with respect to effluent BOD_5 concentration and mass load, is provided in Figures 3.1.3 and 3.1.4. From the time period November 2012 to April 2018, the WWTP operated in compliance with effluent BOD_5 concentration and mass load limits.

FIGURE 3.1.3
HISTORICAL WWTP EFFLUENT BOD_5 PERFORMANCE (CONCENTRATION)

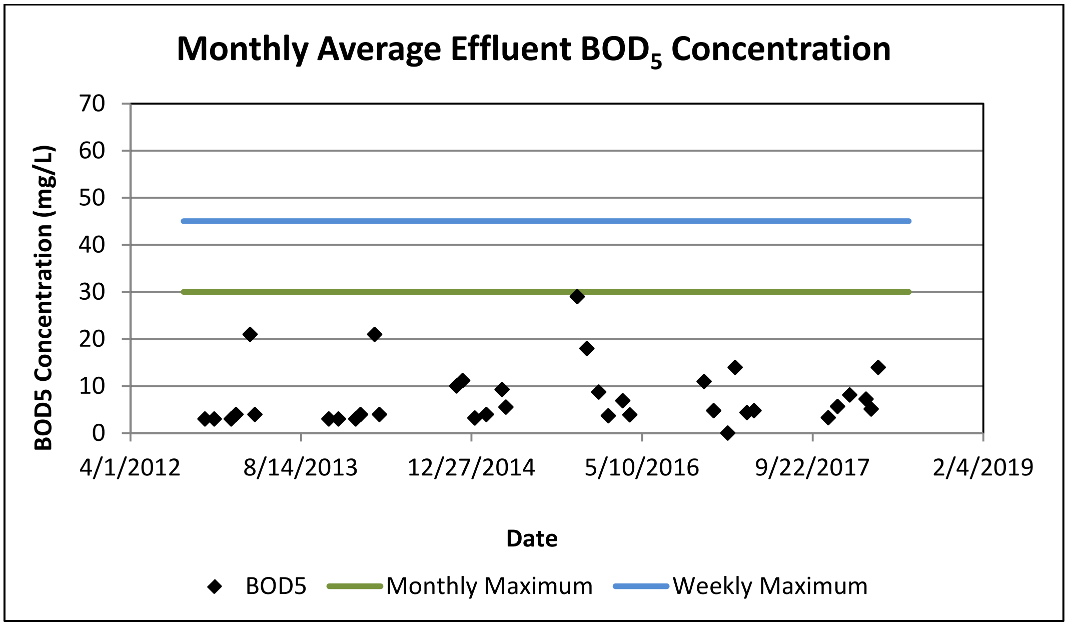
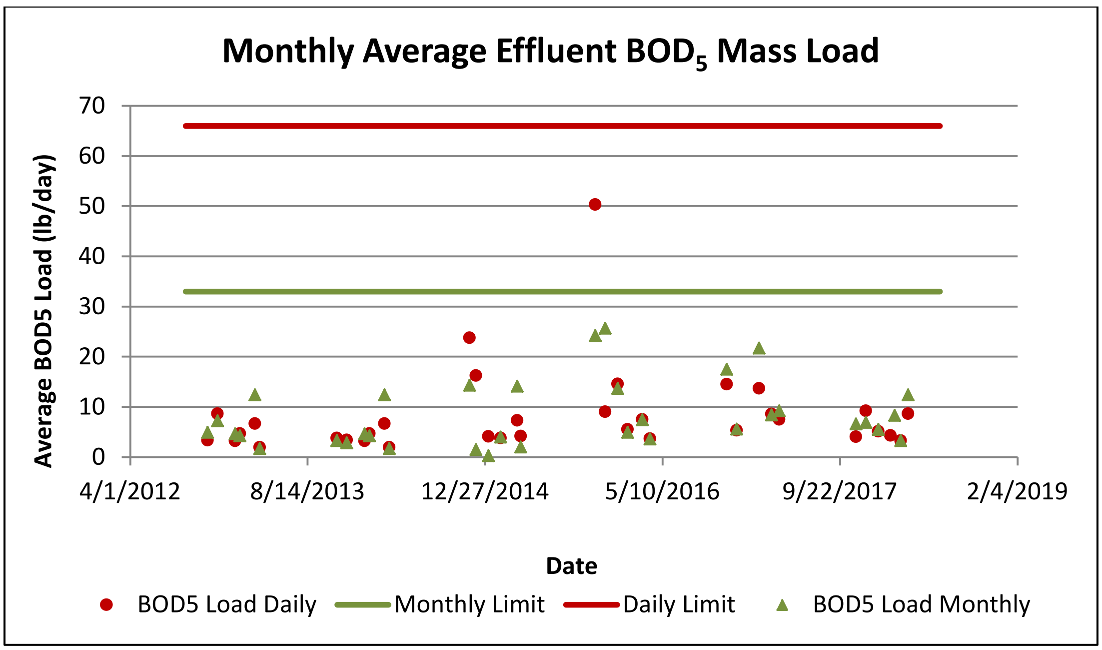


FIGURE 3.1.4
HISTORICAL WWTP EFFLUENT MONTHLY BOD_5 MASS LOAD (LBS/DAY)



Effluent TSS Performance

The existing facility has no difficulty in complying with effluent TSS concentration and mass load requirements. Figures 3.1.5 and 3.1.6 below illustrate the City's ability to comply with the NPDES limitations from November 2012 to April 2018.

FIGURE 3.1.5
HISTORICAL WWTP EFFLUENT TSS PERFORMANCE (CONCENTRATION)

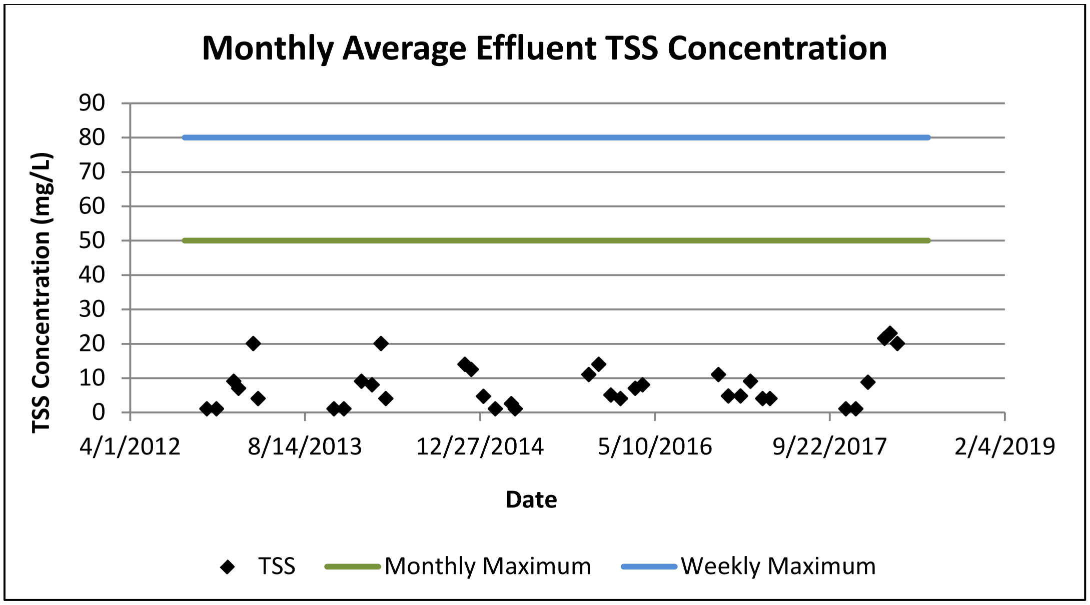
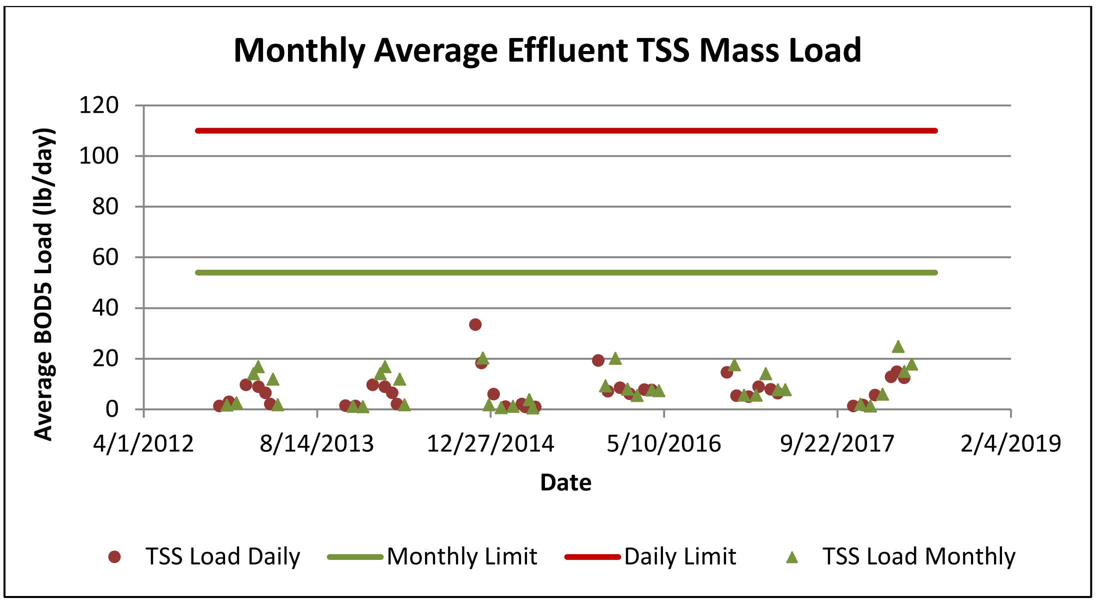


FIGURE 3.1.6
HISTORICAL WWTP EFFLUENT MONTHLY TSS MASS LOAD (LBS/DAY)



<u>Effluent *E. coli* Performance</u>

Effluent *E. coli* data was analyzed to assess compliance with the NPDES Permit. Figure 3.1.7 shows that the monthly geometric mean. *E. coli* is usually well below the monthly geometric mean not to exceed requirement of 126 organisms per 100 mL. Figure 3.1.8 illustrates *E. coli* performance with the daily requirement that no single sample exceed 406 organisms per 100 mL.

FIGURE 3.1.7
HISTORICAL WWTP EFFLUENT *E. COLI* PERFORMANCE (MONTHLY)

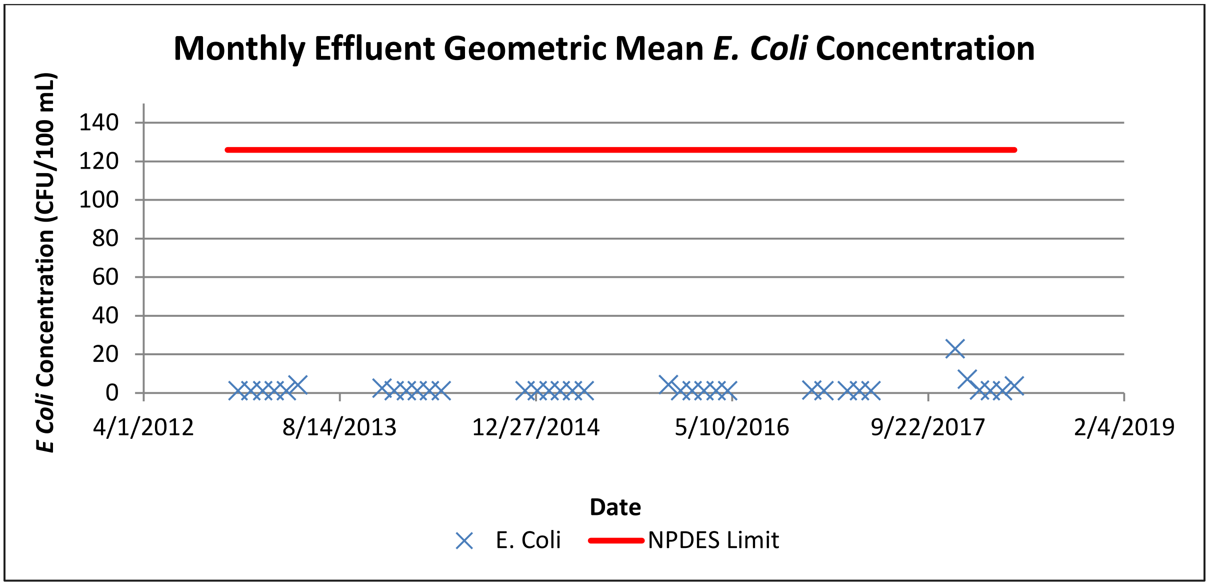
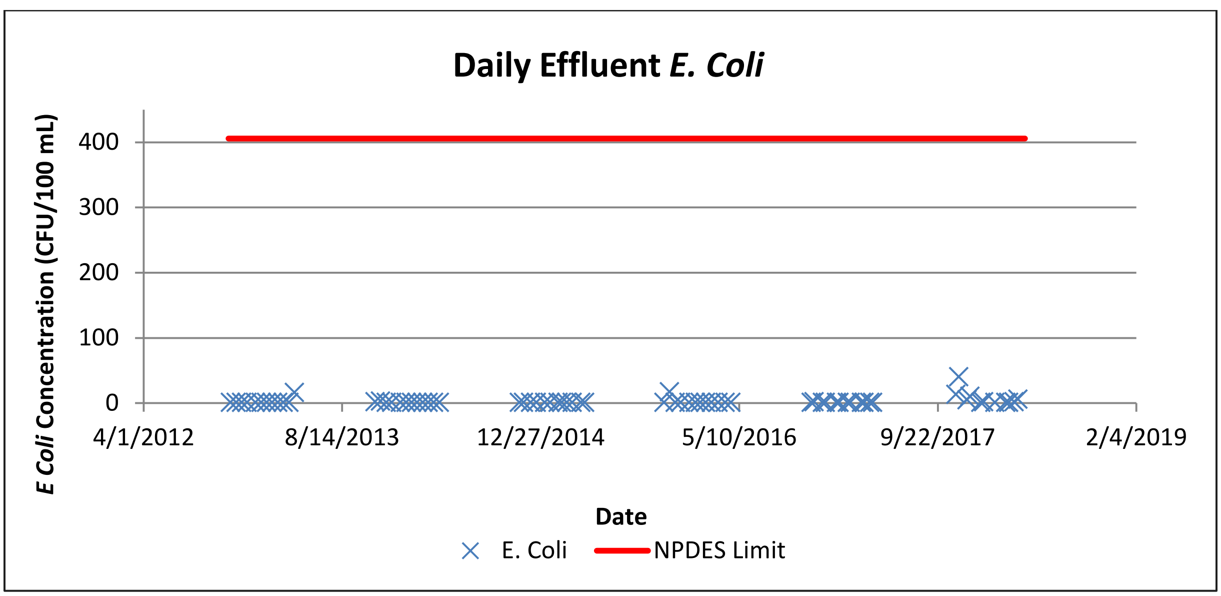


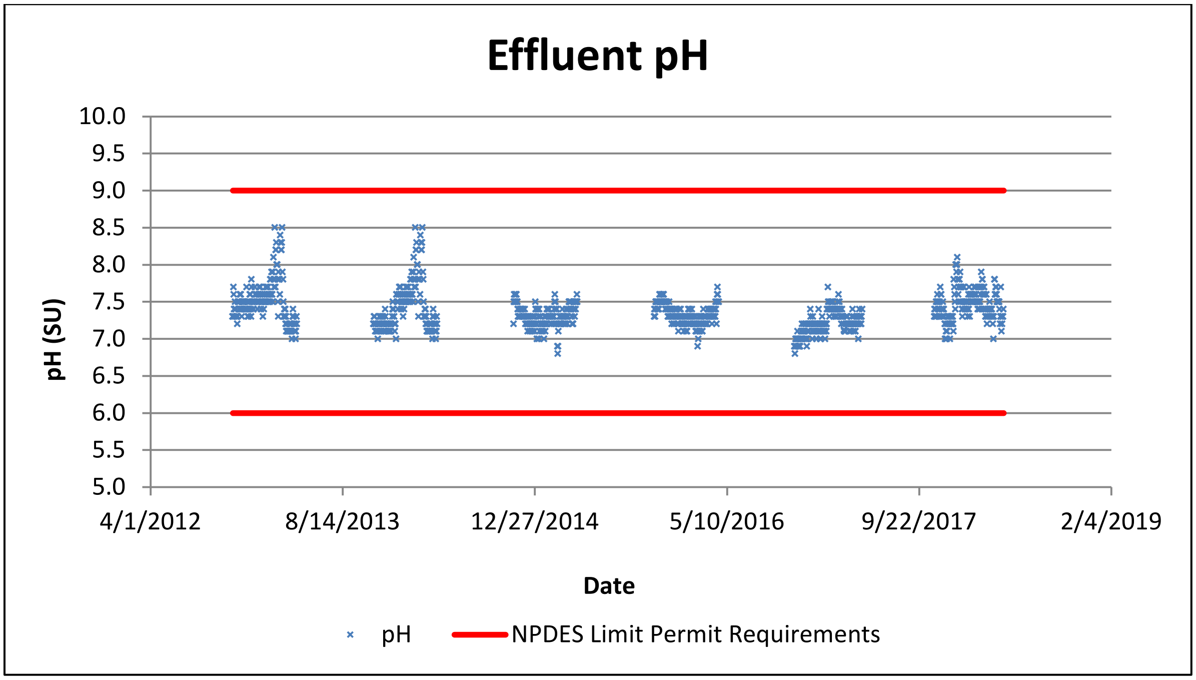
FIGURE 3.1.8
HISTORICAL WWTP EFFLUENT *E. COLI* PERFORMANCE (DAILY)



Effluent pH

The City has always complied with NPDES requirements regarding effluent pH levels. Effluent pH samples, like BOD_5 and TSS, are taken immediately after the Parshall flume but prior to the chlorine contact chamber. Figure 3.1.9 shows historical data on the WWTPs ability to stay within the requirements set forth by the discharge permit.

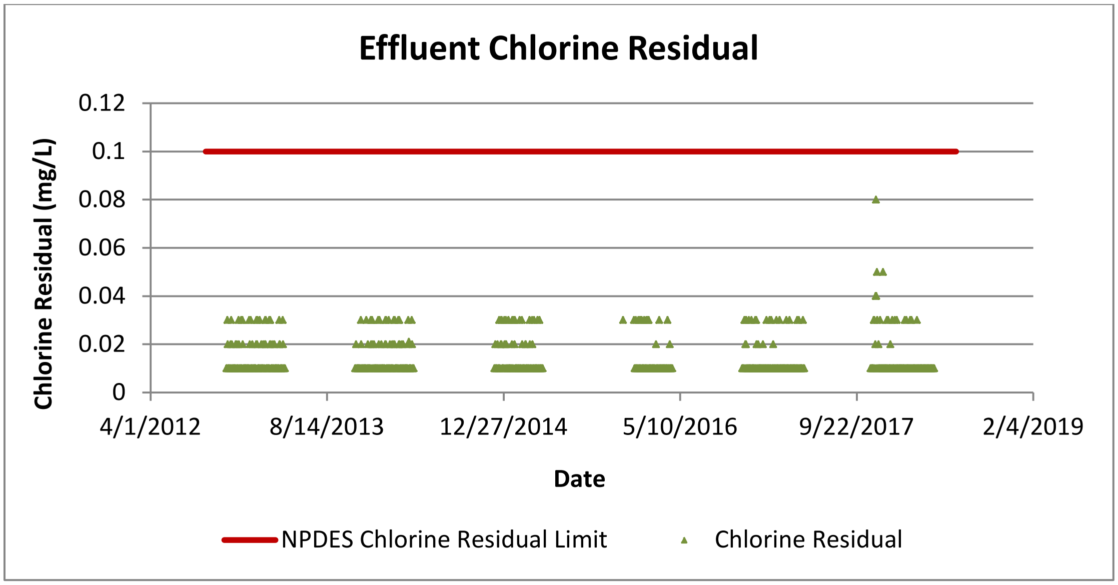
FIGURE 3.1.9
WWTP EFFLUENT PH



Effluent Chlorine Residual Performance

Figure 3.1.10 shows historical effluent chlorine residual. After disinfection, total coliform may not exceed 406 organisms per 100 mL in any single sample. The WWTP continuously satisfies this requirement, as well as the total residual chlorine limitation of 0.10 mg/L. Figure 3.1.10 shows the City's ability to keep chlorine residual to a minimum.

FIGURE 3.1.10
HISTORICAL WWTP EFFLUENT CHLORINE RESIDUAL



Potential Future Regulatory Issues

Future regulatory requirements cannot be thoroughly analyzed, since they are under development and have not yet been implemented. New effluent limits may be incorporated in the NPDES Permit at the time of renewal. It is important to keep in mind the adaptability of WWTP designs to newer or more stringent regulations.

3.2 Design Criteria and Considerations

Treatment planning must take into account existing and projected loadings and flows, and regulatory requirements. General design considerations incorporated in the development and evaluation of alternatives are discussed below. Design criteria for future conveyance system expansions are based on topography. Estimated future flows are discussed in Section 3.6.

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 life. Collection system pump stations serving the properties within the Urban Growth Boundary (UGB) will be based on a design period of 20 years from the date of commissioning. Gravity collection line sizing will be based on ultimate build-out. Treatment facility recommendations will be based on a 20-year planning period from the date the improvements are commissioned.

Collection System

Gravity Sewers

Collection systems must be designed to consider natural ground slope, subsurface conditions, capacity requirements, minimum slope considerations, minimum flow velocities required to maintain solids suspension, and potential sulfide and odor generation. Collection sewers should be designed for ultimate development of an area.

Force Mains

The City currently operates two (2) small pump stations and associated force mains. The DEQ guidelines for force mains are important to help ensure proper performance and longevity. The DEQ issued the current version of *Oregon Standards for Design and Construction of Wastewater Pump Stations* in May 2001, which includes guidelines for force main design.

Pump Stations

Design of pump (lift) stations is a critical element of sanitary sewer collection systems. New pump stations must be designed to meet the *Oregon Standards for Design and Construction of Wastewater Pump Stations*, issued in May 2001 by DEQ. The EPA *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability* are to be used to determine the minimum number and sizing of components. Reliability Class I criteria are to be utilized in design.

Standard DEQ design parameters regarding pump station capacity require that wet wells be sized to accommodate flows associated with a 5-year, 24-hour rainfall event. However, it is important to consider more conservative design approaches when dealing with high risk facilities such as wastewater pump stations within close proximity to rivers. Using peak instantaneous flows, which are significantly higher than flows associated with 5-year, 24 hour rainfall events, to size pump stations will provide additional capacity and a higher factor of safety. The pump stations should be designed without an increase to the total sulfide generation potential of the collection system. Contemporary design practice requires some wet well storage of wastewater plus retention in the force main; both of which tend to increase the potential sulfide generation when supplemental aeration is not provided. To minimize hydrogen sulfide generation, wet wells should be as small as possible while still allowing for future growth. Wet well detention times of 30 minutes or less are recommended to avoid hydrogen sulfide generation. When detention times in the pump station force main exceed 25 to 30 minutes, a system to control hydrogen sulfide generation and the accompanying odor and corrosion problems is recommended.

Pump stations should have redundant pump equipment and provisions for emergency generator operation. Power outage frequency and duration must be considered in pump station design to ensure that overflows do not occur due to power loss. In some cases, a portable generator connected to the pump station with a manual transfer switch will suffice. In larger pump stations, a permanent standby generator may be required. Level controls should include a redundant high wet well level sensor.

Wastewater treatment facilities, including pump stations, are also regulated under National Fire Protection Association (NFPA) 820, *Fire Protection in Wastewater Treatment and Collection Facilities*. The Occupational Safety and Health Administration (OSHA) Permit Required Confined Spaces Standard 29 CFR 1910.146 limits individual access to spaces that might trap a person or contain noxious atmospheres.

Wastewater Treatment Facility

Primary consideration will be given to the degree of treatment required to meet the discharge requirements set forth in the NPDES Permit, and to provide sufficient sizing of the facility to handle future projected peak hydraulic and organic loads.

Flexibility

Conveyance and treatment design should allow for flexibility in operation and maintenance. The treatment plant Operator must have the ability to alter plant flows around the major process units without significantly degrading effluent quality. This goal can be achieved by providing redundant units and multiple interconnections between units when appropriate. Conveyance and treatment equipment design should also be such that maintenance, both routine and emergency, can be performed without excessively loading other components. Flexibility is also needed to ensure that discharge requirements can be met during changing influent conditions and to allow construction and connection of new process units as needed.

Plant Reliability Criteria

Reliability of treatment processes depends on proper application of unit loading factors and conservative selection of equipment to ensure long life and minimum maintenance costs. Each unit process should be selected based on its capabilities to effectively treat the waste characteristics for the specific application. Capabilities of the treatment plant Operator and the community should also be considered. Processes that require a high degree of manual labor and specialized instrumentation should be avoided in most cases, especially for small communities. Redundancy is also a key factor in reliability. Design and construction of a mechanical wastewater treatment plant requires many considerations for effective wastewater treatment. Should a mechanical plant be constructed in the City of Scio, Class I Reliability should be achieved.

For components included in the design of Reliability Class I, the following backup requirements apply:

- **Mechanically Cleaned Bar Screens.** A backup bar screen, designed for mechanical or manual cleaning, shall be provided. Facilities with only two bar screens shall have at least one bar screen designed to permit manual cleaning.

- **Pumps.** A backup pump shall be provided for each set of pumps performing the same function. The capacity of the pumps shall be such that, with any one pump out of service, the remaining pumps will have the capacity to handle the peak flow.

- **Comminution Facility.** If comminution of the total wastewater flow is provided, an overflow bypass with a manually installed or mechanically cleaned bar screen shall be provided. The hydraulic capacity of the comminutor overflow bypass should be sufficient to pass the peak flow with all comminution units out of service.

- **Primary Sedimentation (Clarifier) Basins.** The units should be sufficient in number and size so that, with the largest flow capacity unit out of service, the remaining units should have a design flow capacity of at least 50% of the total design flow.

- **Final Sedimentation (Clarifier) Basins.** The units shall be sufficient in number and size so that, with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 75% of the total design peak day flow. These units are sized for peak day winter flows and large enough to treat Maximum Month Dry Weather Flows (MMDWF) with one out of service.

- **Aeration Blowers, Rotors or Mechanical Aerators.** There shall be a sufficient number of blowers or mechanical aerators to enable the design oxygen transfer to be maintained with the largest capacity unit out of service. It is permissible for the backup unit to be an uninstalled unit, provided that the installed units can be easily removed and replaced. However, at least two units shall be installed.

- **Air Diffusers.** The air diffusion system for each aeration basin shall be designed so that the largest section of diffusers can be isolated without measurably impairing the oxygen transfer capability of the system.

- **Disinfectant Contact Basins or Units.** The units shall be sufficient in number and size so that, with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 50% of the total design flow.

- **Electrical Power Sources.** Two separate and independent sources of electric power shall be provided to the plant either from two separate utility substations or from a single substation and a works based generator located at the plant. As a minimum, the capacity of the backup power source for the treatment plant shall be sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions.

Operability

Operation of a wastewater system entails considerable responsibility and cost while providing public health benefits. For these reasons, personnel assigned to operate and maintain a treatment facility must be trained appropriately. The more sophisticated the process or equipment, the greater the level of expertise needed. Qualified individuals are usually available in metropolitan areas, as is financial support for their employment. However, small communities often have a problem in finding the personnel and the money with which to pay them. Consequently, the selection of a treatment process and equipment should reflect the regional and local level of training of operations and maintenance.

Durability

Conveyance and treatment systems should consist of materials and equipment that are capable of satisfactory performance over the entire design life of the wastewater system components. The selection of durable wastewater system components is a matter of judgment based on a number of factors including type and intensity of use, type and quality of materials used in construction, quality of workmanship during the initial installation, and expected maintenance to be performed during life of the component.

Capacity

Individual treatment components must be capable of handling the hydraulic flow through the plant during peak wet weather periods and be capable of being sized to treat the mass loads projected for the facility. The following guidelines will be used in this plan:

- In general, all processes after the headworks are designed to operate for peak daily flow.

- Influent pump stations are designed to operate for peak instantaneous flow.

- The headworks should be sized for peak instantaneous flows.

- Primary clarifiers, when present, should be sized for peak daily flows.
- Aeration basins should be sized using modeling to generate desired treatment in the final effluent.
- Per DEQ, the secondary clarifiers should be sized for either the peak day with all clarifiers operational or the MMDWF with the largest clarifier off-line, whichever results in the greater treatment capacity. Overflow rates for the separate seasons should be used.
- Per EPA, the secondary clarifiers should be able to handle 75% of peak daily flow with the largest unit out of service.
- The disinfection system should be sized for peak daily flow. The contact chamber should be sized for at least 15 minutes of contact time at the peak hour flow, 20 minutes at peak day, or 60 minutes at ADWF, whichever results in the largest basin.
- Sizing of the digester is based on the estimated volume of suspended solids of the incoming mixed liquor, in addition to the holding time required for the digesters. The assumption is made that sludge is held for a minimum of 60 days and that biosolids are removed at two percent solids.

Expandability

Expandability is a difficult factor for consideration in the design of wastewater treatment facilities. Designs are created that meet the current regulatory environment. Future regulatory requirements could have dramatic effects on the compliance of even the newest designs. Therefore, expandability is considered from a current regulatory compliance viewpoint. The treatment alternatives considered are expandable as long as specific design capacities of the system are not exceeded.

Miscellaneous

Consideration of site location, daily operational tasks, public perception, health and safety concerns, noise, access to equipment, human factors, and hazardous areas all have to be analyzed when assessing the conveyance and treatment alternatives.

3.3 Aging Infrastructure

Infiltration and Inflow

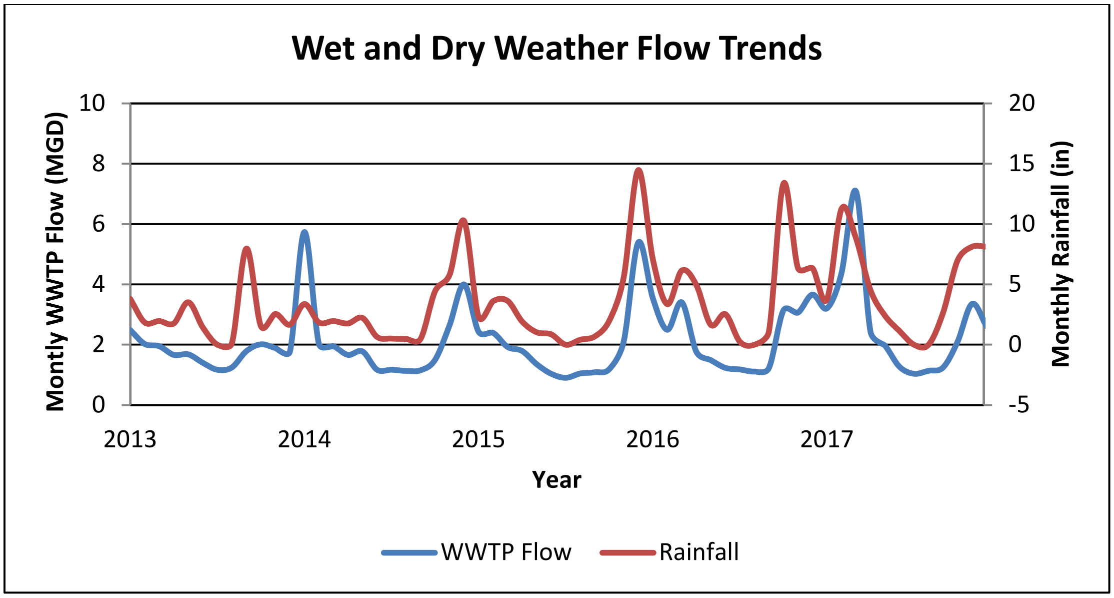
Infiltration and inflow is groundwater (infiltration) and surface rainwater (inflow) that leaks into the sanitary sewer collection system. During wet weather periods high ground water and surface flows enter the system through defects (holes, cracks, and failed pipe joints). Infiltration and inflow can cause wastewater flows to exceed the capacity of the pipes causing backups into buildings and overflowing manholes. Rain induced sewer flows can hydraulically overload a wastewater treatment plant, increase costs of sewer system operations, and require oversized treatment systems. Exfiltration (loss of wastewater into the surrounding soil) can erode the soil and in some cases cause sinkholes. Leakage of sewage into the surrounding soil can lead to groundwater and soil contamination.

Collection systems and wastewater facilities will continue to age and degrade; pipe gaskets develop leaks, Pipes and manholes crack; pumps wear out, grounds must be maintained, and aeration equipment has a limited life. Investment is required to perform wastewater Capacity Management with an Operations and Maintenance program (CMOM). An infiltration and inflow study is a basis for a CMOM program.

Flow Trends

The City of Scio receives relatively little rainfall from June through September. Monthly average flows at the WWTP for July are lower than in May, reflecting the reduction in rain and subsequent I/I. Wet weather flows are heavily influenced by rain and the condition of the collection system, with the highest flows typically occurring between November and April. The average wet weather monthly plant inflow volume has a strong correlation, as shown in Figure 3.3.1, to total monthly wet weather rainfall for the study period.

FIGURE 3.3.1
WWTP FLOW TRENDS (2013 - 2017)



EPA Non-excessive Infiltration

The EPA guidelines (40 CFR 133.103) establish procedures on how to determine whether excessive I/I exists, and how to certify that excessive I/I has been sufficiently reduced through sewer rehabilitation. Infiltration occurs when groundwater enters a sewer system through broken pipes, defective pipe joints or illegal connections of foundation drains. System flows are analyzed under various conditions and compared to benchmarks that have been established for acceptable sanitary sewage flow rates.

Non-excessive infiltration is analyzed by investigating plant flows during periods of seasonal high groundwater with little sustained rainfall. Seven to fourteen day periods during winter months of high groundwater (December through May) were identified where little or no rainfall is measured. The average per capita flow for the system is calculated and compared to the EPA maximum flow criteria of 120 gallons per capita per day (gpcd). Under these conditions, all flows below 120 gpcd are considered to have a non-excessive infiltration component.

A fourteen day period with little or no rainfall occurred between Feb 1, 2013 and Feb 14, 2013. It is assumed that groundwater levels were high during this period. The highest flow day of that week was 0.132 MGD. Based on a 2013 population of 885 people, the resulting flow rate is calculated at 149 gpcd. Since the flow is greater than 120 gpcd, the collection system may have excessive infiltration and will need further testing.

EPA Non-excessive Inflow

Non-excessive inflow is analyzed by investigating plant flows during periods of intense winter rainfall. Major rainfall events and the resulting system flows during winter months are analyzed. Inflow is surface runoff that enters a sewer system through manhole covers, cleanout covers, cross connections between storm sewers and sanitary sewers, and illegal connections of roof drains, yard drains, or catch basins. The EPAs non-excessive inflow criteria are based on “the average daily flow during periods of significant rainfall (i.e. storm event that creates surface ponding and surface runoff; this can be related to a minimum rainfall amount for a particular geographic area).” The average per capita flow for the system is calculated and compared to the EPA maximum flow criteria of 275 gpcd. Flows can exceed EPA guidelines if the plant operation is not impeded by such flows. Under these conditions, provided the treatment plant does not experience hydraulic overloads during storm events, flows below 275 gpcd are considered to have a non-excessive inflow component.

For the City of Scio, the average daily flow recorded during a period of significant rainfall occurred between October 13, 2016 to October 21, 2016. Flows of 0.267 MGD were generated after receiving rainfall of 1.4 inches in one day. Under these conditions and based on a 2017 population of 938, the resulting system flows (combined infiltration and inflow) were determined to be 284 gpcd. Since the flow is greater than 275 gpcd, a cost effective analysis is needed to determine if the inflow is excessive.

The EPA I/I analysis is summarized in Table 3.3.1.

TABLE 3.3.1
I/I ANALYSIS SUMMARY

Description of Flow Condition	Flow Rate	EPA Criteria (Maximum Flow)
Base Sewage	38 gpcd	n/a
Infiltration (High Ground Water)	149 gpcd	120 gpcd
Inflow (High Rainfall Levels)	284 gpcd	275 gpcd

3.4 Wastewater Flows

Future flow projections are determined by evaluating current sewage flow rates, current pollutant loads, and population growth forecasts. Flow and load projections are for a 20-year period from initiation of operations of new equipment. Daily flows and loads are determined from rainfall statistics and system flow records.

Flows and loads have specific recurrence intervals, or probabilities of occurrence, that utilize estimated future wastewater design flows and loads. Information regarding dry weather and wet weather flows as well as I/I are important in the design of wastewater collection, treatment and disposal facilities. The Maximum Month Dry Weather Flows (MMDWF) usually determines the maximum organic loading of the major treatment process units. The Maximum Monthly Wet Weather Flow (MMWWF) determines the size and hydraulic capacity of the major process units necessary to provide the desired degree of treatment. The Peak Instantaneous Flow (PIF) determines the hydraulic capacity of pipelines, pumps, channels, and inlet structures, and the reserve capacity of units such as clarifiers and disinfection facilities.

Unless noted otherwise, the data used for this report is taken from 2013 through 2017 Daily Monitoring Reports for the WWTP. The City’s wastewater system staff records the readings daily on the influent flow meter and rain gauge at the plant. Wastewater is sampled and five-day Biochemical Oxygen Demand

(BOD_5) and Total Suspended Solids (TSS) tests are generally conducted once per month. Rain data for this analysis is from the daily readings of the rain gauge at the wastewater facility.

DEQ Guidelines for Flow Projections

Unless otherwise noted, all theoretical flow calculations were made using the DEQ *Guidelines for Making Wet Weather and Peak Flow Projections for Sewage Treatment in Western Oregon*, 1996 revision. A summary of the calculations is included at the end of this section.

Precipitation Rates for Calculations

In Western Oregon, there is a relationship between peak storm events, ground water elevations and seasonal sewage flows. To reduce the probability of plant failure, the Maximum Month Dry Weather Flow ($MMDWF_{10}$), Maximum Month Wet Weather Flows ($MMWWF_5$), Peak Day Average Flow (PDAF) and Peak Instantaneous Flow (PIF) are utilized in the design process. The $MMDWF_{10}$ is the flow during a ten-year event (10% monthly probability of occurrence in May). The $MMWWF_5$ is the flow during a five-year event (20% monthly probability of occurrence in January). Monthly probability rainfall values were taken from the National Oceanic and Atmospheric Administration's (NOAA) for Stayton, Oregon (See Appendix B). Peak design flows are based on a 24-hour (daily) rainfall event and are taken from NOAA isopluvial charts (See Appendix B). Rainfall events are summarized in Table 3.4.1.

TABLE 3.4.1
CITY OF SCIO STORM EVENTS

Source	20% Probability	10% Probability
NOAA - 24 hour Isopluvial	3.0" per day	3.4" per day
NOAA - Monthly Climatography	10.15" (Jan.)	5.99" (May)

Dry Weather Flow

AAF (Record)

Average Annual Flow (AAF) is the average of all flows over a year. The AAF was determined from analysis of treatment plant influent flow records for the years 2013 through 2017, and the largest was selected for design. The AAF was determined to be 0.091 MGD or 97 gpcd (based on 2017 population of 938). Figure 3.4.1 and Table 3.4.2 lists the AAF for 2013 through 2017.

FIGURE 3.4.1
WWTP DAILY AND ANNUAL AVERAGE FLOWS

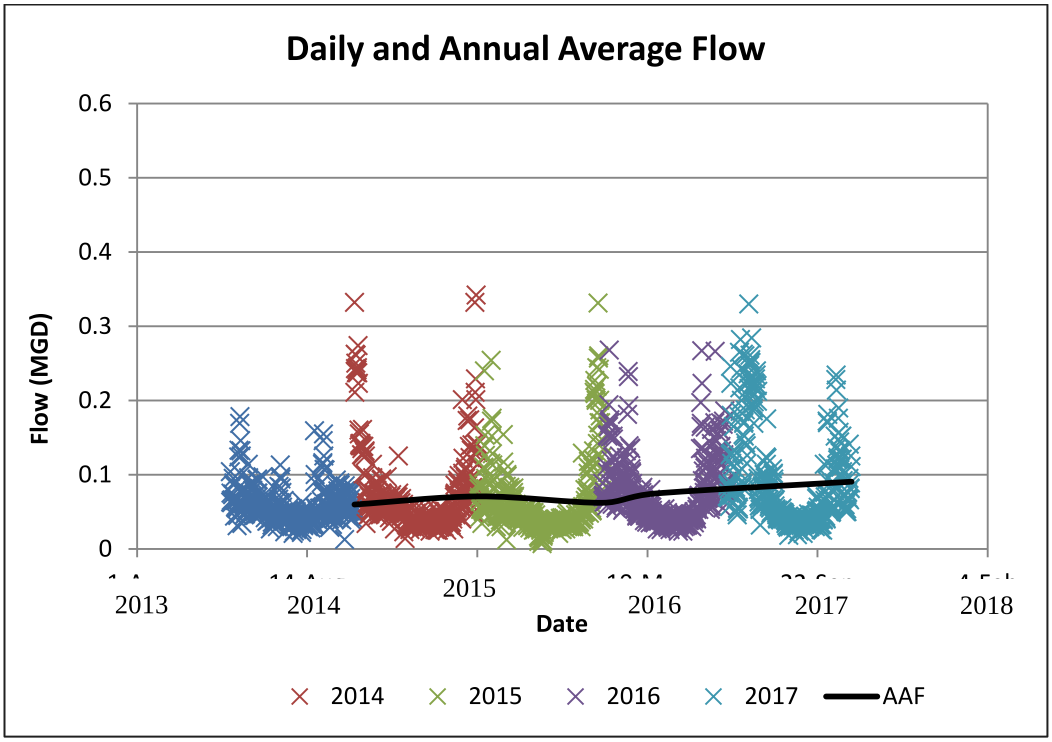


TABLE 3.4.2
AAF (MGD)

Year	AAF (MGD)
2013	0.060
2014	0.071
2015	0.062
2016	0.075
2017	0.091

ADWF (Record)

The Average Dry Weather Flow (ADWF) was determined from analysis of treatment facility influent flow records for the months May through October. The City does not have seasonal dry weather flows which are usually contributed by industrial processes. Wastewater is predominately generated domestically. The ADWF was determined to be 0.054 MGD, or 58 gpcd. Table 3.4.3 summarizes ADWF values for 2013 through 2017

TABLE 3.4.3
ADWF (MGD)

Year	ADWF (MGD)
2013	0.054
2014	0.043
2015	0.036
2016	0.051
2017	0.048

MMDWF (Record)

The Maximum Monthly Dry Weather Flow (MMDWF) represents the maximum monthly average flow in the rainiest month of high groundwater. The MMDWFs for 2013 through 2017 are summarized in Table 3.4.4. The MMDWF for 2016 was 0.101 MGD (108 gpcd).

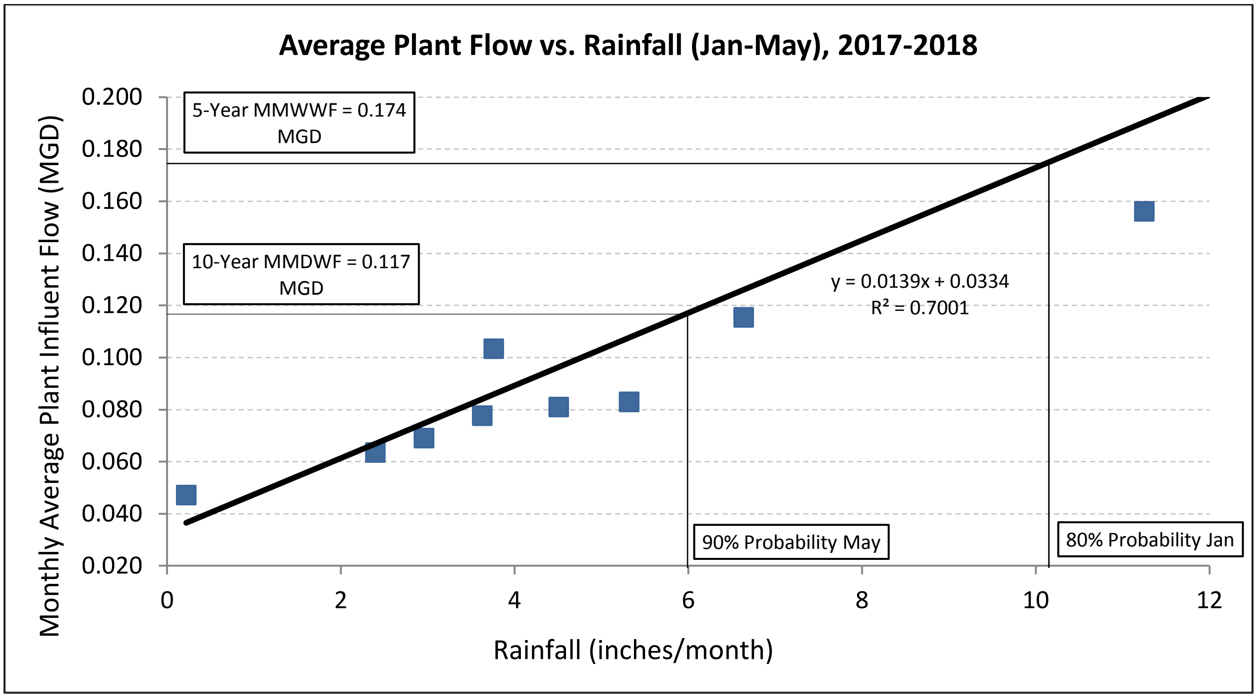
TABLE 3.4.4
MMDWF (MGD)

Year	MMDWF (MGD)
2013	0.083
2014	0.057
2015	0.044
2016	0.101
2017	0.068

$MMDWF_{10}$ (Theoretical)

The Maximum Monthly Dry Weather Flow ($MMDWF_{10}$), defined as the flow recorded at the plant when total rainfall quantities are at ten percent probability of occurrence in any one year (usually in May), was calculated using DEQ guidelines. The $MMDWF_{10}$ was determined by plotting average plant flow versus monthly rainfall between the months of January and May. This is illustrated in Figure 3.4.2 Average Plant Flow vs. Winter Rainfall. Linear regression was used to fit a line to the data. Ninety percent probability of May rainfall values were taken from the National Ocean and Atmospheric Administration's *Climatography of the United States No. 20, 1971-2000* for the City of Stayton, Oregon. In May the City of Stayton had approximately 90% of the rainfall total 5.99 inches. The projected $MMDWF_{10}$ based on a 5.99 inch event for the City of Scio is 0.117 MGD, or 125 gpcd.

FIGURE 3.4.2
AVERAGE PLANT FLOW VS. WINTER RAINFALL

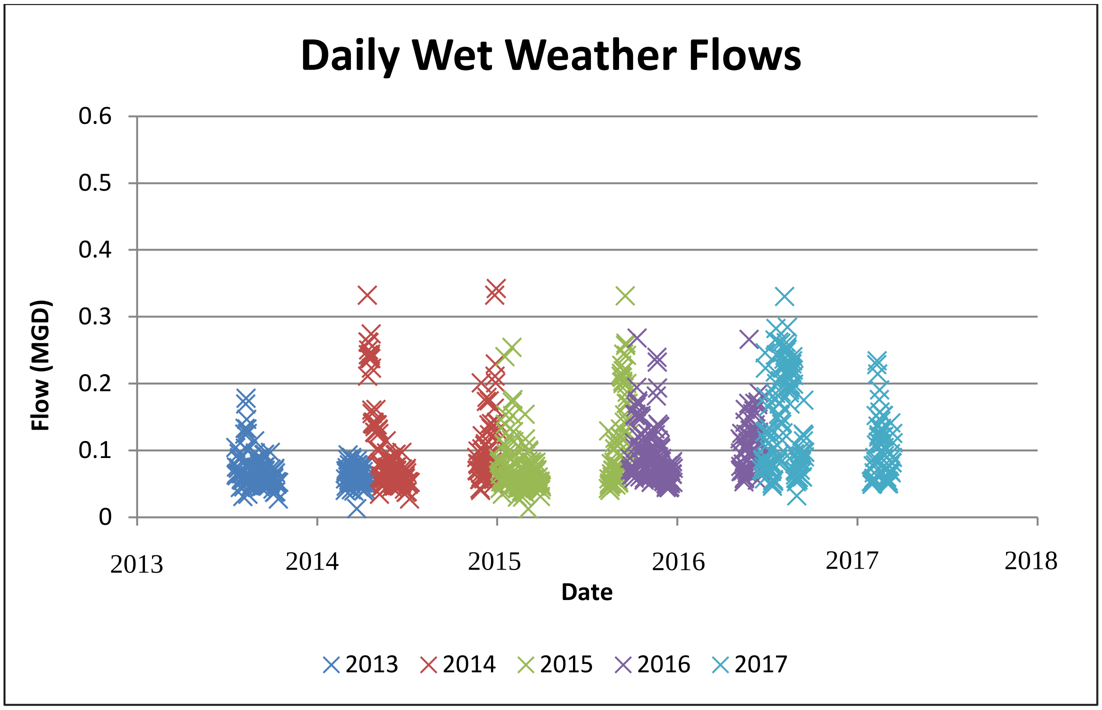


Wet Weather Flow

AWWF (Record)

The Average Wet Weather Flow (AWWF) is defined as the average flow at the WWTP during the wet weather season (November through April). The AWWF was determined from an analysis of the treatment plant flow records for the years 2013 through 2017. The AWWF was determined to be 0.128 MGD (136 gpcd). Figure 3.4.3 shows the WWTPs daily wet weather flows for the study period.

FIGURE 3.4.3
WET WEATHER FLOWS



MMWWF (Record)

The Maximum Monthly Wet Weather Flow (MMWWF) represents the highest monthly average flow attained during the winter period of high groundwater. The MMWWFs for 2013 through 2017 are summarized in Table 3.4.5. The MMWWF was determined to be 0.228 MGD (243 gpcd).

TABLE 3.4.5
MMWWF (MGD)

Year	MMWWF (MGD)
2013	0.080
2014	0.185
2015	0.174
2016	0.118
2017	0.228

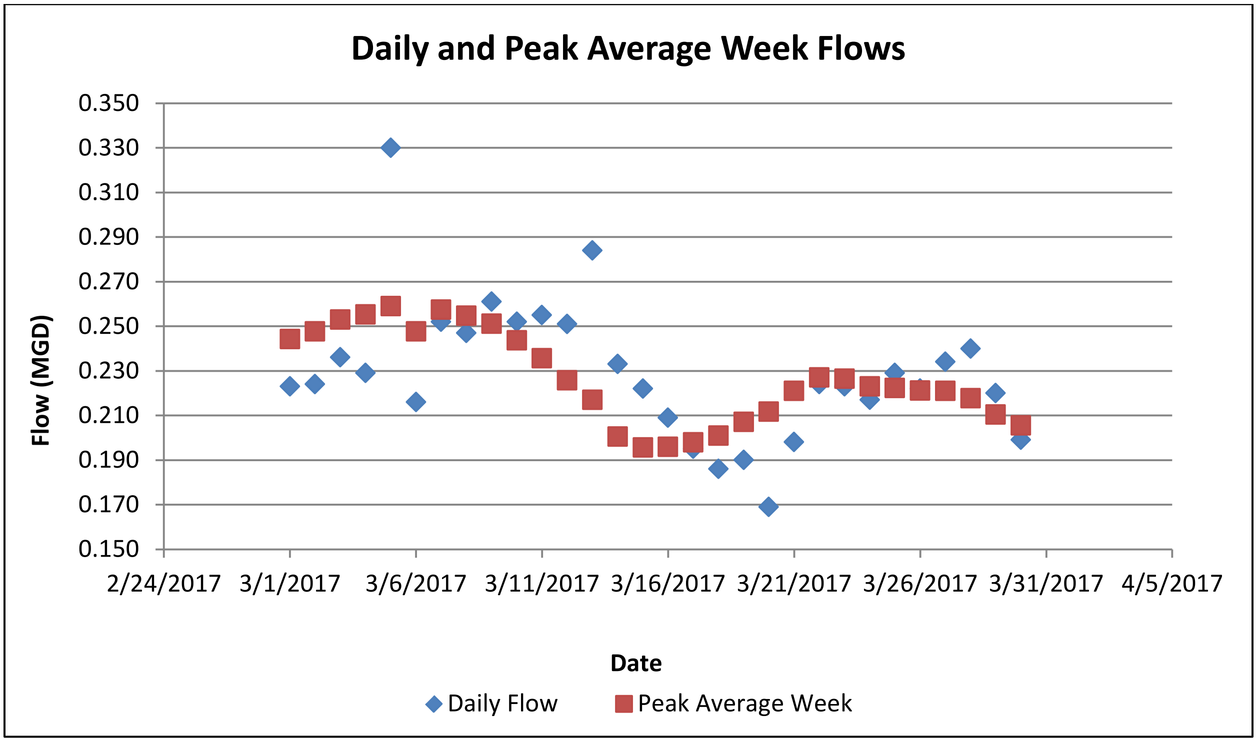
MMWWF$_5$ (Theoretical)

The Maximum Monthly Wet Weather Flow (MMWWF$_5$) was also calculated by following DEQ guidelines, in a manner similar to the theoretical MMDWF$_{10}$ (Figure 4.3.2). The analysis period was from 2017 through 2018. With linear regression analysis of average monthly plant inflow versus monthly rainfall, a MMWWF$_5$ of 0.174 MGD was calculated. The DEQ guidelines suggest that the MMWWF$_5$ represents the highest monthly average flow attained during the winter high groundwater period, and has a 20% chance of occurring in any one year.

Peak Average Week (Record)

For this study, the Peak Average Week (PW) flow was taken as an average of the 2013 through 2017 flows and is the highest average daily flow rate during a seven-day wet weather data set. The peak week flow occurred in March 2017 at 0.259 MGD (or 276 gpcd). Figure 3.4.4 shows the daily and peak average week flows for March 2017.

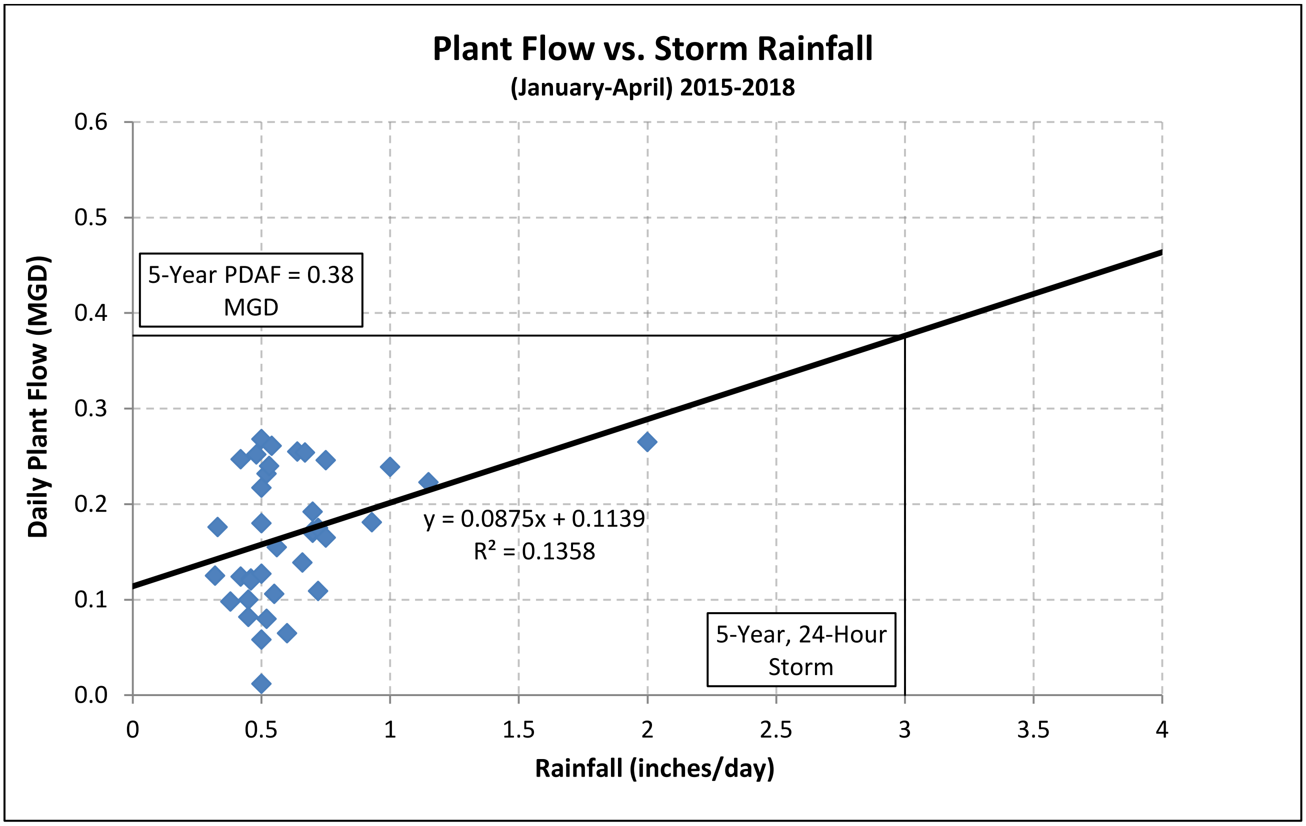
FIGURE 3.4.4
DAILY AND PEAK AVERAGE WEEK FLOWS



PDAF₅ (Theoretical)

The Peak Daily Average Flow associated with a five-year storm ($PDAF_5$) was estimated in accordance with DEQ guidelines. Daily plant flow data was analyzed in order to find available five-year storm event data. The five-year storm rainfall was approximated using Weather Bureau Records in the document *NOAA Atlas 2*, Volume X, Figure 26 Isopluvial Map. Daily plant inflows versus daily rainfall for selected storm events were plotted. Storms with rain exceeding the peak week flows established the DMR data set. The data period was from January through April for the years 2015 through 2018. The DEQ recommends using 24-hour data to match plant flow data. Flows at the WWTP can be higher on the day following high rainfall. The 24-hour rainfall for the first day was used for the rain quantity, and the higher of the two consecutive 24-hour flows (that day or the following day) was used for the flow. The five-year, 24-hour rainfall of 3.0 inches was used from the above-referenced Weather Bureau document, which is provided in Appendix B. The resulting $PDAF_5$ is 0.38 MGD. Refer to Figure 3.4.5.

FIGURE 3.4.5
RAINFALL STORM EVENT VERSUS PLANT INFLOW



PDAF (Record)

Peak Day flows from the DMR Records (2012 to 2018) were also evaluated to determine the Peak Daily Average Flow (PDAF). The peak day (highest 24-hour flow) flow during the 2013 to 2018 time periods occurred in 2012 and was 0.471 MGD.

TABLE 3.4.6
PDAF (MGD)

Year	PDAF (MGD)
2012	0.471
2013	0.178
2014	0.342
2015	0.331
2016	0.268
2017	0.330
2018	0.206

PIF_5 (Theoretical)

The Peak Instantaneous Flow associated with a five-year storm event (PIF_5) was estimated by using the AAF, MMWWF, peak average weak, and PDAF values. These values were plotted on logarithmic probability paper, as outlined by DEQ. Such a projection is based on the principle that an average monthly flow is likely to occur 6/12 of the time or 50%, and a peak monthly flow occurs 1/12 of the time or 8.3%. Likewise, peak weekly flow will take place 1/52 of the time or 1.9%. Peak daily flow occurs once in 365 days or 0.27%. A peak hour flow happens once in 8,760 hours or 0.011%. Plotting these numbers against probability, and fitting a line to the data in excel, gives a current PIF of 0.845 MGD. A summary of existing flow rates as developed from flow data from 2012 to 2018 is provided below in Table 3.4.7 and Figure 3.4.6. Record flows for MMWWF were higher than those calculated following DEQ guidelines, and are used for design calculations. Record flows for PDAF were found to be greater than flows calculated using the DEQ procedures, and is therefore used for the basis for planning.

FIGURE 3.4.6
CITY OF SCIO WWTP EXISTING INFLUENT FLOW RATES

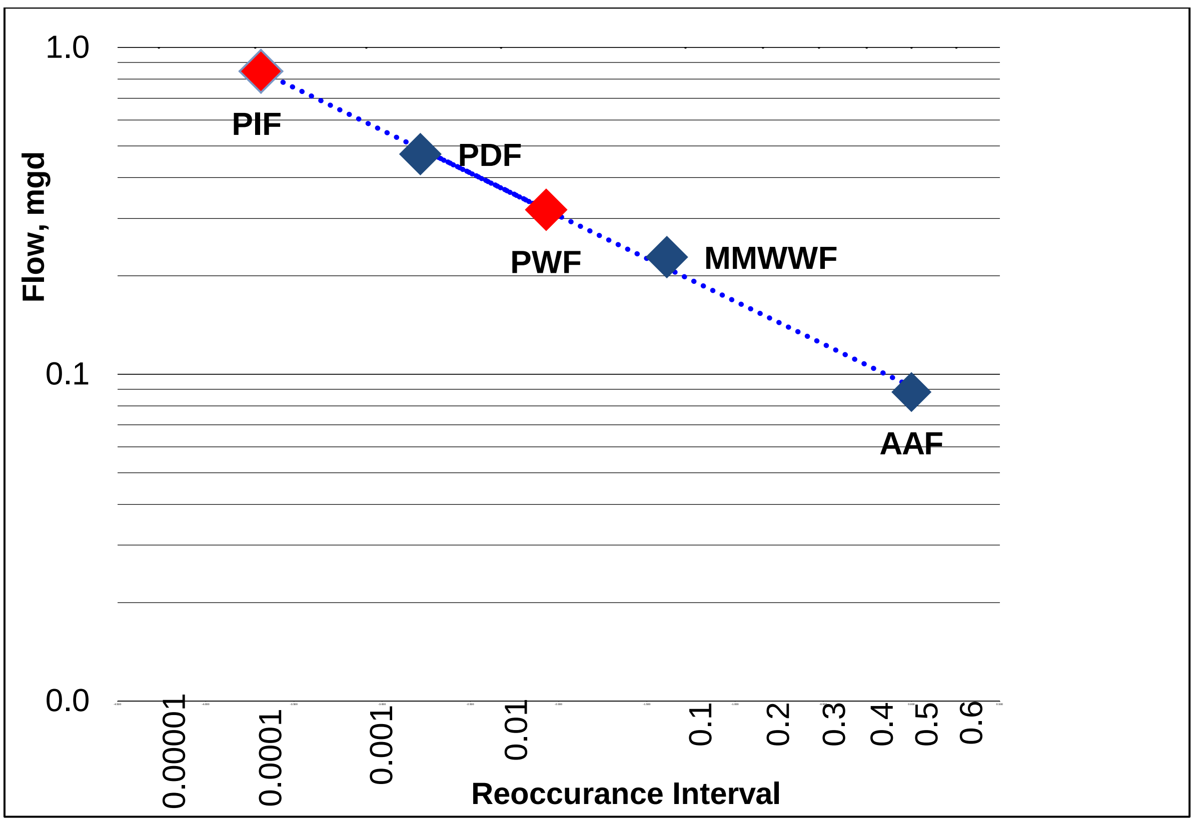


TABLE 3.4.7
CITY OF SCIO WWTP EXISTING INFLUENT FLOW RATES

Parameter	Flow Values				Peaking Factor
Population	938				n/a
Base Sewage	0.036	MGD	38	gpcd	n/a
Base Infiltration	0.01	MGD	11	gpcd	n/a
AAF	0.09	MGD	94	gpcd	1.6
ADWF	0.054	MGD	58	gpcd	1.0
AWWF	0.128	MGD	136	gpcd	2.4
$MMDWF_{10}$	0.117	MGD	125	gpcd	2.2
$MMWWF_5$	0.228	MGD	243	gpcd	4.2
Peak Average Week	0.320	MGD	341	gpcd	5.9
$PDAF_5$	0.471	MGD	502	gpcd	8.7
PIF	0.845	MGD	901	gpcd	15.6

3.5 Wastewater Characteristics

Analysis of Plant Records

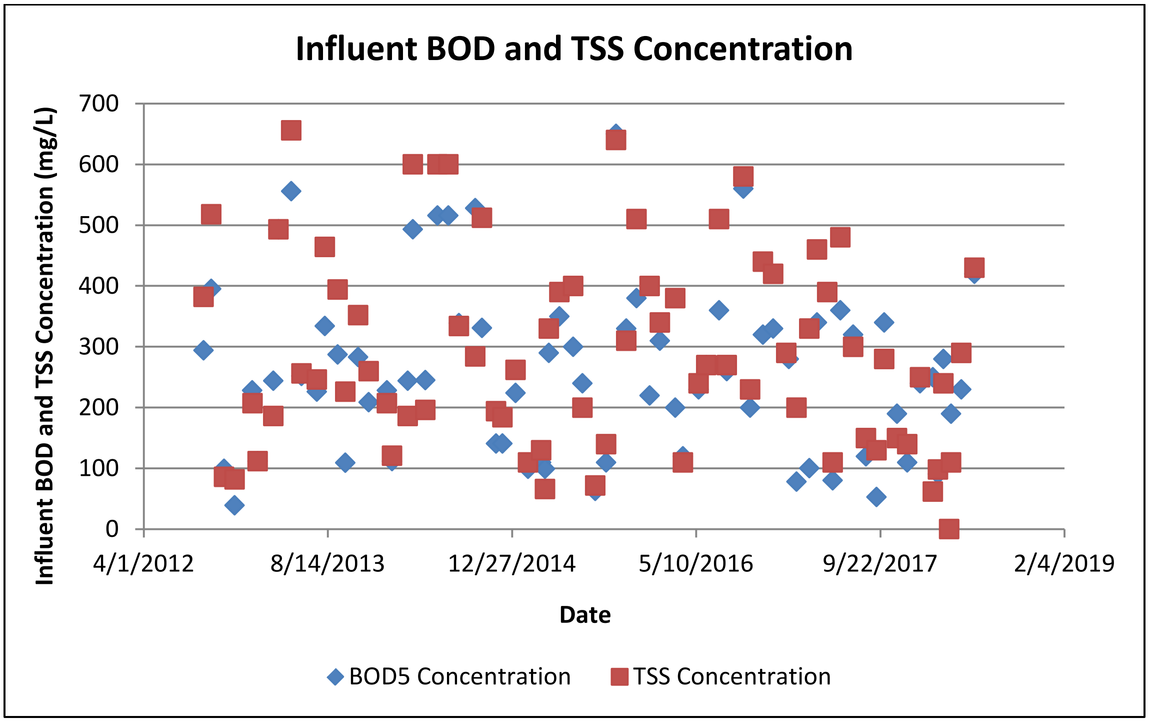
The BOD_5 and TSS influent concentration and loads are summarized in Table 3.5.1 and are based upon DMRs and a sewer population of 938 persons. The accuracy of the findings depends wholly upon the accuracy of the DMR reports themselves.

Typical BOD_5 per capita loads for domestic wastewater range from 0.11 to 0.26. Typical TSS per capita loads for domestic wastewater range from 0.13 to 0.33. In comparison, both the average BOD_5 and TSS concentrations in the City of Scio's influent wastewater are within the typical range during wet weather and dry weather periods. The average BOD_5 and TSS unit loading at the WWTP are within the normal ranges for similar communities.

TABLE 3.5.1
WWTP INFLUENT WW CONCENTRATIONS AND LOADS

Population: 938		**WET WEATHER**		**DRY WEATHER**	
Parameter		**Average**	**Range**	**Average**	**Range**
BOD_5					
	mg/L	217	39 - 493	307	53 - 650
	ppd	177	32 - 403	117	20 - 247
	ppcd	0.19	0.03 - 0.43	0.12	0.02 - 0.26
TSS			-		-
	mg/L	248	62 - 600	348	72 - 656
	ppd	202	51 - 490	132	27 - 249
	ppcd	0.22	0.05 - 0.52	0.14	0.03 - 0.27

FIGURE 3.5.1
WWTP INFLUENT WW CONCENTRATIONS (BOD_5 AND TSS)



Listed below, in Table 3.5.2, are average annual wastewater composition values based on the 2013 to 2017 study period data from plant records. Per the NPDES Permit, the City of Scio must measure BOD_5 and TSS concentrations once per month.

TABLE 3.5.2
WASTEWATER DESIGN COMPOSITION VALUES

Year	Annual Average Concentration			
	BOD_5		TSS	
2013	278	mg/L	321	mg/L
2014	301	mg/L	318	mg/L
2015	250	mg/L	274	mg/L
2016	282	mg/L	349	mg/L
2017	190	mg/L	262	mg/L

3.6 Projected Wastewater Flows and Characteristics

Future sanitary sewer flows generated within the City come from a wide variety of collection system users. The average wastewater flows from these users are expected to grow at approximately the same rate as the overall population. Therefore, future sanitary flows are projected by applying the anticipated population growth rate to the current sanitary flows. Projections for ADWF, MMDWF and AAF were calculated using a unit design value method based on gpcd extrapolated from the DMRs.

Projections of future wet weather flows require additional consideration due to the variability of I/I rates among existing and future developments. When utilizing a straight unit design factor based on existing peaking factors, future peak flows are typically overestimated. Therefore, 2044 peak flows are estimated using current wet weather I/I rates for existing portions of the collection systems while using lower rates in areas with new sewers.

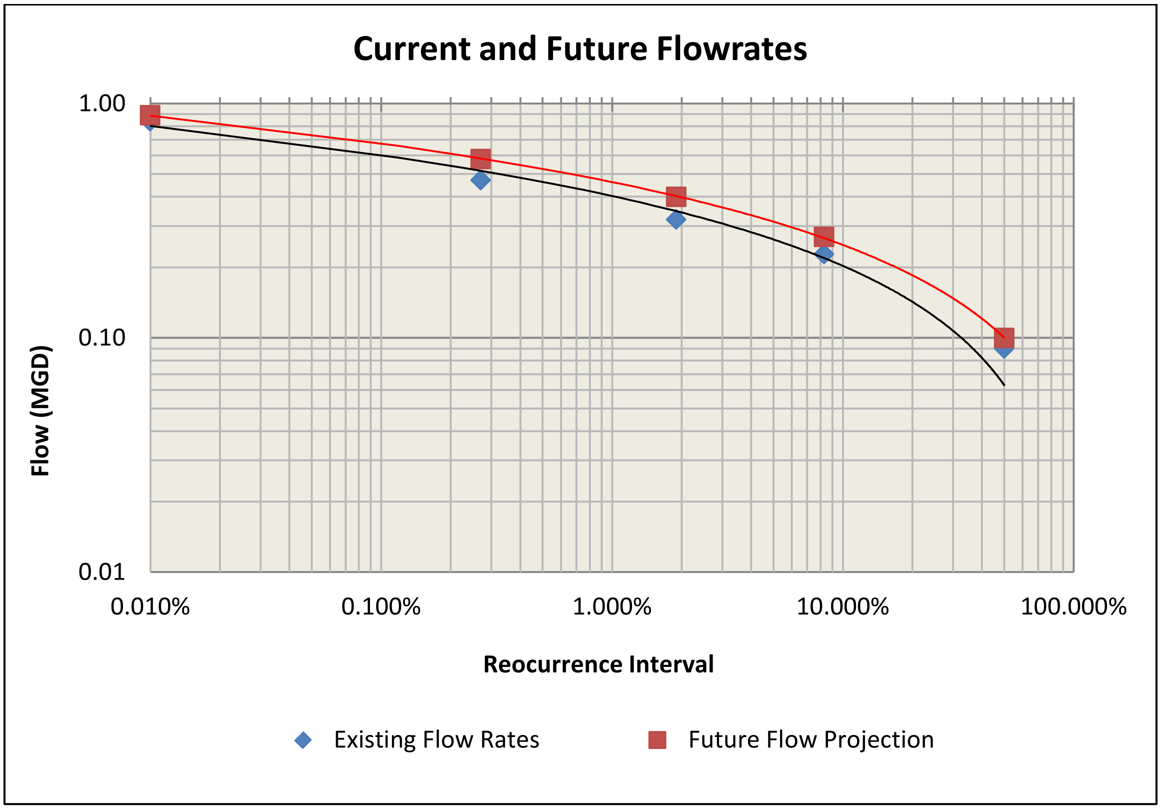
The current PIF of 0.846 MGD is greatly influenced by the presence of collection system deficiencies due to the age of the collection system. Older construction can be subject to poor or no joint gaskets, ridged pipe materials that develop cracking, and poor construction practices. Since improved construction materials and techniques in the new portions of the collection system will greatly reduce I/I sources, the projections of future peak wet weather flow must account for lower wet weather I/I rates in new developments. For the purposes of wet weather flow projections, new developments are assigned an EPA non-excessive I/I wet weather unit design factor of 395 gpcd (120 gpcd infiltration + 275 gpcd inflow).

Wet weather flows are estimated by interpolating a logarithmic relationship between the PIF and the AAF on a semi-logarithmic flow probability chart. $MMWWF_5$ is calculated at 8.3% probability, peak week is based on a 1.9% probability and $PDAF_5$ is based on a 0.27% probability. A comparison of the 2017 and 2044 flow rates is shown in Table 3.6.1 and Figure 3.6.1.

TABLE 3.6.1
WASTEWATER FLOWS (2017 & 2044)

Parameter	2017		Projected (2044)			
Population	938		1,046			
Base Sewage	0.036	MGD	38	gpcd	0.04	MGD
Base Infiltration	0.010	MGD	11	gpcd	0.01	MGD
AAF	0.091	MGD	97	gpcd	0.10	MGD
ADWF	0.054	MGD	58	gpcd	0.06	MGD
AWWF	0.128	MGD	136	gpcd	0.14	MGD
$MMDWF_{10}$	0.117	MGD	125	gpcd	0.13	MGD
$MMWWF_5$	0.228	MGD	254	gpcd	0.27	MGD
Peak Avg. Week	0.320	MGD	385	gpcd	0.40	MGD
$PDAF_5$	0.471	MGD	558	gpcd	0.58	MGD
PIF	0.846	MGD	849	gpcd	0.89	MGD

FIGURE 3.6.1
CURRENT AND FUTURE FLOWRATES (2017 & 2044)



Treatment unit design values are extrapolated from Tables 3.5.1 and 3.6.1. Table 3.6.2 summarizes the recommended design values for unit sizing.

TABLE 3.6.2
WASTEWATER TREATMENT DESIGN VALUES (2044)

	Flow MGD	BOD_5		TSS	
		mg/L	ppd	mg/L	ppd
AAF	0.10	194	160	220	180
$MMDWF_{10}$	0.13	120	130	135	150
$MMWWF_5$	0.27	93	210	106	240
PDAF	0.58	n/a	n/a	n/a	n/a
PIF	0.89	n/a	n/a	n/a	n/a

SECTION 4:
ALTERNATIVES EVALUATION

SECTION 4: **ALTERNATIVES EVALUATION**

An important factor in a successful Wastewater Facilities Plan is the thorough analysis of improvement alternatives. Alternatives, including the no-action option, will be identified and compared for the City's wastewater collection (infiltration and inflow reduction) and wastewater treatment system. Alternatives to be explored for the collection system include: 1) no-action alternative, 2) replacing lines; 3) inversion lining of lines; and 4) system expansion. Based on the pump station deficiencies previously identified, each pump station will also be evaluated for improvement alternatives.

Improvement alternatives to be explored for the wastewater treatment system include: 1) I/I reduction only; 2) no-action; 3) treatment system upgrades; and 4) construct a new mechanical wastewater treatment facility.

Improvement alternatives will be evaluated for the City's biosolids management systems. The two-cell stabilization lagoon process does not generate solids on an ongoing basis. Solids settle to the bottom of the primary and secondary lagoon, accumulate, and are anaerobically digested over long periods of time. Historical sludge judge data will be analyzed to determine future potential dredging, dewatering, and disposal needs. Alternatives to be explored for biosolids management include: 1) no-action; and 2) development of a biosolids dredging, dewatering, bacterial injection, and disposal plan.

Each viable alternative for the collection system and Wastewater Treatment Plant (WWTP) will be further developed and evaluated in detail including a description, flow schematic, and the estimated capital and Operation and Maintenance (O&M) costs will be provided. A present worth analysis of the most cost effective alternatives will be developed taking into consideration the estimated capital and O&M costs, and salvage value for a 25-year planning period. Feasibility and potential ramifications of the no-action alternative will also be described and evaluated.

The alternatives evaluated will be presented to the City for information and gathering feedback.

4.1 Collection System Alternatives

Extraneous water may enter sewers from unintended sources, either from surface water, groundwater, through defects or direct illicit connections. Sewer defects are pipe system deficiencies resulting from system aging, structural failure, lack of proper maintenance, and/or poor construction and design practices.

The City of Scio's collection system currently has excessive Inflow and Infiltration (I/I). In an effort to systematically and continuously address peak flows, I/I reduction projects should be identified, prioritized, and scheduled annually. Reducing I/I is critical to maintain the performance of the collection system, release trapped capacity, and minimize peak flows conveyed to the WWTP.

Currently, I/I in the City's collection system exceeds Environmental Protection Agency (EPA) guidelines. Depending upon further thorough investigations, I/I mitigation alternatives may include lining or replacing pipelines to repair separated joints and holes. In addition, manhole repair is necessary in several cases to correct exfiltration and infiltration. Several deficient manholes were identified during smoke testing and flow mapping activities.

I/I Reduction

Additional I/I reduction projects are necessary to decrease peak flows in the collection system and at the WWTP. Accordingly, a continuous I/I monitoring and reduction program should be implemented by the City. Reducing I/I will release capacity occupied by I/I, help the performance of the collection system, as well as decrease future capital and operational expenditures at the WWTP.

One option for the mitigation of peak flows is the implementation of I/I construction projects. These projects may include catch basin disconnects, inversion lining or pipe replacement projects. In addition, manhole repair should be included to correct deficiencies.

Alternatives

<u>No-Action</u>

The I/I can result in wastewater flows exceeding the capacity of the pipes, causing backups, and potentially causing sanitary sewer overflows. Rain-induced sewer flows can also hydraulically overload wastewater treatment plants, and ultimately require oversized, and energy intensive unit processes. Exfiltration can erode the soil and potentially lead to groundwater contamination. The no action alternative continues to allow extraneous water into the collection system thereby overwhelming the capacity of the aged collection system.

<u>Conduct Annual I/I Investigation and Reduction Projects</u>

Conduct CCTV inspections based upon field results obtained from smoke testing and flow mapping. Perform remedial actions to reduce I/I. Focus on problems outlined in historical CCTV inspections, flow monitoring and smoke testing reports. Serious maintenance and repair issues will be corrected as funding sources become available. It is recommended that the City establish a contract with an outside party to ensure that future collection system emergencies can be dealt with and lines can be maintained with use of vacuum trucks and other maintenance equipment.

Several proposed improvement projects were identified based on results from system evaluation survey methods; smoke testing and flow mapping. It is recommended that the proposed improvements take place in order of priority based on the severity of deficiencies and completed when funding becomes available within the City's budget. Note that when sewer pipe sizes remain the same, rehabilitation should be considered as an alternative to replacement when economically and technically feasible. Replacement versus rehabilitation should be evaluated on a case-by-case basis, early in the design phase. Conservatively, cost estimates provided herein are for complete replacement. The estimated cost for each project is shown in Table 4.1.1. Figure 4.1.1 illustrates the project locations. The proposed collection system improvement projects are prioritized in levels as follows:

- **Priority Level I**
  - **Project 1.** *Replace/Rehabilitate existing 10-inch sewer along SW 2nd St. from MH 39 to MH 43.*
  - **Project 2.** *Replace/Rehabilitate existing 8-inch sewer along SW Beech St. from MH 37 to MH 39.*
  - **Project 3.** *Replace/Rehabilitate existing 10-inch sewer along SW Beech St. from MH 39 to MH 41.*
  - **Project 4.** *Rehabilitate existing dual 6-inch sewer running underneath Thomas Creek from MH 41 to MH 49.*

- **Priority Level II**
  - **Project 5.** *Replace/Rehabilitate existing 10-inch sewer along Main St. from MH 72 to MH 76.*
  - **Project 6.** *Replace/Rehabilitate existing 8-inch sewer between NE Ash and Main St. from MH 68 to clean-out on NE 1st Ave.*
  - **Project 7.** *Replace /Rehabilitate existing 8-inch sewer on SE 1st Ave. from clean-out to MH 48.*
  - **Project 8.** *Replace/Rehabilitate existing 8-inch sewer between SE Ash St. and Main St. from MH 32 to MH 48, and from MH 48 to the eastern clean-out.*

- **Priority Level III**
  - **Project 9.** *Replace/Rehabilitate existing 8-inch sewer along SE Ash St. from MH 22 to MH 30.*
  - **Project 10.** *Replace/Rehabilitate existing 8-inch sewer along SE Birch St. from MH 23 to MH 24.*
  - **Project 11.** *Replace/Rehabilitate existing 10-inch sewer along NW Cherry St. from MH 55 to MH 57.*
  - **Project 12.** *Replace/Rehabilitate existing 8-inch sewer along NE Ash St. from MH 69 to clean-out just south of MH 70.*

TABLE 4.1.1
COST ESTIMATES FOR SEWER MAIN REPLACEMENT/REHABILITATION PROJECTS

Project No.	Phase	Length (ft)	Construction Cost	Total Project Cost
1	1	850	$310,700.00	$425,700.00
2	1	1100	$432,200.00	$591,200.00
3	1	1300	$494,200.00	$676,200.00
4	1	1300	$448,200.00	$613,200.00
5	1	1300	$459,200.00	$627,200.00
6	1	2300	$840,200.00	$1,149,200.00
7	1	600	$217,200.00	$298,200.00
		Subtotal **Phase I**	$3,201,900.00	$4,380,900.00
8	2	1900	$752,200.00	$1,028,200.00
9	2	1350	$506,700.00	$693,700.00
10	2	1000	$373,200.00	$510,200.00
11	2	600	$238,200.00	$326,200.00
		Subtotal **Phase II**	$1,870,300.00	$2,558,300.00
12	3	700	$287,200.00	$394,200.00
13	3	2200	$760,200.00	$1,040,200.00
14	3	750	$287,700.00	$394,700.00
15	3	500	$225,200.00	$309,200.00
16	3	800	$303,200.00	$415,200.00
17	3	750	$278,700.00	$381,700.00
18	3	1800	$572,200.00	$782,200.00
19	3	600	$254,200.00	$348,200.00
20	3	1150	$461,700.00	$631,700.00
21	3	2500	$927,200.00	$1,267,200.00
		Subtotal Phase III	$4,357,500.00	$5,964,500.00
		Total	$9,429,700.00	$12,903,700.00

It is recommended that the City implement a TV program for the entire collection system over a five-year period (video inspect 20% of the collection system per year) and continue to repeat the TV inspections at five-year intervals. Table 4.1.2 lists the annual cost to fund the proposed CCTV program.

TABLE 4.1.2
ANNUAL TV PROGRAM COST ESTIMATE

Item	Total Cost
Annual CCTV Program	$11,000
Total	**$55,000**

As stated in the infiltration and inflow study, approximately 30% of all manholes examined had visible signs of leakage or damage. The City should adopt a manhole repair program immediately to limit infiltration from high groundwater levels during the winter, and address other areas of concern that may arise. Examples of manholes exhibiting the need for rehabilitation can be found within the supporting Smoke Testing Report, located in Appendix B. Assuming 100% of the manholes are repaired, Table 4.1.3 below provides the estimated cost.

TABLE 4.1.3
MANHOLE REPAIR PROGRAM COST ESTIMATE

Item	Total Cost
Manhole Repair Program	$162,400

<u>Inversion Lining</u>

Two 6-inch Ductile Iron (D.I.) pipes convey wastewater from the north side of Thomas Creek to the south side, where Beech St. Pump Station is situated. Based off of the flow analysis conducted by The Dyer Partnership, there appears to be excessive water infiltration from the river into the 6-inch pipes. Although the pipes are encased for protection, potential for river infiltration is still likely.

Inversion lining is a method of pipe rehabilitation wherein a new pipe liner, impregnated with resin, is cast along the inside of existing pipes to increase performance, stop leakage, and improve life span. The cost of inversion lining is approximately $100 per linear foot. If the ductile iron lines exhibit excessive corrosion (1 inch in thickness) or other buildups such as fats, oils, and greases, the cost per linear foot could exceed $100. The combined length of both 6-inch pipes is approximately 300 ft. The total cost for lining both pipes is shown in Table 4.1.4 below. Detailed cost estimates showing additional costs for this project are located in Appendix B.

Compared to the alternative of completely replacing the inverted siphon, which presents many challenges, lining the dual 6-inch pipes is a cost-effective alternative that achieves the desired result of eliminating inflow from Thomas Creek, improving pump station performance. Maintaining adequate hydraulic capacity within the inverted siphon is critical to the success of this alternative. Manning's Equation is a widely used and accepted tool for calculating pipe flow and/or velocity given physical properties of the pipe such as the inside diameter, roughness coefficient, hydraulic radius, and slope. A slight reduction in inside pipe diameter may occur when using cured in place liner, and thicknesses vary depending on the type of liner used. However, for 6-inch pipes, total inside diameter reduction typically does not exceed one inch. It is also worth considering that pipes are thoroughly cleaned before liner placement occurs, effectively increasing the pipe diameter back to its original extent due to the removal of corrosion and grease buildup. Additionally, the roughness coefficient related to liners cured with epoxy is similar to or less than that of new ductile iron, and could also help to maintain or increase hydraulic capacity. It is recommended that the City pursue this alternative over complete reconstruction for this specific project.

Recently, it was discovered that a drop exists within the 6-inch lines feeding into the manhole preceding the pump station wet well. Within recent years, flow has never been observed coming out of the existing drop. It is likely that the drop has been plugged for many years and was finally unclogged after the area experienced high rainfall, raising water levels in Thomas Creek and within the manhole up 14 feet, dislodging the blockage.

TABLE 4.1.4
INVERTED SIPHON LINING COST ESTIMATE

Item	Cost Estimate
Construction	$121,300

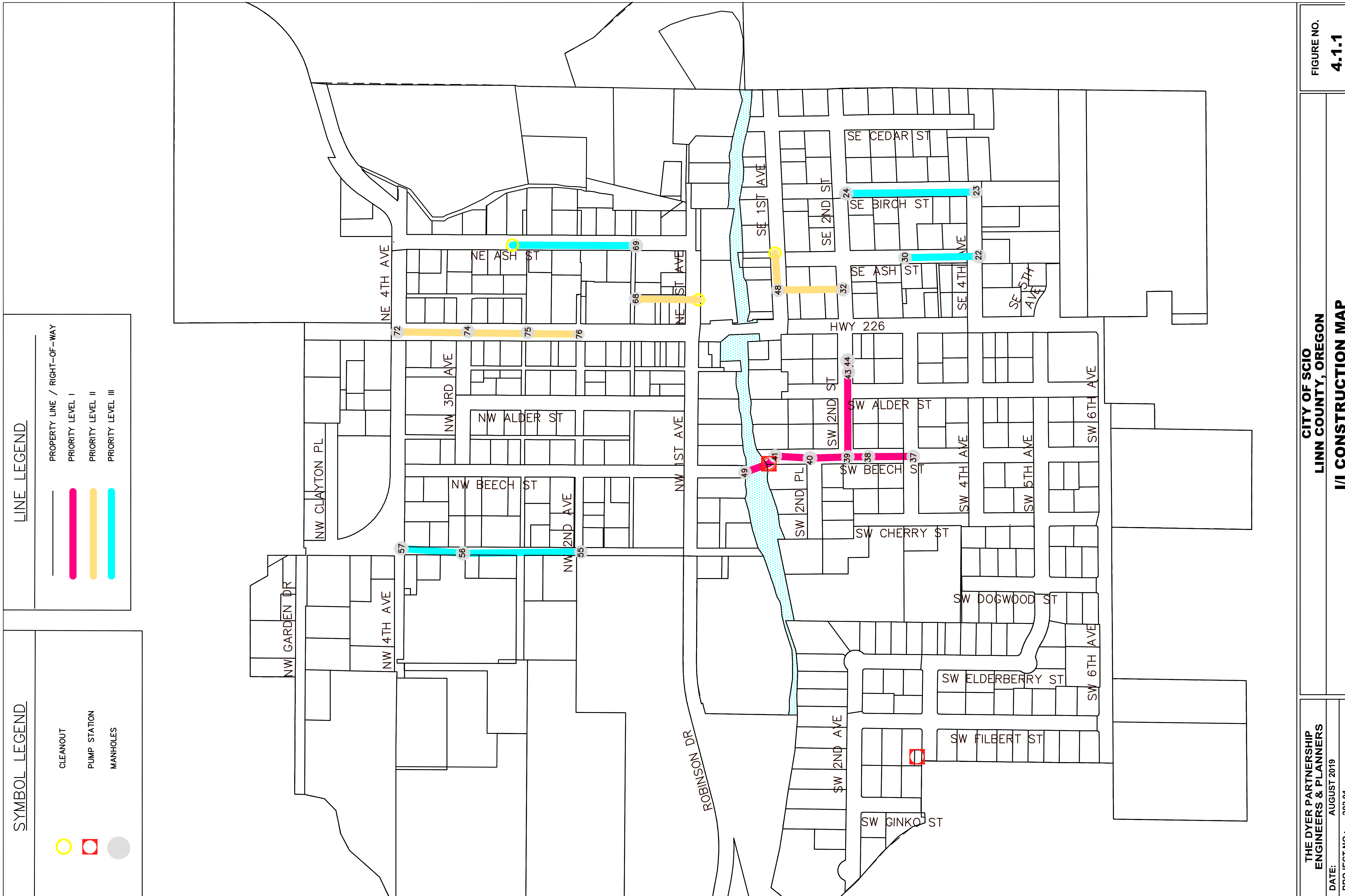


FIGURE NO.
4.1.1
CITY OF SCIO
LINN COUNTY, OREGON
I/I CONSTRUCTION MAP
THE DYER PARTNERSHIP
ENGINEERS & PLANNERS
DATE: AUGUST 2019
PROJECT NO.: 202.01
LINE LEGEND
PROPERTY LINE / RIGHT-OF-WAY
PRIORITY LEVEL I
PRIORITY LEVEL II
PRIORITY LEVEL III
SYMBOL LEGEND
CLEANOUT
PUMP STATION
MANHOLES
SE CEDAR ST
SE BIRCH ST
SE ASH ST
NE ASH ST
HWY 226
SW ALDER ST
NW ALDER ST
SW BEECH ST
NW BEECH ST
SW CHERRY ST
SW DOGWOOD ST
SW ELDERBERRY ST
SW FILBERT ST
SW GINKO ST
SE 1ST AVE
SE 2ND ST
SE 4TH AVE
SE 5TH AVE
NE 1ST AVE
NE 4TH AVE
NW 3RD AVE
NW 1ST AVE
NW 2ND AVE
NW 4TH AVE
NW CLAYTON PL
NW GARDEN DR
SW 2ND ST
SW 2ND PL
SW 4TH AVE
SW 5TH AVE
SW 6TH AVE
SW 2ND AVE
ROBINSON DR
69
68
72
74
75
76
57
56
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48
32
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23
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22
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41
40
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38
37
49

I/I Reduction Recommendation

It is recommended that the City immediately pursue the replacement of sewer mains exhibiting large amounts of I/I and visible signs of deterioration identified in Table 4.1.1. Along with infiltration problems, the threat of exfiltration of sewage into the surrounding soil is becoming more apparent as new TV inspection videos are found. Due to an aging infrastructure and questionable construction methods used in the past, the City of Scio faces a major challenge with infrastructure improvements.

Further exploration of the City's sewer lines through a CCTV program, identified in Table 4.1.2, will help highlight more areas that need to be addressed as soon as possible. While collection system improvements are conducted, and after major lines have been replaced, reassessment of the WWTPs influent wastewater flows and pump run times should be performed to track the progress made in eliminating I/I. The City should adopt a TV line inspection and cleansing, root cutting program ,and a manhole repair program with an outside contractor. Identifying more sewer laterals, manholes and mains that need repair will help to eliminate sources of I/I and improve collection system performance.

Collection System Expansion

An analysis of future expansion requirements for the collection system involved identifying likely areas of expansion and determining the probable impacts of expansion on the existing system. Future growth will likely occur within the City's Urban Growth Boundary (UGB), as developers have already expressed interest in developing the northeastern portion of town. New connections to the existing gravity sewer system will primarily occur by providing service to vacant lots dispersed throughout the UGB.

Alternatives

<u>No-Action</u>

This action prevents the expansion of the collection system by not providing sewer or water connections to new residential or commercial users.

<u>Provide Service as Required for Future Development</u>

This option allows expansion of the City's sewer system to new users located throughout the UGB. The areas of proposed service expansion are scattered throughout the City's UGB. New residential and commercial connections will be added as lots are developed.

Collection System Expansion Recommendation

It is recommended that the City provide sewer service as required for future development without further analysis because it is consistent with the City's Comprehensive Development Plan. Future collection system expansion elements will be constructed through private development and/or as funding becomes available through formation of Local Improvement Districts (LIDs), grants, System Development Charges (SDCs), and/or loans. When collection systems are expanded, it is the developer's responsibility for making sure future developments do not exceed the capacity of the existing collection system, and can properly tie in to existing utilities.

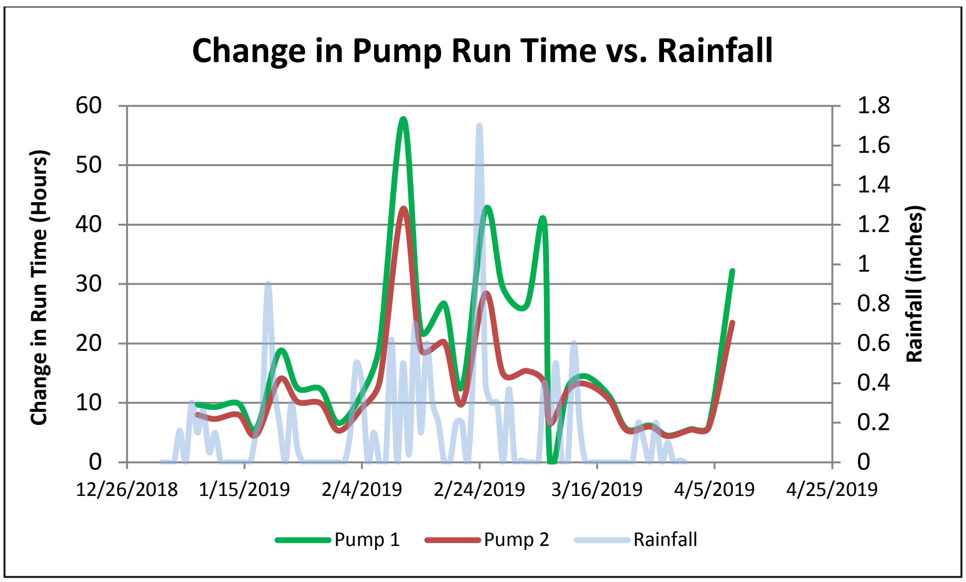
4.2 Existing Pump Station Improvements

The collection system includes two pump stations. Each pump station was analyzed to determine improvement requirements during the twenty year planning period. A summary of the recommended improvements to the pump stations is provided in this section.

Beech St. Pump Station

Beech St. Pump Station receives the majority of the City's wastewater flows. Additional capacity is required for future developments. Population growth within the City can easily lead to an exceedance of the available capacity. The existing dual submersible pumps require excessive repairs and maintenance. The existing telemetry system is unreliable and needs to be replaced to help address problems in a timely manner. Pump run times recorded during recent heavy rainfall periods that are plotted against rainfall suggest high I/I rates, as shown in Figure 4.2.1.

FIGURE 4.2.1
BEECH STREET PUMP STATION OPERATION VS. RAINFALL



Pump No. 1 required maintenance on 3/11/2019, which is depicted by the sudden drop in run time in Figure 4.2.1. After it was rebuilt, the pumping capacity improved and matched that of the second pump. The change in run time during high rainfall increases significantly, and it is obvious that Beech St. Pump Station is experiencing excessive I/I. On 4/9/2019, Thomas Creek experienced rising water levels due to persistent heavy rainfall accompanied by snow melt. Standing water within the inverted siphon manholes was level with the river, forcing the pumps to work continuously and simultaneously.

The Oregon Department of Environmental Quality (DEQ) Oregon Standards for Design and Construction of Wastewater Pump Stations require pump stations to have a rated capacity of the five-year, peak hourly wet-water flow or the 10-year, peak hourly dry weather flow, whichever is higher. The projected peak instantaneous flow for the City of Scio is 0.89 Million Gallons per Day (MGD), which greatly exceeds the current pump station capacity. Along with being undersized, the rim elevation of the wet well manhole is below the current 100-year floodplain elevation specified by the Federal Emergency Management Association (FEMA).

Alternatives

No-Action

Disregarding the need for additional pumping capacity will result in hydraulic overloading of the lift station in the future. Overflow would make its way into the nearby Thomas Creek and pollute the river with municipal waste, potentially resulting in large fines to the City. Left unaddressed, the pumps will continue to require frequent repair and replacement work. Future developments, along with I/I problems, make it apparent that the no-action alternative is infeasible.

New Submersible Pump Station

Future developments will likely be constructed on the property located within the UGB east of NE Ash St. A new submersible pump station could be constructed to take excess load off of the existing pump station and function as to primarily serve newer developments such as the Thomas Creek Estates Pump Station. Locating a new pump station within the new development would save Beech St. Pump Station from additional municipal loading. Force mains from the new pump station would have to travel all the way to the wastewater treatment plant. This would increase the cost of installing a new pump station to serve future developments. Additionally, Beech St. Pump Station already experiences difficulties with the areas it serves, and will still be subject to excessive hydraulic loads. Therefore, if a new submersible pump station is to be constructed, it should replace the existing Beech St. Pump Station at its current location to ensure adequate sizing for current and future loading. This alternative includes the demolition of the existing self-priming pumps. New duplex submersible pumps, controls, effluent piping and valve vault would provide adequate capacity for the 20-year design period.

Table 4.2.1 summarizes the construction cost estimate for installing a new submersible pump station to replace the existing pump station.

TABLE 4.2.1
NEW SUBMERSIBLE PUMP STATION COST ESTIMATE

Item	Cost Estimate
Construction	$750,000

Upgrading Existing Pump Station

Retrofitting Beech St. Pump Station to adequately serve the current amount of flow, as well as future flow caused by growth, is a cost-effective alternative that should not be overlooked. New dual submersible pumps with a rated performance of 550 gallons per minute (gpm) with variable speed options for normal operation at 225 to 250 gpm would replace the existing pumps, without needing to increase the size of the wet well. The peak instantaneous flow would be met, and the likelihood of overflow would be significantly reduced. The existing five-foot diameter wet well housing the pumps and adjacent manhole has exhibited significant signs of infiltration during periods of high groundwater, and would need to be addressed with an epoxy coating. Epoxy resin or cementitious grout can be injected and applied into the existing concrete wet well. This method of repair is effective in providing water resistance, while also providing additional structural stability. Figure 4.2.2 shows a leak in the wet well wall during a site visit. Additionally, a video was taken in 2005 showing significant leakage beneath the 6-inch pipes at the area of protrusion from the adjacent manhole wall. It is difficult to determine the exact amount of groundwater infiltrating the wet well, but it is certainly in need of repair.

FIGURE 4.2.2
WATER INFILTRATION IN BEECH STREET PUMP STATION

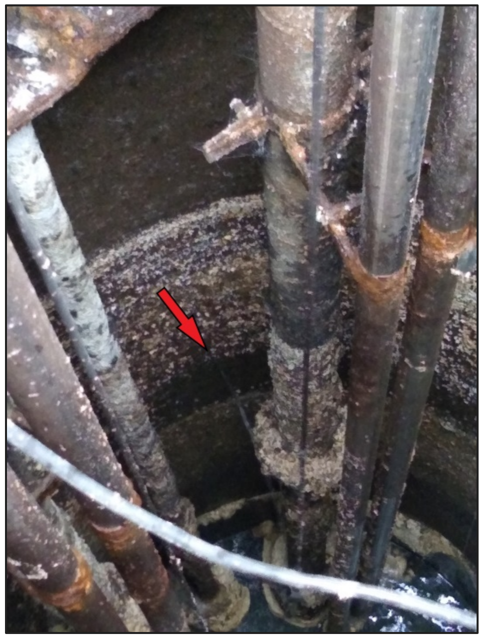


Table 4.2.2 summarizes the construction cost estimate for installing a new submersible pumps. Detailed cost estimates are included in Appendix C.

TABLE 4.2.2
SUBMERSIBLE PUMP SYSTEM UPGRADE COST ESTIMATE

Item	Cost Estimate
Pump Station Upgrade	$473,900

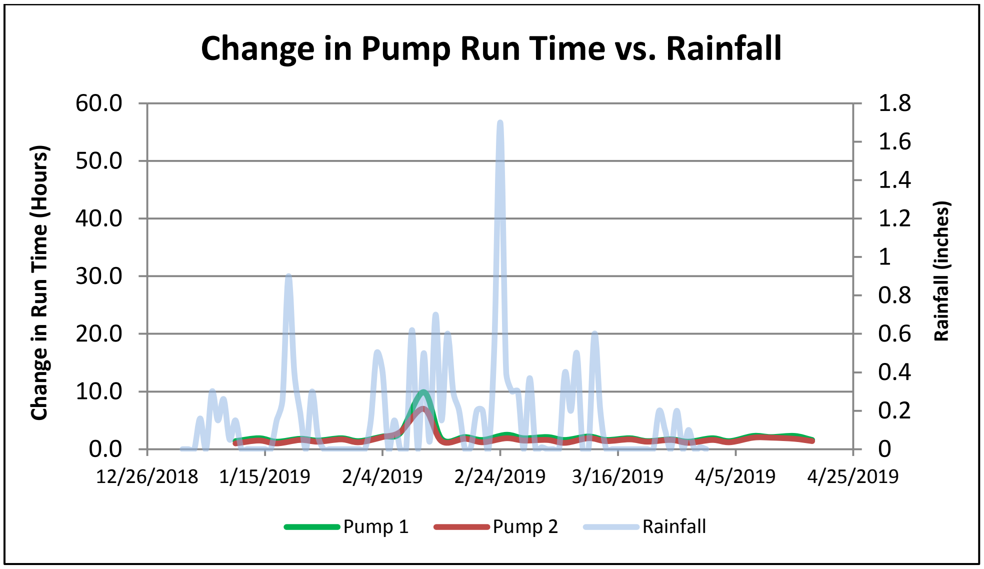
Beech St. Pump Station Recommendation

The existing pump station presents significant challenges and maintenance difficulties. Installing a new submersible pump station would be very expensive due to spatial limitations and close proximity to Thomas Creek. Replacing the existing wet well would be unnecessary since the size does not need to be increased. Based on the City's budget and other priorities, repairing Beech St. Pump Station with epoxy or cementitious material, and installing new submersible pumps with new controls, is the recommended alternative because it is much more economically feasible and achieves the same desired result. Appendix B contains preliminary pump recommendations with their associated specs and pump curves.

Thomas Creek Estates Pump Station

The relatively new development of Thomas Creek Estates takes up approximately 19 acres of the southwestern portion of the City. Newer developments are built using improved construction techniques, materials, and technologies. Therefore, infiltration and inflow contributions are kept to a minimum compared to older infrastructure. This was confirmed in the infiltration and inflow studies completed as part of this Wastewater Facilities Plan. Figure 4.2.3 shows pump run times for Thomas Creek Estates Pump Station during recent periods of heavy rainfall.

FIGURE 4.2.3
THOMAS CREEK ESTATES PUMP STATION OPERATION VS. RAINFALL



Compared to Figure 4.2.1, which uses the same rainfall data, it becomes clear that Thomas Creek Estates Pump Station does not experience significant I/I, and has no problem keeping up with extraneous flows. Given that proper maintenance continues, the pump station does not need any additional upgrades or replacement within the 20-year design period, and will not be explored further in this report.

4.3 Wastewater Treatment Facility Improvements

General Assessment

The facultative lagoon cells are the primary biological process used for treatment of the City's wastewater. The City currently has no problem in meeting discharge permit requirements. Occasional algae blooms following winter periods raise concern for suspended solids removal and chlorine usage. Special permission from DEQ has never been needed to discharge outside acceptable permit dates, but the City has historically come close to needing it. Due to significant amounts of I/I during heavy rainfall, the system has the potential to become hydraulically overloaded during major storms. Lagoon treatment systems offer low Operation and Maintenance (O&M) costs. Considering a projected population growth of 108 persons over the 20-year planning period, the lagoons are not in need of any immediate expansion.

The City has yet to remove sludge buildup that has accumulated over the years at the bottom of both lagoon cells. Excess sludge buildup can inhibit the efficacy of natural biological treatment offered by lagoon systems. Lagoon turnovers, a process in which the bottom anaerobic zone comprised of sludge, gas, and water mix with the top aerobic zones, are caused by thermal stratification, wind, and low levels of dissolved oxygen. Lagoon turnovers release unpleasant odors, as the gases released by anaerobic digestion are not processed by facultative and aerobic bacteria. Turnovers can indicate that lagoon systems may be septic, which is caused by a lack of dissolved oxygen. As temperatures increase on the surface, aerobic bacteria activity increases, resulting in a spike of dissolved oxygen consumption. Consequently, the anaerobic zone rises and mixes with the entire lagoon, lowering the dissolved oxygen further. Without removal of sludge accumulation, Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) effluent concentrations can quickly become difficult to manage.

Influent Fine Screen

Influent fine screening is a physical unit process by which solids are removed from the waste stream. Fine screening removes solids that could, if not removed, damage or clog wastewater process equipment or decrease treatment reliability and efficiency. Fine screens are also commonly used to replace primary treatment at small WWTPs and can remove both influent TSS and BOD_5. Fine screens are classified as screens with openings that range between 0.02 inches to 0.25 inches.

The City currently has a Comminutor that breaks down large solids, only to redistribute them into the lagoon cells. Installing a headworks screen that removes the majority of solids before it settles on the bottom of the lagoon cells would help to increase biological capacity, and reduce the frequency at which dredging is required.

Alternatives

No-Action

Solids will continue to settle at the bottom of lagoon cells. In lieu of a sludge removal program, the lagoon system will exceed biological capacity. Non-biological sediments and metals that are not treated by lagoon systems can make their way into Thomas Creek through the effluent outfall during discharge periods. The existing Comminutor will continue to require operation and maintenance and not address the issue of solids entering the lagoon system.

Construct a New Fine Screen

This alternative includes the addition of a new fine screen. The proposed screen is a Kusters Water Model ICSS-2/6 Screw Screen with 6-millimeter (1/4-inch) clear openings and a minimum channel width of 1.15 feet. The new fine screen would be designed for the future peak instantaneous flow rate of 0.89 MGD. Solids would be transported through a conveyor to be compacted, cleaned, dewatered, and discharged to be hauled to a landfill. Table 4.3.1 summarizes the cost estimate for adding a fine screen and constructing a concrete channel that ties in to existing influent lines and feeds into the existing transfer pump station.

TABLE 4.3.1
FINE SCREEN INSTALLATION COST ESTIMATE

Item	Cost Estimate
Fine Screen	$514,200

Influent Fine Screen Recommendation

Constructing a new influent fine screen is recommended. This alternative provides fine screening capacity for existing and future flows.

Grit Removal

Grit removal is not included at the existing wastewater treatment facility. Instead, grit is allowed to pass through headworks and accumulate in the aerated lagoon. Grit removal is infrequent and burdensome. Grit in wastewater consists of sand, gravel, or other heavy solid material. Grit removal is required to reduce accumulation of heavy deposits in aeration basins, pipes, channels, and to avoid excessive wear on mechanical equipment caused by abrasion. Grit removal consists of the following processes: 1) grit separation; 2) grit washing; and 3) grit dewatering.

Alternatives

No-Action

The WWTP does not currently include grit removal. Grit removal systems are not necessary for smaller cities with facultative sludge lagoons acting as their main biological treatment process. Unless the City decides to construct a mechanical treatment plant, a grit removal system will not be necessary.

Construct Grit Removal System

If the City pursues the construction a mechanical treatment plant, a vortex grit removal system would be constructed immediately prior to the influent fine screen. Grit collected in the system would be cleaned and disposed of in a bagger system located within a small dumpster. Table 4.3.2 summarizes the cost estimate for adding a grit removal system. Detailed cost estimates are included in Appendix C.

TABLE 4.3.2
GRIT REMOVAL SYSTEM COST ESTIMATE

Item	Cost Estimate
Construction	$719,900

Biological Treatment

The City of Scio has relied on facultative lagoons to maintain permit compliance throughout the City’s history. Since the City has consistently maintained permit compliance, there is no need to greatly alter the existing biological treatment system. Wastewater treatment alternatives were evaluated for their suitability and applicability, given existing and future flows, as well as discharge requirements. The following treatment improvement concepts were reviewed as initial alternatives:

1. I/I Reduction Only (no improvement of existing WWTP)
2. No-Action
3. Facultative Lagoon Upgrades
4. Sequencing Batch Reactor (SBR) and Lagoon Conversion – Mechanical Plant

Design parameters used as a basis for evaluation of alternatives, including flow and load projections for the 2044 planning period and NPDES Permit requirements, were established in Section 3.

Alternative Analysis

I/I Reduction Only

One alternative is to only conduct I/I reduction projects without a plan for major improvements to the existing wastewater treatment facilities. During smoke testing and flow mapping endeavors, several collection system deficiencies were identified. The I/I mitigation projects could have a tremendous impact on reducing wet weather flows.

Infiltration and inflow control efforts present a significant challenge. As cracks and leaks in one part of the system are corrected, groundwater migrates through bedding to adjacent deficiencies. Identifying and repairing public sewer deficiencies is often not enough. A portion of the I/I is typically isolated to the private service laterals. More often, utilities and regulatory agencies recognize the need to combat I/I in a holistic approach that addresses both public collection system components and private sources. The privately owned portions of the sewer system have the potential to contribute significantly to I/I flows. In some cities, it is estimated that as much as 60% of the I/I flows originate from service laterals (US Environmental Protection Agency, 1996). According to a 2015 Water Environment Federation (WEF) I/I survey, 31% of the respondents noted private I/I sources contributing 50 to 75% of the I/I, and 36% of the respondents contributing 20 to 50%. As a relatively local example, the City of McMinnville, Oregon estimates that approximately 60% of the City's I/I originates from their private sewer laterals.

Collection system improvements are necessary and recommended to address excessive I/I. Although collection system improvements are the City's primary concern, addressing them will not negate the need for future wastewater treatment plant upgrades. Alternatively, a common approach is to first implement collection system improvement projects, and then re-analyze flows prior to authorizing wastewater treatment plant improvement projects. Under this approach and methodology, collection system improvement projects will likely reduce peak wastewater flows, resulting in comparatively smaller and more affordable WWTP improvements.

<u>No-Action</u>

Under the no-action alternative, no improvements would be made to the existing collection system or WWTP. The WWTP has excessive buildup of solids and will become biologically undersized in the future if left unaddressed. Continuing to operate the existing wastewater treatment plant without any expansions would eventually result in noncompliance and recurrent exposure to fines. Without collection system improvements, I/I will continue to increase and overload pump stations and the WWTP. This alternative is not recommended.

Liquid-Stream Treatment Alternative

In this section the treatment alternatives are evaluated in more detail to determine the most cost-effective and suitable alternative for the City of Scio.

<u>Facultative Lagoon Upgrades</u>

Although the City does not violate discharge limits, it is worthwhile to incorporate additional biological treatment alternatives to the existing lagoon system so that violations are less likely to occur with future industrial, commercial, and municipal growth. High concentrations of algae are generated in the facultative lagoons, which is a common problem with these types of treatment systems. Algal solids are difficult to effectively remove and manage, and are consequently continuously recycled within the system, and infrequently wasted. Algae have continued to make their way to the chlorine contact basin from the lagoons, and cause excessive consumption of sodium hypochlorite. Furthermore, algae presence in effluent threatens the ability of the City to comply with the Total Suspended Solids (TSS) requirement in the future. While algae are an important component in lagoon systems by providing dissolved oxygen, it is important to keep population levels under control to avoid these issues. If TSS levels are too high, the City may not be able to discharge until the problem is addressed. The inability to discharge enough treated effluent in the winter months prevents efficient treatment and adequate flow equalization that takes place in the lagoon cells.

Lagoon aeration and mixing provides improvements to the treatment system by supplying most of the mixing energy required by all treatment ponds. Effective mixing reduces effluent algae, biochemical oxygen demand, and total suspended solids concentration. It can also help stabilize ammonia, phosphorus, and pH levels. Although the City has no permit limitations regarding ammonia and phosphorus, discharge regulations may increase over time and compliance becomes more difficult. Continuous mixing prevents formation of surface films comprised of fats, oils, and greases; it also allows gases such as methane to be released which increase anaerobic digestion of biosolids at the bottom of lagoon cells. Temperature stratification occurs in the summer where the top portion of the water column is heated, which increases algae growth. Most of the oxygen production is lost to the water-atmosphere interface, instead of benefiting the facultative and anoxic sludge zones that lie below. By introducing more dissolved oxygen into facultative zones, ammonia and BOD reducing bacteria can break down organic solids more effectively, thus reducing the frequency at which dredging takes place.

Two floating mixers are recommended to be placed in the lagoon cells; one unit in the primary cell and one unit in the secondary cell in the section where the outlet is located. Each mixer includes a 10 to 20 foot adjustable intake hose that can be set to achieve optimal mixing conditions for each location. Table 4.3.3 summarizes the preliminary design data for the mixer units.

TABLE 4.3.3
MIXING EQUIPMENT PRELIMINARY DESIGN DATA

Item	Specification
Number of Units	2
Adjustable Intake Hose Length (ft)	10-20
Drive Type	Direct
SS Tethering Cable Length (ft)	200-350
SCADA Brain-Board	Yes
Number of Outputs	6
Energy Consumption	Solar

The advantages of this system include relatively low up-front costs, and minimal operation and maintenance costs. Utilizing solar technology minimizes power demands. Biological treatment capacity will increase with the addition of the mixing units. No further wastewater treatment plant modifications are required other than the addition of the floating units and cables to secure them in place. The facultative lagoons still provide primary treatment and the system does not depend on the mixing units should performance issues arise. This is a highly versatile option for the City.

The cost estimate of incorporating mixer technology into the lagoon system is provided in Table 4.3.4. Detailed cost estimates are included in Appendix C. The total present worth estimate assumes a 20 year term and 3.5% interest. Note that operation and maintenance costs do not include existing O&M costs within the current City budget. It is assumed that the mixer units have no salvage value for conservative purposes.

TABLE 4.3.4
MIXER UNITS COST ESTIMATE

Item	Cost Estimate
Construction	$229,900
Annual O&M	$1,500
Total Present Worth	$251,300

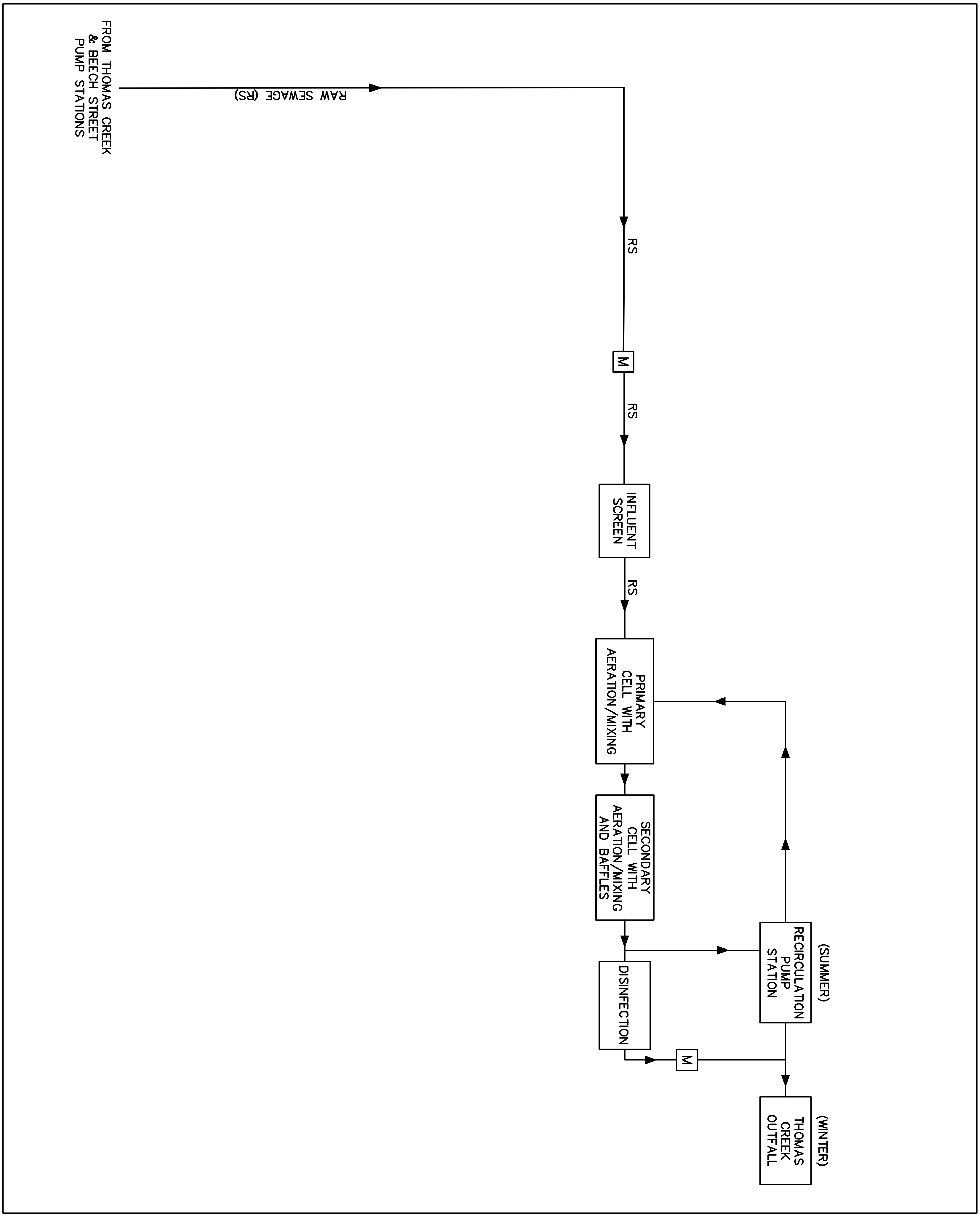
Lagoon systems utilize the natural and complex process of bacteria breaking down organic wastes over time. For an effective lagoon system to operate, adequate detention time is required for the process to take place between the influent and effluent locations. If lagoon systems are not properly designed, short circuiting can occur in which untreated wastewater reaches the discharge point before biological contaminants are properly broken down. Lagoon baffles are common equipment used to prevent short circuiting and provide adequate detention time for facultative lagoon systems. The City of Scio currently has two lagoon baffles in the secondary cell that are clearly in a state of disrepair. It is unlikely that the existing baffles are sufficiently serving their purpose; it is more possible than not they are allowing some short circuiting to take place. Given the overall detention time calculated in Section 2, baffle replacement will improve the City's ability to maintain quality effluent.

Table 4.3.5 shows the cost estimate of baffle replacement in the secondary cell. Detailed cost estimates are included in Appendix C. The total present worth estimate assumes a 20 year term and 3.5% interest. Note that operation and maintenance costs do not include existing O&M costs within the current City budget. It is assumed there is no salvage value for the lagoon baffles for conservative purposes.

TABLE 4.3.5
LAGOON BAFFLE REPLACEMENT COST ESTIMATE

Item	Cost Estimate
Construction	$51,500
Annual O&M	$500
Total Present Worth	$58,700

Figures 4.3.1 and 4.3.2 below depict the lagoon upgrade process flow diagram and a preliminary site layout for this alternative, respectively.



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SCIO*** ***WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN***	FIGURE NO.
DATE: AUGUST 2019 PROJECT NO.: 202.01	***OPTION #1 PROCESS DIAGRAM***	***4.3.1***

THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	*CITY OF SCIO* *WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN*	FIGURE NO.
DATE: AUGUST 2019	*OPTION #1 SITE PLAN*	*4.3.2*
PROJECT NO.: 202.01		

<u>Sequencing Batch Reactor (SBR)</u>

Treatment in a SBR system is accomplished in a single reactor compared to what is done spatially in a flow-through activated sludge system and separate independently designed secondary clarifier. A typical operation sequence consists of four steps: fill, react, settle, and decant. The treatment sequence begins with the introduction of wastewater into a partially filled tank containing settled mixed liquor from a previous cycle (fill phase). In the react phase, aeration and mixing are provided for a length of time sufficient to produce an effluent of the desired quality.

With some SBR units, the fill and react phases are combined in an aerated fill step. After the react phase, the mixed liquor is then allowed to operate in a quiescent settling phase, after which the clear supernatant liquid is then subsequently decanted as effluent. Once the decant phase is completed, the system is ready for refilling. During the settle and decant phases in one tank, the other tank is undergoing the fill and react phases.

Since the process continually runs through cycles, automated controls are utilized to operate the treatment process. Key advantages of the SBR process include its simplicity and reliability, high operational flexibility, capability of very high and consistent effluent quality due to quiescent batch settling (less than 10 mg/L BOD_5, TSS), requirement of less Operator attention than most other mechanical systems, and ideal suitability to wide flow variations. With a SBR, based on discharge requirements of 30/50 mg/L BOD_5/TSS, tertiary treatment systems would not be required.

After preliminary treatment, the wastewater would then flow by gravity to a flow splitter that would divide the flow entering the SBR basins. The two-cell design under consideration is based on the type of SBR that contains a baffled inlet, which allows inlet flow even during the settling cycle without impairing treatment effectiveness. For maintenance purposes, all the inlet flows can be diverted to the other basin. There are a number of SBR vendors in the United States, some of which use a pure batch system and others that are designed for continuous feed.

Each SBR basin would consist of a concrete rectangular structure with a top water and bottom water level of 16 and 10 feet (approximate), respectively. In each basin, there would be a pre-react zone and mixers to inhibit filamentous growth that causes sludge bulking. Since each basin acts as an aeration basin and clarifier, no return activated sludge equipment is required. Scum would be removed by floating skimmers in each basin and sent back to the preliminary treatment process for dewatering and compaction. The waste sludge is pumped and measured from each basin to the biosolids management systems with small submersible pumps. Common wall construction would be utilized to minimize the SBR footprint and construction costs.

Since the SBR is a batch or semi-batch process, the effluent flow rate during a decant cycle is greater than the influent flows. The use of two cells provides adequate equalization allowing uniform downstream flows. The internal dimensions for each SBR basin is 38 feet long by 28.5 feet wide by 19 feet high for each of the two units. Compared with the other biological alternatives investigated, SBRs eliminate the need for Return Activated Sludge/Waste Activated Sludge (RAS/WAS) pumping facilities, separate clarifiers, and associated yard piping.

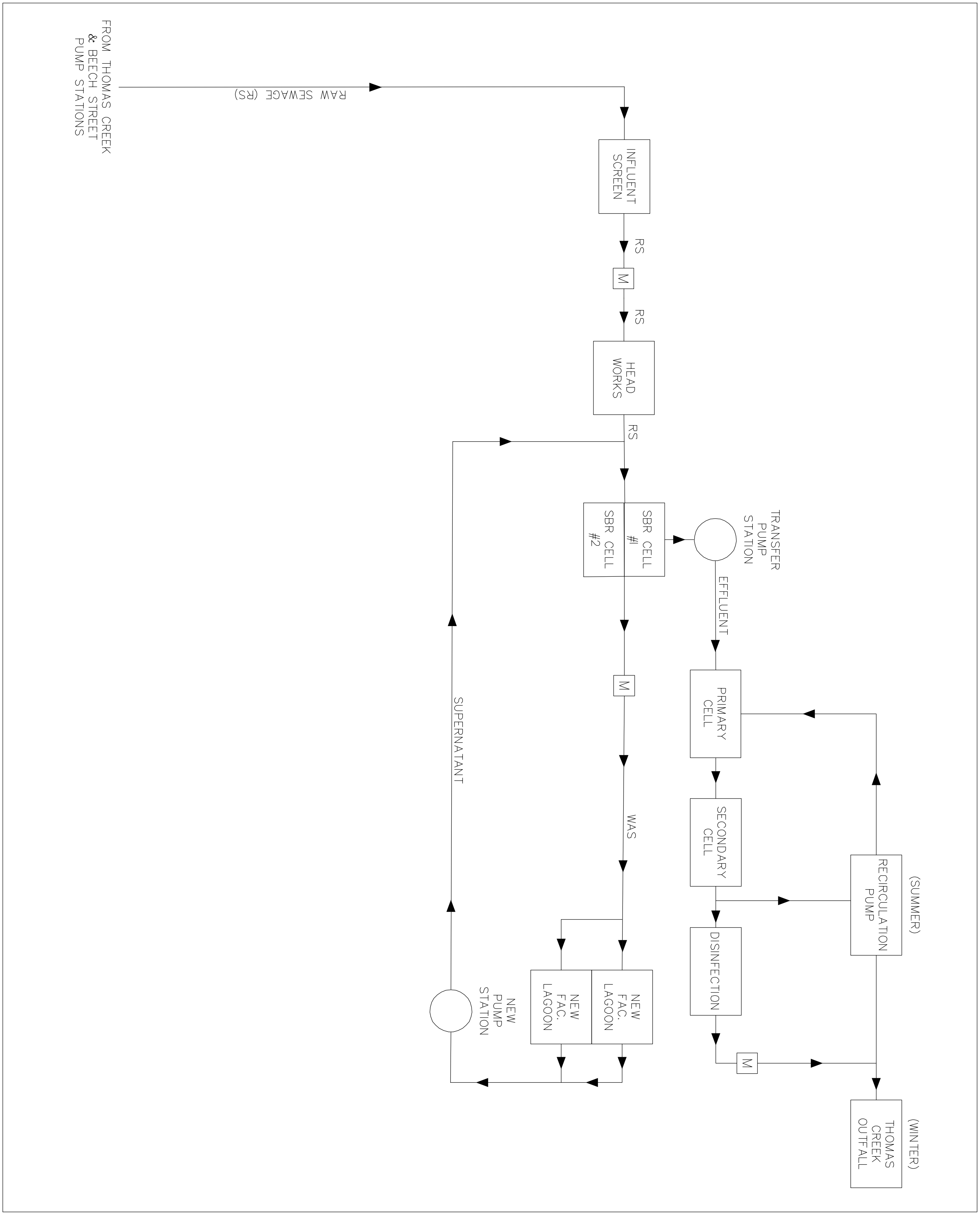
A SBR will require the modification of the existing primary and secondary aeration lagoons to create two smaller facultative lagoons. The facultative lagoons will act as stabilization ponds through aerobic and anaerobic processes for the WAS produced from the SBR during the decant phase. A water depth of seven feet for both facultative lagoons will support the desired microbial populations with three feet of solids and four feet of water. The facultative lagoons will be approximately 2.6 Million Gallon (MG) and 2 MG reducing the primary cell and secondary cell by 5.2 MG and 7.2 MG, respectively (See Appendix B).

A new pump station at the south end of the existing wastewater treatment plant property will convey supernatant back to the head of the SBR. Supernatant from the facultative lagoons will be drawn from the upper four feet of clear liquid to a seven foot deep wet well pump station with two submersible pumps. Two pumps sized between 1.5 to 2 horsepower will have adequate pumping capacity to convey the supernatant back to the SBR for treatment.

A summary of preliminary design data is listed in Table 4.3.6. Figures 4.3.3 and 4.3.4 depict a SBR treatment process diagram and a preliminary site layout for this alternative, respectively.

TABLE 4.3.6
SBR PRELIMINARY DESIGN DATA

Item	Specification
Operating Basins	2
Basin Dimensions (Internal – L x W x SWD), ft	35 x 12 x 16
HRT, days	0.59
Blowers, quantity	2
Air Demand/Basin, scfm @ 7.1 psig	110
MLSS, mg/L	4,675
Normal Decant Rate, GPM	398
Peak Decant Rate, GPM	542
WAS Pump, quantity	2
WAS Pump, capacity (gpm)	110
WAS, lb/day	110
WAS, gal/day	1,550
Effluent BOD_5, mg/L	30
Effluent TSS, mg/L	30



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SCIO*** ***WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN***	FIGURE NO.
DATE: AUGUST 2019 PROJECT NO.: 202.01	***OPTION #2 PROCESS DIAGRAM***	***4.3.3***

THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	CITY OF SCIO WASTEWATER FACILITY & COLLECTION SYSTEM MASTER PLAN	FIGURE NO.
DATE: AUGUST 2019	OPTION # 2 SITE PLAN	4.3.4
PROJECT NO.: 202.01		

The cost estimate of a SBR is provided in Table 4.3.7. Detailed cost estimates are included in Appendix C. The total present worth estimate assumes a 20 year term and 3.5% interest.

TABLE 4.3.7
SEQUENCING BATCH REACTOR COST ESTIMATE

Item	Cost Estimate
Construction	$5,955,540
Annual O&M	$165,000
Salvage Value	($50,000)
Total Present Worth	$8,275,500

<u>Present Worth Analysis</u>

Present worth cost comparisons for the biological treatment options are presented in Table 4.3.8 and Figure 4.3.5. Present worth costs are based on a 3.5% interest rate, and a 20 year term.

TABLE 4.3.8
PRESENT WORTH COSTS
BIOLOGICAL TREATMENT ALTERNATIVES

System	Capital Cost Estimate	Present Value O&M Estimate	Salvage Value	Total Present Worth
Baffle Replacement & Mixers	$281,400	$28,600	$(0)	$310,000
SBR	$4,954,540	$2,319,960	$(50,00)	$7,274,500

Biological and Treatment System Recommendation

The results above indicate that the lagoon upgrade option consisting of baffle replacement and the addition of mixing technology is much more financially feasible than the SBR alternative. The City does not violate discharge permit limitations, and is not in need of higher quality effluent. The lagoon treatment facility suits a small community such as the City of Scio that is expected to have little growth over the next twenty years. Economic factors play a significant role in the selection of treatment alternatives, and it is recommended that the City pursue baffle replacement and incorporation of mixers into the existing lagoon cells.

Disinfection Improvements

When discharging to the Thomas Creek outfall, the monthly *E. coli* geometric mean may not exceed 126 organisms per 100 mL; and no single sample may exceed 406 organisms per 100 mL. The existing disinfection system is a chlorine contact basin that is adequately sized for the current and proposed biological treatment alternatives. Detailed analysis of the disinfection system can be found in Section 2. It is felt that the disinfection system is suitable for use and will accommodate projected flows over the next twenty years; further analysis will not be conducted.

Disinfection System Recommendation

It is recommended that the City continue use of the current disinfection system.

4.4 Biosolids Treatment, Storage and Disposal Alternatives

Biosolids refers to any sludge that has been stabilized to meet the criteria in the US Environmental Protection Agency's 40 CFR 503 regulations and can be used beneficially. The sources of sludge generated at treatment plants vary according to the type facility and mode of operation. The primary sources of sludge from wastewater treatment plants include primary sedimentation and waste activated sludge.

Management of solids from WWTPs includes several processes: sludge treatment, volume reduction by thickening or dewatering, sludge storage, and disposal. All components must adhere to standards set forth in the Code of Federal Regulations (40 CFR Part 503). Biosolids management costs can represent a significant expenditure at WWTPs, and therefore require thorough analysis to select suitable and low life-cycle cost alternatives.

At the existing WWTP, sludge is collected in the lagoons, most notably in the primary cell that receives influent from the pump stations. The sludge undergoes anaerobic digestion and thickens over time due to gravity and long detention times. The existing infrastructure used for biosolids treatment and storage is adequate based on current and future loads. Both liquid stream treatment alternatives include using the facultative sludge lagoons for biosolids management and storage. The lagoons offer adequate storage and treatment capacity for the design period given current and future loads.

Alternatives

Dredging and Biosolids Disposal

The most common form of sludge removal for facultative lagoons is dredging, which is the process of mechanically removing sludge from cell bottoms. Methods for sludge removal vary, but all methods involve the basic concepts of sludge removal, dewatering, and disposal. Quantity of sludge and characteristics need to be determined before removal. In general, the cost of dredging is approximately $350 per dry ton of sludge removed. By using the average sludge depth for each cell specified in the City of Scio Wastewater Lagoons Sludge Profile Report (OAWU, 2018), approximate volumes of sludge were calculated. Assuming conservative percent dry solids content, Table 4.4.1 summarizes the estimated volume and dry tons of solids in the facultative lagoons.

TABLE 4.4.1
LAGOON BIOSOLIDS ESTIMATES

Item	Amount
Lagoon No. 1 Solids Volume, MG	1.3
Lagoon No. 2 Solids Volume, MG	1.2
% Dry Solids, Lagoon No. 1	12%
% Dry Solids, Lagoon No. 2	12%
Dry tons, Lagoon No. 1	71
Dry tons, Lagoon No. 2	66

Cost Estimate

The cost estimate for dredging the lagoons, dewatering the solids, and transporting the solids to a designated disposal site is summarized in Table 4.4.2. Detailed cost estimates are included in Appendix C. No O&M costs are associated with dredging since it is a one-time operation that is not frequently needed.

TABLE 4.4.2
DREDGING AND DISPOSAL COST ESTIMATE

Item	Cost Estimate
Facultative Lagoons Dredging & Disposal	$95,400

Bacterial Injection

Another alternative to removing sludge involves augmenting the natural biological treatment process of lagoons with commercially available bacteria. Upon injection, the additional bacteria essentially serve as a booster to the natural bacteria that already exist in lagoons to speed up the digestion of organic sludge content. The City is currently exploring this alternative to implement in the near future. The Probiotic Scrubber II, commercially available through Bio Lynceus, requires a peristaltic pump incorporated into the Beech St. Pump Station to inject approximately 24 ounces of bacteria per day.

Cost Estimate

Cost estimates including shipping and usage rates provided to the City are extrapolated over the 20-year design period and summarized in Table 4.4.3.

TABLE 4.4.3
BACTERIAL INJECTION COST ESTIMATE

Item	Cost Estimate
Probiotic Scrubber II Bacterial Injection	$80,000

Recommendation

It is recommended that the City adopt a dredging program for sludge removal within the lagoon system. Although there is a high up-front capital cost involved, it is not much more expensive than the bacterial injection alternative. Additionally, bacteria are limited to removing organic components of sludge; inorganic components will remain untouched and will have to be removed eventually. The efficacy of bacteria injection cannot be guaranteed and requires consistent monitoring for optimal performance. Additionally, pricing for the sludge reducer and freight is subject to change and can increase in cost over time. The City would also have to consider storage options for the Probiotic Scrubber shipments, which is not included in the cost estimate above.

Biosolids Storage

Biosolids can be stored within the wastewater treatment process units, biosolids treatment process units, or in separate specially designed tanks. Wastewater treatment units can store biosolids for short-term storage (a few hours to 24 hours). For longer detention times, biosolids treatment units, such as aerobic or anaerobic digesters, and facultative sludge lagoons are used for storage. Odor control measures include either chemical addition of chlorine, hydrogen peroxide or iron salts, and maintenance of an aerobic surface layer (e.g. facultative sludge lagoon). Long-term storage of biosolids that are not completely dried can create serious odor problems.

Storage is required to hold biosolids until biosolids disposal takes place. Disposal by land application typically occurs between the months of May through October, but is dependent on weather. Land use, such as harvesting hay, and rainfall can reduce this window to August through October.

Alternatives

Facultative Sludge Lagoons (FSL)

An FSL is a retention pond or lagoon that stores biosolids for an extended period of time. Anaerobic and aerobic treatment zones are established in the lagoons. Over time, solids are anaerobically digested within the bottom layer of the lagoon. The FSLs can provide volatile solids digestion rates up to 50% and produce Class B biosolids. The biosolids are also thickened by gravity as they reside in the lagoon.

The FSLs typically have a liquid depth of ten to fifteen feet, with the top three to four feet reserved as a water cap for odor mitigation. The FSLs are designed for a detention time of two or more years, depending on land availability and solids removal objectives. Many communities that have FSLs store solids for years or even decades without dredging or disposal events.

Facultative Sludge Lagoons are typically loaded at between 10 to 30 lbs of VSS per day per 1,000 ft^2. Depending on sludge treatment objectives and the target removal frequency, the area required for an FSL suitable for the City of Scio is between three to five acres, or more.

The FSLs are low maintenance and offer a very effective solution that is ideally suited for small communities with limited operational resources. The main disadvantage of FSLs is the large land area required. For the 20-year planning period, FSLs are considered a feasible alternative for biosolids storage for the City of Scio.

Drying Beds

Sludge drying beds are one of the most common dewatering technologies throughout the US and are generally used with mechanical treatment systems. Sludge drying beds are contained structures with the floor sloping to a drain system. A layer of gravel is built up over the drains, and a layer of sand is applied over the gravel; the surfaces of the beds are flooded with digested biosolids. The liquid content of the biosolids drains through sand and gravel and is returned to the headworks of the plant. Dewatered biosolids are scraped off after each application, along with the top layer of the sand, using a small front-end loader.

The biosolids are hauled by dump truck and disposed of by landfill or land application. The solids content of the finished biosolids may vary from 15% to 70%, with 16% used as an estimate for study purposes. However, aerobic digested sludge is more difficult to dewater than anaerobic digested sludge and requires a much longer time to dewater. Covered beds would be required due to the volume and duration of rainfall in the City of Scio**.**

The principal disadvantages of drying beds are the land area required, effects of rainfall, labor-intensive biosolids removal, vector attraction, and odors. Disadvantages also include multiple handling of the material; it must be spread, scraped up, loaded into a truck and then tilled in at the land application site. Use of the drying beds also requires access to a small front-end loader, dump truck and manure spreader. Drying beds are less efficient in the City of Scio’s wet climate. Advantages are low cost and minimal operation attention required.

Typical area requirements for sludge drying beds for dewatering waste activated sludge ranges from 2 to 2.5 ft^2/person. Assuming a future population of 1,046, the City of Scio would require 2,615 ft^2 of covered sludge drying beds. This would require a footprint of approximately 50 feet by 50 feet.

The capital cost and O&M cost estimates for biosolids drying beds is provided in Table 4.4.4. Present worth costs are based on 3.5 % interest, and a 20 year term.

TABLE 4.4.4
DRYING BEDS CAPITAL AND O&M COST ESTIMATE

Item	Cost Estimate
Construction	$188,280
O&M Present Worth	$38,000

Disposal of Biosolids

Disposal alternatives for WWTP biosolids were evaluated with respect to regulatory requirements for pollutant limits (i.e. 40 CFR Part 503, Subpart B) and to agronomic rates for the onsite vegetation (i.e. nitrogen). The Part 503 rule requires that biosolids be land applied at a rate that is equal to or less than the agronomic rate for nitrogen at the application site. Additional Part 503 requirements include the following (EPA 1995):

- Biosolids cannot be land applied unless trace element concentrations in the sludge are below ceiling concentrations specified in Part 503.

- Biosolids must meet either 1) the pollutant concentration limits specified in Table 3 of Part 503; or 2) the Part 503 Cumulative Pollutant Loading Rate (CPLR) limits for bulk biosolids.

The ultimate end use or disposal of biosolids is often the area of greatest uncertainty in sludge handling because of its dependency on solids marketability, land availability, and regulatory requirements. Another important consideration of the potential end use or disposal option is public acceptance. The reluctance of the public to accept a biosolids disposal or processing facility in their area generally stems from concerns about odors and adverse health impacts. Potentially viable options for use and disposal of biosolids include disposal at a landfill, land application, and distribution by marketing. The WWTP improvements proposed will provide the opportunity to use landfill sites for sludge storage.

Land Application

Land application refers to any beneficial use project that applies biosolids to the land. Such land sites include primary agricultural land, pastures, tree farms, and old mines. Any biosolids to be land applied must be classified as non-hazardous and meet criteria for maximum allowable concentrations of trace metals (e.g. cadmium, copper, lead, nickel and zinc). For application to agricultural lands, all biosolids must undergo treatment by a process to significantly reduce pathogens. In addition to evaluating biosolids with respect to environmental suitability, a land application program will depend on the nutrient content of the biosolids, the land to which it will be applied, and the crops to be grown on the land. For most biosolids produced and land applied, the limiting factor is the nutrient content of the biosolids when it is applied as a fertilizer for a particular crop.

Land application is dependent on site conditions and weather. Prolonged heavy rains could greatly reduce the flexibility of liquid land application. The dry sludge land application alternative is relatively unlimited and offers the most flexibility. In addition, land application sites are becoming more difficult to locate and maintain as long-term disposal sites. Land acquisition for biosolids disposal would be complicated, and it is not needed by the City since the SBR alternative is not a feasible alternative.

Landfill Disposal

Landfill disposal is a generally less desirable alternative when compared to land application for beneficial use. If a suitable site is convenient, a commercial facility may be used for the disposal of biosolids if facility Operator and regulatory officials permit this practice. The economics of hauling biosolids usually indicates that the dewatering for volume reduction will result in justifiable savings. While this process is generally more expensive and does not take advantage of the beneficial uses of biosolids, disposal at a landfill is a viable option when weather conditions or regulatory requirements limit land application. Landfill disposal also offers a temporary option for disposal while additional land application sites are identified and expanded.

Disposal costs are a function of biosolids stabilization systems and recommendations. Anaerobically digested biosolids are dewatered to approximately 22%, versus about 14% with aerobically digested biosolids. Land fill costs are estimated based on the different biosolids stabilization options.

Provided the digested biosolids are dewatered and meet certain testing criteria, the City can haul to the Coffin Butte Landfill located in Corvallis, Oregon. The disposal fee is typically around $65 per ton, with an environmental fee of approximately $17 per load.

Distribution and Marketing of Biosolids

Compost and heat-dried (Class A) biosolids may be distributed and marketed to end-users such as the agricultural and horticultural industries, landscape contractors, and homeowners. Each municipality must develop its particular distribution and marketing strategy based on surveys of potential users and competing products. Some municipalities have chosen to market the product through a broker or distributor. Items such as product quality, selling price, storage, responsibility for unsold product, and other risk-sharing decisions should be included in any contracts. Promotional and demonstration programs are usually required to promote public attention and acceptance, and inform potential users of the product's potential use and availability.

The distribution and marketing of processed wastewater biosolids is usually only done by larger municipalities (e.g. Portland, Newberg) that produce considerable amounts of biosolids. These municipalities usually have the resources to successfully develop a product market. The City of Scio currently produces Class B biosolids and would need to further process the waste to achieve Class A. Class A material could be used directly by the City for fertilizing plantings in parks, at local schools and on other municipal property. Surplus could be given away to the public or farmers.

The EPA-approved methods of achieving Class A biosolids include composting, irradiation and heat treatment. The City of Scio lacks adequate space for composting, the public acceptance for irradiation, or an inexpensive energy source for heat treatment. With the current economic and regulatory climate, producing Class A biosolids is not a cost-effective solution and is excluded from further consideration.

Biosolids Treatment, Storage, and Disposal Recommendation

Based on the above analysis, maintaining sludge storage within the lagoons and removal through dredging with the landfill disposal alternative is considered the best alternative for the City. Biosolids production rates will increase over time as the City’s population grows, but the facultative sludge lagoons will have adequate capacity, especially after the installation of the influent fine screen. The City should create a long-term Biosolids Management Program (BMP) that identifies current and future practices for the disposal of biosolids.

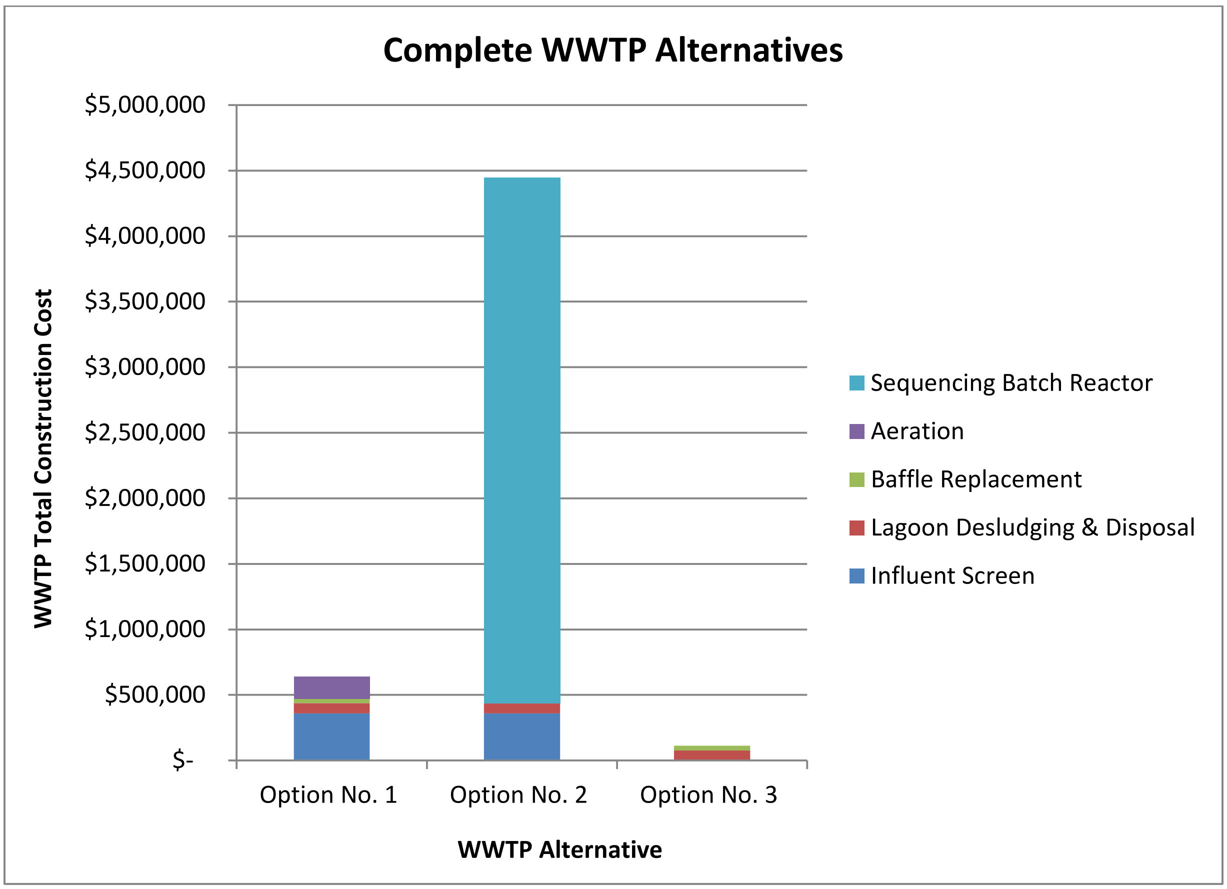
4.5 Summary of Complete WWTP Alternatives

The WWTP system improvements are presented in combination as three potential options. Option No. 1 includes installation of a new influent fine screen, replacement of lagoon baffles, lagoon sludge removal, and incorporation of aeration/mixing technology. Option No. 2 includes the installation of a new influent fine screen, lagoon sludge removal, and construction of an SBR plant. Option No. 3 limits the improvements to only baffle replacement and lagoon sludge removal. A summary of capital costs for the complete WWTP alternatives is included in Table 4.5.1 and Figure 4.5.1. Figure 4.5.1 illustrates construction costs only. Table 4.5.1 includes estimated contingency, administrative, and engineering costs associated with each project. Three options have been developed that the City could pursue depending on available funding and future treatment efficiency. Detailed cost estimates are included in Appendix C.

TABLE 4.5.1
COMPLETE WWTP ALTERNATIVES

Item	Option No. 1 Total Costs	Option No. 2 Total Costs	Option No. 3 Total Costs
Influent Screen	$514,200	$514,200	-
Lagoon Desludging & Disposal	$95,400	$95,400	$95,400
Baffle Replacement	$51,500	-	$51,500
Aeration / Mixing	$229,900	-	-
Sequencing Batch Reactor	-	$5,955,540	-
TOTAL	**$891,000**	**$6,565,140**	**$146,900**

FIGURE 4.5.1
COMPARISON OF COMPLETE WWTP ALTERNATIVES



Matrix Evaluation

For the matrix evaluation, a rating system was employed to compare the treatment plant alternatives. This rating system consists of a three-point scale, three being the best and one the worst. Two or more alternatives may have the same rating for a particular parameter. The ratings are subjective. The ratings for the matrix evaluation are summarized in Table 4.5.2.

- **Flexibility.** Flexibility is an important characteristic of liquid stream and disinfection alternatives, since large variations in flow may be encountered during the wet weather season and effluent storage is required during the dry season. An SBR system eliminates the need for a return activated sludge system, since it is not needed in the process. The SBR system provides treatment and settling within a single tank. In addition, high flows can be treated simply by cycle timing control. Lagoons can adequately handle large variations in flow during wet weather conditions and can store large amounts of water during the summer months. Biological treatment occurs naturally and over time within a lagoon system.

- **Reliability.** The lagoon baffle replacement and removal of sludge is considered to be the most reliable alternative, since it requires the least amount of moving parts and maintenance.

- **Operability.** Equipment and process familiarity should be considered for plant Operators. Option No. 3 is considered to be the simplest to operate, as no knew equipment is added. Option No. 1 includes incorporation of new mixer technology and headworks, which will inevitably require some amount of training. Operational requirements of the SBR alternative would be much greater, and the current WWTP staff does not have the required skill level for this type of operation.

- **Ability to Construct.** The SBR alternative requires the largest amount of usable land, followed by Option No. 1 and Option No. 3, requiring minimal to no amounts of usable land.

- **Environmental Factors.** Option No. 2 changes the primary biological treatment process to an SBR unit, which has potential for greater environmental impacts than allowing the lagoons to naturally break down organic contaminants over time in Options No. 1 and 3.

- **Community Impact.** Each alternative will help to reduce unwanted odors affecting nearby residents; SBR treatment and incorporation of mixers within the lagoons will likely have a greater impact.

- **Expandability.** The SBR is the most expandable alternative, as common walls may be utilized for expansion. It is difficult to expand or include additional lagoon ponds since a large amount of land acquisition is typically involved.

TABLE 4.5.2
MATRIX EVALUATION OF WWTP ALTERNATIVES

Parameter	Option No. 1	Option No. 2	Option No. 3
Flexibility	3	3	3
Reliability	2	1	3
Operability	2	1	3
Ability to Construct	3	1	3
Environmental Factors	3	1	2
Community Impact	3	3	2
Expandability	3	3	2
Total	**19**	**13**	**18**

Complete WWTP Recommendation

It is recommended that the City pursue Option No. 1 which includes the removal of sludge through dredging, replacement of existing baffles, and addition of an influent fine screen and aeration/mixing. Option No. 2 is far too expensive and SBR technology is not needed at this time. The lagoon treatment system that serves the community is adequate and does not need to be drastically altered in this way. Option No. 3 includes only the removal of sludge and baffle replacement, as it is felt that these two items are the highest priority for WWTP improvements at this time. Although Option No. 1 is the best alternative for improving facultative lagoon performance, Option No. 3 is still viable if project funding becomes an issue.

4.6 Effluent Disposal

The current method of effluent disposal will be adequate for the City, provided that I/I is reduced and biosolids accumulated at the bottom of the lagoon are removed. As previously stated, the City has a very good record with meeting the NPDES Permit requirements. The City has never had to discharge outside of allowable dates specified by the permit. Future permits that are issued have the potential to contain additional or more stringent requirements, and this should be considered as the City moves forward with capital improvement projects.

4.7 Project Priority

The City of Scio's population is projected to increase slightly over the next twenty years. To more closely align the capital improvements with the population trajectory, the recommended collection and WWTP improvements were evaluated on their ability to incorporate phasing into their construction sequencing. Recommendations that were outlined are ranked from high to low priority and are summarized below:

1. Collection System Improvements

   The collection system improvements, specifically the Beech St. Pump Station upgrade, have limited phasing opportunities. Installing new submersible pumps that meet projected peak instantaneous flow rates along with repairing the wet well is the top priority for the City. Construction should begin as soon as possible to address growing concerns and problems. The I/I reduction projects can be addressed based on severity of infiltration and disrepair identified through infiltration testing and CCTV inspections as funding is allocated. Collection system improvements can be completed over the next several years. Collection system improvement projects are categorized by priority but will be summarized with one total cost for the City during the twenty year planning period.

2. Lagoon Sludge Removal

   Lagoon dredging is considered the highest priority within the wastewater treatment system and should take place within the next couple of years. The current amount of sludge accumulation within the lagoons can start to cause problems with meeting discharge permit regulations. The operation can take place in the midst of collection system improvements as funding becomes available.

3. Lagoon Baffle Replacement

   Ensuring adequate detention time and preventing the possibility of short circuiting should follow the removal of sludge from the lagoons. Once the sludge is cleared, it will allow for easier removal and replacement of the baffles.

4. Influent Fine Screen

   Constructing a new fine screen that removes solids from the raw wastewater will greatly decrease the rate at which the lagoons need to be dredged, and also increase the overall performance of the lagoon system. The fine screen should be constructed after the majority of collection system improvements have taken place so that new influent flows can be monitored and re-sizing of the screen can be completed if necessary.

5. Lagoon Aeration/Mixing

   Incorporation of this technology is considered the lowest priority for the City because it is not as justifiably important as the preceding items. However, it can improve biological treatment performance within the lagoons and is a good option to explore should effluent regulations become more stringent. Introducing oxygen to the anaerobic zone will increase the rate at which biosolids are consumed and harmful bacteria are removed.

Although phasing capital improvement projects over an extended period of twenty years is viable for larger communities that require greater changes to their treatment system, the most significant issues facing the City of Scio are infiltration and inflow occurring in an aging infrastructure, and a pump station requiring additional capacity. In order to qualify for funding, the recommended capital improvement strategy is to conduct a "One-Stop" meeting with all recommended improvements summed into one total capital cost. Smaller, individual projects broken up into separate phases will be less likely to receive funding and grants.

4.8 Operation and Maintenance

Preliminary Operation and Maintenance (O&M) cost estimates for the recommended collection and WWTP improvements were developed for the 2044 planning year. I/I reduction projects will result in reduced wastewater flows, correlating to a decrease in electrical and operational costs associated with collection system and WWTP systems. The O&M costs for the influent fine screen, baffles, and aeration/ mixing units are summarized in Table 4.8.1 below. O&M cost estimates are for preliminary purposes. Costs include equipment repair and replacement expenditures for short lived assets.

TABLE 4.8.1
SUMMARY OF ANNUAL O&M COST ESTIMATES (2044)

Item	Annual Cost
Influent Screen	$15,000
Baffles	$500
Aeration/Mixing	$1,500
WWTP Annual O&M Estimate Total	**$17,000**
WWTP 20 Year Present Worth (3.5%)	**$241,700**

4.9 Short Lived Assets

A reserve fund should be established to fund equipment repair and replacement needs over the anticipated twenty-year life of the WWTP. Estimated equipment repair, rehabilitation, and replacement expenditures for a twenty-year planning period are summarized in Table 4.9.1. Items listed include existing wastewater treatment plant systems. Long-term capital financing facilities are excluded from the estimates. Refer to Appendix C for a detailed breakdown of short lived assets.

TABLE 4.9.1
WWTP IMPROVEMENTS SHORT LIVED ASSETS (2044)

Item	Annual Cost
Influent Screen	$1,278
Baffles	$25
Aeration / Mixing	$2,210
WWTP Annual Short Lived Asset Total	**$3,500**

SECTION 5:

RECOMMENDED PLAN

SECTION 5: **RECOMMENDED PLAN**

This section summarizes the recommended improvements to provide adequate conveyance, treatment, and effluent disposal capacity to serve the City of Scio's needs through the year 2044. The project descriptions, costs, and timing are intended to serve as the basis for a Capital Improvement Plan (CIP) for implementing the necessary improvements.

5.1 Future Flow and Load Projections

The future flows and loadings are presented in Table 5.1.1, below. For comparative purposes, the table also includes the current facility's design flows.

TABLE 5.1.1
WASTEWATER FLOWS AND LOADS

Parameter	2017		Projected (2044)			
Population	938		1,046			
Base Sewage	0.036	MGD	38	gpcd	0.04	MGD
Base Infiltration	0.010	MGD	11	gpcd	0.01	MGD
AAF	0.091	MGD	97	gpcd	0.10	MGD
ADWF	0.054	MGD	58	gpcd	0.06	MGD
AWWF	0.128	MGD	136	gpcd	0.14	MGD
$MMDWF_{10}$	0.117	MGD	125	gpcd	0.13	MGD
$MMWWF_5$	0.228	MGD	254	gpcd	0.27	MGD
Peak Avg. Week	0.320	MGD	385	gpcd	0.40	MGD
$PDAF_5$	0.471	MGD	558	gpcd	0.58	MGD
PIF	0.846	MGD	849	gpcd	0.89	MGD

TABLE 5.1.2
WASTEWATER TREATMENT DESIGN VALUES (2044)

	Flow MGD	BOD_5		TSS	
		mg/L	ppd	mg/L	ppd
AAF	0.10	194	160	220	180
$MMDWF_{10}$	0.13	120	130	135	150
$MMWWF_5$	0.27	93	210	106	240
PDAF	0.58	n/a	n/a	n/a	n/a
PIF	0.89	n/a	n/a	n/a	n/a

5.2 Existing Collection System Improvements

Smoke testing was performed by The Dyer Partnership Engineers & Planners, Inc. (September, 2018) to identify potential deficiencies that allow Infiltration and Inflow (I/I) into the collection system. Flow mapping was also conducted (January and February, 2019) to determine the quantity and sources of extraneous water that enters the sewer collection system.

Analysis of the results from smoke testing and flow mapping revealed several locations where improvements to the collection system are required to enable the collection and treatment system to handle current and future flows. Successful resolution of deficiencies should reduce collection system peak flows and help minimize future Wastewater Treatment Plant (WWTP) capital and operational expenditures. It is recommended that the City continue to identify and correct I/I in the existing collection system, in accordance with the procedures outlined below:

1. Begin planning to address priority collection system projects listed below.

2. The City should implement a TV program for the entire collection system over a five-year period (20% per year) and continue to repeat the TVing at five-year intervals.

3. The City should adopt a manhole rehabilitation program.

4. Serious maintenance and repair issues should be identified in the I/I inspection program and be corrected as funding becomes available. Collection system improvement projects are categorized based off of priority and are summarized below.

5. A new Sewer System Evaluation survey (SSE) should be completed at least every ten years. A SSE should include: line grit removal and cleaning, inspection of the lines with TV camera, physical inspection of manholes, performance of flow testing at structures, smoke testing of lines, mapping of results, development of I/I repair capital improvement projects, and performance of a cost-effective analysis.

- **Priority Level I**
  - **Project 1.** *Replace/Rehabilitate existing 10-inch sewer along SW 2nd St. from MH 39 to MH 43.*
  - **Project 2.** *Replace/Rehabilitate existing 8-inch sewer along SW Beech St. from MH 37 to MH 39.*
  - **Project 3.** *Replace/Rehabilitate existing 10-inch sewer along SW Beech St. from MH 39 to MH 41.*
  - **Project 4.** *Replace/Rehabilitate existing dual 6-inch sewer running underneath Thomas Creek from MH 41 to MH 49.*

- **Priority Level II**
  - **Project 5.** *Replace/Rehabilitate existing 10-inch sewer along Main St. from MH 72 to MH 76.*
  - **Project 6.** *Replace/Rehabilitate existing 8-inch sewer between NE Ash and Main St. from MH 68 to clean-out on NE 1st Ave.*
  - **Project 7.** *Replace /Rehabilitate existing 8-inch sewer on SE 1st Ave. from clean-out to MH 48.*
  - **Project 8.** *Replace/Rehabilitate existing 8-inch sewer between SE Ash St. and Main St. from MH 32 to MH 48, and from MH 48 to the eastern clean-out.*

- **Priority Level III**
    - **Project 9.** *Replace/Rehabilitate existing 8-inch sewer along SE Ash St. from MH 22 to MH 30.*
    - **Project 10.** *Replace/Rehabilitate existing 8-inch sewer along SE Birch St. from MH 23 to MH 24.*
    - **Project 11.** *Replace/Rehabilitate existing 10-inch sewer along NW Cherry St. from MH 55 to MH 57.*
    - **Project 12.** *Replace/Rehabilitate existing 8-inch sewer along NE Ash St. from MH 69 to clean-out just south of MH 70.*

After substantial completion of high-priority I/I reduction work, the City should re-evaluate influent WWTP flows and amend the flows in this Wastewater Facility Plan, as necessary, based on the results of the I/I improvement work.

5.3 Pump Station Improvements

The collection system includes two pump stations. An analysis of each pump station was conducted to identify deficiencies and recommend improvements, if necessary, during the planning period. Based on pump station assessments summarized in Section 2, future improvements are necessary for only one of the pump stations. Costs for pump station improvements are summarized in Section 5.8.

Beech St. Pump Station

The pump station wet well is in need of repair and is hydraulically overloaded. Repairing the existing wet well and installing pumps with greater capacity is recommended. This is considered to be the City's highest priority and should take place as soon as possible.

5.4 Collection System Expansion

An analysis of future expansion requirements of the collection system involved identifying likely areas of expansion and determining the probably impacts of expansion on the existing system. Future growth will occur within the City's Urban Growth Boundary (UGB). New connections to the existing gravity sewer system will primarily occur by providing service to vacant lots dispersed throughout the UGB. It is recommended that the City provide sewer service as required for future development without further analysis because it is consistent with the City's Comprehensive Development Plan.

5.5 WWTP Improvements

The existing wastewater treatment plant appears to have adequate capacity for future growth within the planning period if infiltration and inflow is reduced. Due to I/I flow contributions during and immediately following storm events, the treatment system has more potential to become hydraulically overloaded. Surcharges that are too great may hinder the ability of the plant to equalize and experience sufficient detention time. Baffle replacement is among the first treatment system improvements the City should conduct. After significant I/I sources have been eliminated and funding is available, the City should construct an influent fine screen and incorporate aeration/mixing technology into the facultative lagoon cells.

Plan views of the proposed wastewater treatment plant improvements were provided in Section 4. A more detailed summary of each improvement is summarized below, and in Table 5.5.1.

TABLE 5.5.1
PLANNING LEVEL DESIGN DATA

Item	**Description / Design Data**	
Influent Fine Screen	Mechanical Fine Screen	1/4-inch, screen washing, compaction
	Quantity	1
	Design Flow	0.89 MGD
	Bypass	Screw Screen
	Channel Width	1.15 ft. (minimum)
	Flow Measurement	Flow Meter (Existing)
	Influent Sampler	Issco-Auto Sampler (Existing)
Lagoon Baffles	Baffle	Elvaloy Fabric
	Quantity	2
	Fasteners	Stainless Steel
	Skirt Depth	8 ft.
	Skirt Length	185 ft. (370 total)
	Lower Chamber Depth	6’-8” (minimum)
	Anchoring	Steel Post Bridle
	Height Adjustment Cable	50 ft.
	Main Tension Cable	50 ft.
Mixing / Aeration	Unit	SolarBee Mixer
	Model	SB10000 v20, SB2500 v20
	Quantity	2 (1 of each model)
	Power	Photovoltaic Modules
	Direct Drive	Low voltage D.C. Motor

Lagoon Dredging, Dewatering, and Disposal

The existing primary and secondary cells have accumulated sludge for years and have no record of being dredged. To maintain biological and equalization functionality, dredging, dewatering, and disposal of biosolids is recommended within the next one to five years. Facultative sludge removal through the services of a professional dredging and disposal company to remove and dispose of the solids is recommended.

Influent Fine Screen

The proposed fine screen would have the capacity to meet current and projected flow rates. Solids would be transported through a spiral screw conveyer to be compacted, cleaned, dewatered, and discharged to be shipped off. With the addition of a fine screen, biological treatment performance will increase, and solids buildup rate will be greatly reduced.

Baffle Replacement

Baffle replacement will ensure adequate detention time and prevent short circuiting. Detention time is important to allow for natural biological treatment processes to take place and break down organic matter before the water reaches the disinfection unit. Forcing the existing influent find screen system consists of one fine screen. Operators state that the existing find screen is incapable of processing flow through a series of baffles prevents short circuiting of the lagoon system, a process in which untreated wastewater reaches the discharge point before biological contaminants are properly broken down. Baffles can also improve water circulation.

Mixing/Aeration

Floating SolarBee mixer units powered by solar photovoltaic cells would provide additional treatment capacity and increase lagoon health by circulating the wastewater within the lagoon. The adjustable intake hose can be set to a specified height to effectively introduce the bottom anaerobic zones of the lagoon cells to the top aerobic zone that contains dissolved oxygen. Improving circulation will decrease the likelihood of the lagoon cells becoming septic and help prevent turnovers, which can cause unpleasant odor problems. By increasing aerobic digestion, Biochemical Oxygen Demand (BOD) concentrations will be lowered and treatment will become more effective. In addition, mixing will help to keep algae blooms under control and reduce Total Suspended Solids (TSS) concentrations. SolarBee mixer units are currently being used in a wide of applications within Oregon besides wastewater, including potable water storage tanks, raw water reservoirs, and lakes. Below is a list showing examples of SolarBee mixers being applied to wastewater treatment:

- St. Helens OR, 9 SolarBee machines installed since 2010
- Dufur OR, 2 SolarBee old style machines installed since 2004
- River Meadows WWTP in Bend, OR, has 1 SolarBee old style machine installed since 2004
- Baker City, OR, has 15 SolarBee old style version 1 machines installed since 2001
- Tri-City Service District WWTP in Oregon City, 1 SolarBee machine installed since 2016
- WWTP in Wallowa, OR, has 2 SolarBee old style version 1 machines installed since 2001

5.6 Biosolids Disposal

The facultative lagoon system has adequate capacity for biosolids storage. After lagoon dredging takes place, many years will pass before the lagoons will need to be dredged again.

5.7 Effluent Disposal

The City is permitted by the NPDES to discharge into Thomas Creek. Based on existing flows and lagoon capacity, the effluent disposal system is adequately sized to handle future growth. Future discharge permit requirements can change in the future, and the City should strive to maintain compliance.

5.8 Project Cost Summary

Cost estimates for the proposed collection and WWTP systems are summarized in this section. Detailed cost estimates are included in Appendix C. All cost estimates are in 2019 dollars. Total project costs include construction costs, contingencies, engineering, legal, and administrative costs.

Collection System Improvements

It is recommended that collection system improvement projects be completed in order of priority: Level I, Level II, followed by Level III. All costs assume complete pipe replacement. Replacement versus rehabilitation should be evaluated on a case-by-case basis, early in the design phase. Cost estimates are presented in Table 5.8.1.

TABLE 5.8.1
COST ESTIMATES FOR SEWER MAIN REPLACEMENT/REHABILITATION PROJECTS

Project No.	Phase	Length (ft)	Construction Cost	Total Project Cost
1	1	340	167,600	230,600
2	1	265	136,450	187,750
3	1	290	150,550	207,150
4	1	300	243,500	334,900
		Subtotal Level I	**698,100**	**960,400**
5	2	725	316,400	435,200
6	2	250	108,400	149,200
7	2	150	69,700	96,000
8	2	260	161,200	221,800
		Subtotal Level II	**655,700**	**902,200**
9	3	295	133,450	183,650
10	3	520	202,600	278,700
11	3	720	285,900	393,200
12	3	495	184,300	253,600
		Subtotal Level III	**806,250**	**1,109,150**
		Total	**2,160,050**	**2,971,750**

The City should implement a TV program for the entire collection system over a five-year period (20% per year) and continue to repeat the TVing at five-year intervals. Table 5.8.2 lists the annual cost to fund the proposed annual CCTV program.

TABLE 5.8.2
ANNUAL TV PROGRAM COST ESTIMATE

Item	Total Cost
Annual CCTV Program	$11,000
Total	**$55,000**

The City should adopt a manhole repair program in which manholes that are determined to contribute I/I to the collection system are repaired. Table 5.8.3 gives the estimated cost of repairing 100% of the manholes within the City.

TABLE 5.8.3
MANHOLE REPAIR PROGRAM COST ESTIMATE

Item	Total Cost
Manhole Repair Program	$162,400

The cost estimate for the proposed pump station improvement project is summarized in Table 5.8.4, and is considered to be the City's top priority.

TABLE 5.8.4
PUMP STATION IMPROVEMENT COST ESTIMATES

Project	Construction Cost	Total Project Cost
Beech St. Pump Station	$331,300	$473,900

WWTP Improvements

Recommended WWTP improvement capital costs are listed in Table 5.8.5. Additional costs such as contingency, administration, legal and engineering costs are included in these estimates.

TABLE 5.8.5
WWTP IMPROVEMENTS COST ESTIMATE

Item	Option #1 Total Cost
Influent Screen	$514,200
Lagoon Desludging & Disposal	$95,400
Baffle Replacement	$51,500
Aeration/Mixing	$229,900
WWTP Total Project Estimate	**$891,000**

Total Project Costs

The total project costs in 2019 dollars for collection system improvements pump station improvements, and WWTP improvements are summarized in Table 5.8.6.

TABLE 5.8.6
TOTAL PROJECT COSTS (2019 DOLLARS)

Item	Total Cost
Collection System Improvements	$3,189,150
Pump Station Improvements	$473,900
WWTP Total Project Cost Estimate	$891,000
Total Project Cost Estimate	**$4,554,100**

5.9 Rates

A fixed rate (base charge) and a water use volumetric rate (overage charge) are used for billing rates in the City of Scio. The City adopted Resolution 18-08, which applies an automatic annual increase of three percent to base and overage charges that becomes effective on July 1^{st} of each year. Base rates for residential, commercial, large commercial and school differ. Sewer charges should be reevaluated since they are not calculated based on the number of Equivalent Dwelling Units (EDUs). It is recommended that the City adjust the base rate for large commercial users and schools based on the number of EDUs of each user. Changes to the City's rate structure will be required, and a sewer rate study will be prepared to establish rates to sufficiently fund future capital replacement and improvement needs.

SECTION 6:

FINANCING

SECTION 6: **FINANCING**

Most communities are unable to finance major infrastructure improvements without some form of governmental funding assistance such as low interest loans or grants. In this Section, a number of major federal and state funding programs and local funding mechanisms appropriate for the recommended improvements are discussed.

6.1 Grant and Loan Programs

Some level of outside funding assistance in the form of grants or low interest loans may be necessary to make the proposed improvement projects affordable for the City of Scio and its citizens. The amount and types of outside funding will dictate the amount of local funding that the City must secure. In evaluating grant and local programs, the major objective is to select a program, or a combination of programs, which are most applicable and available for the intended project.

A brief description of the major federal and state funding programs that are typically utilized to assist qualifying communities in the financing of infrastructure improvement programs is given below. Each of the government assistance programs have particular prerequisites and requirements. These assistance programs promote such goals as aiding economic development, benefiting areas of low to moderate-income families, and providing for specific community improvement projects. With each program having its specific requirements, not all communities or projects may qualify for each of these programs.

Economic Development Administration (EDA) Public Works Grant Program

The EDA Public Works Grant Program, administered by the US Department of Commerce, is aimed at projects which directly create permanent jobs or remove impediments to job creation in the project area. Thus, to be eligible for this grant, a community must be able to demonstrate the potential to create jobs from the project. Potential job creation is assessed with a survey of businesses to demonstrate the prospective number of jobs that might be created if the proposed project were completed.

Proposed projects must be located within an EDA-designated Economic Development District. Priority consideration is given to projects that improve opportunities for the establishment or expansion of industry and that creates or retain private sector jobs in both the near-term and the long-term. Communities that can demonstrate that the existing system is at capacity (i.e. moratorium on new connections) have a greater chance of being awarded this type of grant. The EDA grants are usually in the range of 50 to 80 percent of the project cost; therefore some type of local funding is also required. Grants typically do not exceed one million dollars.

Water and Waste Disposal Loans and Grants (Rural Development)

The Rural Development Administration (Rural Development) manages the loans and grants for wastewater programs that used to be overseen by the Farmers Home Administration. While these programs are administered by a new agency, the program requirements are essentially the same. The Rural Utilities Service (RUS) is one of three entities that comprise the US Department of Agriculture's (USDA) Rural Development (RD) mission area. The RUS supports various programs that provide financial and technical assistance for development and operation of safe and affordable water supply systems and sewer and other forms of waste disposal facilities.

Rural Development has the authority to make loans to public bodies and non-profit corporations to construct or improve essential community facilities. Grants are also available to applicants who meet the Median Household Income (MHI) requirements. Eligible applicants must have a population of less than 10,000. Priority is given to public entities in areas smaller than 5,500 people to restore a deteriorating water supply, or to improve, enlarge, or modify a water facility and/or inadequate waste facility. Preference is given to requests that involve the merging of small facilities and those serving low-income communities.

In addition, borrowers must meet the following stipulations:

- Be unable to obtain needed funds from other sources at reasonable rates and terms.
- Legal capacity to borrow and repay loans, to pledge security for loans, and to operate and maintain the facilities or services.
- Financially sound and able to manage the facility effectively.
- Financially sound facility based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay all facility costs including operation and maintenance, and to retire the indebtedness and maintain a reserve.
- Water and waste disposal systems must be consistent with any development plans of state, multi-jurisdictional area, county, or municipality in which the proposed project is located. All facilities must comply with federal, state, and local laws including those concerned with zoning regulations, health and sanitation standards, and the control of water pollution.
- Loan and grant funds may be used for the following types of improvements:
    - Construct, repair, improve, expand, or otherwise modify waste collection, pumping, treatment, or other disposal facilities. Facilities to be financed may include such items as sewer lines, treatment plants (including stabilization ponds), storm sewer facilities, sanitary landfills, incinerators, and necessary equipment.
    - Legal and engineering costs connected with the development of facilities.
    - Other costs related to the development of the facility, including the acquisition of rights-of-way and easements, and the relocation of roads and utilities.
    - Finance facilities in conjunction with funds from other agencies or those provided by the applicant.

Interim commercial financing will normally be used during construction and Rural Development funds will be available when the project is completed. If interim financing is not available or if the project cost is less than $50,000, multiple advances of Rural Development funds may be made as construction progresses.

The maximum term on all loans is forty years. However, no repayment period will exceed any statutory limitation on the organization's borrowing authority; nor the useful life of the improvement of the facility to be financed. Interest rates are set quarterly and are based on current market yields for municipal obligations. Current interest rates may be obtained from any Rural Development office.

The following rates currently apply for the Rural Development program:

Market rate. Those applicants pay the market rate whose Median Household Income (MHI) of the service area is more than the $52,855 (Oregon non-metropolitan MHI). The market rate is currently 3.500%.

Intermediate rate. The intermediate rate is paid by those applicants whose MHI of the service area is less than $52,855 but greater than $42,284. The intermediate rate is currently 2.750%.

Poverty line rate. Those applicants whose MHI of the service area is below $42,284 (80% of the non-metropolitan MHI) pay the lowest rate. Improvements must also be to correct a regulatory violation or health risk issue to qualify for this lowest rate. The current poverty line rate is 2.125%.

Maximum grant amounts, based on MHI, are provided in Table 6.1.1. The grants are calculated on the basis of eligible costs that do not include the costs attributable to reserve capacity or interim financing. In addition, grant funds cannot be used to reduce total user costs below that of comparable communities funded by RUS.

TABLE 6.1.1
MAXIMUM RURAL DEVELOPMENT GRANT FUNDS
BASED ON MEDIAN HOUSEHOLD INCOME

Median Household Income (MHI)	Maximum Grant [a]	Interest Rate [b]
<$42,284	75%	2.125%
$42,284 - $52,855	45%	2.750%
>$52,855	0%	3.500%

[a] MHI<$42,284 may be considered for a grant up to 75% of eligible project cost if the project is needed to alleviate a health or sanitary problem.
[b] Rates are current as of this quarter.

The 2013 to 2017 American Community Survey 5-Year Median Household Income estimate for the City is $52,174 (± $11,026). The 5-Year Mean Household Income Estimate is $58,071 (± $7,570). The MHI for the State of Oregon is $56,119 (± $370). At this MHI, the City could be eligible for a grant of up to 45% of the total project cost. The City may also be eligible for a Rural Development loan at the intermediate rate of 2.75%.

There are other restrictions and requirements associated with these loans and grants. If the City becomes eligible for grant assistance, the grant will apply only to eligible project costs. Additionally, grant funds are only available after the City has incurred long-term debt resulting in an annual debt service obligation equal to 0.5% of the MHI. In addition, an annual funding allocation limits the Rural Development funds. To receive a Rural Development loan, the City must secure bonding authority, usually in the form of general obligation or revenue bonds.

Applications for financial assistance are made at area offices of Rural Development. For additional information on Rural Development loans and grant programs call 541-673-0136 or visit the RUS website at http://www.usda.gov/rus/water/. The Oregon Rural Development website is http://www.rurdev.usda.gov/or/.

Technical Assistance and Training Grants (TAT)

Available through the USDA Rural Utilities Service (RUS) as part of Water and Waste Disposal programs, TAT grants are intended to provide technical assistance and training to associations on a wide range of issues relating to the delivery of water and waste disposal services.

Rural communities with populations of less than 10,000 persons are eligible along with private, nonprofit organizations that have been granted tax-exempt status by the IRS.

TAT funds may be used for the following activities:

- Identify and evaluate solutions to water and/or waste-related problems of associations in rural areas.
- Assist entities with preparation of applications for Water and Waste Disposal loans and grants.
- Provide training to association personnel in order to improve the management, operation and maintenance of water and/or waste disposal facilities.
- Pay expenses related to providing the technical assistance and/or training.

Grants may be made for up to 100% of the eligible project costs. Applications are filed with any USDA Rural Development office. For additional information on Rural Development loans and grant programs, call 541-673-0136 or visit the RUS website at http://www.usda.gov/rus/water/.

(Oregon) Community Development Block Grant (CDBG) Program

The Community Development Block Grant Program (CDBG) section of the Infrastructure Finance Authority (IFA) administers the CDBG Program. Grants and technical assistance are available to develop livable urban communities for persons of low and moderate incomes by expanding economic opportunities and providing housing and suitable living environments.

Non-metropolitan cities and counties can apply for and receive grants. Oregon tribes, urban cities (Ashland, Bend, Corvallis, Eugene, Gresham, Hillsboro, Medford, Portland, Salem and Springfield) and counties (Clackamas, Multnomah, Washington) receive funds directly from Housing and Urban Development (HUD).

All projects must meet one of three national objectives:

1. The proposed activities must benefit low and moderate income individuals.
2. The activities must aid in the prevention or elimination of slums or blight.
3. There must be an urgent need that poses a serious and immediate threat to the health or welfare of the community.

Funding amounts are based on:

- The applicant’s need.

- The availability of funds.
- Other restrictions defined in the program's guidelines.

The following are the maximum grants possible for any individual project, by category:

- Economic Development: $750,000
- Microenterprise: $100,000
- Public Works
  - Water and Wastewater Improvements: $3,000,000 except preliminary/engineering planning grants: $150,000
  - Downtown Revitalization: $400,000
  - Offsite Infrastructure: $225,000
- Community/Public Facilities: $1,500,000
- Community Capacity/Technical Assistance: no specific per-award-limit but limited overall funds
- Emergency Grants: $500,000
- Regional Housing Rehabilitation: $400,000
- Emergency Projects: $500,000

For additional information on the CDBG programs, call 866-467-3466 or visit the IFA website at http://www.orinfrastructure.org/Learn-About-Infrastructure-Programs/Interested-in-a-Community-Development-Project/Community-Development-Block-Grant/.

Oregon Special Public Works Fund

The Special Public Works Fund (SPWF) provides funds for publically owned facilities that support economic and community development in Oregon**.** Special Public Works Funds provide funding for construction and/or improvement of infrastructure needed to support industrial, manufacturing and certain types of commercial development. Funds are available to public entities for:

- Planning
- Designing
- Purchasing
- Improving and constructing publically owned facilities
- Replacing publically owned essential community facilities
- Emergency projects as a result of a disaster

Public agencies that are eligible to apply for funding are:

- Cities
- Counties
- County service districts (organized under ORS Chapter 451)
- Tribal councils
- Ports
- Districts as defined in ORS 198.010
- Airport districts (ORS 838)

Facilities and infrastructure projects that are eligible for funding are:

- Airport facilities
- Buildings and associated equipment

- Restoration of environmental conditions on publically owned industrial lands
- Port facilities, wharves and docks
- The purchase of land, rights-of-way and easements necessary for a public facility
- Telecommunications facilities
- Railroads
- Roadways and bridges
- Solid waste disposal sites
- Storm drainage systems
- Wastewater systems
- Water systems

Loans

Loans for development (construction) projects range from less than $100,000 to $10 million. The Infrastructure Finance Authority offers very attractive interest rates that reflect tax-exempt market rates for highly qualified borrowers. Initial loan terms can be up to 25 years or the useful life of the project, whichever is less.

Grants

Grants are available for construction projects that create or retain trade-sector jobs. They are limited to $500,000 or 85% of the project cost, whichever is less, and are based on up to $5,000 per eligible job created or retained.

Limited grants are available to plan industrial site development for publically owned sites and for feasibility studies.

For additional information on IFA programs, call 503-986-0123 or visit the IFA website at http://www.orinfrastructure.org/Learn-About-Infrastructure-Programs/Interested-in-a-Community-Development-Project/Special-Public-Works-Fund/.

Water/Wastewater Financing Program

Water/wastewater financing is available for construction and/or improvement of water and wastewater systems to meet state and federal standards. This loan program funds the design and construction of public infrastructure needed to ensure compliance with the Clean Water Act (CWA). The public entities that are eligible to apply for the program are:

- Cities
- Counties
- County service districts (organized under ORS Chapter 451)
- Tribal councils
- Ports
- Special districts as defined in ORS 198.010

The proposed project must be owned and operated by a public entity as listed above. Allowable funded project activities may include:

- Reasonable costs for construction improvement or expansion of drinking water system, wastewater system or storm water system.
- Water source, treatment, storage and distribution.

- Wastewater collection, treatment and disposal facilities, storm water system.
- Purchase of rights-of-way and easements necessary for construction.
- Design and construction engineering.
- Planning/technical assistance for small communities.

To be eligible for funding:

- A system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency or is for a facility plan or study required by a regulatory agency.

- A registered Professional Engineer will be responsible for the design and construction of the project.

Funding and Uses

Loan and grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources and other factors).

Loans

Program guidelines, project administration, loan terms and interest rates are similar to the Special Public Works Fund program. The maximum loan term is 25 years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10 million per project through a combination of direct and/or bond funded loans. Recently IFA is offering lower, reduced interest rates for municipalities whose household income is less than the statewide median income. The current terms of this loan are for 25 years at 3.50 % interest.

Loans are generally repaid with utility revenues or voter approved bond issues. A limited tax general obligation pledge also may be required. "Creditworthy" borrowers may be funded through the sale of state revenue bonds.

Grants

Grant awards up to $750,000 may be awarded based on a financial review.

An applicant is not eligible for grant funds if the applicant's annual median household income is equal or greater than 100 percent of the state average median household income for the same year.

Funding for Technical Assistance

The Infrastructure Finance Authority offers technical assistance with financing for municipalities with populations of less than 15,000. The funds may be used to finance preliminary planning, engineering studies and economic investigations.

Technical assistance projects must be in preparation for a construction project that is eligible and meets the established criteria.

- Grants up to $20,000 may be awarded per project.

- Loans up to $60,000 may be awarded per project.

Interested applicants should contact Business Oregon prior to submitting an application. Applications are accepted year-round. For additional information on this IFA program, call 503-986-0123 or visit the IFA website at http://www.orinfrastructure.org/Learn-About-Infrastructure-Programs/Interested-in-a-Water-or-Wastewater-Improvement-Project/water-wastewater-financing/.

Department of Environmental Quality, Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) loan program is administered by the Oregon Department of Environmental Quality (DEQ) and provides low-cost loans for the planning, design or construction of various projects that prevent or mitigate water pollution. Eligible agencies include Indian tribal governments, cities, counties, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and certain intergovernmental entities.

Six different types of loans are available within the program, including loans for planning, design, construction, emergencies, urgent repairs and local community projects. A portion of the fund is reserved for small communities, planning or green projects.

Interest rates for the loan program change quarterly based on a percentage of the national municipal bond rate. Those percentages vary from 25% to 65% of the bond rate. For example, with a quarterly bond rate of 4.1%, CWSRF interest rates range from 1.0% to 2.7% depending on the length of the loan repayment period.

Current CWSRF interest rates range from around one to three percent depending on the type and terms of the loans. Different interest rates and other financial requirements apply to different loans. Rates are adjusted quarterly, based on the average Bond Buyer Rates of the previous quarter as published by the Federal Reserve. When a loan is signed, the interest rate is fixed for the life of the loan. Below are 2019 interest rates for loans executed from July 1 through September 30, 2019.

TABLE 6.1.2
CWSRF INTEREST RATES

Loan Type	Repayment Term	Annual Interest Rate
Planning	5 years	0.91%
Design/Construction	5 years	0.91%
Design/Construction	10 years	1.09%
Design/Construction	15 years	1.28%
Design/Construction	30 years	1.46%

All eligible proposed projects are ranked based on their application information. Points are assigned based on specific ranking criteria, which include: 1) the anticipated benefit for water quality or public health; 2) potential water quality or public health consequences of not funding the project; and 3) other considerations such as education and outreach. The DEQ website lists detailed ranking criteria.

The Intended Use Plan is one part of Oregon's annual CWSRF capitalization grant application. This plan includes lists of eligible projects ranked in priority order. Projects which are allocated funds are placed on the Funded List. Unfunded projects are placed on the Planning List to receive funds if any of the Funded List projects do not complete the loan process. Projects identified on the Funded List from prior years which have not been initiated are placed on a Supplemental List.

Obtaining CWSRF funding requires the submission of an application, preparation of an environmental report on the project, a land use compatibility statement from a county planning official, and a copy of the user charge system. There are additional requirements depending on the nature of the project. An applicant needs to contact a DEQ Project Officer to discuss the project and find out what is required.

For additional information on this and other DEQ programs, call 800-452-4011 or visit the DEQ website at http://www.deq.state.or.us/wq/loans/loans.htm.

Oregon Department of Energy, Small Scale Energy Loan Program

The Small Scale Energy Loan Program (SELP) program offers loans to projects whose purpose is to promote energy conservation and renewable energy resource development. Eligible applicants include cities, counties, special districts, individuals, and non-profit groups. Loans will cover up to 100% of construction costs, including engineering, fees, and studies. The finished project must at least break even in power costs.

The program offers low-interest loans for projects that:

- Conserve natural gas, electricity, oil, or other source of energy.
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat.
- Use recycled materials to create products.

Interested parties should contact the Oregon Office of Energy for details. For additional information on the Office of Energy programs, call 503-378-4040 or visit the Office of Energy website at http://oregon.gov/ENERGY/.

6.2 Local Funding Sources

The amount and type of local funding obligations for infrastructure improvements will depend, in part, on the amount of grant funding anticipated and the requirements of potential loan funding. Local revenue sources for capital expenditures include *ad valorem* taxes, various types of bonds, wastewater service charges, connection fees, and system development charges. Local revenue sources for operating costs include *ad valorem* taxes and wastewater service charges. The following sections identify those local funding sources and financing mechanisms that are most common and appropriate for the improvements identified in this study.

General Obligation Bonds

A General Obligation (G.O.) bond is backed by the full faith and credit of the issuer. For payment of the principal and interest on the bond, the issuer may levy *ad valorem* general property taxes. Such taxes are not needed if revenue from assessments, user charges or other sources are sufficient to cover debt service.

Oregon Revised Statutes limit the maximum term to 40 years for cities. Except in the event that Rural Development Administration will purchase the bonds, the realistic term for which general obligation bonds should be issued is 15 to 20 years. Under the present economic climate, the lower interest rates will be associated with the shorter terms.

Financing of wastewater system improvements by general obligation bonds is usually accomplished by the following procedure:

- Determination of the capital costs required for the improvement.
- An election authorizing the sale of general obligation bonds.
- Following voter approval, the bonds are offered for sale.
- The revenue from the bond sale is used to pay the capital costs associated with the projects.

From a fundraising viewpoint, general obligation bonds are preferable to revenue bonds in matters of simplicity and cost of issuance. Since the bonds are secured by the power to tax, these bonds usually command a lower interest rate than other types of bonds. General obligation bonds lend themselves readily to competitive public sale at a reasonable interest rate because of their high degree of security, their tax-exempt status, and their general acceptance.

These bonds can be revenue-supported, wherein a portion of the user fee is pledged toward payment of the debt service. Using this method, the need to collect additional property taxes to retire the obligated bonds is eliminated. Such revenue-supported general obligation bonds have most of the advantages of revenue bonds, but also maintain the lower interest rate and ready marketability of general obligation bonds. Since the users of the water system pay their share of the debt load based on their water usage rates, the share of that debt is distributed in a fair and equitable manner.

Advantages of general obligation bonds over other types of bonds include:

- The laws authorizing general obligation bonds are less restrictive than those governing other types of bonds.
- By the levying of taxes, the debt is repaid by all property benefited and not just the system users.
- Taxes paid in the retirement of these bonds are IRS-deductible.
- General obligation bonds offer flexibility to retire the bonds by tax levy and/or user charge revenue.

The disadvantage of general obligation bond debt is that it is often added to the debt ratios of the underlying municipality, thereby restricting the flexibility of the municipality to issue debt for other purposes. Furthermore, general obligation bonds are normally associated with the financing of facilities that benefit an entire community and must be approved by a majority vote and often necessitate extensive public information programs. A majority vote often requires waiting for a general election in order to obtain an adequate voter turnout. Waiting for a general election may take years, and too often a project needs to be undertaken in a much shorter amount of time.

Revenue Bonds

Revenue bonds offer some advantages over general obligation bonds and are becoming a more frequently used option. Revenue bonds are payable solely from charges made for the services provided. These bonds cannot be paid from tax levies or special assessments; their only security is the borrower's promise to operate the system in a way that will provide sufficient net revenue to meet the debt service and other obligations of the bond issue.

Many communities prefer revenue bonding, as opposed to general obligation bonding, because it insures that no tax will be levied. In addition, debt obligation will be limited to system users since repayment is derived from user fees. Another advantage of revenue bonds is that they do not count against a municipality's direct debt, but instead are considered "overlapping debt." This feature can be a crucial advantage for a municipality near its debt limit or for the rating agencies, which consider very closely the amount of direct debt when assigning credit ratings. Revenue bonds also may be used in financing projects extending beyond normal municipal boundaries. These bonds may be supported by a pledge of revenues received in any legitimate and ongoing area of operation, within or outside the geographical boundaries of the issuer.

Successful issuance of revenue bonds depends on the bond market evaluation of the revenue pledged. Revenue bonds are most commonly retired with revenue from user fees. Recent legislation has eliminated the requirement that the revenues pledged to bond payment have a direct relationship to the services financed by revenue bonds. Revenue bonds may be paid with all or any portion of revenues derived by a public body or any other legally available monies. In addition, if additional security to finance revenue bonds is needed, a public body may mortgage grant security and interests in facilities, projects, utilities or systems owned or operated by a public body.

Normally, there are no legal limitations on the amount of revenue bonds to be issued, but excessive issue amounts are generally unattractive to bond buyers because they represent high investment risks. In rating revenue bonds, buyers consider the economic justification for the project, reputation of the borrower, methods and effectiveness for billing and collecting, rate structures, provision for rate increases as needed to meet debt service requirements, track record in obtaining rate increases historically, adequacy of reserve funds provided in the bond documents, supporting covenants to protect projected revenues, and the degree to which forecasts of net revenues are considered sound and economical.

Municipalities may elect to issue revenue bonds for revenue-producing facilities without a vote of the electorate (ORS 288.805-288.945). In this case, certain notice and posting requirements must be met and a 60-day waiting period is mandatory. A petition signed by five percent of the municipality's registered voters may cause the issue to be referred to an election.

Improvement Bonds

Improvement (Bancroft) bonds can be issued under an Oregon law called the Bancroft Act. These bonds are an intermediate form of financing that is less than full-fledged general obligation or revenue bonds. This type of bond is quite useful, especially for smaller issuers or for limited purposes.

An improvement bond is payable only from the receipts of special benefit assessments, not from general tax revenues. Such bonds are issued only where certain properties are recipients of special benefits not accruing to other properties. For a specific improvement, all property within the improvement area is assessed on an equal basis, regardless of whether it is developed or undeveloped. The assessment is designed to apportion the cost of improvements, approximately in proportion to the afforded direct or indirect benefits, among the benefited property owners. This 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 semi-annual installments with interest. Cities and special districts are limited to improvement bonds not exceeding three percent of true cash value. With improvement bond financing, an improvement district is formed, the boundaries are established, and the benefited properties and property owners are determined. The Engineer usually determines an approximate assessment, either on a square foot or a front-foot basis. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for the purpose of making monthly payments to the Contractor. Therefore, some method of interim financing must be arranged, or a pre-assessment program, based on the estimated total costs, must be adopted. Commonly, warrants are issued to cover debts, with the warrants to be paid when the project is complete.

The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value at least equal to fifty percent of the total assessments to be levied. As a result, owners of undeveloped property usually require a substantial cash payment. In addition, the development of an assessment district is very cumbersome and expensive when facilities for an entire community are contemplated. In comparison, general obligation bonds can be issued in lieu of improvement bonds, and are usually more favorable.

Capital Construction (Sinking) Fund

Sinking funds are often established by budgeting for a particular construction purpose. Budgeted amounts from each annual budget are carried in a sinking fund until sufficient revenues are available for the needed project. Such funds can also be developed with revenue derived from system development charges or serial levies.

The disadvantage of a sinking fund is that it is usually too small to undertake any significant projects. Also, setting aside money generated from user fees without a designated and specified need is not generally accepted in a municipal budgeting process.

Connection Fees

Most cities charge connection fees to cover the cost of connecting new development to water and wastewater systems. Based on recent legislation, connection fees can no longer be programmed to cover a portion of capital improvement costs.

System Development Charges

A System Development Charge (SDC) is essentially a fee collected as each piece of property is developed, and which is used to finance the necessary capital improvements and municipal services required by the development. Such a fee can only be used to recover the capital costs of infrastructure. Operating, maintenance, and replacement costs cannot be financed through system development charges. Two types of charges are permitted under the Oregon Systems Development Charges Act, improvement fees and reimbursement fees. The SDCs charged before construction are considered improvement fees and are used to finance capital improvements to be constructed. After construction, SDCs are considered reimbursement fees and are collected to recapture the costs associated with capital improvements already constructed or under construction. A reimbursement fee represents a charge for utilizing excess capacity in an existing facility paid for by others. The revenue generated by this fee is typically used to pay back existing loans for improvements.

Under the Oregon SDC Act, methodologies for deriving improvement and reimbursement fees must be documented and available for review by the public. A capital improvement plan must also be prepared which lists the capital improvements that may be funded with improvement fee revenues and the estimated cost and timing of each improvement. Thus, revenue from the collection of SDCs can only be used to finance specific items listed in a capital improvement plan. In addition, SDCs cannot be assessed on portions of the project paid for with grant funding.

Local Improvement District (LID)

Improvement bonds issued for Local Improvement Districts (LIDs) are used to administer special assessments for financing local improvements in cities, counties, and some special districts. Common improvements financed through an LID include storm and sanitary sewers, street paving, curbs, sidewalls, water mains, recreational facilities, street lighting, and off-street parking. The basic principle of special assessment is that it is a charge imposed upon property owners who receive special benefits from an improvement beyond the general benefits received by all citizens in the community. A public agency should consider three "principles of benefit" when deciding to use special assessment: 1) direct service; 2) obligation to others; and 3) equal sharing/basis. Cities are limited to improvement bonds not exceeding three percent of true cash value.

The Oregon Legislature has provided cities with a procedure for special assessment financing (ORS 223.387-399), which applies when city charter or ordinance provisions do not specify otherwise. To establish an LID, an improvement district is formed, the boundaries are established, and the benefited properties and property owners are determined. An approximate assessment to each property is determined based on the above three principles of benefit, and is documented in a written report. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for the purpose of making monthly payments to the Contractor. Therefore, some method of interim financing must be arranged based on the estimated total costs.

The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value at least equal to fifty percent of the total assessments to be levied. As a result, owners of undeveloped property usually require a substantial cash payment. In addition, the development of an assessment district is very cumbersome and expensive.

Ad Valorem Taxes

Ad valorem property taxes are often used as a revenue source for utility improvements. Property taxes may be levied on real estate, personal property or both. Historically, *ad valorem* taxes were the traditional means of obtaining revenue to support all local governmental functions.

A marked advantage of these taxes is the simplicity of the system; it requires no monitoring program for developing charges, additional accounting and billing work is minimal, and default on payments is rare. In addition, *ad valorem* taxation provides a means of financing that reaches all property owners that benefit from a water system, whether a property is developed or not. The construction costs for the project are 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. Public hearings and election with voter approval would be required to implement *ad valorem* taxation.

User Fee

User fees can be used to retire general obligation bonds, and are commonly the sole source of revenue to retire revenue bonds and to finance operation and maintenance. User fees represent monthly charges of all residences, businesses, and other users that are connected to the wastewater system. These fees are established by resolution and may be modified, as needed, to account for increased or decreased operating and maintenance costs. User fees may be based on a metered volume of water consumption and/or on the type of user (e.g. residential, commercial, schools etc.).

Assessments

Under special circumstances, the beneficiary of a public works improvement may be assessed for the cost of a project. For example, the City may provide some improvements or services that directly benefit a particular development. The City may choose to assess the industrial or commercial developer to provide up-front capital to pay for the administered improvements.

6.3 Financing Strategy

A financing strategy or plan must provide a mechanism to generate capital funds in sufficient amounts to pay for the proposed improvements over the relatively short duration in design and construction, generally two years. The financing strategy must also identify the manner in which annual revenue will be generated to cover the expense for long-term debt repayment and the on-going operation and maintenance of the system.

The objectives of a financial strategy include the following:

- Identify the capital improvement cost for the project and the estimated expense for operation and maintenance.
- Evaluate the potential funding sources and select the most viable program.
- Determine the availability of outside funding sources and identify the local cost share.
- Determine the cost to system users to finance the local share and the annual cost for operation and maintenance.

Project Expenses

A total of approximately $4.9 million for 2021 (2021 Dollars) includes all recommended wastewater collection and treatment system improvement projects that were identified in Section 5. The identified projects replace or repair existing equipment and facilities and are expected to increase the annual operations and maintenance costs to the City.

Funding Sources

With any of the proposed funding sources within the financial strategy, the City is advised to confirm specific funding amounts with the appropriate funding agencies prior to making local financing arrangements. A “One-Stop” meeting with funding agencies is recommended as soon as the City has made a firm commitment as to schedule and the extent of capital improvements.
It is recommended that the City undertake efforts to secure funding in the form of grants and loans. Most of the grant programs require that the project address a DEQ-issued violation or order before the project is eligible for funding. Rural Development will issue grants for projects without this requirement, but will require a documented need to alleviate a health problem or sanitary problem.

It is recommended that the City schedule and attend a “One-Stop” meeting after regulatory approval of the final Wastewater Facilities Plan (WWFP) in order to assess the funding environment at that time.

Changes to the City's rate structure will be necessary. The EPA has indicated sewer rates of two percent per year (or less) of the median household income are affordable. Based on a MHI of $52,174, the City of Scio's EPA affordable rate is $87 per month. Sewer collections from recent rate code reports were averaged and found to be $35 per EDU per month. Rural Development uses the average service cost for the system when allocating grant funds. See Appendix C for the calculation of EDUs and sewer service costs. Table 8.3.1 summarizes the City's current wastewater rate structure.

TABLE 6.3.1
CITY OF SCIO WASTEWATER RATE STRUCTURE

Rate Description	2019 No. of Users	Current Rate per EDU	2019 Current EDUs
In Town Residential	337	$35	337
Commercial	28	$35	20
Large Commercial	6	$35	9
School	6	$35	42

After the City conducts a "One-Stop" meeting following the approval of the final WWFP to assess the funding environment and identify potential funding sources, the City's rate structure will need to change in order to accommodate the collection system and wastewater treatment plant improvements. Potential funding sources are listed in Table 6.3.2 below. Note that this is strictly for preliminary purposes, and does not reflect the outcome of the "One-Stop" meeting. Additionally, terms and rates may change from this time.

TABLE 6.3.2
POTENTIAL COLLECTION SYSTEM AND WWTP PROJECT FUNDING SOURCES

Project Description	**Cost**		**Funding Source**	
Collection System Improvements		$3,189,150		
WWTP Improvements		$891,000		
Source of Funding	Grant	Loan Amount	Years	Interest Rate
RUS Loan and Grant	$500,000	$4,054,100	40	4.25%
RUS Loan Only	$0	$4,554,100	40	4.25%
Combination Sources:				
IFA / CDBG Grant	$500,000	$0	n/a	n/a
DEQ / CWSRF Loan	$0	$4,054,100	30	1.6%
Business Oregon W/W	$0	$4,554,100	25	3.74%
Private Funding	$0	$4,554,100	20	5.00%

The City does not have a history of violating the NPDES Permit requirements for the WWTP and the collection system. No Mutual Agreement and Order (MAO) has been needed since violations very rarely occur. The potential funding scenarios are used to allow the City to anticipate potential impacts to

ratepayers. Once the City has determined what funding is available through the "One-Stop" meeting, the current rate structure should be reviewed to determine the actual impact to ratepayers. All grants, loans, existing debts and reserves, and surpluses should be taken into account when calculating the final impact to ratepayers.

TABLE 6.3.3
COLLECTION SYSTEM AND WWTP IMPROVEMENTS FUNDING SOURCE USER RATE

Source of Funding	**Ann. Loan**	**Loan Cost/EDU**	**Operation Cost/EDU**	**Required Min. Rate**
	Payment	per Month	per Month	per EDU
IFA & DEQ – Grants and Loans	$167,854	$34.28	$33.78	$68.06
RUS Loan & Grant	$233,760	$47.75	$33.78	$81.52
RUS Loan	$262,590	$53.63	$33.78	$87.41
Business Oregon	$276,316	$56.44	$33.78	$90.22
Private Funding	$365,433	$74.64	$33.78	$108.42

SECTION 7:

REFERENCES

SECTION 7: **REFERENCES**

Climate Scio – Oregon, U.S. Climate Data

Coordinated Population Forecast for Linn County, its Urban Growth Boundaries (UGB) and Area Outside of UGBs (2017 - 2067), College of Urban and Public Affairs, Portland State University.

Federal Emergency Management Agency (FEMA), The National Flood Insurance Program Status Book.

Guidelines for Making Wet-Weather and Peak Flow Projections for Sewage Treatment in Western Oregon, Department of Environmental Quality Guidelines, State of Oregon (1996).

Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions.

Oregon Administrative Rules, Chapter 340, Division 55 (OAR 340-055).

APPENDICES

APPENDIX A: DEQ DOCUMENTS

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 Scio
P.O. Box 37
Scio, OR 97373

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 7.3

FACILITY TYPE AND LOCATION:
Stabilization Lagoons without Aeration
Scio STP
38841 SW 6th Ave
Scio, Oregon
Treatment System Class: Level I

RECEIVING STREAM INFORMATION:
Basin: Willamette
Sub-Basin: South Santiam
Receiving Stream: Thomas Creek
LLID: 1229666446777 7.3 D
County: Linn

EPA REFERENCE NO: OR0029301

Issued in response to Application No. 973614 received January 29, 2008. This permit is issued based on the land use findings in the permit record.

Steve Schnurbusch, Acting Water Quality Manager
Western Region North

Date 12/27/11

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:

	Page
Schedule A - Waste Discharge Limitations not to be Exceeded	2
Schedule B - Minimum Monitoring and Reporting Requirements	4
Schedule D - Special Conditions	6
Schedule F - General Conditions	8

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge of waste is prohibited, including discharge to waters of the state or an underground injection control system.

SCHEDULE A

1. Waste Discharge Limitations not to be exceeded after permit issuance.

a. Treated Effluent Outfall 001

(1) May 1 - October 31: The permittee may not discharge to waters of the state

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	33	50	66
TSS	50 mg/L	80 mg/L	54	81	110

* Average dry weather design flow to the facility equals 0.09 MGD. Mass load limits based upon the winter discharge rate of 0.13 MGD to allow for disposal of summer accumulations of treated wastewater as well as winter stormwater impacting lagoon surface. Schedule D, Condition 4 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 340-041-0061 (10), and upon request of the permittee, the Department intends to modify this permit and include revised mass load limits.

(3) Other Parameters

Year-round (except as noted)	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 85% monthly average for BOD_5 and 65% monthly for TSS.
Total Residual Chlorine	Must not exceed 0.01 mg/L monthly average and 0.04 mg/L as a daily maximum. **(see Note 2)**

(4) No wastes may be discharged or activities conducted that cause or contribute to a violation of water quality standards in OAR 340 Division 041 applicable to the Willamette basin except as provided for in OAR 340-045-0080 and the following regulatory mixing zone:

The regulatory mixing zone is that portion of Thomas Creek contained within a band extending out fifteen (15) feet 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 regulatory mixing zone that is within ten (10) feet of the point of discharge.

b. No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals shall be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340 Division 040).

NOTES:

1. If a single *E. coli* bacteria 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 of the *E. coli* bacteria standard is not be triggered.
2. When the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level (i.e. daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation).

SCHEDULE B

1. **Minimum Monitoring and Reporting Requirements.**
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 as soon as possible for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

The facility influent grab samples and measurements and composite samples must be taken the influent pipeline just before entering the first lagoon cell and in accordance with the table below.

Item or Parameter	Minimum Frequency	Type of Sample/Action
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
pH	2/Week	Grab

b. Treated Effluent Outfall 001

The facility effluent samples for BOD_5, TSS, pH, and flow measurements must be taken just after the Parshall flume but prior to the chlorine contact chamber. Residual chlorine and E. coli bacteria samples are collected just prior to exiting the chlorine contact chamber. A second residual chlorine sample is collected just after the injection of the sodium bi-sulfide and in accordance with the table below.

Item or Parameter	Minimum Frequency	Type of Sample/Action
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annual	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
pH	2/Week	Grab
E. coli	2/Month	Grab
Quantity Chlorine Used	Daily	Measurement
Total Chlorine Residual	Daily	Grab
Pounds Discharged (BOD_5 and TSS)	Monthly	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Temperature	2/Week	Measurement

c. Sludge Management (Cell #1)

Item or Parameter	Minimum Frequency	Type of Sample
Sludge Depth in Cell #1	Once prior to submittal of renewal application	Representative Measurement

2. Reporting Procedures

a. Monitoring results must be reported on Department approved forms. The reporting period is the calendar month. The permittee shall submit monitoring reports to the appropriate Department office by the 15th day of the following month.

b. 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 must have a program in place to identify and reduce inflow and infiltration into the sewage collection system. A copy of the program must be kept at the wastewater treatment facility for review upon request by the DEQ. An annual Inflow and Infiltration report must be submitted to the DEQ by February 1 each year that includes the following:

(1) Details of activities performed in the previous year to identify and reduce Inflow and infiltration,
(2) Similar Inflow and Infiltration activities planned for the following year, and
(3) A summary of sanitary sewer overflows that occurred during the previous year.

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 must have its wastewater system supervised by one or more operators who are certified in a classification and grade level that is equal to or greater than 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 1.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 wastewater system must have 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 redesignation of certified operators responsible for supervising wastewater system operation. The notice must be sent to the Water Quality Division, Operator Certification Program, 2020 SW 4th Avenue, Suite 400, Portland OR 97201. 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. The permittee must notify the appropriate DEQ office in accordance with the response times noted in the General Conditions of this permit, of any malfunction of the collection system or treatment facility so that corrective action can be coordinated between the permittee and the Department.

3. The permittee will not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and;

   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facilities impact on groundwater quality.

4. Six (6) months prior to the removal of accumulated solids from the lagoon, the permittee shall submit to the Department a revised 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 permittee shall implement the plan.

5. Recycled water used by a wastewater treatment system owner for landscape irrigation or for in plant processes at a wastewater treatment system is exempt from OAR 340 Division 50 if:

   a. The recycled water is an oxidized and disinfected wastewater;

   b. The recycled water is used at the wastewater treatment system site where it is generated or at an auxiliary wastewater or sludge treatment facility that is subject to the same NPDES or WPCF permit as the wastewater treatment system. Contiguous property to the parcel of land upon which the treatment system is located is considered the wastewater treatment system site if under the same ownership;

   c. Spray or drift or both from the use does not occur off the site; and

   d. Public access to the site is restricted.

SCHEDULE F
NPDES GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

A1. <u>Duty to Comply with Permit</u>

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and the federal Clean Water Act and is grounds for an enforcement action. Failure to comply is also grounds for DEQ to terminate, modify and reissue, revoke, or deny renewal of a permit.

A2. <u>Penalties for Water Pollution and Permit Condition Violations</u>

The permit is enforceable by DEQ or EPA, and in some circumstances also by third-parties under the citizen suit provisions 33 USC § 1365. DEQ enforcement is generally based on provisions of state statutes and Environmental Quality Commission (EQC) rules, and EPA enforcement is generally based on provisions of federal statutes and EPA regulations.

ORS 468.140 allows DEQ to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit. The federal Clean Water Act provides for civil penalties not to exceed $32,500 and administrative penalties not to exceed $11,000 per day for each violation of any condition or limitation of this permit.

Under ORS 468.943, unlawful water pollution, if committed by a person with criminal negligence, is punishable by a fine of up to $25,000, imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense. The federal Clean Water Act provides for criminal penalties of not more than $50,000 per day of violation, or imprisonment of not more than 2 years, or both for second or subsequent negligent violations of this permit.

Under ORS 468.946, a person who knowingly discharges, places, or causes to be placed any waste into the waters of the state or in a location where the waste is likely to escape into the waters of the state is subject to a Class B felony punishable by a fine not to exceed $250,000 and up to 10 years in prison. ORS 161. The federal Clean Water Act provides for criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment of not more than 3 years, or both for knowing violations of the permit. In the case of a second or subsequent conviction for knowing violation, a person is subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

A3. <u>Duty to Mitigate</u>

The permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of DEQ, the permittee must 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.

A4. <u>Duty to Reapply</u>

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 must be submitted at least 180 days before the expiration date of this permit.

DEQ may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

A5. Permit Actions

This permit may be modified, 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.
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a total maximum daily load (TMDL).
e. New information or regulations.
f. Modification of compliance schedules.
g. Requirements of permit reopener conditions
h. Correction of technical mistakes made in determining permit conditions.
i. Determination that the permitted activity endangers human health or the environment.
j. Other causes as specified in 40 CFR §§ 122.62, 122.64, and 124.5.
k. For communities with combined sewer overflows (CSOs):
   (1) To comply with any state or federal law regulation for CSOs that is adopted or promulgated subsequent to the effective date of this permit.
   (2) If new information that was not available at the time of permit issuance indicates that CSO controls imposed under this permit have failed to ensure attainment of water quality standards, including protection of designated uses.
   (3) Resulting from implementation of the permittee's long-term control plan and/or permit conditions related to CSOs.

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

A6. Toxic Pollutants

The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rule (OAR) 340-041-0033 and section 307(a) of the federal Clean Water Act for toxic pollutants, and with standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, 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.

A7. Property Rights and Other Legal Requirements

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

A8. Permit References

Except for effluent standards or prohibitions established under section 307(a) of the federal Clean Water Act and OAR 340-041-0033 for toxic pollutants, and standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

A9. Permit Fees

The permittee must pay the fees required by OAR.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

B1. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that 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.

B2. Need to Halt or Reduce Activity Not a Defense

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, 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 is not 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.

B3. Bypass of Treatment Facilities

a. Definitions
   (1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b and c of this section.
   (2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources that 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 and DEQ may take enforcement action against a permittee for bypass unless:
      i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      ii. 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 judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and
      iii. The permittee submitted notices and requests as required under General Condition B3.c.
   (2) DEQ may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, if DEQ determines that it will meet the three conditions listed above in General Condition B3.b.(1).

c. Notice and request for bypass.
   (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to DEQ at least ten days before the date of the bypass.
   (2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D5.

B4. 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 B4.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 must 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 D5, hereof (24-hour notice); and
   (4) The permittee complied with any remedial measures required under General Condition A3 hereof.
d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

B5. Treatment of Single Operational Upset

For purposes of this permit, a single operational upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one federal Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include federal 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 upset is a violation.

B6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definition. "Overflow" means any spill, release or diversion of sewage including:
   (1) An overflow that results in a discharge to waters of the United States; and
   (2) An overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral), even if that overflow does not reach waters of the United States.
b. Prohibition of overflows. Overflows are prohibited. DEQ may exercise enforcement discretion regarding overflow events. In exercising its enforcement discretion, DEQ may consider various factors, including the adequacy of the conveyance system's capacity and the magnitude, duration and return frequency of storm events.
c. Reporting required. All overflows must be reported orally to DEQ within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D5.

B7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (for example, public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B8. 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.

B8. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses, or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;

b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
e. Provide emergency operations; and
f. Ensure that DEQ is notified of the public notification steps taken.

B9. Removed Substances
Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from such materials from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

C1. Representative Sampling
Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and must be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points must not be changed without notification to and the approval of DEQ.

C2. Flow Measurements
Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must 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 must 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.

C3. Monitoring Procedures
Monitoring must be conducted according to test procedures approved under 40 CFR part 136 or, in the case of sludge use and disposal, approved under 40 CFR part 503 unless other test procedures have been specified in this permit.

C4. Penalties of Tampering
The federal 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 may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or 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.

C5. Reporting of Monitoring Results
Monitoring results must be summarized each month on a Discharge Monitoring Report form approved by DEQ. The reports must 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.

C6. 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 part 136 or, in the case of sludge use and disposal, approved under 40 CFR part 503, or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the discharge monitoring report. Such increased frequency must also be indicated. For a

pollutant parameter that may be sampled more than once per day (for example, Total Chlorine Residual), only the average daily value must be recorded unless otherwise specified in this permit.

C7. Averaging of Measurements
Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which must be averaged as specified in this permit.

C8. Retention of Records
Records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities must be retained for a period of at least 5 years (or longer as required by 40 CFR part 503). Records of all monitoring information including all calibration and maintenance records, 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 must be retained 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 DEQ at any time.

C9. Records Contents
Records of monitoring information must 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.

C10. Inspection and Entry
The permittee must allow DEQ or EPA 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.

C11. Confidentiality of Information
Any information relating to this permit that is submitted to or obtained by DEQ is available to the public unless classified as confidential by the Director of DEQ under ORS 468.095. The permittee may request that information be classified as confidential if it is a trade secret as defined by that statute. The name and address of the permittee, permit applications, permits, effluent data, and information required by NPDES application forms under 40 CFR § 122.21 are not classified as confidential. 40 CFR § 122.7(b).

SECTION D. REPORTING REQUIREMENTS

D1. Planned Changes
The permittee must comply with OAR 340-052, "Review of Plans and Specifications" and 40 CFR § 122.41(l)(1). Except where exempted under OAR 340-052, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and specifications are submitted to and approved by DEQ. The permittee must give notice to DEQ as soon as possible of any planned physical alternations or additions to the permitted facility.

D2. Anticipated Noncompliance
The permittee must give advance notice to DEQ of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

D3. 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 EQC rules. No permit may be transferred to a third party without prior written approval from DEQ. DEQ may require modification, revocation, and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under 40 CFR § 122.61. The permittee must notify DEQ when a transfer of property interest takes place.

D4. 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 must be submitted no later than 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

D5. Twenty-Four Hour Reporting
The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to the DEQ regional office or Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.
   (1) Oral Reporting within 24 hours.
      i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to the DEQ regional office.
         (a) The location of the overflow;
         (b) The receiving water (if there is one);
         (c) An estimate of the volume of the overflow;
         (d) A description of the sewer system component from which the release occurred (for example, manhole, constructed overflow pipe, crack in pipe); and
         (e) The estimated date and time when the overflow began and stopped or will be stopped.
      ii. The following information must be reported to the DEQ regional office within 24 hours, or during normal business hours, whichever is earlier:
         (a) The OERS incident number (if applicable); and
         (b) A brief description of the event.
   (2) Written reporting within 5 days.
      i. The following information must be provided in writing to the DEQ regional office within 5 days of the time the permittee becomes aware of the overflow:
         (a) The OERS incident number (if applicable);
         (b) The cause or suspected cause of the overflow;
         (c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
         (d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
         (e) For storm-related overflows, the rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

      DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

b. Other instances of noncompliance.
   (1) The following instances of noncompliance must be reported:
      i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
      ii. Any upset that exceeds any effluent limitation in this permit;
      iii. Violation of maximum daily discharge limitation for any of the pollutants listed by DEQ in this permit; and
      iv. Any noncompliance that may endanger human health or the environment.
   (2) During normal business hours, the DEQ regional office must be called. Outside of normal business hours, DEQ must be contacted at 1-800-452-0311 (Oregon Emergency Response System).
   (3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:
      i. A description of the noncompliance and its cause;
      ii. The period of noncompliance, including exact dates and times;
      iii. The estimated time noncompliance is expected to continue if it has not been corrected;
      iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
      v. Public notification steps taken, pursuant to General Condition B7.
   (4) DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

D6. Other Noncompliance

The permittee must report all instances of noncompliance not reported under General Condition D4 or D5 at the time monitoring reports are submitted. The reports must 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.

D7. Duty to Provide Information

The permittee must furnish to DEQ within a reasonable time any information that DEQ may request to determine compliance with the permit or to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit. The permittee must also furnish to DEQ, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to DEQ, it must promptly submit such facts or information.

D8. Signatory Requirements

All applications, reports or information submitted to DEQ must be signed and certified in accordance with 40 CFR § 122.22.

D9. Falsification of Information

Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $125,000 per violation and up to 5 years in prison. ORS 161. Additionally, according to 40 CFR § 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance will, upon conviction, be punished by a federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

D10. Changes to Indirect Dischargers

The permittee must provide adequate notice to DEQ 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 federal 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 must 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.

SECTION E. DEFINITIONS

E1. *BOD* or *BOD_5* means five-day biochemical oxygen demand.
E2. *CBOD* or *$CBOD_5$* means five-day carbonaceous biochemical oxygen demand.
E3. *TSS* means total suspended solids.
E4. *Bacteria* means but is not limited to fecal coliform bacteria, total coliform bacteria, and *E. coli* bacteria.
E5. *FC* means fecal coliform bacteria.
E6. *Total residual chlorine* means combined chlorine forms plus free residual chlorine
E7. *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 340-041.
E8. *mg/l* means milligrams per liter.
E9. *kg* means kilograms.
E10. *m^3/d* means cubic meters per day.
E11. *MGD* means million gallons per day.
E12. *24-hour composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow. The sample must be collected and stored in accordance with 40 CFR part 136.
E13. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
E14. *Quarter* means January through March, April through June, July through September, or October through December.
E15. *Month* means calendar month.
E16. *Week* means a calendar week of Sunday through Saturday.
E17. *POTW* means a publicly-owned treatment works.

PUBLIC NOTICE

FACT SHEET
And
NPDES WASTEWATER DISCHARGE PERMIT EVALUATION

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

PERMITTEE: City of Scio
PO Box 37
Scio, OR 97374
File Number: 79633

SOURCE LOCATION: 38841 SW 6th Ave., Scio, OR 97374

SOURCE CONTACT: Robert Walker Telephone Number: 503-394-334

PERMIT WRITER: Robert Dicksa Telephone Number: 503-378-8240, ext. 246

PROPOSED ACTION: Renewal of a National Pollutant Discharge Elimination System (NPDES) wastewater discharge permit

SOURCE CATEGORY: Minor Domestic

TREATMENT SYSTEM CLASS: Level I

COLLECTION SYSTEM CLASS: Level I

PERMIT APPLICATION DATE: February 4, 2002

PERMIT APPLICATION NUMBER: 986625

BACKGROUND

Introduction

City of Scio operates a wastewater treatment facility located in Scio, Oregon **(See Attachment 1)**. Wastewater is treated and discharged to Thomas Creek in accordance with National Pollutant Discharge Elimination System (NPDES) Permit number 101503 **(See Antidegradation Review Sheet Attachment 2)**. The Permit for the facility was issued on September 15, 1997 and expired on July 31, 2002.

The Department received a renewal application on February 4, 2002. A renewal permit is necessary to discharge to state waters pursuant to provisions of Oregon Revised Statutes (ORS) 468B.050 and the Federal Clean Water Act. The Department proposes to renew the permit.

Facility Description

The City of Scio operates a two-cell stabilization lagoon without aeration that discharges to Thomas Creek at River Mile (RM) 7.2. There are no major contributing industries to the influent flows, therefore the waste influent flow is primarily domestic sewage. The wastewater flows by gravity through the North and South sides of town where it is collected in a wet well and then conveyed by an inverted siphon under Thomas Creek to a lift station. The lift station then pumps the raw sewage to the first lagoon cell. Cell one is approximately four acres in area and Cell two is approximately three acres. Influent flows come in at the north end of the cell and then a gravity transfer pipeline at the south end of the first cell allows the water to flow into cell two. The water circulates through cell two where a still well allows the water to flow over inner v-notch weirs to a Parshall flume and into the chlorine contact chamber. The effluent is disinfected using gaseous chlorine and then de-chlorinated with sodium bi-sulfide powder and discharged through a half mile long pipeline to Thomas Creek.

Influent samples are collected from a point just prior to entering the first lagoon cell. Effluent samples for BOD_5, TSS, pH, and flow are collected just after the Parshall flume but prior to the chlorine contact chamber. Residual chlorine and *E. coli* bacteria samples are collected just prior to exiting the chlorine contact chamber. A second residual chlorine sample is collected just after the injection of the sodium bi-sulfide to determine if chlorine removal is taking place and the permittee is complying with the existing chlorine permit limit. A small flash mixer has been installed to help mix the gaseous chlorine with the effluent to attain adequate bacterial disinfection. Both the influent and effluent grab and composite samples are collected using an ISCO auto-sampler.

The dry weather flows do not include the high levels of infiltration and inflow that are associated with the winter in Oregon. Therefore, the design dry weather flows are used mostly to estimate how much treatment capacity there is for organic loads. For this facility, the average design dry weather flow is .087 million gallons/day (MGD). The current actual dry weather flow for May 1 to October 31, for the past two years, is 0.032 MGD. Based on the current flows, this facility is at 37 percent of organic treatment capacity.

Biosolids Management and Utilization

Waste sludge accumulates in the treatment lagoon. A Biosolids Management Plan must be submitted 6 months prior to removing any biosolids from the lagoon. It is anticipated that biosolids will be land applied at agronomic rates after approval of the application sites and the revised biosolids management plan by the Department.

No beneficial land application will be allowed under this permit until a Biosolids Management Plan is submitted by the permittee and is approved by the Department. The Biosolids Management Plan will ensure compliance with the federal biosolids regulations (40 CFR Part 503).

Pretreatment

The permittee does not have a formal pretreatment program, nor is one required for this source.

Pollutants Discharged

The current permit allows City of Scio to discharge treated effluent from the wastewater treatment plant during the winter season from November 1 – April 30. The current permit sets limits on the following pollutants: Five-day Biochemical Oxygen Demand (BOD5), Total Suspended Solids (TSS), and *E. coli* bacteria. The discharge is also regulated for pH, pollutant removal efficiency and total chlorine residual.

The proposed permit will continue to allow the City to discharge treated effluent from November 1 – April 30 each year and will set limits on the following pollutants: BOD_5, TSS, *E. coli* bacteria, pH, total chlorine residual, and pollutant removal efficiency.

Outfalls

The current NPDES Permit allows the treatment facility to discharge treated wastewater through Outfall 001 to Thomas Creek at RM 8.0. However, the Department's GIS tool identifies the discharge location as River Mile 7.2. The permittee is allowed to discharge treated wastewater from November 1 through April 30 each year.

Receiving Streams/Impact

The water quality standards for the Willamette Basin (Oregon Administrative Rules 340-041-0445) were developed to protect the beneficial uses for the basin. Treated wastewater is discharged to Thomas Creek at RM 7.2. Thomas Creek has been listed as water quality limited for temperature during the summer season on the Department's 2002, 303(d) list.

The permittee discharges only during the winter season and should not have an impact on temperature increases in the receiving stream. Discharges that are in compliance with the permit should not have a significant impact on the water quality of the receiving stream. The Department will develop a Total Maximum Daily Load (TMDL) for the Willamette River Basin by the end of 2003 that will determine the corrective actions necessary to bring specific water bodies back into compliance with water quality standards. The TMDL will be incorporated into specific NPDES permit for dischargers in the basin by 2005. Should the Department determine that a Waste Load Allocation for temperature in Thomas Creek be necessary for this specific discharge, the permit may be re-opened to assign a WLA for temperature to this discharge.

Groundwater

Based on the Department's current information, this facility has a low potential for adversely impacting groundwater quality **(See Groundwater Prioritization Worksheet Attachment 3)**. To confirm the Departments information, Schedule C of the proposed permit will contain a compliance condition for leak testing the existing lagoon cells. The permit also includes a condition in Schedule A that prohibits any adverse impact on groundwater quality.

Temperature

The discharge to surface waters only occurs in the winter, when the receiving stream basin meets all applicable water quality criteria for temperature. The Department will require temperature monitoring of the effluent in the proposed permit to determine if the discharge has the potential to contribute to any exceedance of the temperature standard or impact on the receiving stream. The permittee will not be required to submit or implement a Temperature Management Plan at this time.

Stormwater

Stormwater is not addressed in this permit. General NPDES permits for storm water are not required for facilities with a design flow of less than 1 MGD.

Compliance History

This facility was last inspected on July 23, 2003, and was found to be operating in compliance.

The monitoring reports for this facility were reviewed for the period since the current permit was issued, including any actions taken relating to effluent violations. The permit compliance conditions were reviewed and all inspection reports for the same period were reviewed. Based on this review, the following violations have been documented at this facility during the term of the current permit.

Date of Violation	Type of Enforcement Action	Description of Violation
November 2002	Class II Notice of Non-compliance	Exceeding BOD_5 Monthly average concentration
February 2003	Class II Notice of Non-compliance	Exceeding BOD_5 Monthly average concentration

The permittee has made adjustments to the treatment process to help eliminate recurring violations.

PERMIT DISCUSSION

Face Page

The permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system. Permits discharge of treated effluent to Thomas Creek within limits set by Schedule A and the following schedules. All other discharges are prohibited.

Schedule A - Waste Discharge limitations

BOD and TSS concentration and mass limits

Based on the Willamette Basin minimum design criteria, wastewater treatment resulting in a monthly average effluent concentration of 10 mg/L for BOD5 and TSS must be provided from May 1 - October 31. From November 1 - April 30, a minimum of secondary treatment or equivalent control is required. Secondary treatment is normally defined as 30 mg/L for BOD and TSS. However, the federal secondary treatment standards (40 CFR 133.103(c)) allow states to give lagoons special consideration in setting concentration limit for TSS. Therefore, secondary treatment for this facility is defined as monthly average concentration limit of 30 mg/L for BOD5 (or 25 mg/L for CBOD5) and 50 mg/L for TSS.

The Department is proposing concentration limits at least as stringent as the basin minimum design criteria. The proposed monthly average BOD5 concentration limit is 30 mg/L with a weekly average limit of 45 mg/L. The proposed monthly average TSS concentration limit is 50 mg/L with a weekly average limit of 80 mg/L.

The winter mass load limits for the facility are based on a discharge flow rate of .130 MGD and the monthly average BOD_5 or TSS concentration limits of 30 mg/L and 50 mg/L, respectively. The limits are in accordance with OAR 340-41-120(9) (e). All mass load limitations are rounded to two significant figures.

The winter mass limits can be based on design average wet weather flow (AWWF) but the Department does not have the necessary information to make the change. The proposed permit bases winter mass discharge limits on the monthly average dry weather design flow and are considered interim in accordance with Oregon Administrative Rule (OAR) 340-41-120(9)(d).

The proposed permit contains a compliance condition requiring the permittee to submit an engineering study that accurately determines design wet weather flow. The alternative is for the permittee to accept winter mass load limits for BOD_5 and TSS that are based on twice the monthly average dry weather flow.

BOD_5 and TSS

The limits are:

(1) May 1 - October 31:

No discharge to state waters is permitted.

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations		Monthly Average lb/day	Weekly Average lb/day	Daily Maximum Lbs
	Monthly	Weekly			
BOD_5	30 mg/L	45 mg/L	33	50	66
TSS	50 mg/L	80 mg/L	54	81	110

Calculations:

(1) BOD_5

(a) 0.130 MGD x 8.34 #/gal x 30 mg/L monthly avg. = 33 lbs/day
(b) 33 lbs/day monthly avg. x 1.5 = 50 lbs/day weekly avg.
(c) 33 lbs/day monthly avg. x 2.0 = 66 lbs/day daily max.

(2) TSS

(a) 0.130 MGD x 8.34 #/gal x 50 mg/L monthly avg. = 54 lbs/day
(b) 54 lbs/day monthly avg. x 1.5 = 81 lbs/day weekly avg.
(c) 54 lbs/day monthly avg. x 2.0 = 110 lbs/day daily max.

A review of recent monitoring data indicates the City should generally be able to comply with the permit limits.

BOD and TSS Percent Removal Efficiency

A minimum level of percent removal for BOD5 and TSS for municipal dischargers is required by the Code of Federal Regulations (CFR) secondary treatment standards (40 CFR, Part 133). In accordance with the federally approved standards for Oregon under 40 CFR 133.105, certain types of treatment facilities (including trickling filters and facultative lagoons) are eligible for consideration of lower percent removal limits. The proposed permit requires a minimum monthly average BOD5 and TSS removal efficiency of 85 and 65 percent respectively. An examination of the DMR data indicates the permittee will have little difficulty meeting the limit with the current facilities.

pH

The Willamette Basin Water Quality Standard for pH is found in OAR 340-041-0445(2)(d). The allowed range is 6.5 to 8.5. The proposed permit limits pH to the range 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 permittee's mixing zone, the water quality standard for pH does not have to be met. It is the Department's belief 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 proposed permit limits to be protective of the water quality standard.

Bacteria

The proposed permit limits are based on an *E. coli* standard approved in January 1996. The proposed limits are a monthly geometric mean of 126 *E. coli* per 100 ml, with no single sample exceeding 406 *E. coli* per 100 ml. The bacteria standard allows that if a single sample exceeds

406 *E coli* per 100 ml, then the permittee may take five consecutive re-samples. If the log mean of the five re-samples is less than or equal to 126, a violation is not triggered.

The new rule states that the re-samples should be taken at four hour intervals beginning as soon as practicable (preferably within 28 hours) after the original sample was taken. The rule also allows for changing the re-sampling time frame if it would pose an undue hardship on the treatment facility. After discussions with the permittee, the Department is proposing that the five re-samples be taken beginning no later than 48 hours after the original sample was taken.

<u>Chlorine Residual</u>

Disinfection of the effluent with chlorine is the process the permittee uses to comply with the waste discharge limitations for bacteria. Chlorine is a known toxic substance and as such is subject to limitation under Oregon Administrative Rules. The rule (OAR 340-041-0445(2)(p)) states in part that toxic substances shall not be discharged to waters of the state at levels that adversely affect public health, aquatic life or other designated beneficial uses. In addition, levels of toxic substances shall not exceed the criteria listed in Table 20 which were based on criteria established by the EPA and published in Quality Criteria for Water (1986), unless otherwise noted.

However, OAR 340-041-0445(4) states that the Department may allow a designated portion of a receiving water to serve as a zone of dilution for wastewaters and receiving waters to mix thoroughly and this zone will be defined as a mixing zone. The Department may suspend all or part of the water quality standards, or set less restrictive standards, in the defined mixing zone, provided the water within the mixing zone is free of materials in concentrations that will cause acute toxicity to aquatic life as measured by the acute bioassay method and outside the boundary of the mixing zone is free of materials in concentrations that will cause chronic toxicity.

Furthermore, 40 CFR §122.44(d) states that permit limitations must control all pollutants or pollutant parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality. The fresh water criteria for chlorine were used to calculate permit limitations. According to OAR 340-041, Table 20, chlorine concentrations of 11 μg/l can result in chronic toxicity in fresh waters while 19 μg/l can result in acute chlorine toxicity in fresh waters.

Compliance with acute toxicity criteria is required at the edge of the Zone of Immediate Dilution (ZID) and compliance with chronic toxicity criteria is required at the edge of the mixing zone. In the previous permit, the permittee had a Schedule C compliance condition that required: "By no later than January 31, 2001, the permittee shall submit to the Department either a mixing zone study demonstrating that the facility complies with acute and chronic standards for chlorine at the edge of the zone of immediate dilution and at the edge of the mixing zone, respectively, **<u>or</u>** and approvable plan, to be implemented during the next permit cycle, to bring the facility into compliance with these standards." The permittee constructed de-chlorination facilities in 2002, in order to comply with the in stream water quality standard for chlorine.

A low flow analysis for the month of November for Thomas Creek was done using flow data from the USGS gauging station number 14188800 (Thomas Creek near Scio, Oregon). The flow data period of record for Thomas Creek was from October 1, 1962, to September 30, 1987. The November 7Q10 (lowest average week flow for a ten year period) was calculated to 63.2 cubic feet per second (cfs). The discharge flowrate for the facility is 0.13 MGD. The available dilution was determined using 25 percent of the receiving stream for the mixing zone and 10 percent of the receiving stream for the zone of immediate dilution. The data was input into a DEQ spreadsheet program to calculate permit limits based on the acute and chronic criteria. Since the acute and chronic criteria are based on different durations, the spreadsheet also equalizes the durations to determine the more restrictive criteria **(See Attachment 4).**

In this case, the acute criterion is the more stringent of the two. Thus, end-of-pipe limits based on that criteria are proposed in the permit. The total residual chlorine in the effluent shall not exceed 0.14 mg/l monthly average and 0.36 mg/l daily maximum. The permittee currently has the ability to de-chlorinate the discharge to reduce potential toxic effects on the receiving stream, therefore the facility should have no problem meeting the current permit limits and still attain adequate disinfection of effluent.

Mixing Zone and Zone of Immediate Dilution

The allowable mixing zone is that portion of Thomas Creek contained within a band extending out fifteen (15) feet 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) shall be defined as that portion of the allowable mixing zone that is within ten (10) feet of the point of discharge. The Department believes that the beneficial uses of the receiving stream will not be affected by the discharge and this mixing zone and that the defined mixing zone meets the criteria in the rule.

Schedule B - Minimum Monitoring and Reporting Requirements

In 1988, the Department developed a monitoring matrix for commonly monitored parameters. Proposed monitoring frequencies for all parameters are based on this matrix and, in some cases, may have changed from the current permit. The proposed monitoring frequencies for all parameters correspond to those of facilities of similar size and complexity in the state.

The permittee is required to have a laboratory Quality Assurance/Quality Control program. The Department recognizes that some tests do not accurately reflect the performance of a treatment facility due to quality assurance/quality control problems. These tests should not be considered when evaluating the compliance of the facility with the permit limitations. Thus, the Department is also proposing to include in the opening paragraph of Schedule B a statement recognizing that some test results may be inaccurate, invalid, do not adequately represent the facility's performance and should not be used in calculations required by the permit.

Monitoring for *E. coli* must be performed in accordance with one of the methods approved by the Department.

Total chlorine residual and chlorine used must be monitored daily before and after de-chlorination of the effluent.

Daily monitoring of influent and effluent flow is required in this permit. In addition, calibration of the flow meter is required on a regular basis.

Discharge monitoring reports must be submitted to the Department monthly by the 15th day of the following month. The monitoring reports need to identify the principal operators designated by the Permittee to supervise the treatment and collection systems. The reports must also include records concerning application of biosolids and all applicable equipment breakdowns and bypassing.

Schedule B of the permit includes the requirement for the submittal of an annual report. The conditionis a standard language requirement concerning:

Annual report on inflow and infiltration removal

<u>Schedule C - Compliance Conditions</u>

The proposed permit includes seven (7) compliance conditions with compliance deadlines. The requirements include:

A compliance condition requiring either an engineering evaluation demonstrating the design average wet weather flow for winter mass load limits, or a request to retain the existing mass load limits in the proposed permit.

A report that proposes a program and schedule for identifying and reducing inflow in the collection system if the mass load limits are revised in accordance with Condition 1.

The permittee will be required to submit a Biosolids Management Plan to the Department for approval at least six months prior to the removal of biosolids from the lagoon.

A report identifying known sewage overflow locations and a plan and schedule for eliminating the overflow(s), if any, or confirming that there are no overflow points.

A condition requiring that the permittee conduct a leak test on the existing lagoon cells by no later than nine (9) months after permit issuance.

A condition requiring the permittee to submit the results of the leak test by no later than 3 months after conducting the tests. And, should the results of the leak test show significant leakage rate greater than or equal to 0.25 inches per day, then the permittee shall submit a Corrective Action Plan and/or Groundwater Monitoring Plan to the Department for review and approval within six (6) months after a determination that the lagoon cell(s) are leaking at an unacceptable rate.

The final condition requires the permittee to meet the compliance dates established in this schedule or notify the Department within 14 days following any lapsed compliance date.

Schedule D - Special Conditions

The proposed permit includes four (4) special conditions. The requirements include:

Managing all biosolids or septage in accordance with the current biosolids or septage management plan approved by the Department and site authorization letters approved by the Department.

The permittee must have the facilities supervised by personnel certified by the Department in the operation of treatment and/or collection systems.

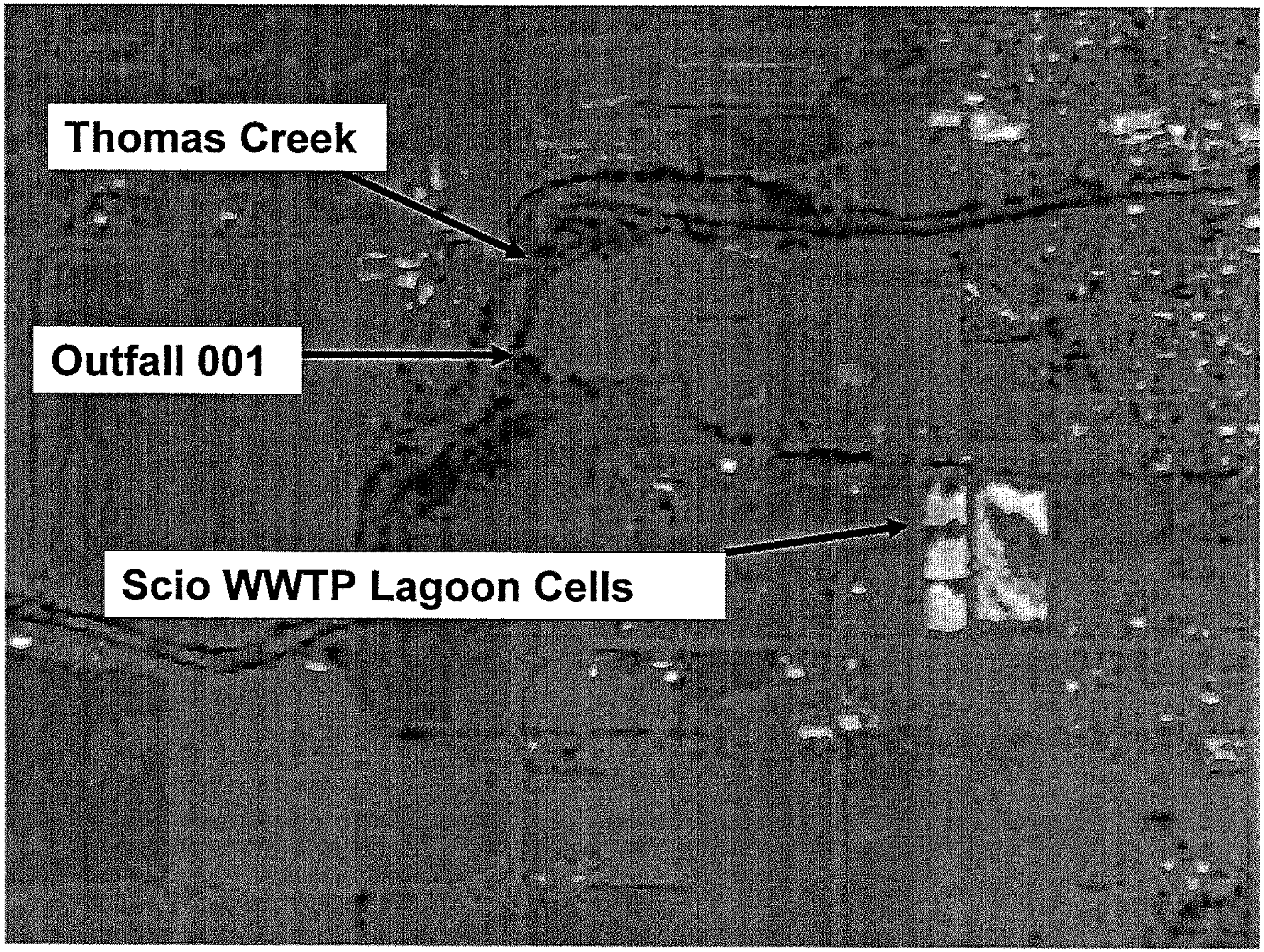
Adverse groundwater impacts and hydrogeologic characterization of the area of impact.

Notifying the Department of any malfunctions.

Schedule F - NPDES General Conditions

All NPDES permits issued in the State of Oregon contain certain conditions that remain the same regardless of the type of discharge and the activity causing the discharge. These conditions are called General Conditions. These conditions can be changed or modified only on a statewide basis. The latest edition of the NPDES General Conditions is December 1, 1995 and this edition is included as Schedule F of the draft permit.

Attachment 1 City of Scio WWTP



PUBLIC NOTICE

Attachment 2

Antidegradation Review Sheet

ANTIDEGRADATION REVIEW SHEET
FOR A PROPOSED INDIVIDUAL NPDES DISCHARGE

1. What is the name of Surface Water that receives the discharge? **Thomas Creek**

   Briefly describe the proposed activity:

   Is this review for a renewal OR new (circle one) permit application?
   Go to Step 2. **NEW.**

---

2. Is this surface water an **Outstanding Resource Water** or **upstream** from an **Outstanding Resource Water**?
   Yes. Go to Step 5.
   No. Go to Step 3. **NO**

3. Is this surface water a **High Quality Water**?
   Yes. Go to Step 8.
   No. Go to Step 4. **YES**

8. Will the proposed activity result in a Lowering of Water Quality in the **High Quality Water**?
   Yes. Go to Step 9.
   No. Proceed with Permit Application. Applicant should provide basis for conclusion. Go to Step 24. **NO**

24. On the basis of the Antidegradation Review, the following is recommended:
   __**X**__ Proceed with Application to Interagency Coordination and Public Comment Phase.
   _____ Deny Application; return to applicant and provide public notice.

Action Approved

Section:	Water Quality-Western Region, Salem Office
Review Prepared By:	Robert A. Dicksa
Phone:	503-378-8240, ext. 246
Date Prepared:	August 4, 2003

Please provide the following information and submit with the completed application form to:

Department of Environmental Quality
Water Quality Division—Surface Water Management
811 SW Sixth Avenue
Portland, Oregon 97204-1390

Name:	Robert Waller, Director of Public Works
Name of Company:	City of Scio
Address:	PO Box 37
	Scio, OR 9737
Phone:	503-394-3342

Attachment 3

PRIORITIZATION WORKSHEET

Permit Type (circle one): NPDES	
Type of Facility: Facultative Lagoons	
Application Number: 986625	
File Number: 79633	
Worksheet Completed by: ____________________ Date: ________________	Approved by: ____________________
Prioritization Worksheet and Preliminary Groundwater Assessment Steps Waived by Permit Applicant. Applicant will proceed directly to Hydrogeologic Characterization. Approved by: ____________________	Date: ________________

DOMESTIC WASTEWATER FACILITIES

EXISTING **Wastewater and Sludge/Biosolids Impoundment Systems (confirm all statements given as true or false):**		
1. System (any or all of its individual impoundment components) does not leak excessively. (An **"excessively"** leaking lagoon system or cell may be defined as one that has been designed for subsurface infiltration, rarely or never needs to discharge, dries up in the summer, or contains rooted vegetation.)	True	
2. System is not located in a Groundwater Management Area where an identified contaminant of concern (ie. nitrates) may be associated with domestic wastewater or sludge.	True	
3. System is not located within 500 ft. of an existing public or private drinking water supply well, is not located within a designated Wellhead Protection Area, and all land within 500 ft. of the system is zoned such that no drinking water wells are likely to be installed in the future.	True	
4. There are no **exceptional situations** under which the impoundment system may require further groundwater review to determine the likelihood of an adverse impact	True	

DOMESTIC WASTEWATER FACILITIES (CONTINUED)

NEW **and** *EXISTING* **Wastewater and Sludge/Biosolids Land Application (confirm all statements given as true or false):**		
1. Application is in compliance with the "reuse" rules (or municipal sewage sludge application rules) and application rates are at or less than agronomic rates. (Note: Nominal leaching fractions may be considered to be in compliance with the "reuse" rules in some areas of the state such as parts of eastern Oregon where climate conditions indicate the need.)	True	
2. There are no **exceptional situations** under which the impoundment system may require further groundwater review to determine the likelihood of an adverse impact.	True	

Permit Limits - Chlorine and Ammonia

Facility Name: City of Scio

Date: 8/15/2003

Dilution Values? (Y/N)	n	calculated
Low Flow Dilution @ ZID =	*	*
Low Flow Dilution @ MZ =	*	*
High Flow Dilution @ ZID =	*	19.0
High Flow Dilution @ MZ =	*	79.6
	Summer	Winter
Effluent Flow (MGD) =	*	0.13
7Q10 (CFS) =	*	63.2
1Q10 (CFS) =	*	36.3
% dilution at MZ =	*	25
% dilution at ZID =	*	10

Summer data	Effluent	Stream	Mixed		
			ZID	MZ	
pH * =	*	*	*	*	(6.5-9)
Temp * =	*	*	*	*	° C
Alkalinity =	*	*			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity	*	*	*	*	
Winter data					
pH * =	7.2	6.5	6.5	6.5	(6.5-9)
Temp * =	20	20	20.0	20.0	° C
Alkalinity =	25	25			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity	0	20	19.0	19.7	

probability basis (for WLA multipliers)	99	%

PARAMETER	WATER QUALITY CRITERIA 1 Hour (CMC) mg/l	4 Day (CCC) mg/l	Back-ground mg/l	Allocations Acute mg/l	Chronic mg/l	CV	# Samples /Mo	Acute LTA mg/l	Chronic LTA mg/l	Min LTA mg/l	95TH % LIMITS Daily mg/l	Monthly mg/l	99TH % LIMITS Daily mg/l	Monthly mg/l
High Flow Season														
CHLORINE	0.019	0.011	0.00	0.36	0.88	0.6	30	0.12	0.46	0.12		**0.14**	**0.36**	

State of Oregon
Department of
Environmental
Quality

National Pollutant Discharge Elimination System
PERMIT EVALUATION REPORT AND FACT SHEET

Oregon Department of Environmental Quality

Western Region
750 Front Street NE, Suite 120
Salem, OR 97301
(503) 378-8240

Permittee:	City of Scio PO Box 37 Scio OR 97374
Existing Permit Information:	File Number: 79633 Permit Number: 101503 Expiration Date: 9-30-2008 EPA Reference Number: OR-002930-1
Source Contact:	Robert Waller: 503-394-3342 Title: Director of Public Works
Source Location:	38841 SW 6th Ave Scio, Oregon Linn County
LLID:	LLID: 1229666446777-7.3-D
Receiving Stream/Basin:	Thomas Creek/Willamette Basin
Proposed Action:	Renew Permit Application Number: 973614 Date Received: January 29, 2008
Source Category:	NPDES Minor– Domestic
Sources Covered:	Domestic sewage
Permit Writer:	Steve Schnurbusch Acting Manager October 31, 2011

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1.0 INTRODUCTION

The Department of Environmental Quality (DEQ) proposes to renew the National Pollutant Discharge Elimination System (NPDES) wastewater permit for the City of Scio. This permit allows and regulates the discharge of treated domestic wastewater to Thomas Creek in the South Santiam sub-basin of the Willamette River Basin.

The current NPDES Permit expired on September 30, 2008. DEQ received renewal application number 973614 from the City of Scio on January 29, 2008. Because the permittee submitted a renewal application to DEQ in a timely manner, the current permit will not expire until DEQ takes final action on the renewal application as per OAR 340-045-0040.

This permit evaluation report describes the basis and methodology used in developing the permit. The permit is divided into several sections:

Schedule A – Waste discharge limits
Schedule B – Minimum monitoring and reporting requirements
Schedule C – Compliance conditions and schedules
Schedule D – Special conditions
Schedule F – General conditions

The Federal Water Pollution Control Act of 1972 and its subsequent amendments, as well as Oregon Revised Statutes (ORS 468B.050), require a NPDES permit for the discharge of wastewater to surface waters. This proposed permit action by DEQ complies with both federal and state requirements.

2.0 FACILITY DESCRIPTION

2.1 Wastewater Facilities Description

The City of Scio operates a two-cell stabilization lagoon without aeration that discharges to Thomas Creek at river mile 7.3. There are no major industries contributing to the influent, therefore the waste influent flow is primarily domestic sewage. The wastewater flows by gravity through the north and south sides of town where it is collected in a wet well and then conveyed by an inverted siphon under Thomas Creek to a lift station. The lift station then pumps the raw sewage to the first lagoon cell. Cell one is approximately four acres in area and cell two is approximately three acres. Influent flows come in at the north end of the cell and then a gravity transfer pipeline at the south end of the first cell allows the water to flow into cell two. The water circulates through cell two where a still well allows the water to flow over inner v-notch weirs to a Parshall flume and into the chlorine contact chamber. The effluent is disinfected using gaseous chlorine and then de-chlorinated with sodium bi-sulfide powder and discharged through a half mile long pipeline to Thomas Creek.

Influent samples are collected from a point just prior to entering the first lagoon cell. Effluent samples for BOD_5, TSS, pH, and flow are collected just after the Parshall flume but prior to the chlorine contact chamber. Residual chlorine and *E. coli* bacteria samples are collected just prior to exiting the chlorine contact chamber. A second residual chlorine sample is collected just after the injection of the sodium bi-sulfide to determine if chlorine removal is taking place and the permittee is complying with the existing chlorine permit limit. Both the influent and effluent grab and composite samples are collected using an ISCO auto-sampler.

The dry weather flows do not include the high levels of infiltration and inflow that are commonly associated with the winter in Oregon. Therefore, the design dry weather flows are used mostly to estimate how much treatment capacity there is for organic loads. For this facility, the average design dry weather flow is 0.090 million gallons/day (MGD). The current actual dry weather flow for May 1 to October 31, for the past two years, is 0.032 MGD. Based on the current flows, this facility is at 37 percent of organic treatment capacity.

2.2 Outfalls

The current NPDES Permit allows the treatment facility to discharge treated wastewater through Outfall 001 to Thomas Creek at river mile 7.3. The permittee is allowed to discharge treated wastewater from November 1 through April 30 each year.

2.3 Inflow and Infiltration

Average flow into the wastewater facilities averaged 0.045 million gallons per day (MGD) during the last two dry seasons and 0.091 MGD during the last two wet weather periods. The wet period average flow is about two times the dry period average flow. The highest monthly average flow of 0.18 MGD occurred in December 2010 and was about four times the average dry weather flow. The peak day flow of 0.394 MGD occurred during December 2010 and was almost nine times the dry period average flow. The 2:1 wet weather to dry weather flow ratio indicates the inflow and infiltration (I/I) is not excessively high. As in all domestic permits, the permittee must have a program in place to identify and reduce I/I into the sewage collection system and must submit an annual report by February 1st of each year which details sewer collection maintenance activities that reduce I/I.

Collection system overflows can result from catastrophic failure of the treatment plant or pump station or high flows due to storm events. The permit prohibits raw sewage discharge. The permittee has experienced no overflow during the prior permit cycle and can comply with this requirement.

The current permit requires a removal efficiency of 85 percent for biochemical oxygen demand (BOD_5) and 65% for total suspended solids (TSS). The permittee did not violate the above removal efficiency limits during the past permit cycle.

2.4 Biosolids Management

The city treats their effluent with a two-cell stabilization lagoon process. These types of lagoon systems do not generated solids on an ongoing basis. Solids settle to the bottom of the lagoon and breakdown over time. If the facility is operating within the design capacity, it could be 30 years or more before the lagoons need to be dredged of any accumulated solids. DEQ does not anticipate the city needing to dredge their lagoon during this next permit cycle. If they do, the proposed permit requires the city to submit a biosolids management plan to DEQ six months prior to land application of the biosolids.

2.5 Stormwater

Stormwater is not addressed in this permit. General NPDES permits for stormwater are not required for facilities with a design flow of less than 1 MGD.

2.6 Groundwater

The existing permit required a leak test of the lagoons. A leak test was conducted in the summer of 2004. The leak test indicated the seepage rates are well below DEQ thresholds. DEQ does not anticipate any adverse impacts due to groundwater from these lagoons.

2.7 Industrial Pretreatment

The permittee does not have a DEQ-approved industrial pretreatment program. One is not required for this source based on current information.

3.0 PERMIT HISTORY

3.1 Permit History

The permit was last issued in October 2003. No modifications have been made to the permit since it was issued.

3.2 Compliance History

The wastewater treatment plant was last inspected on April 24, 2009. During the inspection two issues were noted. The city failed to meet a deadline regarding their mass load limits and the city was not conducting BOD, TSS and pH testing according to proper methods. The city corrected these issues shortly after the inspection. There have not been any documented violations since the last permit issuance in 2003.

4.0 RECEIVING WATER

The City of Scio discharges to Thomas Creek in the Willamette Basin. The designated beneficial uses of Thomas Creek at this location are as follows:

- public and private domestic water supply,
- industrial water supply,
- irrigation and livestock watering,
- fish and aquatic life (including salmonid rearing and migration),
- wildlife and hunting,
- fishing,
- boating,
- water contact recreation,
- aesthetic quality, and
- hydropower

The water quality standards for the Willamette Basin were developed to protect these beneficial uses and can be found in Oregon Administrative Rules 340-041-0345.

4.1 Receiving Stream Water Quality

The Thomas Creek Watershed is 145 square miles (732,797 acres). The city of Scio is located within this watershed. Forestry dominates the land use area at approximately 73%. Agriculture supports 27% of the watershed. The watershed is dominated by private ownership, however, the Bureau of Land Management owns approximately one-fifth of the watershed. There are five concentrated animal feeding operations in the watershed, three dairies and two unidentified operations.

Thomas Creek flows into the South Santiam River at approximately river mile 2.7. The flow in Thomas Creek is supplemented by its major tributary, Neal Creek. The watershed supports spring Chinook, winter steelhead, and resident fisheries. There are two real-time flow gages in the watershed, USGS flow gage #14188800, Thomas Creek near Scio, and USGS flow gage #14188850, Thomas Creek near Crabtree.

Data collected on Thomas Creek indicated the creek is not consistently meeting the salmon rearing and migration temperature standard of 18°C in the summer. DEQ developed a total maximum daily load for Thomas Creek in 2006 and determined the City of Scio did not need a waste load allocation for temperature because it does not discharge during the summer. The section of Thomas Creek where the city discharges is not designated for spawning. Spawning occurs further up in the basin.

4.2 Mixing Zone Analysis

Federal regulations and Oregon Administrative Rules allow DEQ to suspend all or part of the water quality standards in small, designated areas around a discharge point. Initial mixing of the wastewater with the receiving stream occurs in these small areas. These are known as "allocated impact zones" or "regulatory mixing zones." Two mixing zones can be developed for each discharge: 1) The acute mixing zone, also known as the "zone of initial dilution" (ZID), and 2) the chronic mixing zone, usually referred to as "the mixing zone." The ZID is a small area where acute criteria can be exceeded as long as it does not cause acute toxicity to organisms drifting through it. The mixing zone is an area where acute criteria must be met but chronic criteria can be exceeded. It must be designed to protect the integrity of the entire water body. The applicable rules for Oregon are found in OAR 340-041-0053.

The city's existing permit describes the mixing zone as follows:

> The allowable mixing zone is that portion of Thomas Creek contained within a band extending out fifteen (15) feet 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) shall be defined as that portion of the allowable mixing zone that is within ten (10) feet of the point of discharge.

DEQ performed a field mixing zone study on October 20, 2010. Results of this study are discussed in the February 2011 *Scio WWTP Mixing Zone Study Final Report.* Dilution values were calculated based on data in this report and discussed in an October 17, 2011 internal memorandum. DEQ determined the dilution at the edge of the ZID and mixing zone is 2 and 7 respectively.

There are public access sites to this portion of the creek. Private residences are located along the river but no public use was observed at the time of sampling. No public water supply drinking water intakes are located within ½ mile downstream of the outfall. No other NPDES discharges are located within ½ mile upstream or downstream of the outfall.

5.0 PERMIT LIMITS

There are two categories of effluent limits for NPDES permits: Technology-based effluent limits (TBEL) and Water quality-based effluent limits (WQBEL).

Technology-based effluent limits define a minimum level of treatment using readily-available technology. In the case of domestic wastewater treatment facilities, federal technology-based effluent limits address biochemical oxygen demand (BOD_5) and total suspended solids (TSS) concentrations and removal efficiency as well as pH.

The minimum treatment levels referred to above are the secondary treatment standards established by EPA for domestic wastewater treatment facilities (found in 40 CFR Part 133). In general, domestic facilities must achieve biochemical oxygen demand (BOD_5) and suspended solids (TSS) monthly average concentrations of 30 mg/L and weekly average concentrations of 45 mg/L. If carbonaceous biochemical oxygen demand ($CBOD_5$) is substituted for BOD_5, the monthly average concentration is 25 mg/L and the weekly average concentration is 40 mg/L. In addition, a minimum removal efficiency of 85 percent is required of domestic dischargers for BOD_5 (or $CBOD_5$) and TSS. Finally, the pH must be between 6.0 and 9.0.

There are exceptions to these secondary treatment standards for some types of treatment facilities. Federal standards include treatment equivalent to secondary treatment (40 CFR 133.105) and allow states to set special BOD_5 and TSS limits for lagoon and trickling filter facilities. The monthly average concentration limits can be as high as 45 mg/L while weekly average limits can be as high as 65 mg/L. The removal efficiency limits can be as low as 65%. There are additional, special considerations for TSS discharges from lagoon facilities in 40 CFR 133.103(c). Monthly average concentration limits can be as high as 50 mg/L west of the Cascade Mountains and 85 mg/L east of the Cascade Mountains.

Oregon Administrative Rules establish minimum design criteria for domestic treatment facilities. In this portion of the Willamette Basin, the BOD_5 and TSS minimum design criteria are monthly average concentrations of 10 mg/L in the low stream flow period and secondary treatment standards in the high stream flow period (OAR 340-041-0345(3)). In addition, there are requirements for disinfection, dilution of oxygen demanding pollutants, and prevention of raw sewage overflows (OAR 340-041-0007(17)).

In contrast, water quality-based effluent limits are developed independent of the available treatment technology and, instead, take into account the quality and quantity of the receiving stream. Water quality-based effluent limits are typically more stringent than technology-based permit limits when the receiving stream is small, is water quality-limited or shows evidence of impairment,

When renewing a permit, a permit writer typically evaluates the existing limits in the permit against changes to technology based standards and water quality standards that may have occurred during the permit term. With some exceptions, the anti-backsliding provisions (described in CFR 122.44(l)) do not allow relaxation of effluent limits in renewed/reissued permits. The most stringent of the existing or new limits must be included in the new permit.

5.1 Existing Permit Limits

The existing permit contains the following effluent limits:

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	33	50	66
TSS	50 mg/L	80 mg/L	54	81	110

(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.
pH	Shall be within the range of 6.0 - 9.0
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and 65% monthly for TSS.
Total Residual Chlorine	Shall not exceed 0.14 mg/l monthly average and 0.36 mg/l daily maximum.

5.2 Technology-Based Effluent Limits

DEQ is applying the following secondary treatment standards to this facility:

Effluent Parameter	Concentration (mg/L)		Percent Removal
	Monthly	Weekly	
BOD_5	30	45	85%
TSS	50	80	65%
pH	must be between 6.0 and 9.0		

The summer standards for this basin discussed above do not apply to this facility because they do not discharge during the summer.

5.3 Water Quality-Based Effluent Limits

Reasonable Potential Analysis

EPA has developed a methodology called Reasonable Potential Analysis (RPA) for determining if there is a reasonable potential for a discharge to cause or contribute to violations of water quality standards. RPA takes into account effluent variability, available dilution (if applicable), receiving stream water quality, aquatic health water quality standards, and human health water quality standards.

DEQ has adopted EPA's methodology for RPA. If the RPA results indicate that there is a potential for the discharge to cause or contribute to exceedances of water quality standards, the methodology is then used to determine permit limits for the discharge so as to *not* cause or contribute to violations of water quality standards.

Chlorine

Chlorine is a strong chemical oxidizer that is toxic to many aquatic organisms. Its oxidizing properties also make it an effective disinfectant. Wastewater treatment plants, for example, often use it to kill bacteria in their effluent before discharging into waters of the state. The City of Scio uses chlorination to disinfect their effluent. They dechorinate their effluent using sodium bisulfate. This reduces the residual chlorine in their effluent allowing them to comply with in-stream water quality toxicity standards for chlorine. The current permit contains a chlorine limit and the facility uses dechlorination equipment to comply with this limit.

The existing effluent limits were based on older mixing zone dilution estimates. The mixing zone study conducted in 2010 indicates the dilutions are significantly lower. The effluent does not mix rapidly with the receiving water which limits the amount of dilution. These lower dilution values require recalculation of the chlorine limits. DEQ uses EPA's statistical analysis for establishing effluent limits. DEQ performed this analysis using the updated dilution values and determined more stringent chlorine limits are necessary. The monthly average permit limit was calculated to be 0.01 mg/L with a daily maximum limit of 0.04 mg/L. DEQ's spreadsheet incorporates EPA's methodology and the results of the chlorine analysis are shown in attachment A.

The water quality based effluent limits for total residual chlorine proposed in this permit are lower than the Minimum Level (ML) for chlorine of 0.1 mg/L published by EPA. In accordance with EPA Region X Guidance for Water Quality Based Effluent Limits (WQBELs) Below Analytical Detection Limits issued in 1996, the permit should include the ML as a "compliance evaluation level". The Department is proposing to include a note in Schedule A establishing 0.10 mg/L as a compliance evaluation level for total residual chlorine.

Temperature

Water temperatures affect the life cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations. The purpose of the temperature criteria in OAR 340-041-0028 is to protect designated, temperature sensitive, beneficial uses (including salmonid life cycle stages) from adverse warming caused by human activities.

DEQ is required to determine if there is a reasonable potential to violate the applicable temperature criteria. The city discharges to a section of Thomas Creek that supports rearing and migration year round. Spawning is not listed as a beneficial use according to DEQ's fish use maps (OAR 340-041-0340 (2)). The temperature criterion for supporting rearing and migration is 18°C. The effluent temperature does not exceed 18°C and therefore is in compliance with the criterion.

DEQ is also required to determine if there is a reasonable potential to violate the thermal plume limitations in OAR 340-041-0053(2)(d). The thermal plume regulations state the following:

- Adverse effects are prevented or minimized by limiting potential fish exposure to temperatures of 13°C or less for salmon and steelhead

- Acute impairment is prevented or minimized by limiting potential fish exposure to temperatures of 32°C or more to less than 2 seconds

- Thermal shock is minimized or limited by limiting potential fish exposure to temperature of 25°C or more to less than 5 percent of the cross section of the stream at 7Q10 critical stream flows

- Migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21°C or more to less than 25% of the stream cross section at 7Q10 critical stream flow

The discharge does not have the potential to violate any of these limitations because no spawning occurs in this stream reach and the effluent temperature does not exceed any of the thermal plume temperatures show to cause adverse effects to salmonids.

pH

The Willamette Basin water quality standard for pH is found in OAR 340-041. The allowable ambient range is 6.5 to 8.5 s.u. The pH permit limits for domestic treatment plants generally range from 6.0 to 9.0 s.u. These limits are based on federal secondary treatment standards for sewage treatment facilities, and are applied to the majority of NPDES permittees in the state. The water quality standard for pH does not have to be met within a permittee's mixing zone.

DEQ evaluated the potential pH of the mixed water at the edge of the mixing zone based on a discharge with a pH of 6.0 and 9.0 s.u. (see attachment B). DEQ analyzed the effects of the permittee's discharge on pH at the edge of the mixing zone and concluded that the pH would remain within the water quality standard of 6.5 to 8.5 s.u. as long as the effluent remained within the range of 6.0 to 9.0 s.u.

DEQ is proposing pH limits of 6.0 to 9.0 s.u. and considers these limits to be protective of the water quality standard. The permittee should be able to comply with the proposed pH limits.

Bacteria

The proposed permit limits are based on the *E. coli* standard contained in OAR 340-041-0009(5). The proposed limits are a monthly geometric mean of 126 *E. coli* per 100 mL, with no single sample exceeding 406 *E. coli* per 100 mL. If a single sample exceeds 406 *E. coli* per 100 mL, then the permittee may take five consecutive re-samples. If the log mean of the five re-samples is less than or equal to 126, a violation is not triggered. The re-sampling must be taken at four-hour intervals beginning within 28 hours after the original sample was taken. The rule also allows for changing the resampling timeframe if it would pose an undue hardship on the treatment facility. After discussions with the permittee, the Department is proposing that the five re-samples be taken beginning no later than 72 hours after the original sample was taken. This is consistent with OAR 340-041-0009(5)(a).

The proposed limits are taken directly from the Oregon bacteria rule which is found in OAR 340-041-0009. This rule establishes numeric in-stream water quality standards (OAR 340-041-0009(1)), establishes a prohibition against discharging raw sewage, establishes effluent limitations and the methodology for establishing a violation (OAR 340-041-0009(5)). Regarding the general condition 6 found in Section B of Schedule F in this permit which prohibits overflows from wastewater conveyance systems, the Environmental Quality Commission (EQC) recognizes that it is impossible to design and construct a conveyance system that will prevent overflows under all storm conditions. The applicant is not seeking permit coverage for overflows and the permit does not authorize such discharges. The State of Oregon has determined that all wastewater conveyance systems should be designed to transport storm events up to a specific size to the treatment facility. Therefore, in exercising its enforcement discretion regarding Sanitary Sewer Overflows, the Department will consider the following:

(1) Whether the permittee has conveyance and treatment facilities adequate to prevent overflows except during a storm event greater than the one-in-five-year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten-year, 24-hour duration storm from May 22 through October 31. In addition, DEQ will also consider using enforcement discretion for overflows that occur during a storm event less than the one-in-five-year, 24-hour duration storm from November 1 through May 21 if the permittee had separate sanitary and storm sewers on January 10, 1996, had experienced sanitary sewer overflows due to inflow and infiltration problems, and has submitted an acceptable plan to the Department to address these sanitary sewer overflows by January 1, 2010;

(2) Whether the permittee has provided the highest and best practicable treatment and/or control of wastes, activities, and flows and has properly operated the conveyance and treatment facilities;

(3) Whether the permittee has minimized the potential environmental and public health impacts from the overflow; and

(4) Whether the permittee has properly maintained the capacity of the conveyance system.

DEQ will review the permittee's determination of the one-in-five-year, 24-hour duration winter storm and the one-in-ten year, 24-hour duration summer storm as described above in the permit holder's facilities plan. In the event that a permit holder reports an overflow event associated with a storm event and DEQ does not have information from the permit holder sufficient to determine whether or not the storm event exceeds storm events as specified in OAR 340-041-0009(6) & (7), DEQ will perform the determination using the information contained in Figure 26 of the 1973 NOAA Atlas 2 entitled "Precipitation-Frequency Atlas of the Western United States, Volume X – Oregon". This figure is entitled "Isopluvials of 5-yr 24-hr precipitation in tenths of an inch". The Atlas can be obtained on line at:

http://hdsc.nws.noaa.gov/hdsc/pfds/other/or_pfds.html

The file is very large. A scanned version of Figure 26 is available at:

http://www.wrcc.dri.edu/pcpnfreq/or5y24.gif

DEQ will compare the information in this figure with rainfall data available from the National Weather Service, or other source as necessary.

5.6 Antidegradation

DEQ performed an anti-degradation review for this discharge. Permit renewals with the same discharge loadings as the previous permit, as in this case, are not considered to lower water quality from the existing condition. Based on the antidegradation review (see attachment C). DEQ determined that the proposed discharge complies with the antidegradation policy for surface waters found in OAR 340-041-0026.

6.0 PERMIT DRAFT DISCUSSION

6.1 Face Page

The face page provides information about the permittee, description of the wastewater, outfall locations, receiving stream information, permit approval authority, and a description of permitted activities. The permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control, and disposal system. The permit allows discharge to Thomas Creek within limits set by Schedule A and the following schedules. It prohibits all other discharges.

In accordance with state and federal law, NPDES permits will be effective for a fixed term not to exceed 5 years. Upon issuance, this permit will be effective for no more than 5 years.

DEQ evaluated the classifications for the treatment and collection systems (see attachment D). The treatment system is considered a Class 1 system and the collection system is considered a Class 1 system. DEQ is not proposing any changes to the system classifications.

6.2 Schedule A, Waste Discharge Limits

Limits remain unchanged from the existing permit with the exception of chlorine. Chlorine effluent limits are more stringent due to less dilution within the mixing zone than previously assumed.

The proposed effluent limits for the discharge (outfall 001) are as follows:

a. Treated Effluent Outfall 001

(1) *May 1 - October 31: No discharge to waters of the state*

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	33	50	66
TSS	50 mg/L	80 mg/L	54	81	110

(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.
pH	Shall be within the range of 6.0 - 9.0
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and 65% monthly for TSS.
Total Residual Chlorine	Shall not exceed 0.01 mg/l monthly average and 0.04 mg/l daily maximum.

The BOD_5 and TSS mass load limits were established based on the winter discharge rate of 0.130 and the respective concentration limits as follows:

(1) BOD_5

(a) 0.130 MGD x 8.34 lb/gal x 30 mg/L monthly avg. = 33 lbs/day
(b) 33 lbs/day monthly avg. x 1.5 = 50 lbs/day weekly avg.
(c) 33 lbs/day monthly avg. x 2.0 = 66 lbs/day daily max.

(2) TSS

(a) 0.130 MGD x 8.34 lb/gal x 50 mg/L monthly avg. = 54 lbs/day
(b) 54 lbs/day monthly avg. x 1.5 = 81 lbs/day weekly avg.
(c) 54 lbs/day monthly avg. x 2.0 = 110 lbs/day daily max.

The water quality based effluent limits for total residual chlorine proposed in this permit are lower than the minimum level (ML) for chlorine of 0.1 mg/L published by EPA. In accordance with EPA Region X Guidance for Water Quality Based Effluent Limits (WQBELs) Below Analytical Detection Limits issued in 1996, the permit should include the ML as a "compliance evaluation level". The Department is proposing to include a note in Schedule A establishing 0.10 mg/L as a compliance evaluation level for total residual chlorine.

6.3 Schedule B – Minimum Monitoring and Reporting Requirements

6.3.1 Monitoring Requirements

Schedule B describes the minimum monitoring and reporting necessary to demonstrate compliance with the conditions of this permit. The authority to require periodic reporting by permittees is included in ORS 468.065(5). Self-monitoring requirements are the primary means of ensuring that permit limits are being met. Other parameters may also need to be monitored when insufficient data exist to establish a limit, but where there is a potential for a water quality concern.

DEQ has developed a monitoring matrix for commonly monitored parameters that is based on size and complexity of facilities. Proposed monitoring frequencies for all parameters are based on this matrix and, in some cases, may have changed from the current permit.

The permittee is required to have a laboratory Quality Assurance/Quality Control program. DEQ recognizes that some tests do not accurately reflect the performance of a treatment facility due to quality assurance/quality control problems. These tests should not be considered when evaluating the compliance of the facility with the permit limits. Thus, DEQ proposes a statement in the opening paragraph of Schedule B recognizing that some test results may be inaccurate, invalid, or do not adequately represent the facility's performance and should not be used in calculations required by the permit.

The parameters to be monitored, the minimum monitoring frequencies, and sample types are specified in the tables below.

a. Influent

The facility influent grab samples and measurements and composite samples must be taken the influent pipeline just before entering the first lagoon cell and in accordance with the table below.

Item or Parameter	Minimum Frequency	Type of Sample/Action
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
pH	2/Week	Grab

b. Treated Effluent Outfall 001

The facility effluent samples for BOD_5, TSS, pH, and flow measurements must be taken just after the Parshall flume but prior to the chlorine contact chamber. Residual chlorine and E. coli bacteria samples are collected just prior to exiting the chlorine contact chamber. A second residual chlorine sample is collected just after the injection of the sodium bi-sulfide and in accordance with the table below.

Item or Parameter	Minimum Frequency	Type of Sample/Action
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annual	Verification
BOD_5	Monthly	24-hour Composite
TSS	Monthly	24-hour Composite
pH	2/Week	Grab
E. coli	2/Month	Grab
Quantity Chlorine Used	Daily	Measurement
Total Chlorine Residual	Daily	Grab
Pounds Discharged (BOD_5 and TSS)	Monthly	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Temperature	2/Week	Measurement

c. Sludge Management (Cell #1)

Item or Parameter	Minimum Frequency	Type of Sample
Sludge Depth in Cell #1	Once prior to submittal of renewal application	Representative Measurement

6.3.2 Reporting Requirements

The proposed NPDES permit requires monitoring results to be submitted monthly. Monthly reports must be submitted by the 15th day of the following month (including "no discharge" reports if any) as follows:

a. Monitoring results must be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate DEQ office by the 15th day of the following month.

b. State monitoring reports must 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 must also identify each system classification as found on page one of this permit.

c. Monitoring reports must 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.

In addition, the permittee is required to submit an annual report to DEQ as follows:

a. The permittee must have a program in place to identify and reduce inflow and infiltration into the sewage collection system. A copy of the program must be kept at the wastewater treatment facility for review upon request by the DEQ. An annual Inflow and Infiltration report must be submitted to the DEQ by February 1 each year that includes the following:

(1) Details of activities performed in the previous year to identify and reduce Inflow and Infiltration,

(2) Similar Inflow and Infiltration activities planned for the following year, and

(3) A summary of sanitary sewer overflows that occurred during the previous year.

6.4 Schedule C, Compliance Schedules and Conditions

There are no compliance schedules contained in this permit.

6.5 Schedule D - Special Conditions

The permit contains 5 special conditions:

1. The facility must be operated by a certified operator at a classification level appropriate for the treatment plant
2. The facility must notify DEQ of any malfunctions according to the general conditions
3. The facility is not required to perform a hyrdrogeologic evaluation
4. The facility needs to submit a biosolids management plan 6 months prior to land application of any biosolids.
5. Contains requirements for land applying treated effluent at the plant site

6.6 Schedule F, NPDES General Conditions

These conditions are standard to all domestic NPDES permits and include language regarding operation and maintenance of facilities, monitoring and record keeping, and reporting requirements. The General Conditions were recently revised. A summary of the changes is as follows:

- There are additional citations to the federal Clean Water Act and CFR, including references to standards for sewage sludge use or disposal.
- There is additional language regarding federal penalties.
- Bypass language has been made consistent with the Code of Federal Regulations.
- Overflow language has been modified. Formerly the language stated that overflows in response to the five or ten year event would not violate the permit. Now it states that overflows are prohibited. DEQ will continue to exercise enforcement discretion with respect to overflows consistent with the provisions of the Bacteria Rule (OAR 340-041-0009).
- Reporting requirements regarding overflows have been made more explicit.
- Requirements regarding emergency response and public notification plans have been made more explicit.
- Language pertaining to duty to provide information has been made more explicit.
- Confidentiality of information is addressed.

7.0 NEXT STEPS

7.1 Public Comment Period

The proposed NPDES permit will be made available for public comment for 35 days. Public notice and links to the proposed permit will be posted on DEQ's website, advertised in newspapers (major sources), and sent to subscribers to DEQ's pertinent public notice e-mail lists. A Public Hearing will be scheduled if requested by 10 or more people, or by an authorized person representing an organization of at least 10 people. If a public hearing is to be held, then an additional public notice would be published to advertise the public hearing.

7.2 Response to Comments

DEQ will respond to comments received during the comment period. All those providing comment will receive a copy of DEQ's response. Interested parties may also request a copy of DEQ's response. Once comments are received and evaluated, DEQ will decide whether to issue the permit as proposed, to make changes to the permit, or to deny the permit. DEQ will notify the permittee of DEQ's decision.

7.3 Modifications to Permit Evaluation Report and Fact Sheet

Depending on the nature of the comments and any changes made to the permit as result of comments, DEQ may modify this permit evaluation report and fact sheet. DEQ may also choose to update the permit evaluation report and fact sheet through memorandum or addendum. If substantive changes are made to the permit, then an additional round of public comment may occur.

7.4 Issuance

The DEQ mails the finalized, signed permit to the permittee. The permit is effective 20 days from the mailing date.

Attachment A: Chlorine Limit Calculation

Facility Name: City of Scio   **Date:** 10/28/2011

Dilution Values? (Y/N)	y	calculated
Low Flow Dilution @ ZID =	*	*
Low Flow Dilution @ MZ =	*	*
High Flow Dilution @ ZID =	7	*
High Flow Dilution @ MZ =	2	*
	Summer	Winter
Effluent Flow (MGD) =	*	*
7Q10 (CFS) =	*	*
1Q10 (CFS) =	*	*
% dilution at MZ =	*	*
% dilution at ZID =	*	*

Summer data	Effluent	Stream	Mixed ZID	Mixed MZ	
pH * =	*	*	*	*	(6.5-9)
Temp * =	*	*	*	*	° C
Alkalinity =	*	*			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity	*	*	*	*	
Winter data					
pH * =	7.2	6.5	6.6	6.7	(6.5-9)
Temp * =	20	20	20.0	20.0	° C
Alkalinity =	25	25			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity	0	20	17.1	10.0	

probability basis 99 %
(for WLA multipliers)

PARAMETER	WATER QUALITY CRITERIA 1 Hour (CMC) mg/l	4 Day (CCC) mg/l	Back-ground mg/l	Allocations Acute mg/l	Chronic mg/l	CV	# Samples /Mo	Acute LTA mg/l	Chronic LTA mg/l	Min LTA mg/l	95TH % LIMITS Daily mg/l	Monthly mg/l	99TH % LIMITS Daily mg/l	Monthly mg/l
High Flow Season														
CHLORINE	0.019	0.011	0.00	0.13	0.02	0.6	30	0.04	0.01	0.01		**0.01**	**0.04**	

Attachment B: pH Analysis

	RPA for pH	
INPUT	Lower pH Criteria	Upper pH Criteria
1. DILUTION FACTOR AT MZ BOUNDARY - (Qe+Qr)/Qe	7	7
2. UPSTREAM/BACKGROUND CHARACTERISTICS		
Temperature (deg C):	5.2	5.2
pH:	7.0	7.8
Alkalinity (mg CaCO3/L):	25.0	25.0
3. EFFLUENT CHARACTERISTICS		
Temperature (deg C):	15.7	15.7
pH:	6.1	9.0
Alkalinity (mg CaCO3/L):	75.0	75.0
4. APPLICABLE PH CRITERIA	6.5	8.5
OUTPUT		
1. IONIZATION CONSTANTS		
Upstream/Background pKa:	6.51	6.51
Effluent pKa:	6.41	6.41
2. IONIZATION FRACTIONS		
Upstream/Background Ionization Fraction:	0.75	0.95
Effluent Ionization Fraction:	0.33	1.00
3. TOTAL INORGANIC CARBON		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	33.13	26.29
Effluent Total Inorganic Carbon (mg CaCO3/L):	229.66	75.19
4. CONDITIONS AT MIXING ZONE BOUNDARY		
Temperature (deg C):	6.70	6.70
Alkalinity (mg CaCO3/L):	32.14	32.14
Total Inorganic Carbon (mg CaCO3/L):	61.20	33.27
pKa:	6.50	6.50
pH at Mixing Zone Boundary:	**6.5**	**7.9**
Is there Reasonable Potential?	**No**	**No**

Attachment C: Antidegradation Review Sheet

ANTIDEGRADATION REVIEW SHEET
FOR A PROPOSED INDIVIDUAL NPDES DISCHARGE

1. What is the name of Surface Water that receives the discharge? Thomas Creek

   Briefly describe the proposed activity:

   Is this review for a renewal OR new (circle one) permit application?
   Go to Step 2.

---

2. Is this surface water an **Outstanding Resource Water** or **upstream** from an **Outstanding Resource Water**?
   Yes. Go to Step 5.
   No. Go to Step 3.

3. Is this surface water a **High Quality Water**?
   Yes. Go to Step 8.
   No. Go to Step 4.

4. Is this surface water a **Water Quality Limited Water**?
   Yes. Go to Step 14.
   No. Go to Step 2. Note: The surface water must fall into one of three (3) categories: Outstanding Resource Water (Step 2), High Quality Water (Step 3), or Water Quality Limited Water (Step 4).

14. Will the proposed activity result in a Lowering of Water Quality in the **Water Quality Limited Water**? [see OAR 340-041-0004(3)-(5) for a description in rule of discharges that do not result in lowering of water quality or do not constitute a new and/or increased discharge or are otherwise exempt from antidegradation review; otherwise see "Is an Activity Likely to Lower Water Quality?" in *Antidegradation Policy Implementation Internal Management Directive for NPDES Permits and Section 401 Water Quality Certifications*.]
    Yes. Go to Step 15.
    No. Proceed with Permit Application. Applicant should provide basis for conclusion. Go to Step 21.

    Permit renewals with the same discharge loadings as the previous permit, as in this case, are not considered to lower water quality from the existing condition.

21. On the basis of the Antidegradation Review, the following is recommended:
__X__ Proceed with Application to Interagency Coordination and Public Comment Phase.
_____ Deny Application; return to applicant and provide public notice.

Action Approved

Section: ____________________________

Review Prepared By: ____Steve Schnurbusch____________
Phone: ____________________________
Date Prepared: _____10/28/11_________________

APPENDIX B: FIGURES, MAPPING, REPORTS & STUDIES

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Service

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: STAYTON, OR **COOP ID: 358095**

Climate Division: OR 2 **NWS Call Sign:** **Elevation: 425 Feet** **Lat: 44˚47N** **Lon: 122˚49W**

Temperature (˚F)

	Mean (1)			Extremes										Degree Days (1) Base Temp 65		Mean Number of Days (3)					
Month	Daily Max	Daily Min	Mean	Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Heating	Cooling	Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	46.8	32.8	39.8	67	1960	29	44.7	1998	2	1957	27	31.7	1979	781	0	.0	.0	11.3	.8	14.4	.0
Feb	50.8	35.2	43.0	72	1963	9	47.7	1991	7	1989	4	35.4	1989	616	0	.0	.0	16.9	.3	9.8	.0
Mar	55.7	38.0	46.9	74+	1972	17	51.4	1986	18	1955	5	43.1	1971	564	0	.0	.0	26.2	.0	5.5	.0
Apr	60.5	40.5	50.5	86	1957	29	54.6	1992	25	1975	5	45.6	1975	435	0	.0	.0	28.8	.0	1.8	.0
May	67.0	44.9	56.0	98	1983	29	61.3	1997	31+	1985	11	51.5	1977	285	5	.0	.3	30.9	.0	.2	.0
Jun	73.1	49.3	61.2	100	1992	23	65.7	1992	33	1973	1	57.4	1976	140	26	@	.8	30.0	.0	.0	.0
Jul	79.9	52.5	66.2	105+	1958	27	70.2	1996	34	1965	28	62.7	1993	51	89	.2	4.1	31.0	.0	.0	.0
Aug	80.5	52.4	66.5	106	1978	10	70.1	1997	34	1965	5	62.4	1973	44	88	.6	3.7	31.0	.0	.0	.0
Sep	75.5	48.3	61.9	102	1955	4	66.2	1974	30	1954	30	57.9	1972	132	38	@	1.7	30.0	.0	@	.0
Oct	64.2	42.6	53.4	91	1980	3	57.0	1987	23	1971	28	50.1	1984	360	1	.0	@	30.2	.0	1.2	.0
Nov	52.4	38.2	45.3	76	1970	2	50.6	1995	9	1955	15	37.6	1985	592	0	.0	.0	20.5	.2	6.5	.0
Dec	46.2	33.6	39.9	66+	1993	10	44.1	1979	-7	1972	8	33.5	1990	778	0	.0	.0	10.2	1.3	13.1	.1
Ann	62.7	42.4	52.6	106	Aug 1978	10	70.2	Jul 1996	-7	Dec 1972	8	31.7	Jan 1979	4778	247	.8	10.6	297.0	2.6	52.5	.1

+ Also occurred on an earlier date(s)

@ Denotes mean number of days greater than 0 but less than .05

Complete documentation available from: www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1951-2001

(3) Derived from 1971-2000 serially complete daily data

Issue Date: February 2004

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Service

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
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Station: STAYTON, OR **COOP ID: 358095**

Climate Division: OR 2 **NWS Call Sign:** **Elevation: 425 Feet** **Lat: 44˚47N** **Lon: 122˚49W**

Precipitation (inches)

	Precipitation Totals									Mean Number of Days (3)				Precipitation Probabilities (1) Probability that the monthly/annual precipitation will be equal to or less than the indicated amount										
	Means/ Medians(1)		Extremes							Daily Precipitation				Monthly/Annual Precipitation vs Probability Levels These values were determined from the incomplete gamma distribution										
Month	**Mean**	**Med-ian**	**Highest Daily(2)**	**Year**	**Day**	**Highest Monthly(1)**	**Year**	**Lowest Monthly(1)**	**Year**	**>= 0.01**	**>= 0.10**	**>= 0.50**	**>= 1.00**	**.05**	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**	**.95**
Jan	7.17	7.88	3.50	1974	15	12.97	1996	.48	1985	20.4	13.9	4.9	1.5	2.07	2.75	3.77	4.66	5.53	6.44	7.44	8.62	10.15	12.55	14.78
Feb	6.46	5.86	3.24	1996	7	14.19	1996	2.18	1973	18.4	13.0	4.5	1.2	2.52	3.12	3.97	4.68	5.35	6.03	6.76	7.62	8.70	10.36	11.88
Mar	5.37	4.99	2.10	1966	9	9.40	1974	2.06	1978	18.8	13.7	3.3	.6	2.61	3.07	3.70	4.20	4.67	5.14	5.64	6.20	6.91	7.98	8.94
Apr	4.26	4.01	1.99	1971	9	10.48	1993	1.70	1973	16.6	11.3	2.7	.3	1.62	2.01	2.58	3.05	3.50	3.96	4.46	5.03	5.76	6.89	7.92
May	3.31	3.07	1.85	1991	17	6.80	1998	.13	1992	13.9	8.6	1.8	.3	.84	1.15	1.63	2.06	2.48	2.92	3.42	4.00	4.77	5.99	7.12
Jun	2.42	2.02	2.10	1969	23	5.46	1984	.94	1972	9.5	6.0	1.5	.2	.79	1.02	1.36	1.64	1.92	2.21	2.52	2.89	3.36	4.09	4.76
Jul	.87	.47	1.74	1987	18	3.62	1983	.00	1973	4.7	2.5	.3	.1	.02	.07	.17	.29	.43	.59	.79	1.05	1.41	2.02	2.63
Aug	1.15	.94	1.68	1995	11	4.09	1978	.00+	1994	5.2	2.6	.7	.2	.00	.04	.19	.35	.54	.77	1.04	1.40	1.90	2.75	3.60
Sep	2.18	1.90	1.91	1996	15	6.07	1977	.03+	1999	7.9	4.8	1.5	.4	.07	.16	.38	.66	.99	1.40	1.91	2.58	3.55	5.24	6.95
Oct	4.03	3.89	4.47	1955	9	8.26	1979	.13	1987	13.0	8.6	2.7	.7	.58	.92	1.50	2.06	2.64	3.28	4.01	4.92	6.13	8.11	10.02
Nov	8.16	8.18	4.05	1994	1	17.62	1973	1.68	1993	20.7	14.9	6.1	1.9	2.94	3.71	4.81	5.74	6.63	7.54	8.53	9.68	11.15	13.41	15.49
Dec	8.00	8.00	3.50	1987	3	17.83	1996	2.46	1976	21.4	14.3	5.6	1.9	2.76	3.52	4.62	5.55	6.44	7.35	8.35	9.52	11.01	13.32	15.44
Ann	53.38	52.99	4.47	Oct 1955	9	17.83	Dec 1996	.00+	Aug 1994	170.5	114.2	35.6	9.3	37.57	40.62	44.53	47.50	50.14	52.70	55.34	58.27	61.82	66.97	71.43

\+ Also occurred on an earlier date(s)
\# Denotes amounts of a trace
@ Denotes mean number of days greater than 0 but less than .05
****** Statistics not computed because less than six years out of thirty had measurable precipitation

(1) From the 1971-2000 Monthly Normals
(2) Derived from station's available digital record: 1951-2001
(3) Derived from 1971-2000 serially complete daily data
Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Services

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: STAYTON, OR **COOP ID: 358095**

Climate Division: OR 2 **NWS Call Sign:** **Elevation: 425 Feet** **Lat: 44˚47N** **Lon: 122˚49W**

Snow (inches)

	Snow Totals															Mean Number of Days (1)								
	Means/Medians (1)				Extremes (2)										Snow Fall >= Thresholds					Snow Depth >= Thresholds			
Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year	0.1	1.0	3.0	5.0	10.0	1	3	5	10
Jan	.6	.0	#	0	5.0	1971	11	5.0	1971	3	1982	6	1	1982	1.4	.9	.1	.1	.0	.4	.1	.0	.0
Feb	.7	.0	#	0	4.0	1971	27	5.0	1971	1+	1986	12	#+	1986	.5	.4	.1	.0	.0	.1	.0	.0	.0
Mar	#	.0	#	0	#	1980	15	#+	1980	#	1980	15	#	1980	.0	.0	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	0	0	.1	1983	3	.1	1983	0	0	0	0	0	.1	.0	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jun	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jul	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Aug	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Nov	#	.0	#	0	#	1983	30	#	1983	1	1985	30	#	1985	.0	.0	.0	.0	.0	.0	.0	.0	.0
Dec	1.0	.0	#	0	4.0	1972	12	7.0	1972	1	1980	4	#+	1990	.4	.3	.2	.0	.0	.1	.0	.0	.0
Ann	2.3	.0	N/A	N/A	5.0	Jan 1971	11	7.0	Dec 1972	3	Jan 1982	6	1	Jan 1982	2.4	1.6	.4	.1	.0	.6	.1	.0	.0

+ Also occurred on an earlier date(s) #Denotes trace amounts

@ Denotes mean number of days greater than 0 but less than .05

-9/-9.9 represents missing values
Annual statistics for Mean/Median snow depths are not appropriate

(1) Derived from Snow Climatology and 1971-2000 daily data

(2) Derived from 1971-2000 daily data

Complete documentation available from:
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Climate Division: OR 2 **NWS Call Sign:** **Elevation: 425 Feet** **Lat: 44˚47N** **Lon: 122˚49W**

Freeze Data

Spring Freeze Dates (Month/Day)

Temp (F)	Probability of later date in spring (thru Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	5/30	5/22	5/16	5/11	5/06	5/01	4/26	4/20	4/11
32	5/04	4/25	4/18	4/12	4/07	4/01	3/27	3/20	3/11
28	4/10	3/29	3/20	3/12	3/05	2/26	2/18	2/09	1/28
24	2/26	2/16	2/08	2/01	1/26	1/19	1/11	12/29	0/00
20	2/15	2/07	1/31	1/26	1/20	1/13	1/03	0/00	0/00
16	2/03	1/22	1/12	1/01	12/14	0/00	0/00	0/00	0/00

Fall Freeze Dates (Month/Day)

Temp (F)	Probability of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	9/23	9/29	10/04	10/08	10/11	10/15	10/19	10/23	10/30
32	10/07	10/15	10/21	10/26	10/31	11/05	11/10	11/16	11/24
28	10/29	11/07	11/13	11/19	11/24	11/29	12/05	12/11	12/20
24	11/06	11/18	11/27	12/06	12/13	12/22	1/01	1/16	0/00
20	12/02	12/15	12/26	1/04	1/14	1/26	2/16	0/00	0/00
16	12/15	12/28	1/08	1/20	0/00	0/00	0/00	0/00	0/00

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	192	180	172	164	158	151	144	135	124
32	248	234	224	215	207	198	189	179	165
28	313	296	284	273	263	254	243	231	214
24	>365	>365	>365	354	327	312	299	285	268
20	>365	>365	>365	>365	>365	356	337	323	307
16	>365	>365	>365	>365	>365	>365	>365	>365	343

***** Probability of observing a temperature as cold, or colder, later in the spring or earlier in the fall than the indicated date.

0/00 Indicates that the probability of occurrence of threshold temperature is less than the indicated probability.

Derived from 1971-2000 serially complete daily data

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

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Degree Days to Selected Base Temperatures (˚F)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	781	616	564	435	285	140	51	44	132	360	592	778	4778
60	626	476	409	288	154	54	10	7	51	212	443	623	3353
57	533	392	317	206	94	23	2	1	22	136	358	530	2614
55	471	337	260	157	63	12	0	0	12	94	304	469	2179
50	327	210	132	65	15	1	0	0	1	28	183	323	1285
32	20	4	0	0	0	0	0	0	0	0	5	17	46

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	263	311	460	555	742	877	1061	1067	896	664	403	261	7560
55	0	1	6	21	92	198	348	354	218	44	12	1	1295
57	0	0	2	11	61	150	288	293	169	24	7	0	1005
60	0	0	0	3	28	90	202	206	107	7	1	0	644
65	0	0	0	0	5	26	89	88	38	1	0	0	247
70	0	0	0	0	0	4	23	21	8	0	0	0	56

Growing Degree Units (2)

Base	Growing Degree Units (Monthly)												Growing Degree Units (Accumulated Monthly)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	94	135	225	321	498	640	815	825	660	425	192	94	94	229	454	775	1273	1913	2728	3553	4213	4638	4830	4924
45	33	48	100	180	344	490	660	670	510	276	84	33	33	81	181	361	705	1195	1855	2525	3035	3311	3395	3428
50	2	7	31	77	199	340	505	515	361	139	23	1	2	9	40	117	316	656	1161	1676	2037	2176	2199	2200
55	0	0	0	23	94	195	350	360	220	53	1	0	0	0	0	23	117	312	662	1022	1242	1295	1296	1296
60	0	0	0	3	33	87	201	210	99	12	0	0	0	0	0	3	36	123	324	534	633	645	645	645
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	31	50	105	166	273	365	500	507	401	234	65	28	31	81	186	352	625	990	1490	1997	2398	2632	2697	2725

(1) Derived from the 1971-2000 Monthly Normals
(2) Derived from 1971-2000 serially complete daily data
Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Notes

a. The monthly means are simple arithmetic averages computed by summing the monthly values for the period 1971-2000 and dividing by thirty. Prior to averaging, the data are adjusted if necessary to compensate for data quality issues, station moves or changes in station reporting practices. Missing months are replaced by estimates based on neighboring stations.

b. The median is defined as the middle value in an ordered set of values. The median is being provided for the snow and precipitation elements because the mean can be a misleading value for precipitation normals.

c. Only observed validated values were used to select the extreme daily values.

d. Extreme monthly temperature/precipitation means were selected from the monthly normals data.
Monthly snow extremes were calculated from daily values quality controlled to be consistent with the Snow Climatology.

e. Degree Days were derived using the same techniques as the 1971-2000 normals.
Compete documentation for the 1971-2000 Normals is available on the internet from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

f. Mean "number of days statistics" for temperature and precipitation were calculated from a serially complete daily data set .
Documentation of the serially complete data set is available from the link below:

g. Snowfall and snow depth statistics were derived from the Snow Climatology.
Documentation for the Snow Climatology project is available from the link under references.

Data Sources for Tables

Several different data sources were used to create the Clim20 climate summaries. In some cases the daily extremes appear inconsistent with the monthly extremes and or the mean number of days statistics. For example, a high daily extreme value may not be reflected in the highest monthly value or the mean number of days threshold that is less than and equal to the extreme value. Some of these difference are caused by different periods of record. Daily extremes are derived from the station's entire period of record while the serial data and normals data were are for the 1971-2000 period. Therefore extremes observed before 1971 would not be included in the 1971-2000 normals or the 1971-2000 serial daily data set. Inconsistencies can also occur when monthly values are adjusted to reflect the current observing conditions or were replaced during the 1971-2000 Monthly Normals processing and are not reconciled with the Summary of the Day data.

a. Temperature/ Precipitation Tables
1. 1971-2000 Monthly Normals
2. Cooperative Summary of the Day
3. National Weather Service station records
4. 1971-2000 serially complete daily data

b. Degree Day Table
1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals
2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data

c. Snow Tables
1. Snow Climatology
2. Cooperative Summary of the Day

d. Freeze Data Table
1971-2000 serially complete daily data

References

U.S. Climate Normals 1971-2000, www.ncdc.noaa.gov/normals.html

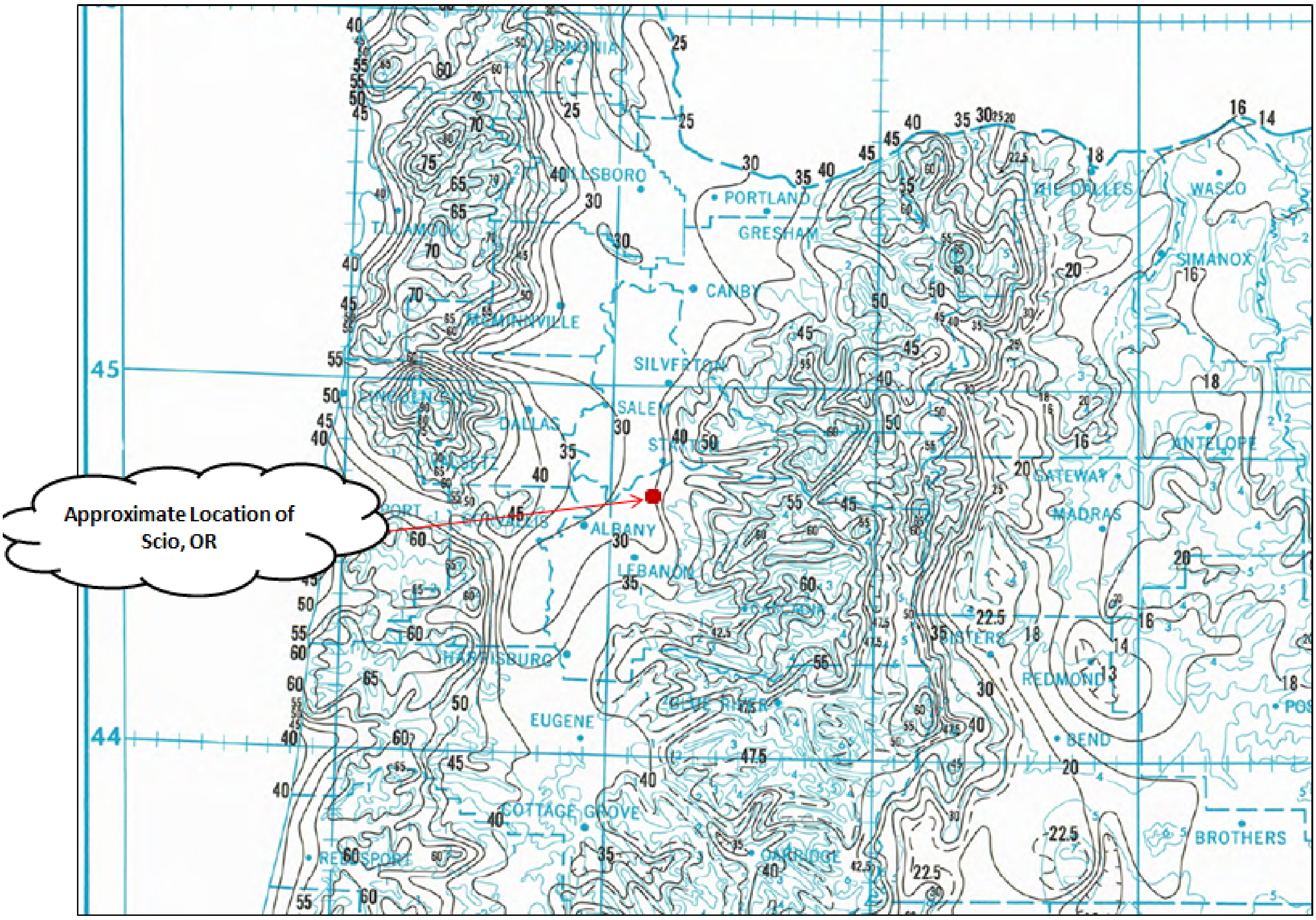
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normals/usnormalsprods.html

Snow Climatology Project Description, www.ncdc.noaa.gov/oa/climate/monitoring/snowclim/mainpage.html

Eischeid, J. K., P. Pasteris, H. F. Diaz, M. Plantico, and N. Lott, 2000: Creating a serially complete, national daily time series of temperature and precipitation for the Western United States. J. Appl. Meteorol., 39, 1580-1591,
www1.ncdc.noaa.gov/pub/data/special/ serialcomplete_jam_0900.pdf

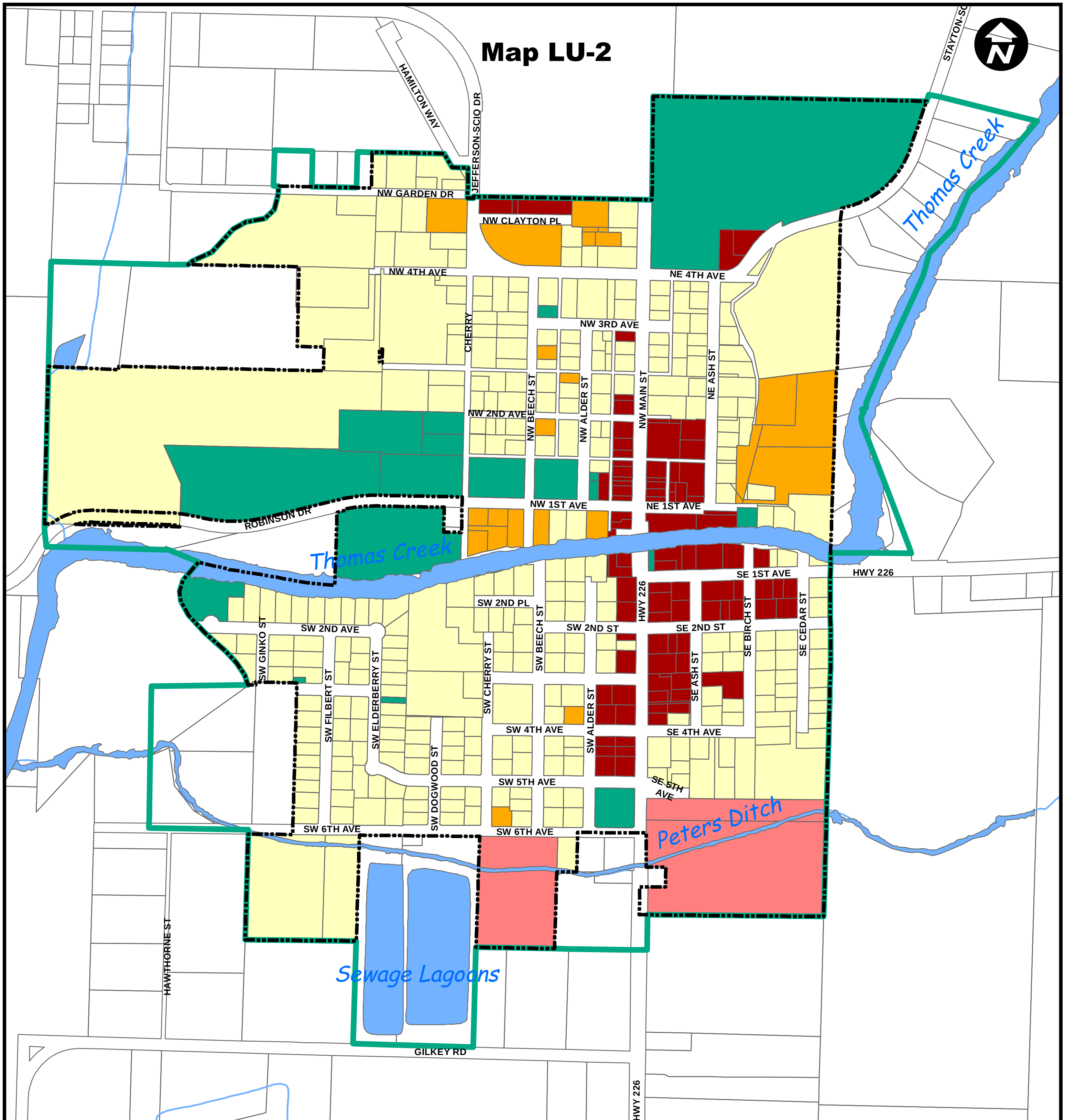
PRECIPITATION NORMALS (Total in Inches)

No.	Station Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
139	PAISLEY	1.29	.98	1.09	.87	1.00	.91	.54	.58	.60	.63	1.16	1.16	10.81
140	PARKDALE 1 NNE	5.29	4.53	2.96	1.99	1.17	.86	.33	.47	1.17	2.40	5.52	5.61	32.30
141	PAULINA	1.30	.85	1.14	.96	1.28	.91	.65	.64	.48	.82	1.19	1.10	11.32
142	PELTON DAM	1.65	1.10	.95	.80	.85	.56	.37	.44	.41	.65	1.53	1.49	10.80
143	PENDLETON BR EXP STN	1.94	1.61	1.90	1.66	1.67	1.06	.39	.72	.81	1.29	2.44	2.06	17.55
144	PENDLETON DOWNTOWN	1.53	1.29	1.35	1.51	1.54	.88	.36	.46	.59	1.18	1.93	1.33	13.95
145	PENDLETON MUNICIPAL AP	1.45	1.22	1.26	1.13	1.22	.78	.41	.56	.63	.99	1.63	1.48	12.76
146	PILOT ROCK 1 SE	1.34	1.18	1.55	1.46	1.67	1.24	.40	.67	.72	.98	1.72	1.38	14.31
147	PORTLAND KGW TV	6.24	5.07	4.51	3.10	2.49	1.60	.76	.99	1.87	3.39	6.39	6.75	43.16
148	PORTLAND INTL AP	5.07	4.18	3.71	2.64	2.38	1.59	.72	.93	1.65	2.88	5.61	5.71	37.07
149	PORT ORFORD 2	11.40	9.57	9.69	5.75	3.85	2.11	.63	1.20	2.02	4.86	10.89	12.24	74.21
150	PORT ORFORD 5 E	18.68	16.40	15.68	9.49	6.06	3.43	.95	1.78	3.31	7.76	17.25	20.07	120.86
151	POWERS	9.45	8.26	7.43	5.14	2.96	1.14	.32	.69	1.62	3.53	8.98	9.87	59.39
152	P RANCH REFUGE	1.06	.97	1.21	1.43	1.56	1.12	.45	.64	.72	.92	1.17	1.28	12.53
153	PRINEVILLE 4 NW	1.14	1.00	.95	.80	1.06	.84	.58	.45	.41	.76	1.30	1.20	10.49
154	PROSPECT 2 SW	6.08	5.03	4.71	3.19	2.61	1.15	.64	.87	1.43	3.02	6.70	6.80	42.23
155	REDMOND ROBERTS AP	.97	.68	.76	.65	.95	.62	.55	.54	.37	.56	.98	.92	8.55
156	RESTON	8.00	6.66	5.63	3.68	2.08	.92	.22	.60	1.37	3.25	8.66	8.82	49.89
157	REX 1 S	6.37	5.16	4.45	3.04	2.51	1.69	.64	.89	1.76	3.33	6.83	6.95	43.62
158	RICHLAND	1.50	.96	1.06	1.03	1.34	1.07	.70	.75	.50	.67	1.50	1.39	12.47
159	RIDDLE	4.70	3.86	3.51	2.42	1.56	.86	.38	.62	1.01	2.15	5.20	5.28	31.55
160	RIVERSIDE 7 SSW	1.06	.92	1.05	.82	1.08	.85	.53	.50	.46	.62	1.01	1.11	10.01
161	ROCK CREEK	2.47	1.94	1.86	1.42	1.77	1.80	1.09	.97	.82	1.03	2.65	2.73	20.55
162	ROCKVILLE 5 N	1.01	.95	1.41	1.35	1.64	1.11	.54	.53	.62	.85	1.16	1.11	12.28
163	ROME 2 NW	.79	.59	.79	.83	1.17	.85	.44	.29	.53	.54	.71	.75	8.28
164	ROSEBURG KQEN	4.97	4.10	3.81	2.75	1.82	.92	.44	.67	1.07	2.27	5.42	5.42	33.66
165	ROUND GROVE	1.90	1.91	2.14	1.43	1.50	1.20	.56	.69	.74	1.36	2.10	2.21	17.74
166	RUCH	3.79	3.10	3.05	1.80	1.27	.76	.49	.53	.97	1.70	3.98	4.30	25.74
167	ST HELENS RFD	6.13	5.32	4.72	3.58	2.80	2.01	.85	1.12	1.97	3.39	6.73	7.08	45.70
168	SALEM MCNARY AP	5.84	5.09	4.17	2.76	2.13	1.45	.57	.68	1.43	3.03	6.39	6.46	40.00
169	SANTIAM JUNCTION	9.60	7.33	6.70	5.13	3.55	2.63	.99	.85	1.75	4.43	9.74	9.49	62.19
170	SANTIAM PASS	12.59	11.00	8.82	6.08	4.25	3.27	1.11	1.60	3.17	5.89	13.08	13.43	84.29
171	SCOTTS MILLS 9 SE	11.64	9.87	9.03	6.85	5.41	3.55	1.38	1.54	3.35	6.19	12.23	12.47	83.51
172	SEASIDE	10.27	9.57	8.44	5.74	3.96	3.00	1.63	1.34	3.00	6.07	11.38	11.34	75.74
173	SENECA	1.34	1.09	1.28	1.06	1.60	1.17	.70	.72	.69	.83	1.47	1.63	13.58
174	SEXTON SUMMIT	4.71	4.29	3.92	2.38	1.35	.94	.35	.61	1.20	2.93	5.32	5.18	33.18
175	SHEAVILLE 1 SE	1.83	1.71	1.81	1.59	1.58	1.33	.54	.50	.70	1.11	1.72	1.79	16.21
176	SILVER CREEK FALLS	9.90	9.35	8.79	7.01	4.98	3.45	1.25	1.32	2.75	5.38	11.29	10.59	76.06
177	SILVER LAKE RANGER STN	.99	.73	.81	.76	1.11	.79	.58	.59	.57	.61	1.10	1.16	9.80
178	SILVERTON	6.49	5.57	5.03	3.79	2.98	2.08	.86	.99	1.88	3.60	7.16	7.07	47.50
179	SISTERS	2.32	1.72	1.17	.89	.79	.60	.45	.50	.48	.98	2.14	2.15	14.19
180	SOUTH DEER CREEK	5.04	4.20	3.98	3.12	2.23	1.26	.50	.68	1.19	2.62	5.80	5.72	36.34
181	SPRAGUE RIVER 2 SE	2.36	1.79	1.93	1.05	1.15	.71	.47	.55	.68	1.07	2.06	2.26	16.08
182	SQUAW BUTTE EXP STATION	1.41	1.02	1.30	1.03	1.31	.80	.45	.58	.63	.79	1.25	1.23	11.80
183	STAYTON	7.17	6.46	5.37	4.26	3.31	2.42	.87	1.15	2.18	4.03	8.16	8.00	53.38
184	SUMMER LAKE 1 S	1.56	1.25	1.14	.99	1.17	.86	.55	.53	.61	.79	1.67	1.66	12.78
185	SUMMIT	10.08	8.64	7.21	5.24	3.35	2.35	.84	.89	2.20	4.67	10.44	11.52	67.43
186	SUNTEX	.72	.64	.91	.70	1.15	.59	.38	.53	.57	.64	1.23	.88	8.94
187	SUTHERLIN 2 W	5.65	4.92	4.41	3.35	2.36	1.32	.59	.75	1.38	2.90	6.67	6.45	40.75
188	THE DALLES	2.62	2.07	1.20	.85	.54	.42	.18	.36	.48	.96	2.03	2.77	14.48
189	THE POPLARS	1.30	1.32	1.04	.89	1.25	.86	.60	.74	.49	.70	1.12	1.22	11.53
190	THREE LYNX	10.47	8.85	7.58	5.94	4.36	3.01	1.01	1.08	2.82	5.29	11.03	11.27	72.71
191	TIDEWATER 2 SW	14.22	11.93	10.88	7.00	4.66	2.77	.87	1.16	2.72	5.92	14.07	15.42	91.62
192	TILLAMOOK 1 W	13.09	10.79	9.90	6.81	4.84	3.41	1.64	1.42	3.68	7.16	13.72	13.94	90.40
193	TOKETEE FALLS	6.61	5.55	5.44	4.26	3.07	1.75	.80	1.13	1.63	3.55	7.65	7.41	48.85
194	TROUTDALE	6.09	5.16	4.40	3.65	2.83	2.20	.94	1.10	2.00	3.34	6.53	6.61	44.85
195	UKIAH	1.78	1.39	1.37	1.45	1.77	1.29	.73	.85	.75	1.21	2.00	1.96	16.55
196	UNION EXPERIMENT STN	1.15	.97	1.20	1.52	2.02	1.47	.71	.84	.84	.97	1.53	1.19	14.41
197	UNITY	1.24	.74	.81	.78	1.13	1.16	.58	.78	.53	.61	1.20	1.20	10.76
198	VALE	1.22	.96	1.00	.85	1.05	.75	.47	.38	.52	.62	1.11	1.35	10.28
200	VALSETZ	18.88	17.28	14.36	9.07	5.82	3.91	1.25	1.77	3.95	8.81	21.03	21.58	127.71
201	VERNONIA 2	7.47	5.91	5.27	3.73	2.38	1.65	.62	.79	2.09	3.66	7.56	8.01	49.14
202	WAGONTIRE	.83	.80	.89	.63	1.13	.59	.50	.51	.52	.71	1.23	1.09	9.43
203	WALLA WALLA 13 ESE	5.46	4.56	4.51	3.74	2.95	2.05	.75	1.06	1.58	2.99	5.82	5.01	40.48
204	WALLOWA	1.84	1.44	1.30	1.39	1.76	1.44	.94	.89	1.09	1.33	2.07	1.91	17.40
205	WASCO	1.80	1.22	1.09	.82	.71	.57	.27	.38	.50	.85	1.73	1.72	11.66
206	WATERLOO	6.12	5.45	5.00	3.60	2.87	2.08	.63	1.01	1.61	3.35	7.11	6.72	45.55
207	WESTFALL	1.24	.97	.92	.81	1.18	.93	.47	.51	.43	.53	1.17	1.30	10.46



Approximate Location of Scio, OR
PORTLAND
GRESHAM
CANBY
SILVERTON
SALEM
DALLAS
ALBANY
LEBANON
HARRISBURG
EUGENE
COTTAGE GROVE
OAKRIDGE
BLUE RIVER
SISTERS
REDMOND
BEND
MADRAS
GATEWAY
ANTELOPE
SIMANOX
WASCO
THE DALLES
BROTHERS
MCMINNVILLE
TILLAMOOK
VERNONIA
45
44

Map LU-2



City of Scio

Map Revised 04/15/2016.
Data Provided by the City of Scio and Linn County.

Zoning

Effective Date: May 15, 2015

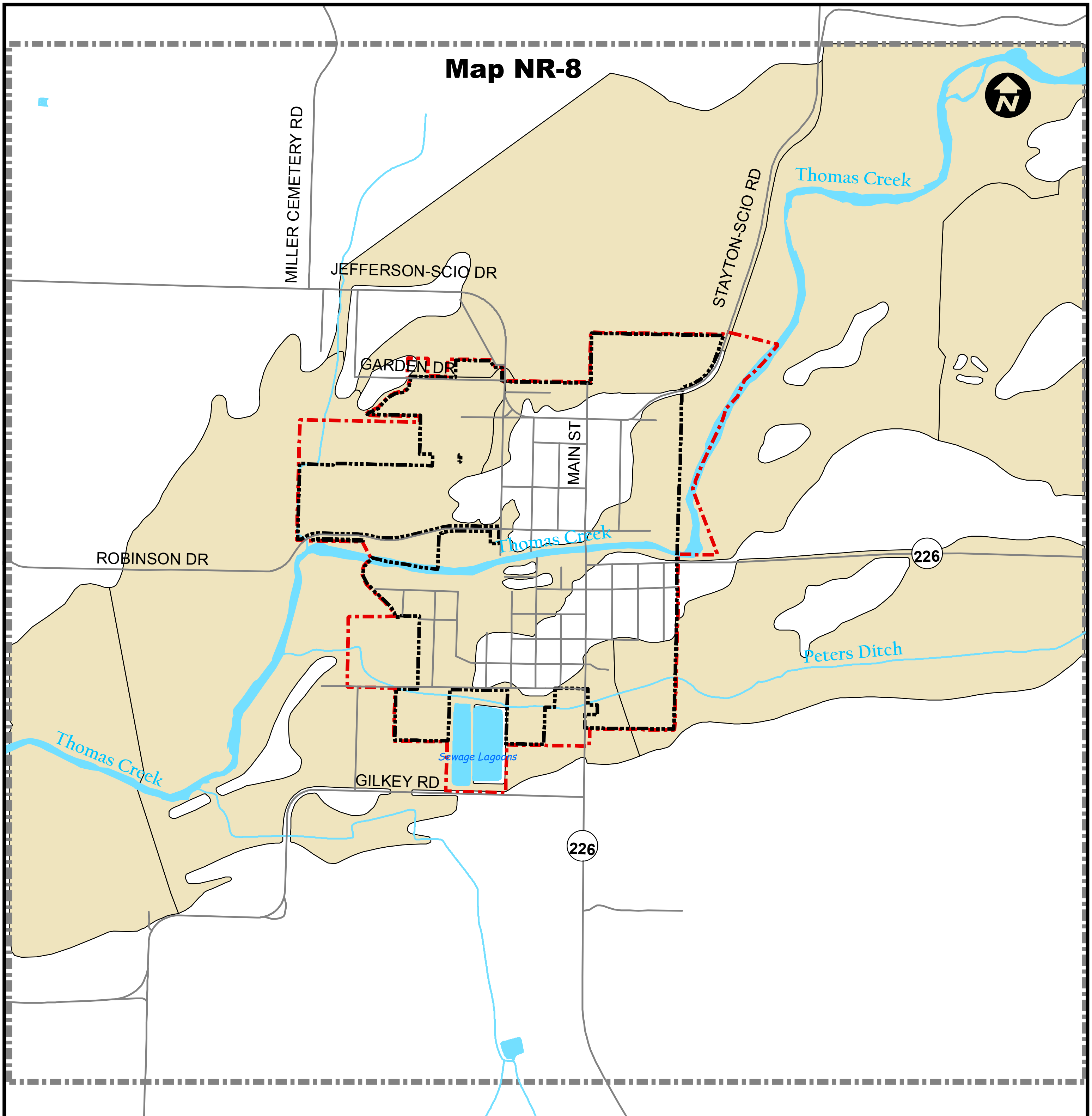
Feet
0 250 500 1,000 1,500

This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the suitability of the information.

Legend

CityZoning

- Commercial
- Light Industrial
- Public
- R-1 Single Family Residential
- Multi-Family Residential
- City Limits
- Taxlots
- UGB
- Rivers and Streams



Special Flood Hazard Area

0 500 1,000 2,000 3,000 4,000 5,000 Feet

City of Scio

Map Revised 11/01/2014.
Data Provided by the City of Scio and Linn County.

This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the suitability of the information.

Legend

- 100 Year Flood Plain
- Roads
- City Limits
- UGB
- Rivers, Streams, Ponds
- Planning Area

Lagoon Balance (Scio, OR)

City of Scio
Monthly Water Balance
Existing Condition

Project Number 202.01

Influent Flow Information:	AWWF	0.128	mgd
	ADWF	0.051	mgd
Lagoon Information:	Average Lagoon Area	7.9	acres
	Future Additional Lagoon Area	0	acres
	Assumed Level at beginning of summer	2.5	ft
	Maximum water level	7	ft
	Maximum total storage capacity	55	ac-ft
	Maximum surge volume	35.55	ac-ft
	Irrigation area	0	acres
	Additional Irrigation Area	0	acres

Month	Influent (1)		Precipitation (2)		Evap. (3)		Lagoon Leakage (4)			Thomas Creek Discharge		Net Storage	Storage Accum.	Surge Volume
	(MG)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(in)	(ac-ft)	(MG)	(MG)	(ac-ft)	(ac-ft)	(ac-ft)	(ac-ft)
													20	
May	0.00	0.0	3.31	0.690	4.6	-0.96	0.0	0.0	0.0	0	0	0	25	5
June	0.00	0.0	2.42	0.504	5.9	-1.22	0.0	0.0	0.0	0	0	-1	26	7
July	0.00	0.0	0.87	0.181	7.7	-1.60	0.0	0.0	0.0	0	0	-1	25	6
August	0.00	0.0	1.15	0.240	7.1	-1.47	0.0	0.0	0.0	0	0	-1	25	5
Septembe	0.00	0.0	2.18	0.454	5.1	-1.05	0.0	0.0	0.0	0	0	-1	27	7
October	0.00	0.0	4.03	0.840	2.3	-0.49	0.0	0.0	0.0	0	0	0	34	15
November	0.00	0.0	8.16	1.700	1.0	-0.20	0.0	0.0	0.0	0.0	0.0	2	28	8
December	0.00	0.0	8	1.667	0.0	0.00	0.0	0.0	0.0	0.0	0.0	2	28	8
January	0.00	0.0	7.17	1.494	0.0	0.00	0.0	0.0	0.0	0.0	0.0	1	29	9
February	0.00	0.0	6.46	1.346	0.0	0.00	0.0	0.0	0.0	0.0	0.0	1	30	11
March	0.00	0.0	5.37	1.119	1.8	-0.37	0.0	0.0	0.0	0.0	0.0	1	33	13
April	0.00	0.0	4.26	0.888	3.0	-0.62	0.0	0.0	0.0	0.0	0.0	0	22	2
Total	0		53.4		38.3		0.0	0.0	0.0	0.0	0.0	Required	34	14.7

(1) Influent based on AWWF and ADWF and historical distribution of flows.
(2) Precipitation data derived from historical Daily Monitoring Reports from Scio
(3) Evaporation based on historical means for Corvallis from the Western Regional Climate Center, 1889 - 2005.
(4) Assuming no Lagoon Leakage to be conservative

City of Scio

Wastewater Lagoons Sludge Profile

Final Report

November 2018

Prepared by:

Oregon Association of Water Utilities

City of Scio Wastewater Lagoon Sludge Profile – December 2018 –

This Study, by Oregon Association of Water Utilities, is a summary report, written for the City of Scio, to assist in establishing the levels of sludge accumulation in the two lagoon cells. The combined acreage of the primary and secondary lagoon consist of approximately 7.82 total acres of open space and receives the entire portion of the treated effluent wastewater from the City of Scio's collection system.

On November 6, 2018 the Oregon Association of Water Utilities arrived to begin the sludge profiling, by using a tube style sludge judge sized 1.5-inch diameter by 15 feet in length. The tube has a one-way check valve that allows materials (water and sludge) to enter. The tube is labeled with both one-inch and one-foot increments. The process involved collecting designated probes throughout each cell by means of following a 75-foot by 100-foot grid pattern using traffic cones placed as markers along the edges of the cell. These probes are collected only for the purpose of determining the depth of sludge accumulated at various locations throughout each cell. No samples were collected that were sent to a laboratory for analysis. Each probe indicates both the total depth of water and the depth of the bottom solids. The probing locations is accomplished by means of a small boat to the approximate center of two markers, sampling the sludge blanket depth, and noting the depth measurement and any visual comments within the field notes.

Profiling a lagoon is a way of determining how much sludge has accumulated in the wastewater ponds and the results can be used as a tool to better manage the bio-solids. Better management of bio-solids can improve the water quality of lagoons, help to keep the system in compliance with State and Federal regulations and allow a wastewater utility to determine the costs in preparation and advanced planning to meet operational conditions and needs.

As wastewater lagoon sludge volumes reach 15 percent, operational concerns may begin. However, most of these problems are not visibly noticeable at the time. After sludge levels reach 33 percent, it becomes challenging to remain in compliance with the NPDES permit. Once sludge levels reach a 50 percent level, the lagoon ceases to function properly.

Two sets of charts are presented for each cell. The first chart displays a grid format that correlates the measurements using Google Earth mapping. The grid squares are colored to indicate the boundaries of the ponds. Light blue colored squares represent the lagoon (water) area while the shoreline or land area is indicated by a black border. Inch measurements are provided to illustrate the approximate depth of sludge.

Based on the configuration of our Excel spreadsheet, a second series of charts were produced to show how the depth numbers transfer to diamond shaped points indicating three levels of depth, correlating a deeper depth of sludge with the darker colored areas. Observations are as follows:

An aerial map is provided to gain a sense of perspective as to the location, size and process the wastewater lagoons serve for the City of Scio:

Cell # One:

On November 6, 2018 OAWU began the lagoon profile process to determine the depth of sludge found in the lagoon system for the City of Scio. Cell # 1 is the initial storage lagoon that receives the raw sewage from the community. Beginning in the area of the inlet, total depth was measured in several locations, and the operating level at the time of the process was 60 inches. The total height of the water board is 96 inches, yet the cells are usually not operated above 72 inches. Approximately 3-feet of free-board was visible during the process.

The average depth of the sludge throughout the entire cell was calculated at 12.2 inches, with numerous areas measuring a minimum of 8-9 inches. The greatest depth was just at the inlet and measured 20 inches, both at the inlet area and at the south-east corner. Total measured accumulative sludge was 293 inches. The southern quarter of the pond exhibited a sludge that was thick grey and paste-like consistency. In the remaining pond, the consistency of the sludge had changed to a loose mud-like texture. The sludge would simply rinse off the tube when moved through the water. See first chart with depth figures. The clarity of water (overcast) was approximately 12 inches.

To approximate the total amount of sludge in the cell, an average 12.2 inches or 1.01 feet was multiplied by 410 ft. (L) by 370 ft. (W).

- 800 x 200 x 1.01 = 161,600 cu. ft.
- 161,600 cu. ft divided by 27 cu. ft per cubic yard = 5,985 cu. yds.

Cell # Two:

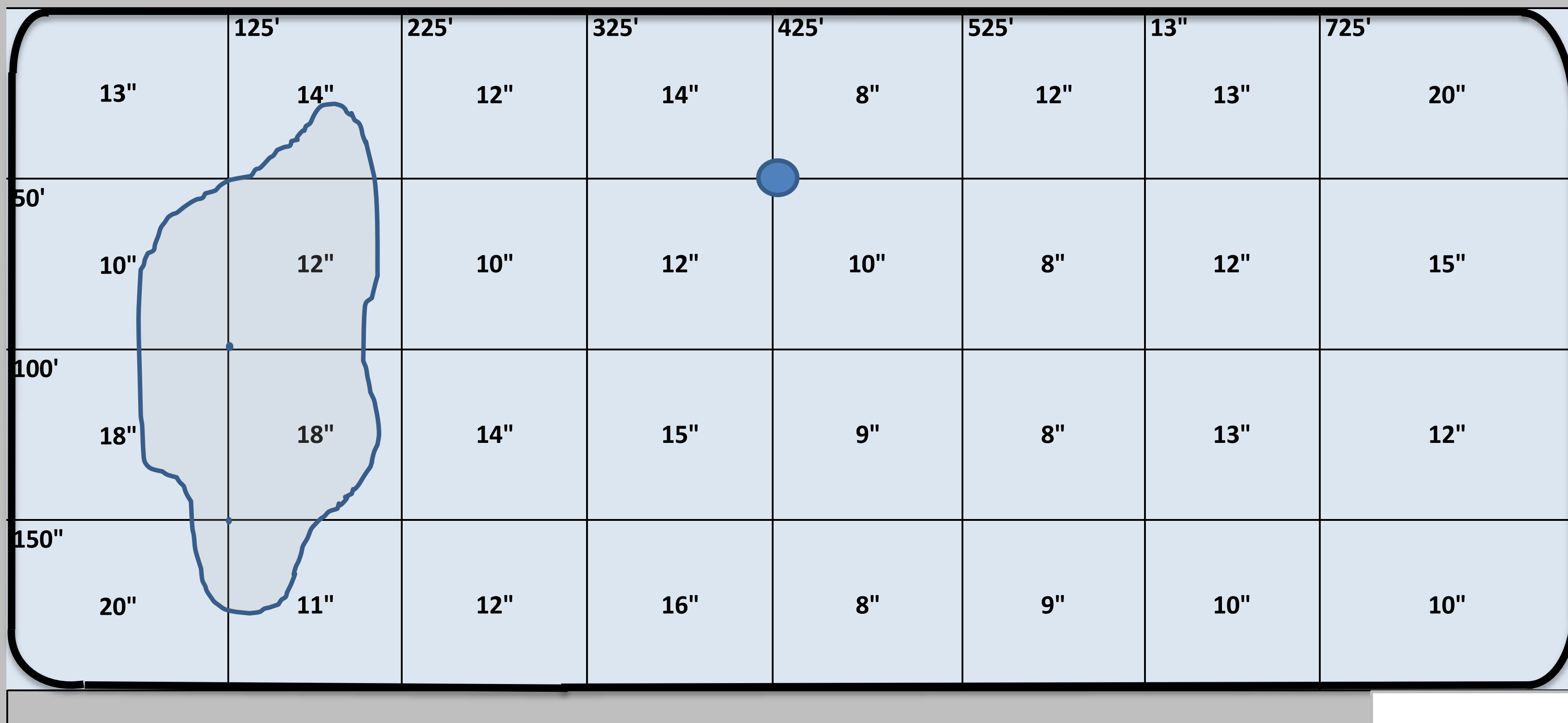
The second cell was operating at a depth of 72-inches and had a water clarity of 30-inches with an exception of the southern end measured 7-feet of depth. This additional foot of depth will not be calculated in the over-all totals of accumulated cubic yards of sludge. The average overall sludge depth was 11.2 inches. The total water board height was 112 inches and the cell is usually operated at a depth of 72 inches. Total measured accumulative sludge was 268 inches. Throughout the entire cell, the consistency was the sludge was mud-like, with the exception along the central eastern length (see chart 1) when the sludge became more paste-like, sticky and would not rinse of the tube.

To approximate the total amount of sludge in the cell, an average 11.9 inches or 0.93 feet was multiplied by 380 ft. (L) by 370 ft. (W).

- 750 x 250 x 0.93 = 97,014 cu. ft.
- 174,375 cu. ft divided by 27 cu. ft per cubic yard = 6,458 cu. yds.

The following pages are the lagoon grids developed to assist in outlining the sampling points as well as the depth interpretation of the measurements as they are transferred into the software. Included on the lagoon grids are notes of the findings as they relate to each cell specifically.

This report is solely for the purpose of determining depth of sludge in the lagoon cells for the City of Scio, providing a proactive tool to stay ahead of the compliance curve. There are no regulatory requirements mandating the profiling of the lagoons.



Notes:

City of Scio Cell / Pond # 1

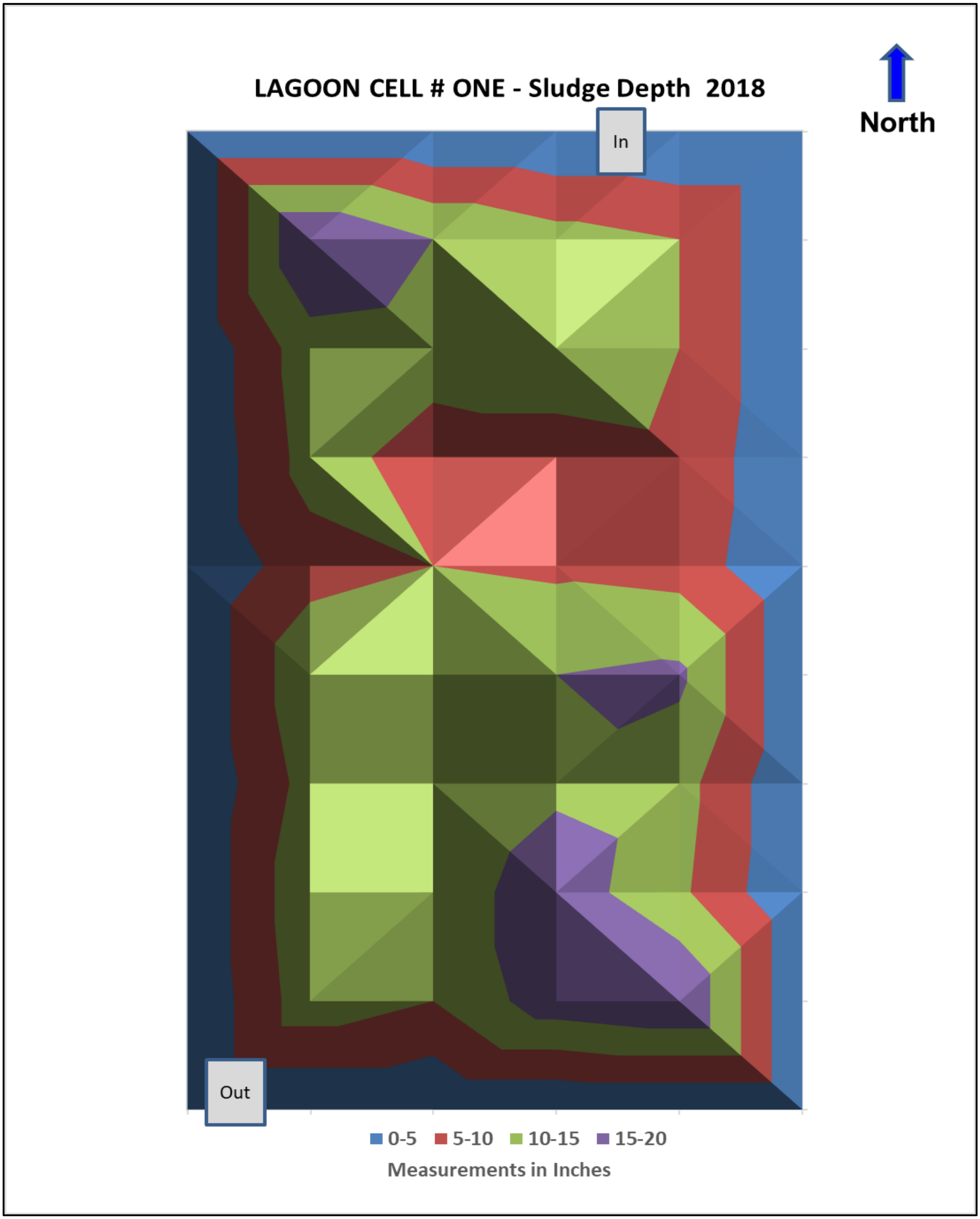
3.67 acres or approximately 800 ft. x 200 ft. Total Sampling Points (attempts) = 30

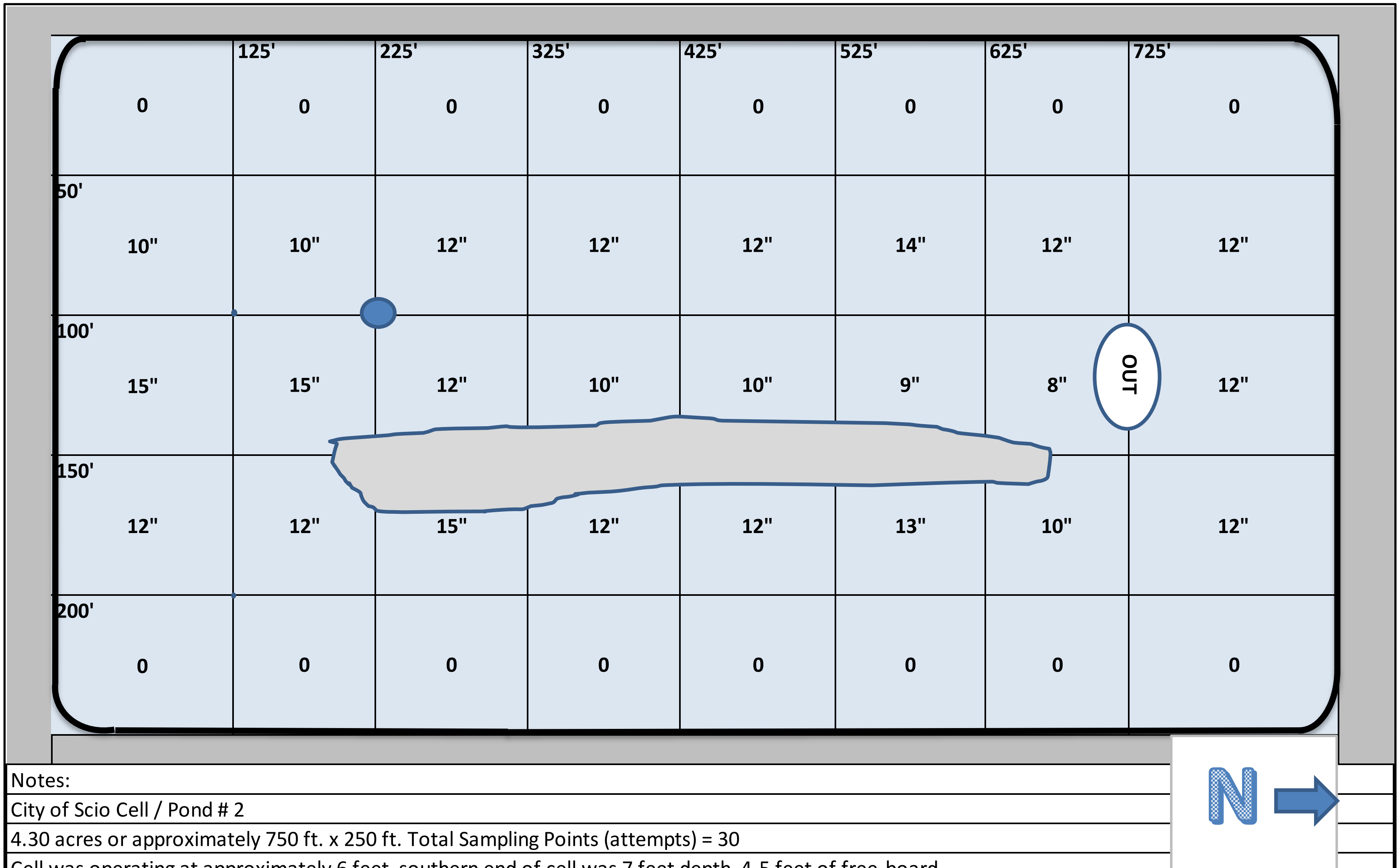
Cells were low in depth at 5 feet, Clarity of water = 12 inches, 3 feet of free-board remaining, average operating level at 6 feet

Southern section, sludge was paste-like, grey area, sticky, remaining cell sludge black, loose in consistency

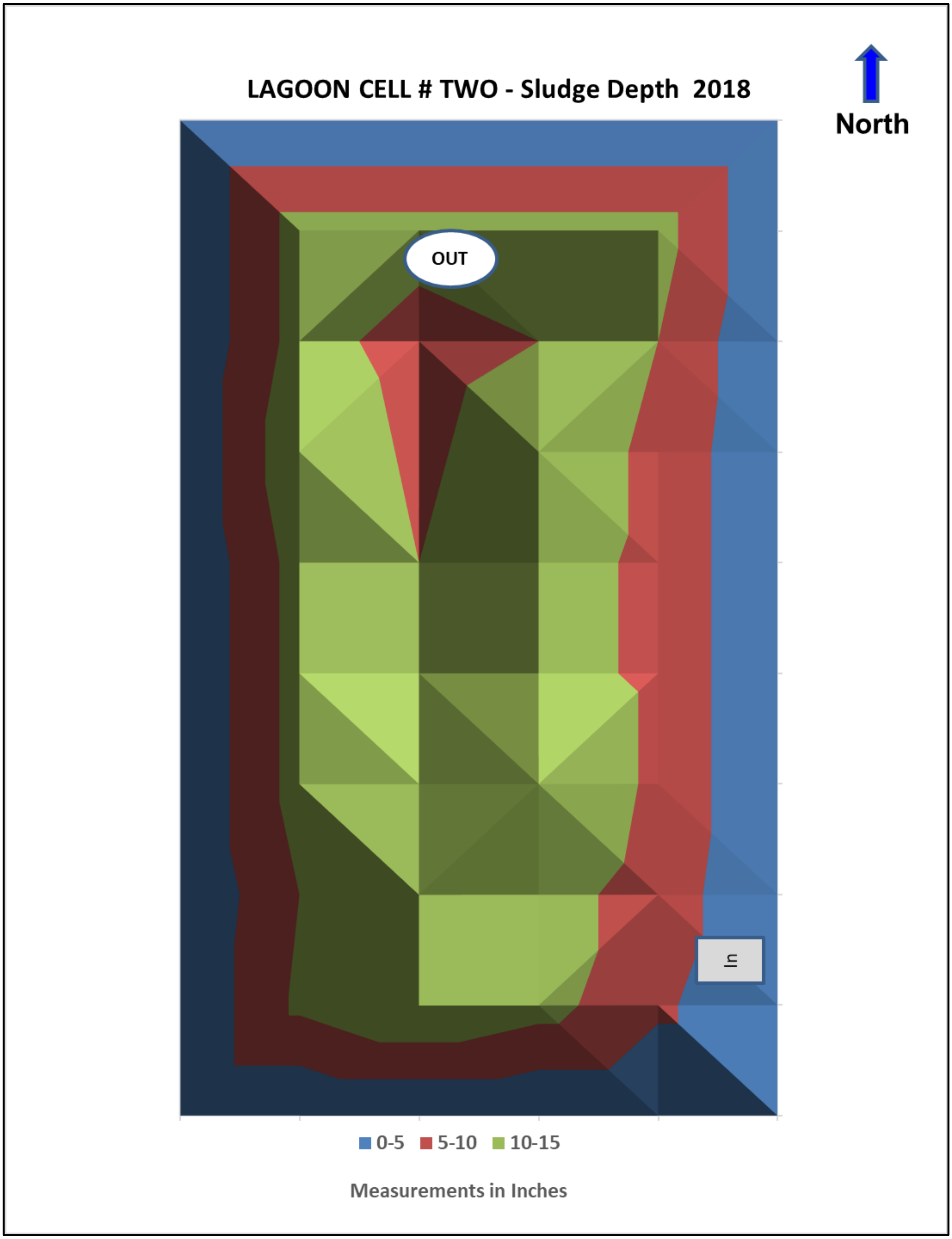
Average depth of sludge was 12.2 inches

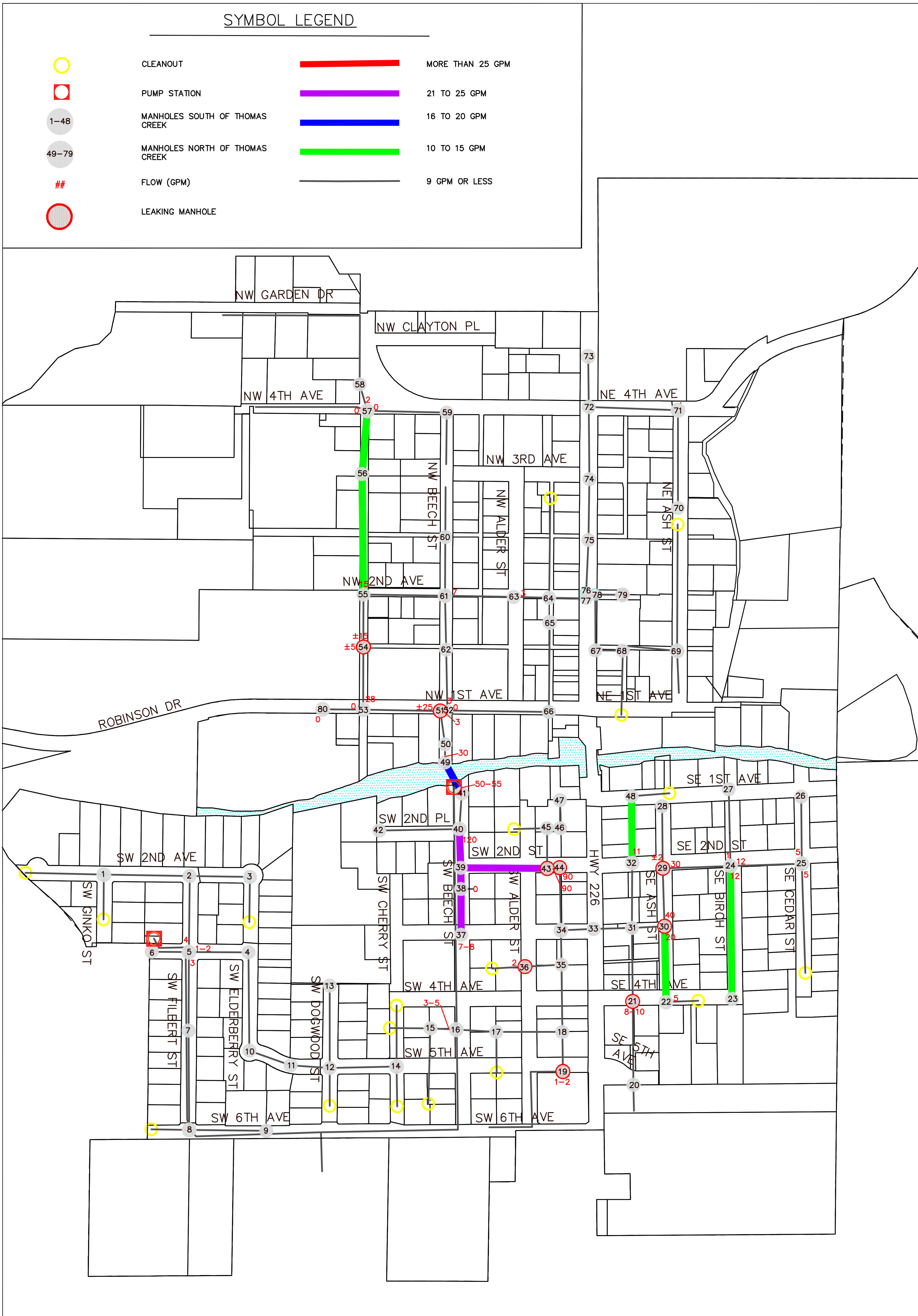
- sampling points will be at each intersection


LAGOON CELL # ONE - Sludge Depth 2018
North
In
Out
0-5
5-10
10-15
15-20
Measurements in Inches



Notes:
City of Scio Cell / Pond # 2
4.30 acres or approximately 750 ft. x 250 ft. Total Sampling Points (attempts) = 30
Cell was operating at approximately 6 feet, southern end of cell was 7 feet depth, 4-5 feet of free-board
Clarity of water was 30 inches in depth, no duckweeed, no odor
Sludge was paste-like along the eastern shore, average depth of sludge at 11.2 inches
● sampling points will be at each intersection


LAGOON CELL # TWO - Sludge Depth 2018
North
OUT
In
0-5
5-10
10-15
Measurements in Inches



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SCIO LINN COUNTY, OREGON	FIGURE NO.
DATE: FEBRUARY, 2019 PROJECT NO.: 202.01	FLOW POKING MAP	A

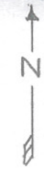
CITY OF SCIO

FLOW POKING

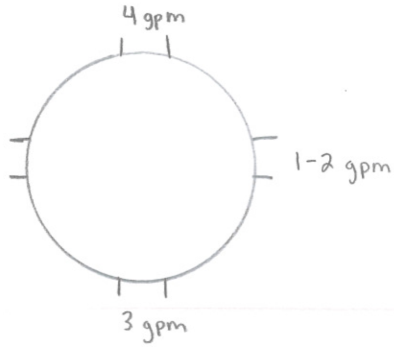
DATE: 2/12/19 – 2/13/19

START TIME: 10:45
RAIN GAUGE READING = 0.6”
INFLUENT FLOW READING (GALLONS)
2282770e2

END TIME: 4:00
RAIN GAUGE READING = 0.7”
INFLUENT FLOW READING (GALLONS)
2283139e2



#5



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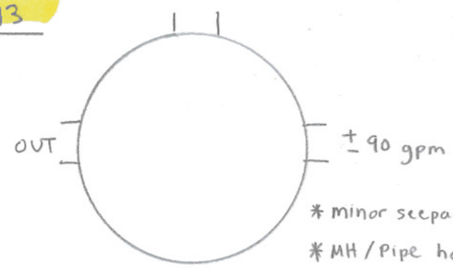
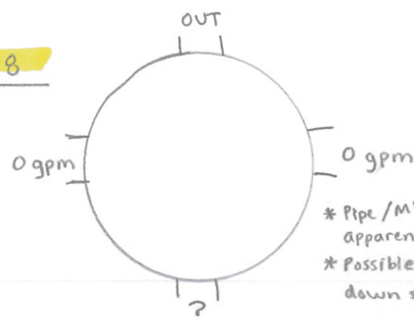


* minor seepage @ MH ring
* MH / Pipe half full, could not measure 8" from North. Assume little flow. Possible TV

#41

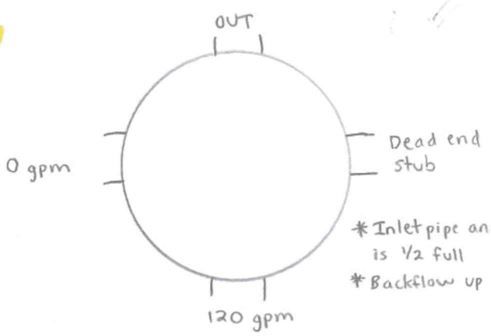
BEECH ST.
PUMP STATION

#38



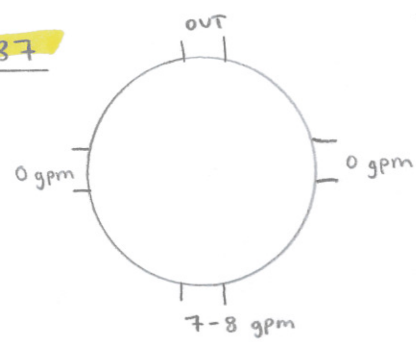
* Pipe / MH half full, no apparent flow
* Possible backflow from down stream

#40



* Inlet pipe and MH is 1/2 full
* Backflow up 8" to west

#37



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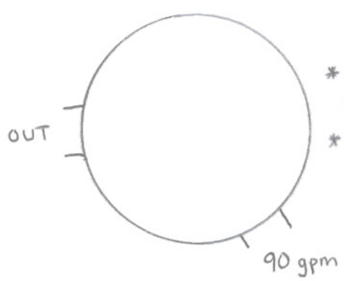
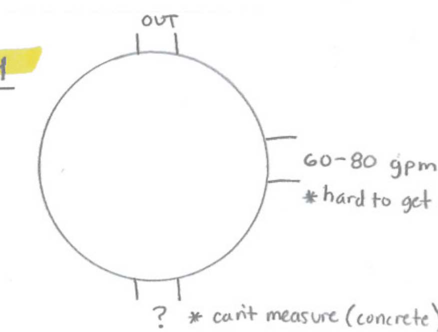


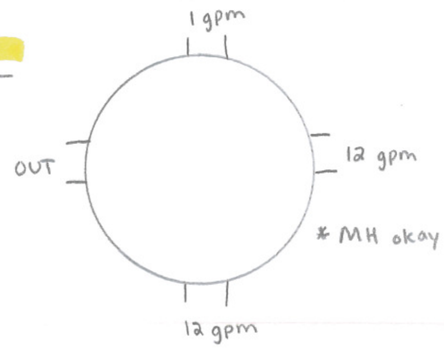
* minor seepage @ MH joints
* pipe / MH half full

#34



* hard to get weir set
* can't measure (concrete)

#24



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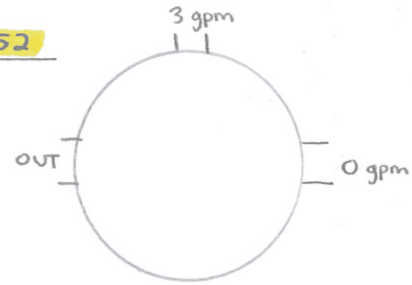

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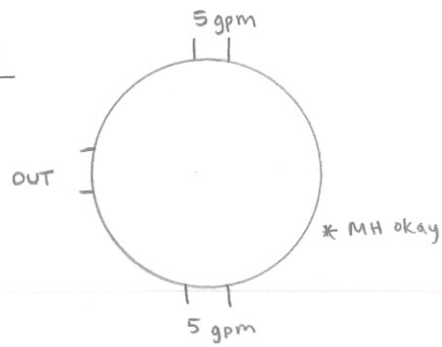
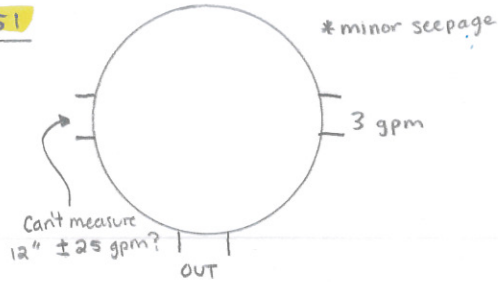


#51



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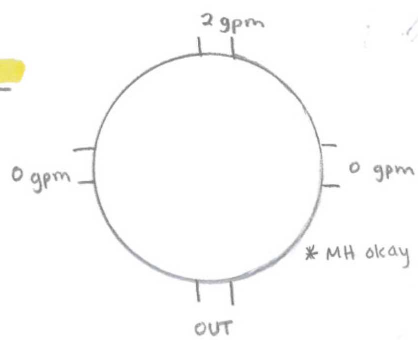

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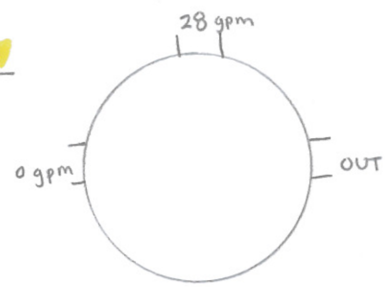
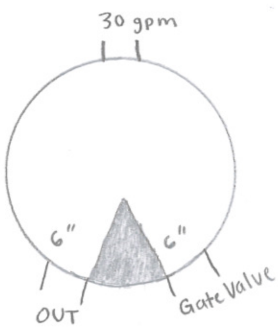
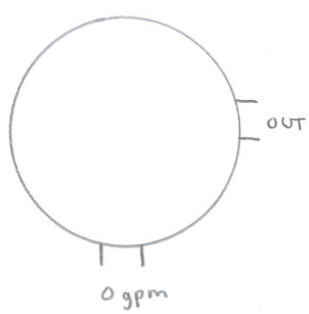
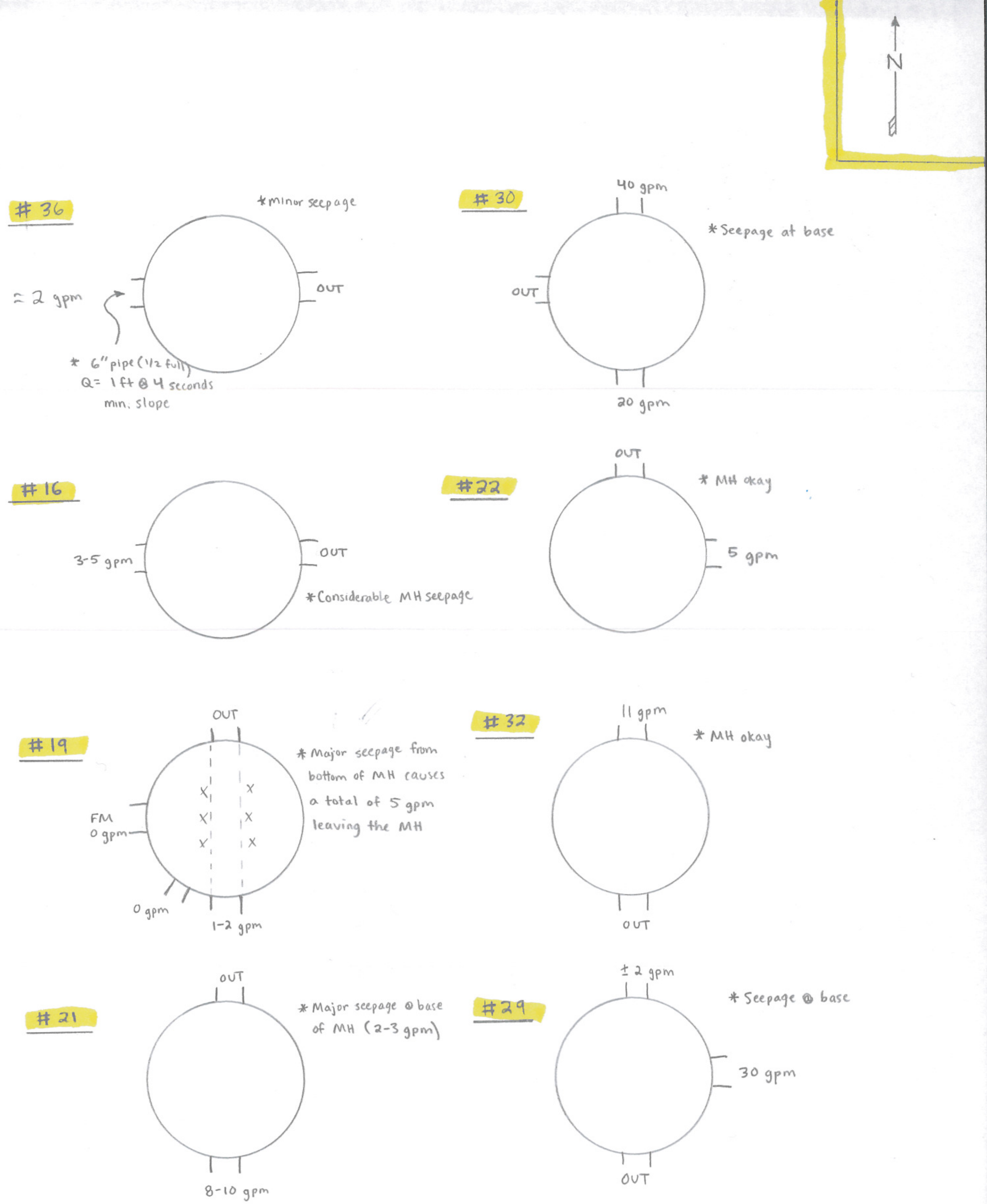


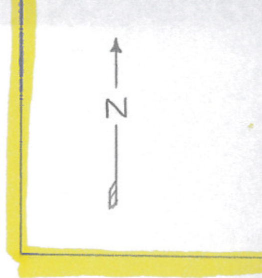
#49



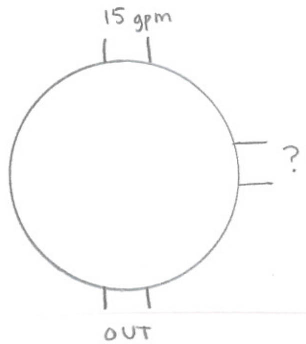
#80



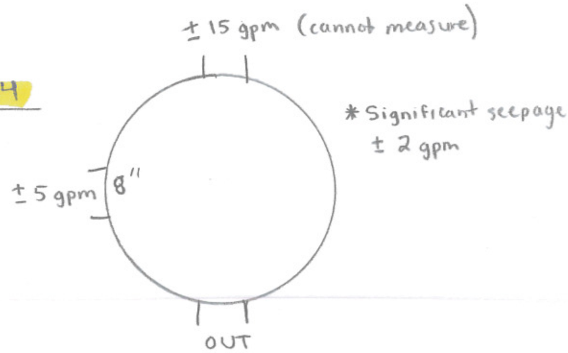

N
#36
*minor seepage
≃ 2 gpm
OUT
* 6" pipe (1/2 full)
Q= 1 ft @ 4 seconds
min. slope
#30
40 gpm
*Seepage at base
OUT
20 gpm
#16
3-5 gpm
OUT
*Considerable MH seepage
#22
OUT
* MH okay
5 gpm
#19
OUT
* Major seepage from
bottom of MH causes
a total of 5 gpm
leaving the MH
FM
0 gpm
0 gpm
1-2 gpm
#32
11 gpm
* MH okay
OUT
#21
OUT
* Major seepage @ base
of MH (2-3 gpm)
8-10 gpm
#29
± 2 gpm
* Seepage @ base
30 gpm
OUT


N

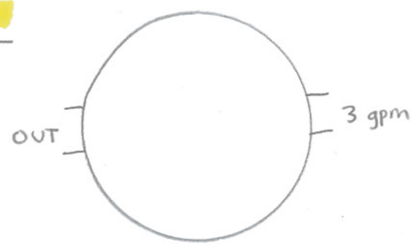
#55


15 gpm
?
OUT

#54


± 15 gpm (cannot measure)
* Significant seepage
± 2 gpm
± 5 gpm
8"
OUT

#63


OUT
3 gpm

CITY OF SCIO

SMOKE TESTING REPORT

OCTOBER 2018

The Dyer Partnership
Engineers & Planners, Inc.

Project No. 202.01

1330 Teakwood Avenue
Coos Bay, Oregon 97420
(541) 269-0732
www.dyerpart.com

759 West Central Avenue
Sutherlin, Oregon 97479
(541) 459-4619

1165 South Park Street
Lebanon, Oregon 97355
(541) 405-4520

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SECTION 1:
INTRODUCTION

SECTION 1: **INTRODUCTION**

1.1 General

Infiltration and inflow (I/I) is a problem affecting many Oregon communities. Infiltration and inflow, which is defined as groundwater and rainwater that enters a sanitary sewer collection system, creates many wastewater-related problems. Rain-induced sewer flows can hydraulically overload a wastewater treatment plant or pump station, increase the cost of operations, potentially cause a discharge of inadequately treated effluent, and lead to regulatory compliance issues. Infiltration and inflow can also cause flows to exceed the capacity of the pipes, thereby compromising the collection system.

1.2 Background and Need

The City of Scio ('City') experiences higher sanitary sewer flows in "wet" weather months. Excessive infiltration and inflow can overload the wastewater treatment facility, and potentially contributes to violations at the wastewater treatment plant.

Smoke testing was performed to identify potential deficiencies allowing I/I into the collection system. Some of the sources of I/I that smoke testing identifies includes catch basins and roof drains tied to the sewer system, leaks in main and lateral sewer lines, leaky cleanouts, and deteriorated manholes. Correction of these I/I sources is an economical way to reduce extraneous flows within the collection system, reduce the operation and maintenance costs associated with treatment, and facilitate compliance at the wastewater treatment facility. Smoke testing the City's wastewater collection system is also a requirement of the Department of Environmental Quality.

1.3 Scope of Study

The scope of this study includes the following two main tasks: smoke testing and summary report.

Smoke Testing of the study area was completed to assist in identifying inflow sources. Detailed, individual reports were developed to document each "smoke sign". Each report includes a photograph of the observed smoke, a hand-drawn map of the location of the smoke, a written description of the source of smoke, and other pertinent information. The ultimate and intended purpose of the smoke report is to assist the City in focusing on problem areas. Individual reports are attached in Appendix A.

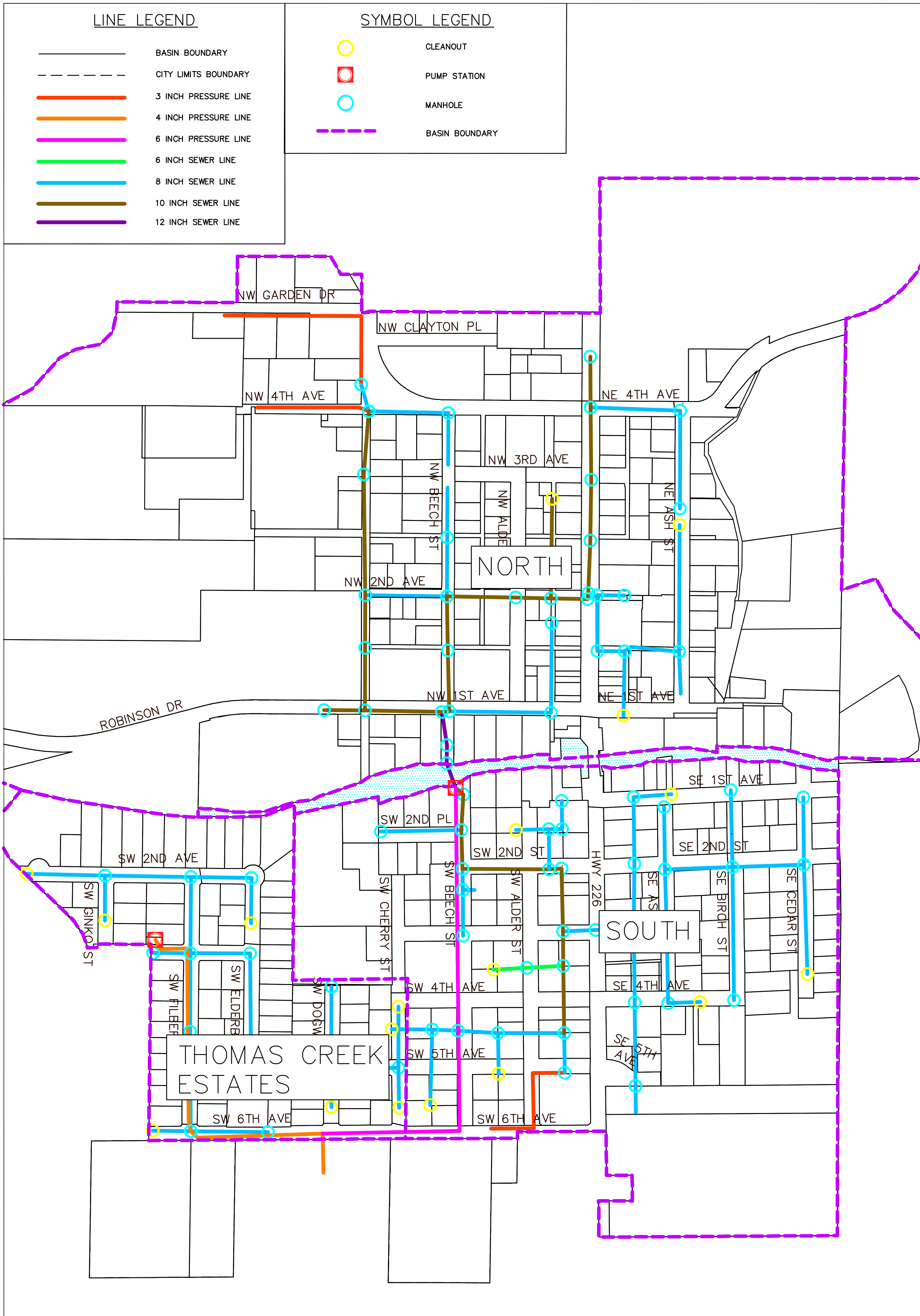
Summary and Recommendations were developed that identify the areas of that portion of the City's sewer collection system which need further investigation. The City should determine whether the individual defects are their responsibility or the responsibility of individual property owners, and create a plan to repair or rehabilitate each problem.

1.4 Study Area

The City's collection system is divided into three basins; North, South, and Thomas Creek Estates. The basins are separated by Thomas Creek and the newer developed residential area called Thomas Creek Estates. Both North and South basins flow to the same pump station, while Thomas Creek Estates has its own pump station that specifically serves that development. The study area associated with the smoke testing includes all basins, as set forth in Table 1.4.1. Figure 1.4.1 illustrates the limits of the study area associated with the smoke testing.

TABLE 1.4.1
BASINS SMOKE TESTED
CITY OF SCIO

Basin ID	Acres Served
North	93
South	77
Thomas Creek Estates	22



THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: AUGUST, 2019

PROJECT NO.: 202.01

CITY OF SCIO
LINN COUNTY, OREGON

WASTEWATER COLLECTION SYSTEM

FIGURE NO.
1.4.1

SECTION 2:
FIELD RESULTS

SECTION 2: **FIELD RESULTS**

2.1 Smoke Testing

Smoke testing was conducted from September 12 through September 13, 2018. The smoke testing was successful in identifying several possible sites of infiltration and inflow. Some catch basins and service laterals are connected to the sewer system, which could introduce high flows into the collection system during wet weather conditions.

Table 2.1.1 lists the type and number of deficiencies that were indicated by the presence of smoke. Figure 2.1.1 illustrates the number and percentage of type of deficiency. Figures 2.1.2 and 2.1.3, located at the end of this section, are maps of the City's collection system, which show the sewer lines that were tested, the location of each deficiency discovered, and which manholes were smoked. Table 2.1.2 provides a reference to each of these individual deficiency reports according to the type of deficiency. A table of the smoke testing report number and its associated deficiency is included in Appendix A.

TABLE 2.1.1
NUMBER AND TYPE OF DEFICIENCIES

Deficiency	Total
Open Cleanout	14
Catch Basin	4
Leaking Service Lateral	9
Leaking Main Line	1
Other	4
TOTAL DEFICIENCIES:	32

FIGURE 2.1.1
SMOKE TESTING RESULTS SUMMARY
NUMBER OF VIOLATIONS BY TYPE

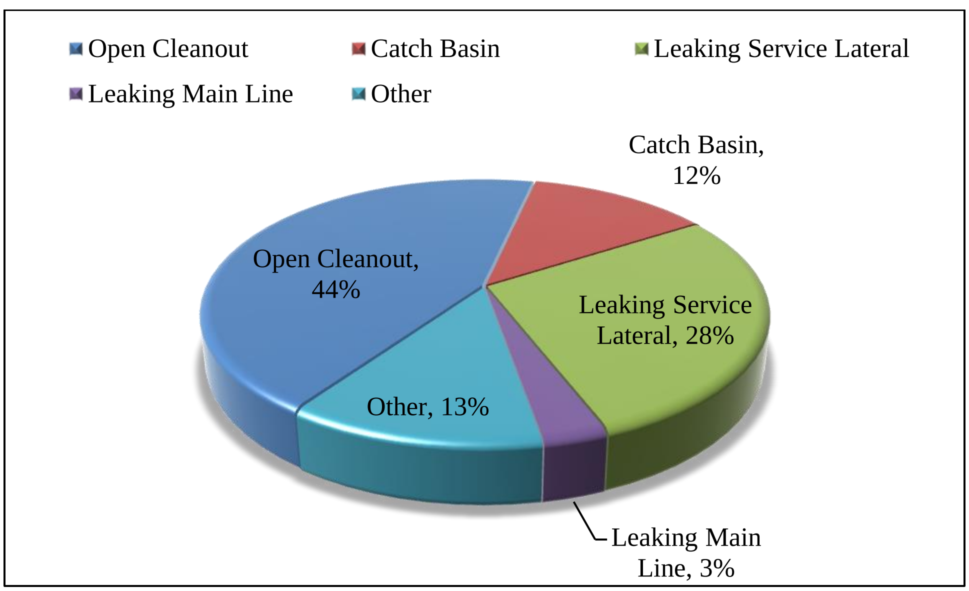


TABLE 2.1.2
REPORT NUMBERS ACCORDING TO DEFICIENCY TYPE[1]

Deficiency Type	Deficiency Code	Smoke Test Report Number		
Catch Basin	CB	1-2		
		1-9		
Leaking Main Line	LML	2-12		
Leaking Manhole	LMH	1-1	1-6	2-13
		1-4	2-8	2-14
		1-5	2-10	
Leaking Service Lateral	LSL	1-3	2-1	2-15
		1-10	2-3	2-17
		1-12	2-10	
Open Cleanout	OCO	1-3	2-2	2-7
		1-7	2-3	2-11
		1-8	2-4	2-12
		1-11	2-5	2-16
		2-1	2-6	

1. Some smoke reports included multiple deficiencies.

Other deficiencies, outside of the above categories, are summarized below:

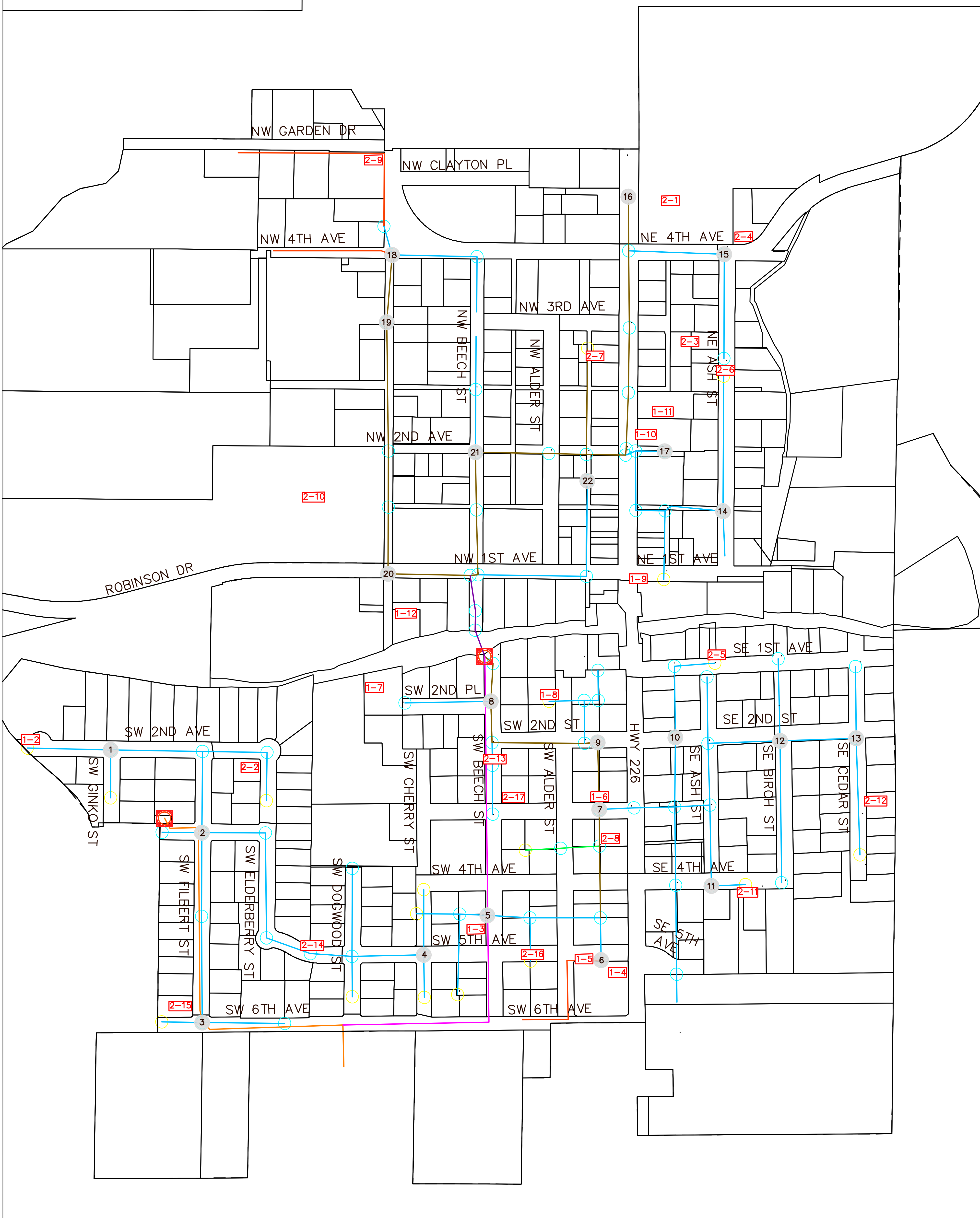
- 2-9. Smoke was exiting from a leaking septic tank near 38938 Jefferson-Scio Drive.
- 2-10. A floor drain in Centennial Elementary School was leaking smoke.
- The following locations within the City called during the smoke test or came outside to indicate smoke coming from inside:

  - Scio Youth Club (39001 NE 4th Ave.)
  - 38604 SW Alder St. (Bathroom)
  - 38885 Main St. (Sink)
  - 38829 SW 2nd Ave. (Laundry Room)

  It is important to note that other households can potentially have similar problems, as not all residents were home at the time of smoke testing. Some deficiencies could have gone unnoticed. It is suggested that the City inform residents about potential health concerns caused by these deficiencies and recommend testing for sewer gases in homes.
- Difficulties arose in determining how some manholes near Clevenger's Automotive Tire on SW 2nd St. were connected to the adjacent properties. It is recommended that the City TV the main lines in this area to better understand the existing layout.
- The majority of the manholes in the City seem to be in need of repair. A select few manholes are covered in this report, but the condition of all manholes should be re-evaluated for potential grouting.

LEGEND

(solid line)	BASIN BOUNDARY
(dashed line)	CITY LIMITS BOUNDARY
(symbol)	PUMP STATION
#-#	DEFICIENCY REPORT NUMBER
(symbol)	CLEAN OUT / MANHOLE
#	MANHOLES USED FOR SMOKE TESTER



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SCIO LINN COUNTY, OREGON	FIGURE NO.
DATE: OCTOBER, 2018 PROJECT NO.: 202.01	SEWER BASIN MAP	2.1.2

SECTION 3:
POTENTIAL DEFICIENCIES

SECTION 3: **POTENTIAL DEFICIENCIES**

3.1 Major Line Failures

Failed lines can be described as having any of the following problems, many of which may be identified during television inspection.

- Blockages, collapses, or corroded pipes.
- Material degradation due to hydrogen sulfide gas.
- Joint gaskets exposed or missing.
- Large or multiple areas with earth exposure.
- Cross connections to storm drain infrastructure.
- Major joint or crack infiltration.
- Excessive settlement or sags such that the crown of the pipe deflects below the invert of upper and lower pipeline sections (submerged flow conditions).

3.2 Spot Failures

Spot failures can typically be characterized as a localized break, crack, or failure in a pipe section. The failures can come in the form of circumferential cracks, holes in the pipe walls, areas of minor root intrusion, chipped and broken pipe joints, and displaced or gapped joints. Many of these types of failures can be identified during television inspection of the main lines.

3.3 Leaky Service Laterals

As is the case with aging collection systems, many service laterals within the collection system contribute to the I/I problem. More often, utilities and regulatory agencies recognize the need to combat I/I in a holistic approach that addresses both public collection system components and private sources. The privately owned portions of the sewer system have the potential to contribute significantly to I/I flows. In some cities, it is estimated that as much as 60% of the I/I flows originate from service laterals (US Environmental Protection Agency, 1996). According to a 2015 Water Environment Federation (WEF) I/I survey, 31% of the respondents noted private I/I sources contributing 50 to 75% of the I/I, and 36% of the respondents contributing 20 to 50%. As a relatively local example, the City of McMinnville, Oregon estimates that approximately 60% of the City's I/I originates from their private sewer laterals.

Many communities throughout Oregon have recognized the need to address private sewer lateral I/I. The cities of Lebanon, McMinnville, Albany, and Mt. Angel, many of which were faced with similar sewer and WWTP capacity issues, all developed programs geared towards identifying and repairing defective private sewer laterals.

If the time of television inspection is correctly chosen, leaking laterals can clearly be identified. In order for this to occur, the collection system must not be surcharged, but high groundwater levels must be present. For Scio, 28% of deficiencies were leaking service laterals.

Service laterals with leakage can, and should be, replaced from the connection to the main line, to the edge of the right-of-way during pipe reconstruction and rehabilitation. The City should work with private property owners to provide technical and other assistance to repair or replace private laterals. In many cases, the lateral connection can be deteriorating or failed. Improperly installed lateral connections include protruding lateral taps that extend far into the pipe cross section. In many cases, the protruding tap acts like a dam, trapping solids behind it. The protruding taps also make it troublesome or impossible to get an inspection camera or cleaning head through a sewer line.

Associated with service laterals are cleanouts that may be installed between the dwelling or structure and the main sewer line. Cleanouts can act as area drains if the caps are not properly installed. For Scio, 44% of deficiencies noted were due to open cleanouts.

3.4 Leaky Manholes

Although not a part of this task, all manholes should be inspected to determine if leaks are present in incoming pipes, manhole bases, or other locations. Significant leaks can occur at pipe entrances if not properly grouted. As with service laterals, whenever a major improvement is proposed for a sewer line, the manholes on either side should be replaced or rehabilitated as necessary. In some cases, it is possible to effectively repair manholes using grouting or lining techniques. Leaky manholes can be rehabilitated for a fraction of the cost of a new manhole. In Scio, approximately 65 manholes were found to be leaking or show signs of potential leaking.

3.5 Storm and Roof Drain Connections

As with any gravity sewer system, potential exists for interconnection of catch basins, ditching and storm drain piping with the sewer system. These storm drain connections can cause significant flows into the sewer system and can easily exceed capacities of the gravity sewer system. Depending on location and topography, the removal of the storm drain connection may entail placement of new storm drain lines to maintain drainages. Four catch basins showed some type of interconnection with the gravity sewer system in the study area.

3.6 Deficient House Plumbing

Smoke from rooftop vents is normal and allows harmful sewer gasses to release outside rather than within structures. Occasionally a vent will be plugged or blocked allowing sewer gasses to escape within a structure. Smoke should not enter structures unless:

- Vents connected to the building’s sewer pipe are inadequate, defective, or improperly installed.
- Traps under sinks, tubs, basins, showers, and other drains are dry, defective, improperly installed, or missing.
- Pipes, connections, and seals of the wastewater drain system in and under building are damaged, defective, or are improperly installed.

The most common defects allowing smoke into buildings are dry traps for wash basins, showers, or tubs that are used infrequently. Smoke was discovered inside some structures, and one structure was noted as having a plugged house vent where smoke did not exit the rooftop vent.

SECTION 4:
ALTERNATIVES

SECTION 4: **ALTERNATIVES**

4.1 General

Until recently, infiltration in sewer collection systems was either ignored or the piping systems were completely replaced in order to correct infiltration problems. Today, new "trenchless technologies" allow collection systems to be rehabilitated without excavating to replace the old pipe. Expenses associated with new asphalt, sidewalks, landscaping, and other costs resulting from trenching can be almost completely avoided. If applicable, trenchless technology can almost always reduce project costs when rehabilitating sewer collection systems. A summary of different repair and rehabilitation techniques is provided below.

4.2 Collection System Repair and Rehabilitation Methods

Repair and rehabilitation methods to correct pipe deficiencies and minimize I/I intrusion are discussed below.

Complete Pipe Replacement

Pipeline replacement by conventional excavation and backfill is normally required when the existing pipeline is deteriorated so badly that other methods of rehabilitation are not feasible. However, complete replacement provides the opportunity to correct any misalignments or low areas, increase the hydraulic capacity of the line, repair service connections, or eliminate storm water entry points such as catch basins. Replacing pipelines can also remove any "incidental" I/I (i.e. minor leaks that would not individually be cost-effective to remove). A rehabilitation alternative that is similar to complete pipe replacement is point repairs, which involve excavation, pipe replacement, backfill and resurfacing for selected sections only.

The obvious advantage of pipe replacement is that the service life gained with modern materials and methods is generally considered to be more than 50 years. The cost of pipe replacement is generally high, and the associated inconveniences and restoration required are expensive.

Another advantage associated with complete pipe replacement is the fact that I/I along a replaced pipe segment should be significantly reduced; however, it is important to note that a large percentage of I/I will continue to originate from service laterals or other aboveground sources. It is therefore recommended that wherever feasible, complete service replacement to the property line be included in a replacement project.

There are a number of techniques for installing new sewer pipe, including the traditional open cut construction, and trenchless techniques (e.g. horizontal directional drilling (HDD)) and pipe bursting). Some of the key criteria for selecting a method for new pipe installation are given in Table 4.2.1.

TABLE 4.2.1
KEY CRITERIA FOR NEW PIPE INSTALLATION

Criteria	Potential Factors
Surface Conditions	Type (paved/unpaved), traffic use, land use (urban/rural), type (forest, water, etc.).
Cost	Pipe installation, surface restoration, subsurface difficulties
Environmental Considerations	Wetlands, critical habitat, migratory route
Subsurface Conditions	Installation depth, groundwater level, soil type, existing utilities
Hydraulics	Gravity vs. pressure flow, needed flow capacity, existing grades

Typically, the decision process will involve weighing the advantages of avoiding surface disruption against the costs. Surface conditions, depth of installation, subsurface conditions and environmental considerations also will affect the cost analysis. The evaluation and weighing criteria for choosing a particular construction technique will depend on specific site conditions. Brief descriptions of open cut, pipe bursting and HDD construction techniques are given below.

Open Trench Construction
Open trench construction consists of excavating an open trench in the ground for pipe installation. Typically, the width of the trench is at least 12 inches greater than the pipe diameter. While the trench depth will depend upon the specific application (e.g. force main versus gravity sewer), the cover depth over the pipe is generally at least three feet.

Open trench construction is traditionally used in most new sewer pipe installations because of cost considerations and availability of local contractors and crews to perform the work. The disadvantages of open trench construction include trench shoring requirements for trenches over five feet in depth or where soils are unstable, dewatering of the trench when high groundwater is present, and increased cost and complexity with deep excavations.

Horizontal Directional Drilling (HDD)
In horizontal directional drilling methods, a pilot bore is first made using a controllable drilling head. Once a hole is drilled from the entry point to the terminus, a new pipe is “towed” back through the bore hole behind the drill head on the return trip from the terminus to the entry point. While drift control within a few inches is available using electromagnetic tracking systems, this method cannot be used for minimum grade gravity sewer lines. Most projects utilize high-density polyethylene (HDPE) or fusible PVC for new line installations. The advantages of this construction technique include minimal impact to the surface conditions and ability to install pipe under adverse subsurface conditions (e.g. high groundwater). The disadvantages of horizontal directional drilling include cost (typically from 3 to 5 times greater than open trench construction), inability to construct minimum grade sewers, and difficulty in dealing with subsurface conditions containing boulders and cobbles. Environmental issues might potentially exist as well in that pressurized drilling fluids can fracture the soil surrounding the bore and migrate to the surface at undesirable locations.

Pipe Bursting
Pipe bursting is a trenchless replacement method that is used in certain circumstances to replace failed pipe or when upsizing of a pipe section is required. Pipe bursting consists of a hydraulically activated cutting head that is pushed or pulled through the inside of the old pipe to be replaced, breaking it up, and forcing the broken fragments into the surrounding ground. The cutting head tows a new pipeline behind it that is simultaneously installed in place as the head bursts the old line. The cutting head has a slightly larger outside diameter than the new pipe and is bigger than the inside diameter of the old pipe. Depending upon the size of the cutting head, new pipes of the same size or up to almost twice the original size can be installed. For example, an existing 8-inch diameter concrete sewer pipe can be replaced with a 15-inch diameter HDPE pipe utilizing pipe bursting technology.

The advantage of pipe bursting is the minimization of trenching and surface restoration. Pipe bursting, however, is generally not used if congestion underground is a question or if the existing pipeline is not of a brittle nature (e.g. clay, concrete, asbestos-cement pipe). In addition, this technique has major noise and vibration problems and is somewhat uneconomical if a number of laterals must be reconnected. Pipe bursting of AC pipe is also a concern as this process converts “non-friable” asbestos material in an intact AC sewer main to a friable one. While pipe bursting is performed underground with limited construction exposure, the shattered pipe material may be exposed during the installation of new sewer laterals or connections.

Summary
Among the complete pipe replacement techniques listed above, open trench construction is considered the preferred method for the replacement of existing sewer pipes. This construction technique is the most common means of constructing new sewers and is familiar to local contractors. Horizontal directional drilling and pipe bursting may be warranted and would be considered if pipe replacement was needed in an area with a deep sewer line and/or in areas where surface disturbance should be minimized.

Trenchless Pipe Rehabilitation Methods

Cured in Place Pipe
Cured in place pipe (CIPP) is best described as "manufacturing a new pipe within an existing pipe". A CIPP installation uses a plastic-lined felt bag that has been impregnated with resins. The impregnated bag is inverted (turned inside out) allowing the plastic exterior to be turned inward. Two methods are commonly used to cure the liner. The inner space is either filled with pressurized water or with air as the inverted bag is oriented into the existing pipe. The pressurized water or air drives the bag's inversion until the entire section of liner has been turned inside out and the end has been retrieved at the downstream manhole. The water or air pressure forces the resin material against the existing sewer pipe. Then heated water or steam is continuously pumped through the tube, causing the resins in the bag to cure and harden.

The use of CIPP lining is appropriate for pipelines requiring minor structural repair, sealing holes, leaky joints, leaky misalignments, and for correcting corrosion problems. Because this method of rehabilitation does not require excavations, it may be used under highways, railroads, and buildings. Service lateral connections are typically made with special cutters and sealers from inside the pipe. Laterals are sometimes physically reconnected in a manner similar to a spot repair. This is done with specific types of lateral saddles. If properly completed, the life of an inversion-lined pipe has been claimed by several lining manufacturers to be more than 50 years. Due to frictional factors of the lining, the hydraulic capacity of the pipe is increased.

Chemical Grouting
Chemical grouting is commonly used to seal leaking joints in structurally sound pipe, laterals, and manholes experiencing infiltration. Typical applications consist of two separate chemicals that are pumped through separate hoses to the joint, crack or manhole being sealed. Once the two chemicals are mixed together they form a gel or foam that expands out through the defect and into the surrounding earth.

The equipment used for chemical grouting of pipelines includes a joint or lateral packer and television (TV) camera. The entire assembly is pulled inside the sewer pipe with cables and winches. Chemical feed lines are extended from the supply tanks to the packer unit. Chemical injection is performed internally, using robotic equipment without requiring man entry or excavations unless unique problems develop.

Since manholes are a major component of the collection system, it is often desirable to enhance the grout rehabilitation method by applying an interior coating. This coating increases the effectiveness of a grout repair by providing an interior seal that will last beyond the expected grout life. Successful manhole coatings include cementitious linings, polyethylene linings, epoxy coatings, and cured-in-place fiberglass lining systems.

Chemical grouting does not improve the structural strength of a pipeline; therefore this method of rehabilitation should not be used on pipes that are badly broken or deteriorated. If the groundwater table drops below the level of the pipe, the chemical grout may become dehydrated and its useful life will be shortened. Also, many chemical grouts do not have shear strength and will tear or fracture if a load is applied to the surrounding earth. When used appropriately, rehabilitation by chemical grouting should serve a useful life of at least ten years.

Internal Spot Repairs
There are a number of highly effective methods for performing internal spot repairs without requiring excavations. Two methods commonly utilized are Link-Pipe (stainless sleeve) and ambient cured soft liners. Each method has unique advantages.

Link-Pipe is a stainless steel grouting sleeve that is used to accomplish small spot repairs within a sewer line; these sleeves come in a variety of lengths—12, 18, 24 and 36 inches—and diameters ranging between 4 and 36 inches. Link-Pipe can be used to restore partially collapsed pipes, close holes created by material loss in pipe walls, and seal infiltrating cracked pipes and pipe joints. This method of rehabilitation requires no trenching and can be performed without bypassing water.

A Link-Pipe installation involves the placement of a grouting sleeve inside the damaged portion of a sewer line. This grouting sleeve is of stainless steel construction and is surrounded by a grout-absorbing gasket. The sleeve is moved into position on a wheeled flow-through plug; a video camera is used to monitor the positioning of the grout sleeve. Once in place, compressed air is used to inflate the plug, which in turn compresses the gasket against the walls of the sewer line. The repair is completed when the flow-through plug is fully inflated, the gasket has adhered to the wall, and the Link-Pipe’s internal locks have engaged.

This method of rehabilitation creates a smooth stainless steel channel that supports damaged pipe and may actually improve the hydraulic properties of the existing line. Manufacturers of the stainless steel sleeve indicate a substantially long service life and guarantee 100 percent infiltration reduction. This guarantee, however, does not account for other sources or leaks associated with service laterals.

The second method of performing an internal spot repair commonly utilized is to install an ambient cure soft-liner. This type of liner is very similar to CIPP except that the liner does not require an inversion system and the resin does not require an external heat source to harden. Spot repair liners are especially applicable when a section of pipe requires a repair over a few feet in length. Another advantage of an ambient cure liner is that it can be used to repair laterals with or without having to excavate at the mainline connection.

Summary
Among the trenchless pipe rehabilitation methods described above, cured in place pipe (CIPP) is considered the preferred method for the rehabilitation of existing sewer pipes that have various defects throughout the entire length of pipe. Chemical grouting and internal spot repairs may be warranted and would be considered if the defects were isolated to a particular area within a pipe segment. Trenchless pipe rehabilitation method construction techniques are specialized and require the use of special equipment.

SECTION 5:
SUMMARY

SECTION 5: **SUMMARY**

5.1 Smoke Testing Summary

The smoke testing identified a number of deficiencies that need to be addressed. The City of Scio's collection system and wastewater treatment facility can become hydraulically overloaded in the future. Eliminating infiltration and inflow is necessary to release capacity, within the collection system and at the wastewater treatment facility, trapped by infiltration and inflow.

The City of Scio should return to each site using the reports to determine what measures must be taken to repair or rehabilitate each problem that is allowing smoke to escape the collection system. Some of the repairs can be fairly easy to correct, such as leaky cleanouts, while others such as catch basins, may require more extensive efforts to reroute flows to nearby drainages. Some of the deficiencies may also require additional television inspection to see the extent of deterioration of sewer main lines, sewer laterals, and lateral connections.

In some cases, the problem is located within the public right-of-way and should be repaired or rehabilitated by the City. In other cases, the deficiency is located on private property and the private property owner should be required to address and repair the problem. It is recommended that letters be sent to all private property owners where deficiencies were noted. A sample letter is provided in Appendix B.

APPENDICES

APPENDIX A: SMOKE TESTING REPORT

City of Scio
Smoke Testing Report Summary
Project 202.01

Smoke Test Report Number	Deficiency Type
1-1	LMH
1-2	CB
1-3	OCO/LSL
1-4	LMH
1-5	LMH
1-6	LMH
1-7	OCO
1-8	OCO
1-9	CB
1-10	LSL
1-11	OCO
1-12	LSL
2-1	OCO/LSL
2-2	OCO
2-3	OCO/LSL
2-4	OCO
2-5	OCO
2-6	OCO
2-7	OCO
2-8	LMH
2-9	Leaking Septic
2-10	LMH/LSL, Floor Drain, LSL
2-11	OCO
2-12	OCO/LML
2-13	LMH
2-14	LMH
2-15	LSL
2-16	OCO
2-17	LSL

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name: Scio Smoke Testing		Location / Address: City of Scio		
Project No.: 202.01	Report No.: 1-1	Basin: All Basins	Line:	Name / Station:
Tested By: Ryan Quigley			Date: September 12-13, 2018	

TESTING CODE	**PHOTOGRAPHS**	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line		Leaking Manholes
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- All manholes (at least a majority) within the City appear to be leaking. It is apparent that most manholes have not been properly grouted, or are in need of more grouting. It is suggested that all manholes should be properly grouted.
-
-
-
-

SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name	Scio Smoke Testing
Location / Address	West end of SW 3rd St. near Thomas Creek Pump Station
Project No.	202.01
Report No.	1-2
Basin	T. Creek Estates
Line	
Name / Station	
Tested By	Ryan Quigley
Date	September 12, 2018

TESTING CODE

- LSL = Leaking Service Lateral
- LML = Leaking Main Line
- CB = Catch Basin
- LMH = Leaking Manhole
- OCO = Open Cleanout
- PHV = Plugged House Vent
- RD = Roof Drain

PHOTOGRAPHS

No.	Description
1	Thomas Creek Pump Station
2	Catch Basins at West end of 3rd

Comments

- Check Pump Station plans – probably an overflow line to catch basins
-
-
-
-

SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

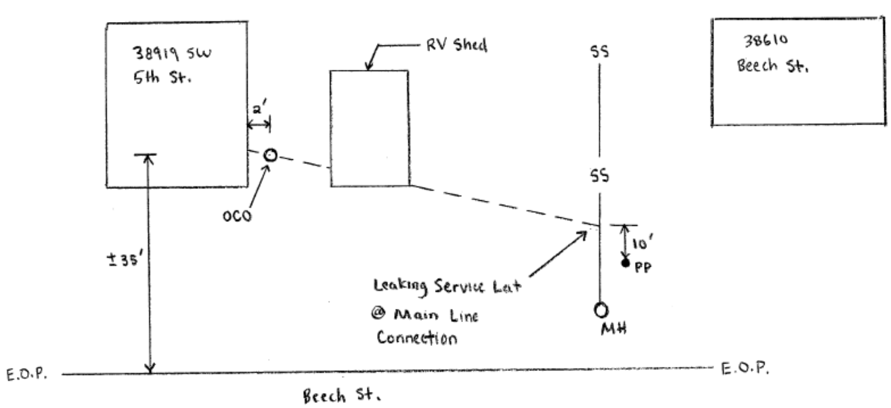
Scio Smoke Testing		38919 SW 5th St.	
Project Name		Location / Address	
202.01	1-3	South		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1 / 2	Open Cleanout
LML = Leaking Main Line	3 / 4	Leaking Service Lateral at Main Line
CB = Catch Basin		Connection
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

-
-
-
-
-

SKETCH



38919 SW 5th

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

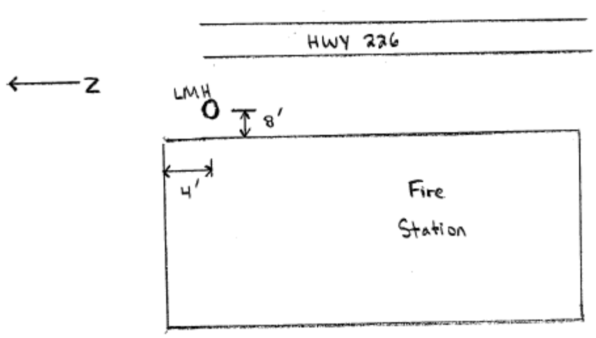
Scio Smoke Testing		Fire Station		
Project Name		Location / Address		
202.01	1-4	South		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1 / 2	Wash Down Vault
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Smoke from below vault lid - LMH
- Consider grouting
-
-
-

SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing	North Side of Fire Station sidewalk (SW 5th Ave)
Project Name	Location / Address

202.01	1-5	South		
Project No.	Report No.	Basin	Line	Name / Station

Ryan Quigley	September 12, 2018
Tested By	Date

TESTING CODE	**PHOTOGRAPHS**	
	No.	Description
LSL = Leaking Service Lateral	1	Leaking manhole
LML = Leaking Main Line	2	Edge of sidewalk at manhole
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Smoke from manhole and at edge of sidewalk adjacent to manhole.
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SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		3rd St. between Alder St. and HWY 226		
Project Name		Location / Address		
202.01	1-6	South		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Leaking Manhole
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- The manhole is in a low area that collects a lot of runoff.
- The lid of the manhole is cracked.

SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38877 2nd Place		
Project Name		Location / Address		
202.01	1-7	South		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Possible OCO
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Smoke was pouring out of a decorative well.
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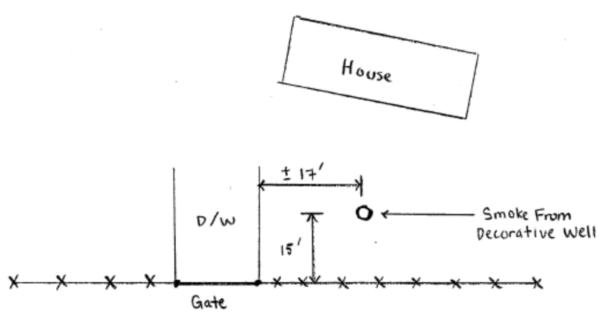
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		SW Alder St. (Empty lot across from 38685)		
Project Name		Location / Address		
202.01	1-8	South		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Smoke from open cleanout
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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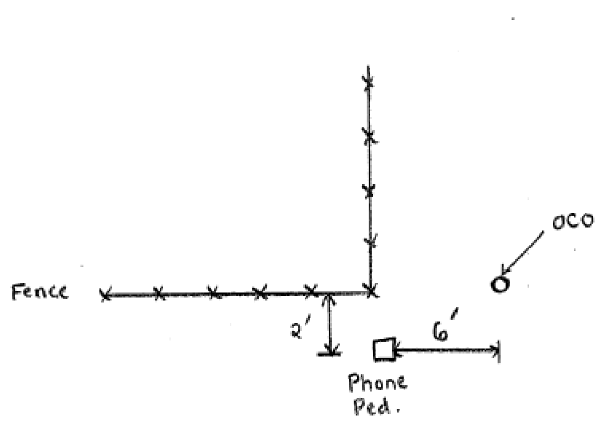
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing	39036 NE 1st Ave
Project Name	Location / Address

202.01	1-9	North		
Project No.	Report No.	Basin	Line	Name / Station

Ryan Quigley	September 13, 2018
Tested By	Date

TESTING CODE	PHOTOGRAPHS	
	No.	**Description**
LSL = Leaking Service Lateral	1	Manhole and Catch Basin at loading dock
LML = Leaking Main Line	2	Catch Basin on North side of 1st Ave.
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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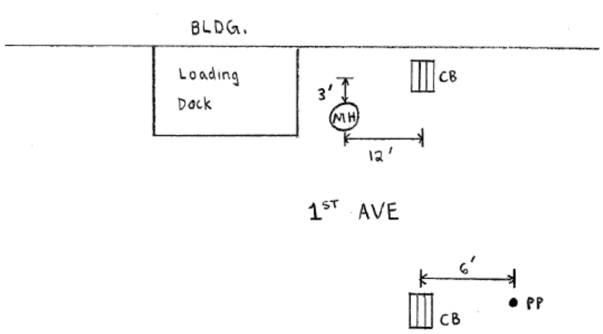
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name: Scio Smoke Testing	Location / Address: 38787 N. Main St.
Project No.: 202.01	Report No.: 1-10
Basin: North	Line:
Name / Station:	
Tested By: Ryan Quigley	Date: September 13, 2018

TESTING CODE	**PHOTOGRAPHS**	
	No.	Description
LSL = Leaking Service Lateral	1	Smoke from back of curb
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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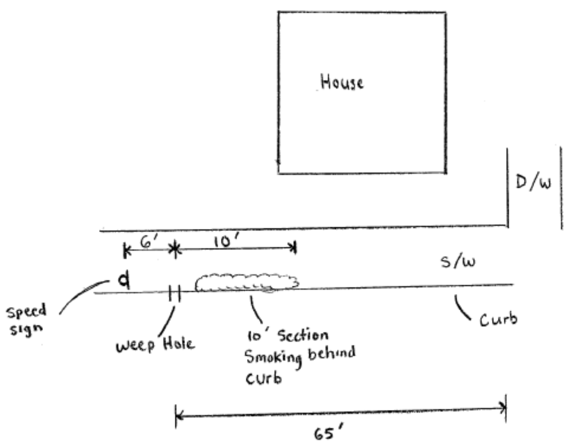
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38795 N. Main Street		
Project Name		Location / Address		
202.01	1-11	North		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Smoke from broken cleanout cap
LML = Leaking Main Line	2	Possible open cleanout
CB = Catch Basin		
LMH = Leaking Manhole		(Photos on next page)
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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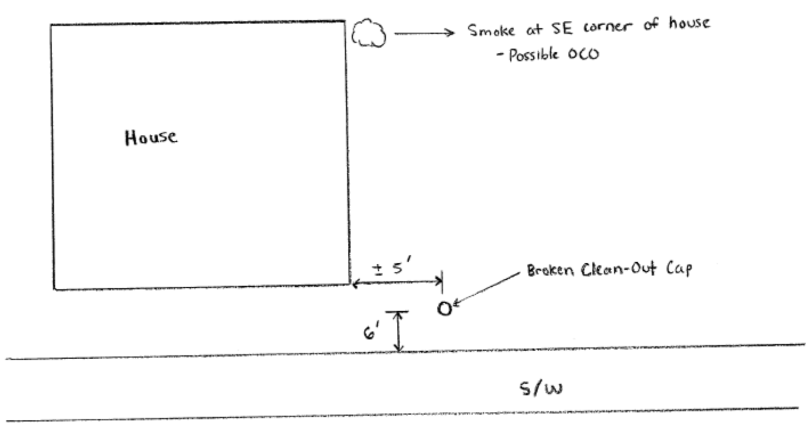
SKETCH



38795 N. Main St.

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38717 Cherry St.		
Project Name		Location / Address		
202.01	1-12	North		
Project No.	Report No.	Basin	Line	Name / Station
Ryan Quigley			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Smoke coming from ground behind D/W
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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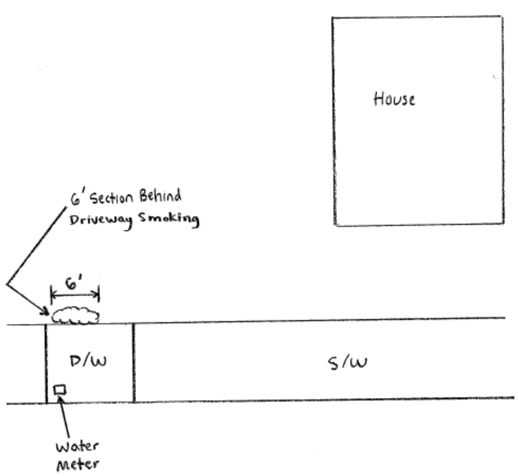
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		North of 4th Ave. and NE Ash St.		
Project Name		Location / Address		
202.01	2-1	North Basin		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	**Description**
LSL = Leaking Service Lateral	2	Open cleanout right side of front door
LML = Leaking Main Line	1	5' section of smoke from the ground
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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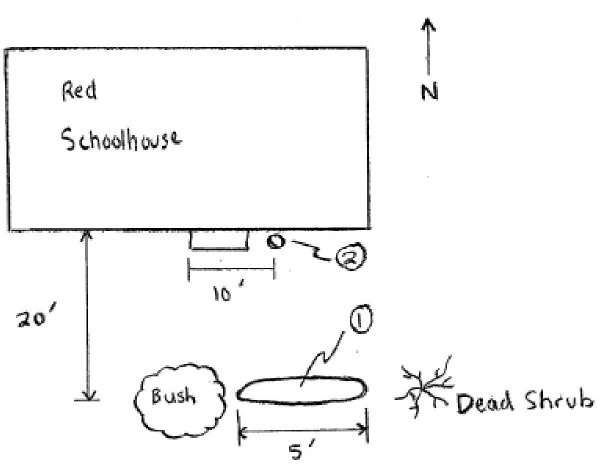
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing	38820 SW 2nd Ave.
Project Name	Location / Address

202.01	2-2	T. Creek Estates		
Project No.	Report No.	Basin	Line	Name / Station

Cody Heuberger	September 12, 2018
Tested By	Date

TESTING CODE	PHOTOGRAPHS	
	No.	**Description**
LSL = Leaking Service Lateral	1	Open cleanout in front lawn
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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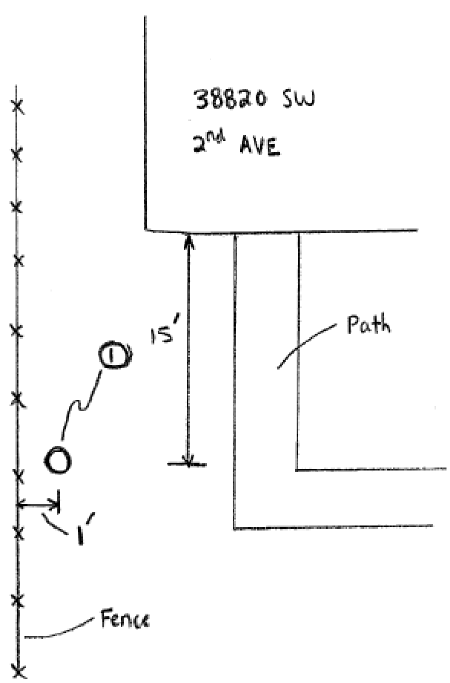
SKETCH



N

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38814 NE Ash St.		
Project Name		Location / Address		
202.01	2-3	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Open Cleanout near downspout
CB = Catch Basin	2	Leaking service lateral underneath faucet
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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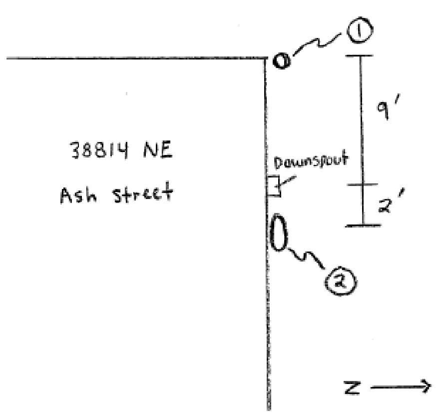
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		RV Lot		
Project Name		Location / Address		
202.01	2-4	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Open cleanout in RV area near high school
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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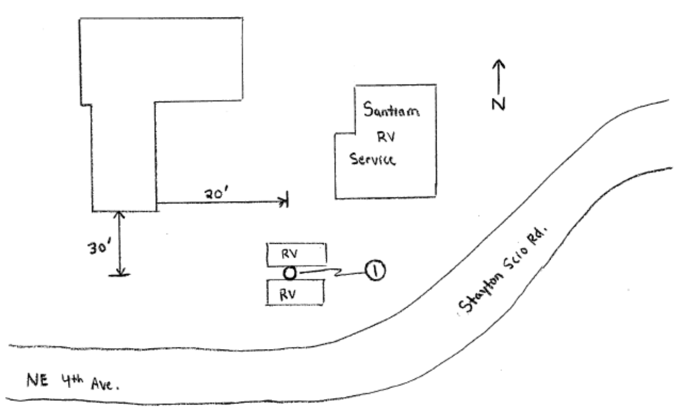
SKETCH



SMOKE TEST REPORT
The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		SE 1st Ave.		
Project Name		Location / Address		
202.01	2-5	South		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

Testing Code	**Photographs**	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Open Cleanout near Scio Automotive and
CB = Catch Basin		Light Truck Repair
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments
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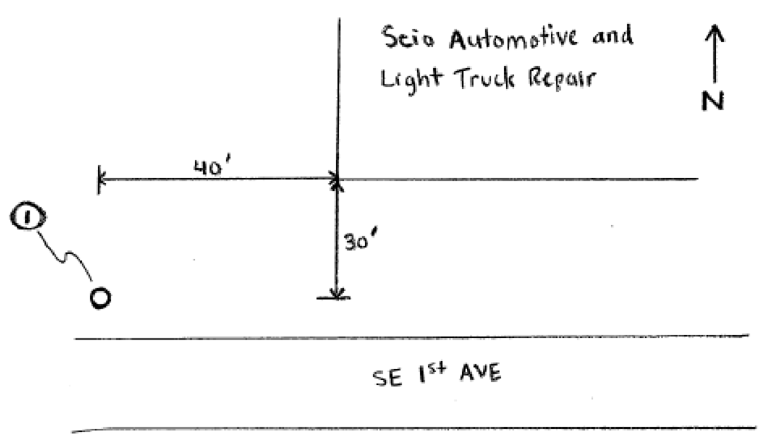
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		NE Ash St.		
Project Name		Location / Address		
202.01	2-6	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

Testing Code	**Photographs**	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Open cleanout
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Located near 38794 N. Ash St. on the shoulder of the road
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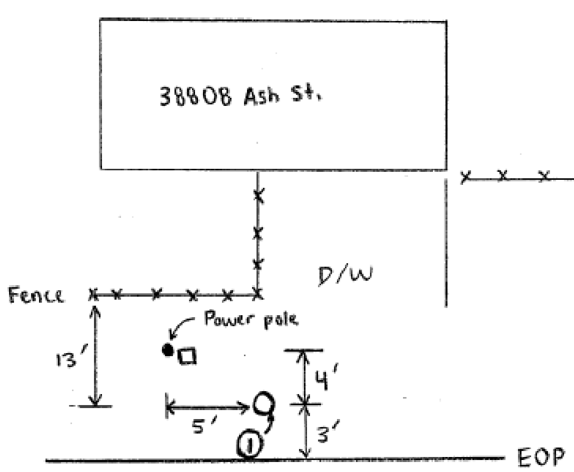
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		House on 3rd Ave Backyard		
Project Name		Location / Address		
202.01	2-7	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Open cleanout in backyard
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- The house with the deficiency is adjacent to 38958 NW 3rd Ave (On the right when looking North)
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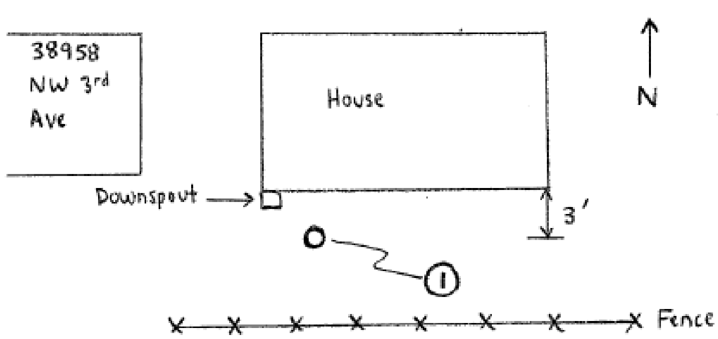
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name	Scio Smoke Testing
Location / Address	8966 SW 2nd St. backyard
Project No.	202.01
Report No.	2-8
Basin	South
Line	
Name / Station	
Tested By	Cody Heuberger
Date	September 12, 2018

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Leaking Manhole near fences, south of koi pond
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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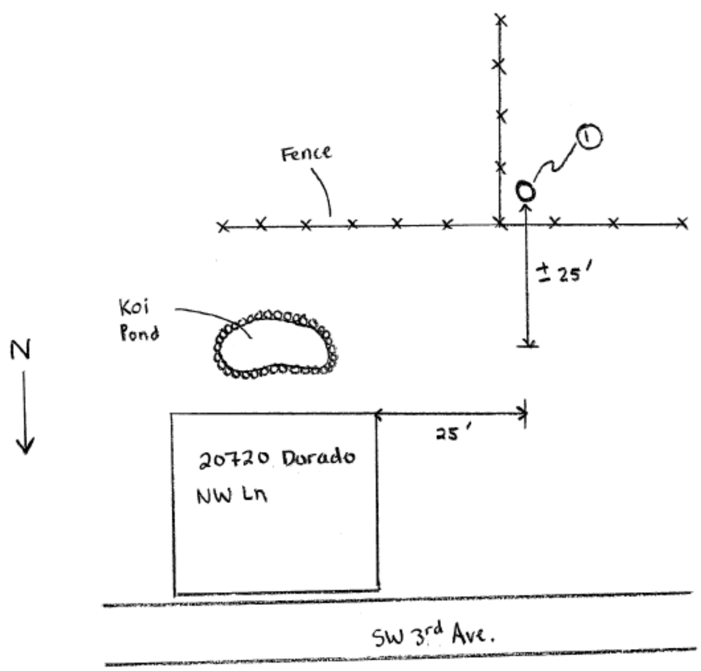
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38938 Jefferson-Scio Drive		
Project Name		Location / Address		
202.01	2-9	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Leaking Septic Tank
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Leaking Septic tank on the bank of NW Cherry-NW 4th Ave transition near 38938 Jefferson-Scio Drive
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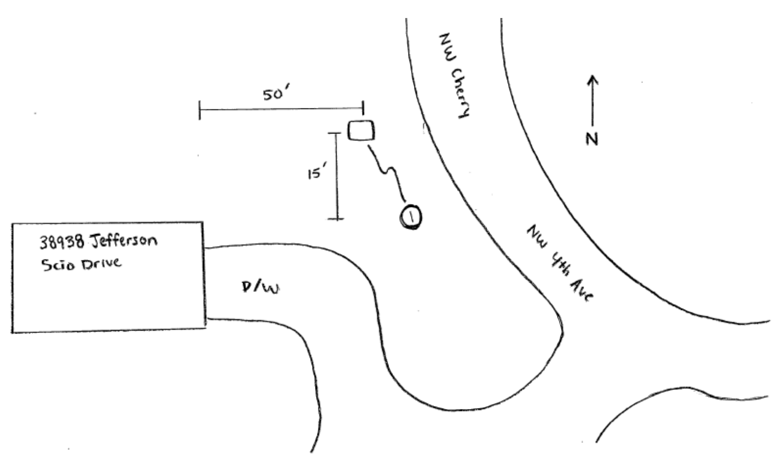
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		Centennial Elementary School		
Project Name		Location / Address		
202.01	2-10	North		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 13, 2018	
Tested By			Date	

Testing Code	**Photographs**	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Probable leaking service lateral
CB = Catch Basin	2	Leaking Storm ditch drain
LMH = Leaking Manhole	3	Leaking Floor drain in school hallway
OCO = Open Cleanout	4	Leaking Manhole (New Manhole)
PHV = Plugged House Vent		(Pictures on next page)
RD = Roof Drain		

Comments

- Storm drain (picture on next page) is an old sewer line converted to storm drain. It is recommended that the drain be plugged and fixed.
- The leaking manhole seems to be connected to the existing storm drain mentioned above
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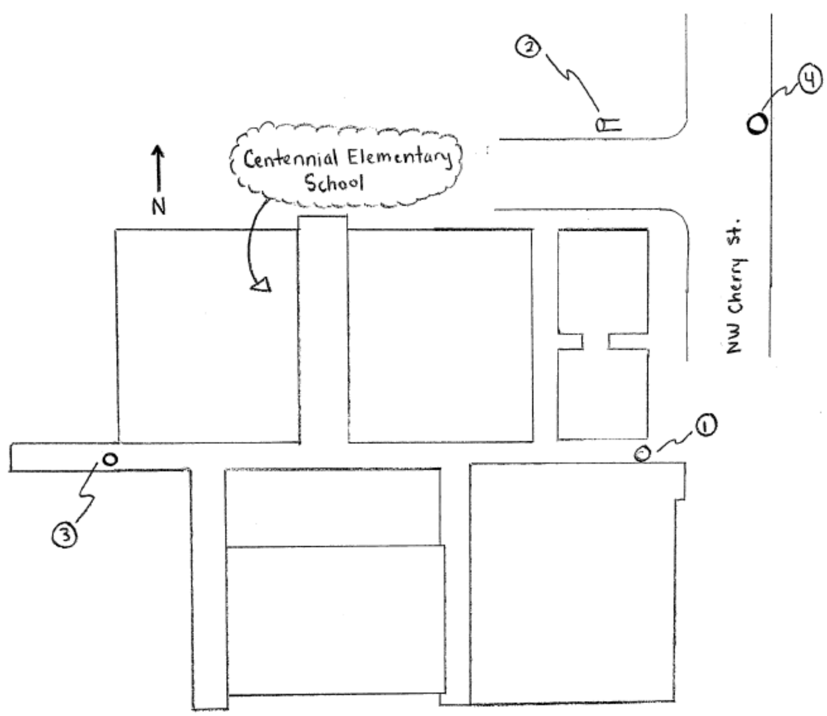
SKETCH

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SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		4th Ave. between SE Ash St. and SE Birch St.	
Project Name		Location / Address	
202.01	2-11	South		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

TESTING CODE	**PHOTOGRAPHS**	
LSL = Leaking Service Lateral	No.	Description
LML = Leaking Main Line	1	Open cleanout
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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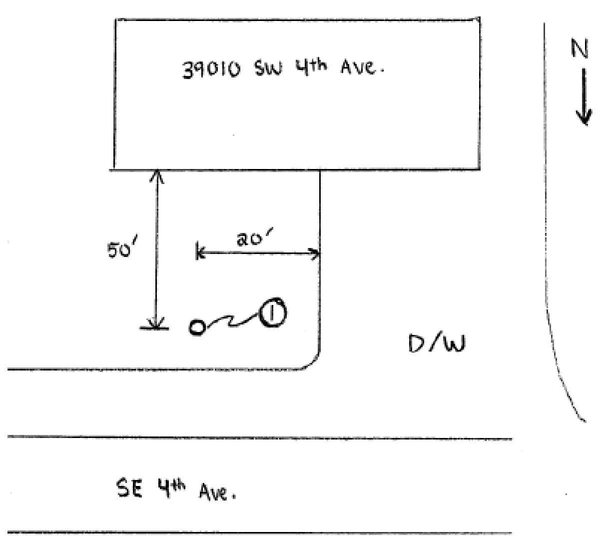
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38653 SE Cedar St.	
Project Name		Location / Address	
202.01	2-12	South		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018
Tested By			Date

TESTING CODE	**PHOTOGRAPHS**	
	No.	Description
LSL = Leaking Service Lateral	1	Open Cleanout
LML = Leaking Main Line	2	Leaking Main Line (appx. 10' of smoke)
CB = Catch Basin		(Pictures on next page)
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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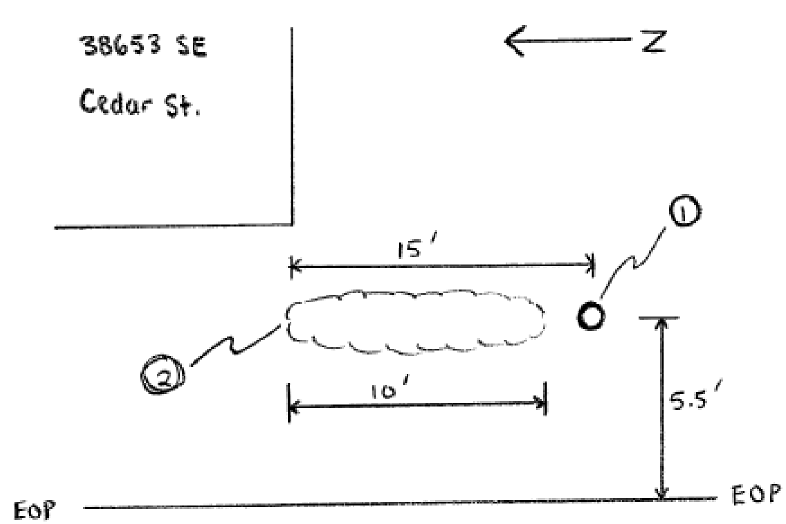
SKETCH



38653 SE Cedar St.

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name	Location / Address		
Scio Smoke Testing	SW Beech St. between 2nd and 3rd Ave.		

Project No.	Report No.	Basin	Line	Name / Station
202.01	2-13	South		

Tested By	Date
Cody Heuberger	September 12, 2018

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral		Leaking Manhole
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Significant amount of smoke coming up through the surrounding grass
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SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		SW 5th Ave. between SW Dogwood St. and Elderberry St.		
Project Name		Location / Address		
202.01	2-14	T. Creek Estates		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

TESTING CODE	**PHOTOGRAPHS**	
	No.	Description
LSL = Leaking Service Lateral		Leaking Manhole
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Smoke leaking out of crack in the road, it is recommended that it be repaired
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SKETCH

SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38586 SW Filbert St.	
Project Name		Location / Address	
202.01	2-15	T. Creek Estates		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	Description
LSL = Leaking Service Lateral	1	Smoke From Foundation Vents
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Possible broken service lateral under house or below flower stand
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- It is suggested that the homeowner be notified so this issue can be addressed
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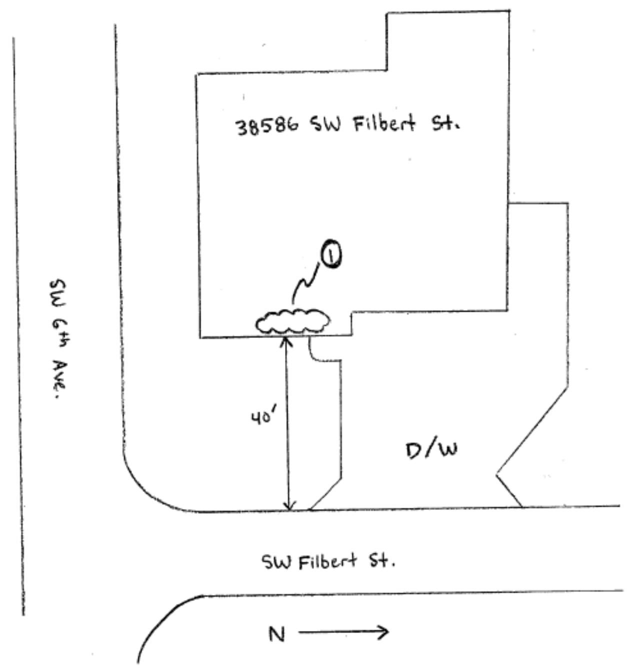
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Project Name	Location / Address
Scio Smoke Testing	SE 5th Ave.

Project No.	Report No.	Basin	Line	Name / Station
202.01	2-16	South		

Tested By	Date
Cody Heuberger	September 12, 2018

TESTING CODE	PHOTOGRAPHS	
	No.	**Description**
LSL = Leaking Service Lateral		Open Cleanout in front of 38588 SE 5th Ave
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

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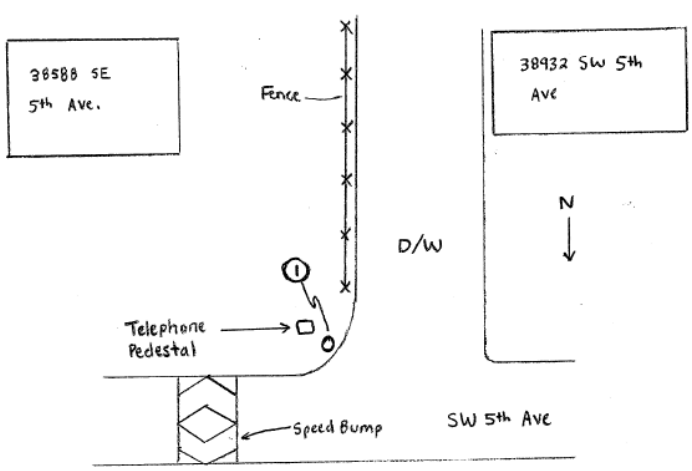
SKETCH



SMOKE TEST REPORT

The Dyer Partnership, Engineers & Planners, Inc.

Scio Smoke Testing		38933 SW 3rd Ave.	
Project Name		Location / Address	
202.01	2-17	South		
Project No.	Report No.	Basin	Line	Name / Station
Cody Heuberger			September 12, 2018	
Tested By			Date	

TESTING CODE	PHOTOGRAPHS	
	No.	**Description**
LSL = Leaking Service Lateral	1	Leaking House Vent
LML = Leaking Main Line		
CB = Catch Basin		
LMH = Leaking Manhole		
OCO = Open Cleanout		
PHV = Plugged House Vent		
RD = Roof Drain		

Comments

- Possible Leaking Service Lateral under the house
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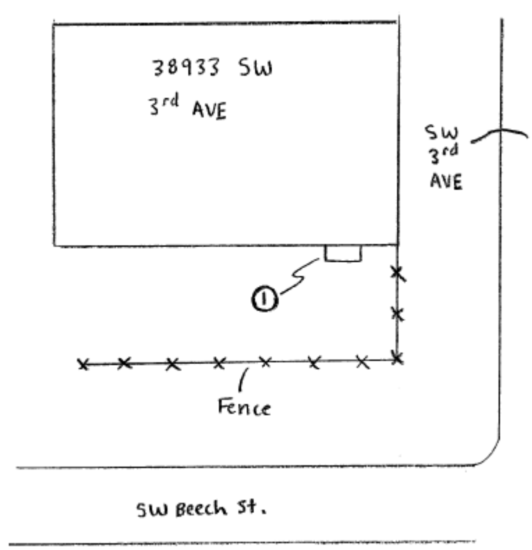
SKETCH



APPENDIX B: SAMPLE NOTIFICATION LETTER

CITY OF ___________________

Address______________

Phone ___________

Date______________________

Owner____

Address____

City, State____

Subject Property_______________________________________

Dear Property Owner:

The City of ______________ experiences high in-flows during the winter months. This can, in large part, be attributed to "holes" in the sewage collection and piping system. In an effort to locate these holes and reduce the high seasonal inflows, the City of ______________ recently completed a City-wide smoke testing project. The project included pumping smoke into manholes and observing where the smoke escapes from the system. If smoke is observed leaving the sewer system through a "hole," surface and/or groundwater is capable of entering the system through the same "hole." The potential for one of these infiltration "holes" was discovered on your property and requires some immediate attention to correct the problem.

Some of the problems discovered are directly related to the infiltration waters that overload the sewer system during the winter months. Other problems are related to plumbing deficiencies outside the home that should be corrected.

A side benefit of the smoke testing project was that, in some cases, smoke was observed entering homes. While this could be a result of a dry or unused "trap" in a home's plumbing, it could pose a serious health risk. If a trap is not present or not functioning properly, harmful sewer gases may find their way into a home. This type of plumbing deficiency should be corrected immediately.

The following sheet includes a checklist of potential problems discovered during the smoke testing project. If a problem is marked with an X, it requires the action described immediately after the marked description.

If for some reason you are unable to correct the problem in the time suggested, please contact ____________________. We are interested in correcting these problems and will help in any way we can to do that.

1._____DOES NOT HAVE A SEWER CONNECTION PERMIT ON RECORD.
Please provide City Hall with date and contractor's name or obtain permit.

2._____RVs HOOKED INTO SEWER SYSTEM.
Notification is hereby given to remove.

3._____PIPING OR LATERAL PIPE PROBLEMS ON SITE.
Have plumbing inspection by qualified person. Report result to City Hall within two (2) weeks of this notice.

4._____RAIN GUTTERS CONNECTED TO SEWER SYSTEM.
Immediate removal of roof drains from sewer system required. City personnel will be on site within two (2) weeks of the date of this notice to inspect the outfall of the roof drain system to confirm disconnection.

5._____AREA DRAIN OR OTHER SURFACE DRAINAGE SYSTEM TIED INTO SEWER SYSTEM.
Immediate removal of area drains from sewer system required. City personnel will be on site within two (2) weeks of the date of this notice to inspect the area drain to confirm disconnection.

6._____UNCAPPED OR OPEN SEWER LATERAL CLEANOUT.
Immediate cap of lateral cleanout required with water-tight cap. City personnel will be on site within two (2) weeks of the date of this notice to inspect the cleanout to confirm capping.

7._____SMOKE INSIDE HOUSE OR BUILDING.
Have inspection and repairs performed by qualified plumber. Sewer gas passing into the home can pose a serious health risk.

8._____OTHER PROBLEM.
____
____

Please note that any of these problems are of a serious nature. Any items marked with an X require your immediate attention and cooperation. Please call _________________ at (541)____________ if you have any questions. By reducing these high seasonal inflows to the sewer system, we can help reduce unnecessary sewer treatment costs and associated rate increases.

Thank you for your help in this matter.

Sincerely,

____

Public Works Director

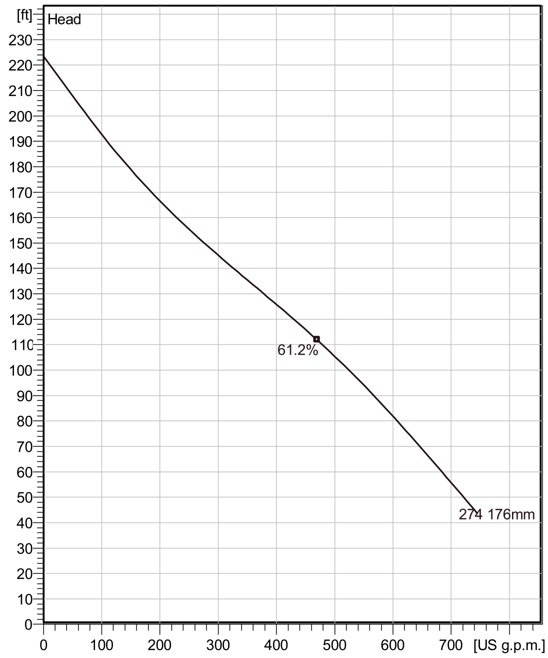
NP 3153 SH 3~ 274

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

FLYGT
a xylem brand

Technical specification

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Configuration

Motor number
N3153.095 21-18-2BB-W 23hp

Installation type
P - Semi permanent, Wet

Impeller diameter
176 mm

Discharge diameter
3 15/16 inch

Pump information

Impeller diameter
176 mm

Discharge diameter
3 15/16 inch

Inlet diameter
150 mm

Maximum operating speed
3510 rpm

Number of blades
2

Materials

Impeller
Hard-Iron

Project		**Created by**		**Last update**
Block		**Created on**	5/21/2019	

NP 3153 SH 3~ 274

Technical specification

Motor - General

Motor number	Phases	Rated speed	Rated power
N3153.095 21-18-2BB-W 23hp	3~	3510 rpm	23 hp

Approval	Number of poles	Rated current	Stator variant
FM	2	26 A	1

Frequency	Rated voltage	Insulation class	Type of Duty
60 Hz	460 V	H	S1

Motor - Technical

Power factor - 1/1 Load	Motor efficiency - 1/1 Load	Total moment of inertia	Starts per hour max.
0.90	91.0 %	0.759 lb ft²	30

Power factor - 3/4 Load	Motor efficiency - 3/4 Load	Starting current, direct starting
0.87	91.5 %	215 A

Power factor - 1/2 Load	Motor efficiency - 1/2 Load	Starting current, star-delta
0.79	91.5 %	71.7 A

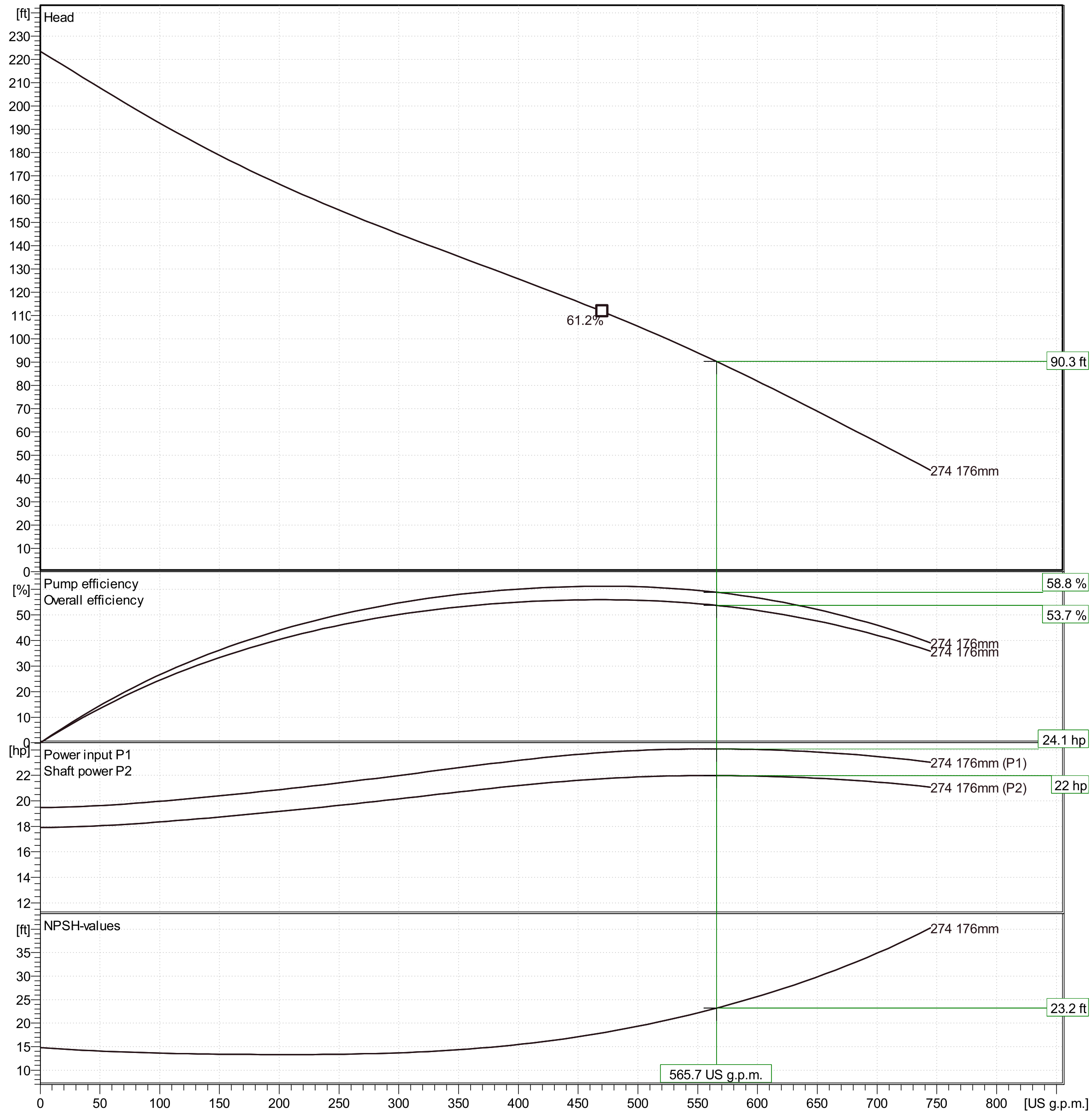
NP 3153 SH 3~ 274

Performance curve

Duty point

Flow	Head
566 US g.p.m.	90.3 ft

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



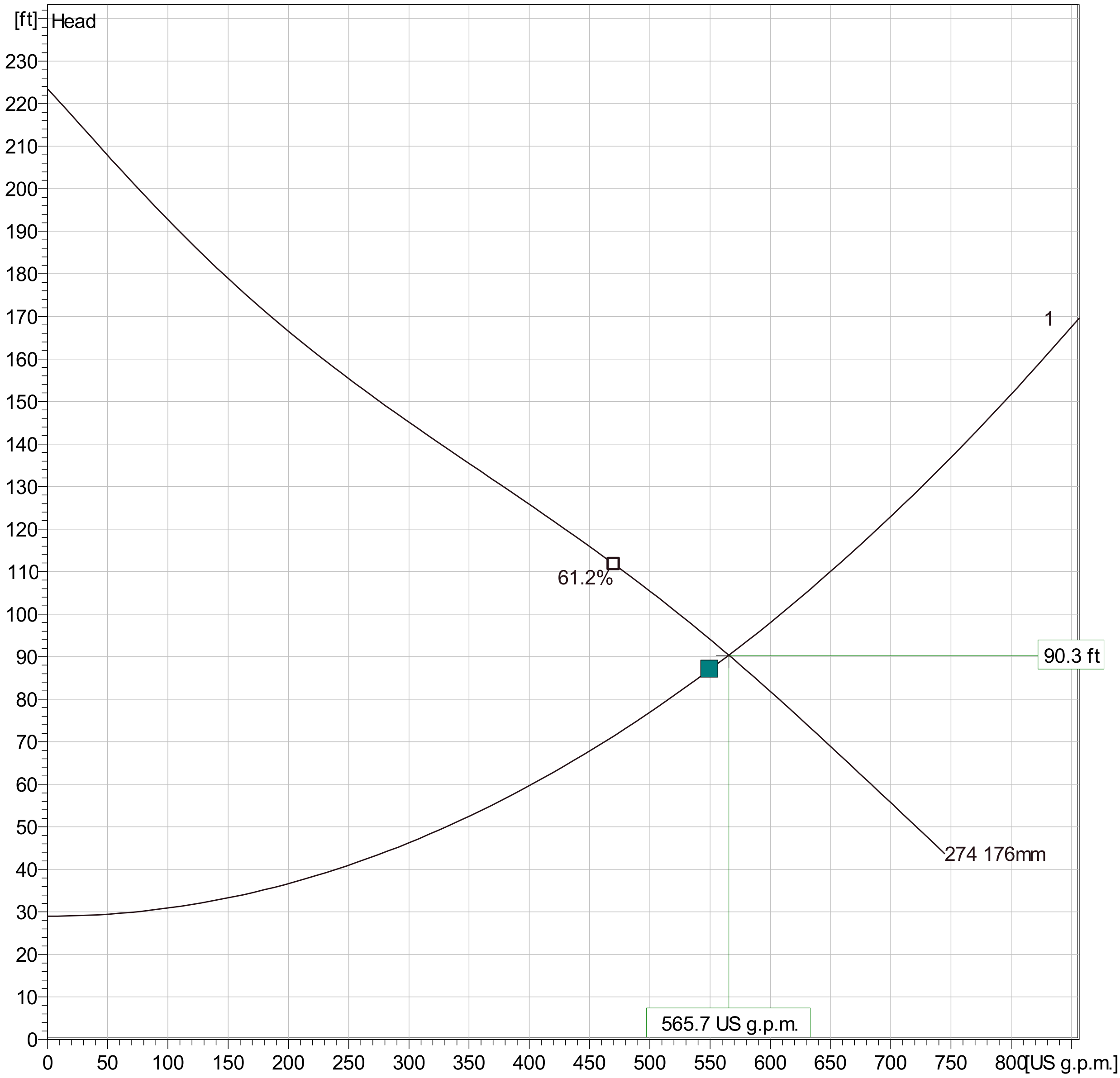
Project	Created by	Last update
Block	Created on 5/21/2019	

NP 3153 SH 3~ 274

Duty Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

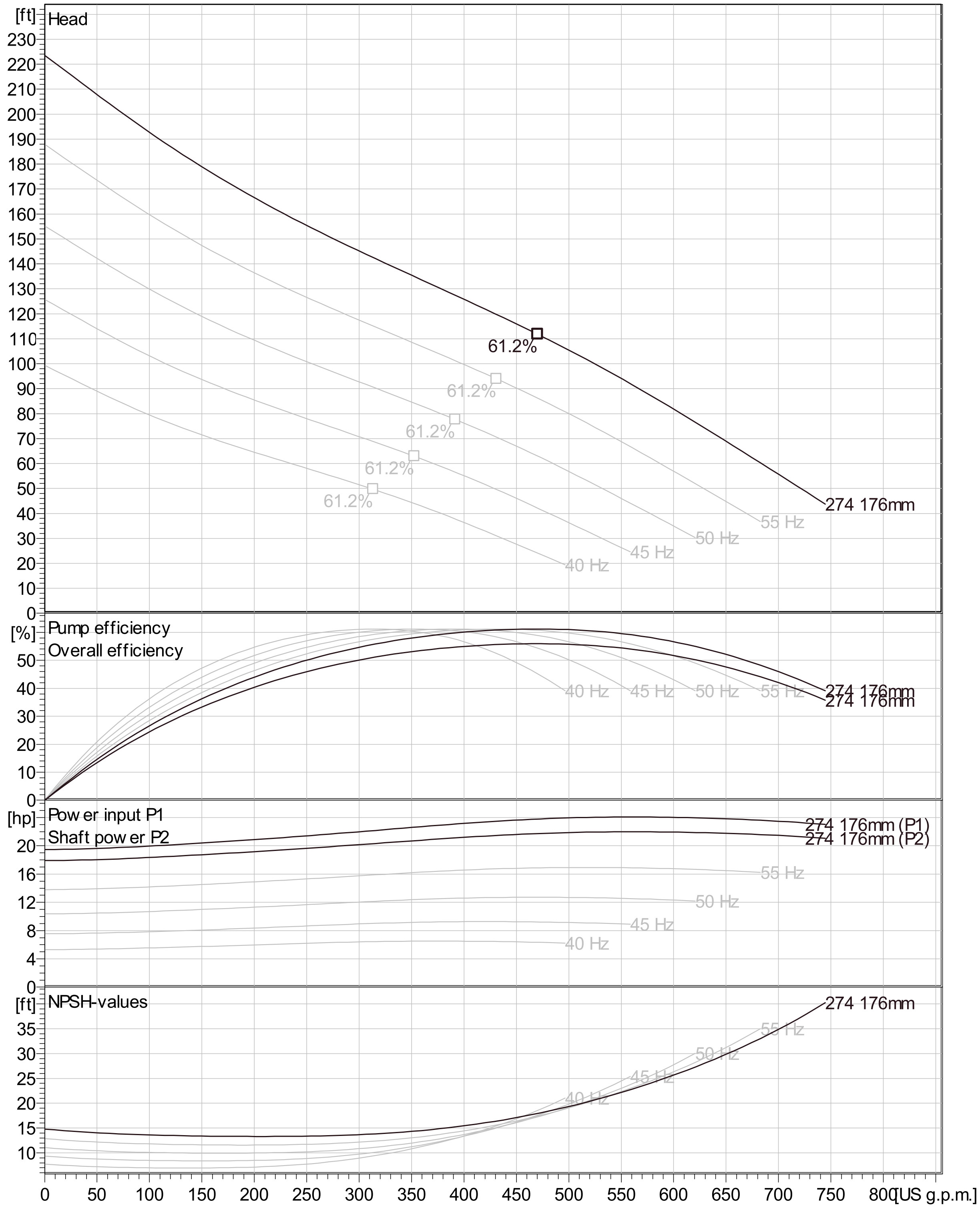
Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	566 US g.p.m.	90.3 ft	22 hp	566 US g.p.m.	90.3 ft	22 hp	58.8 %	529 kWh/US MG	23.2 ft

Project	Created by		Last update	
Block	Created on	5/21/2019		

NP 3153 SH 3~ 274

VFD Curve

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



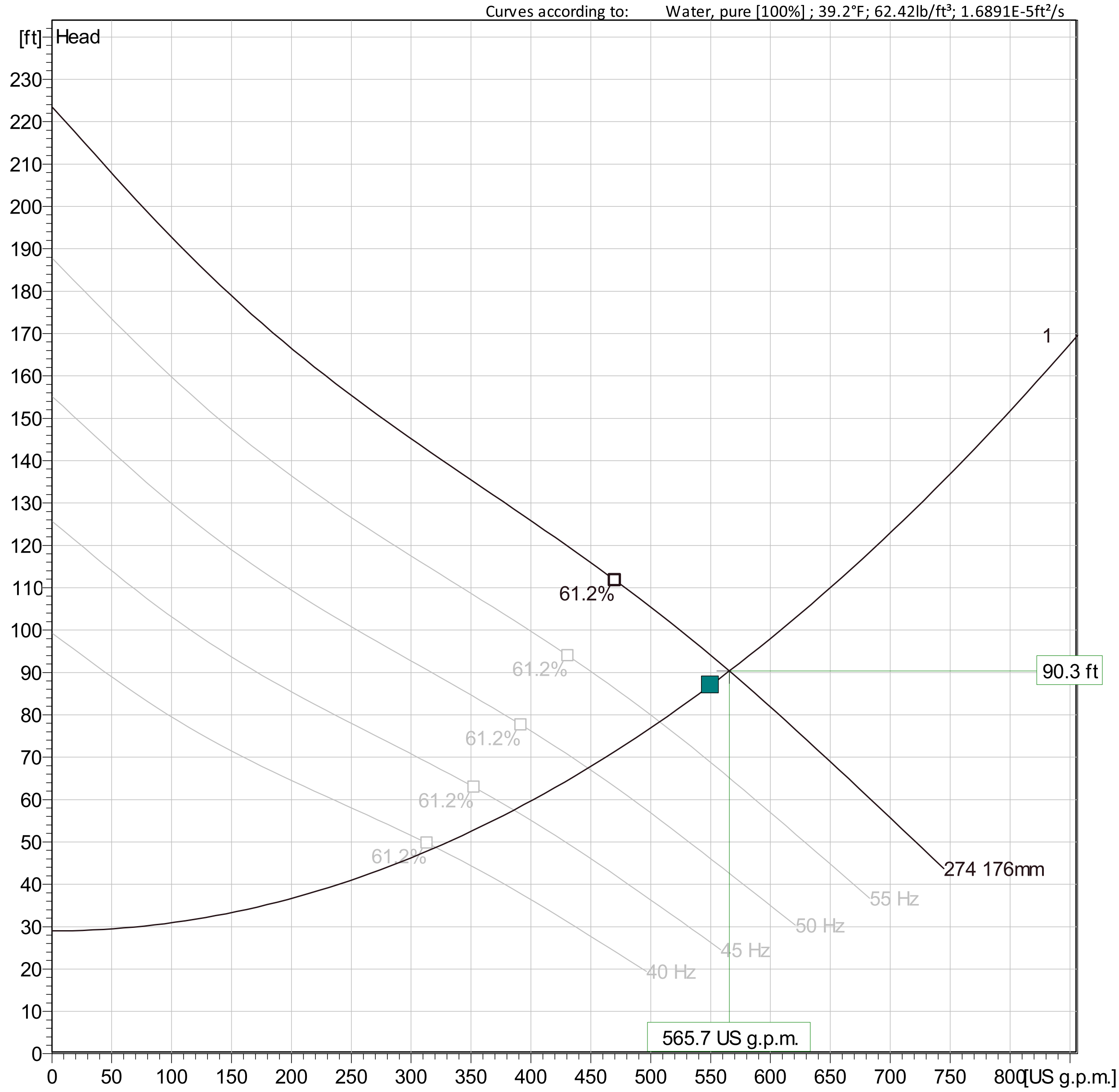
Project		**Created by**		**Last update**
Block		**Created on**	5/21/2019	

NP 3153 SH 3~ 274

VFD Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



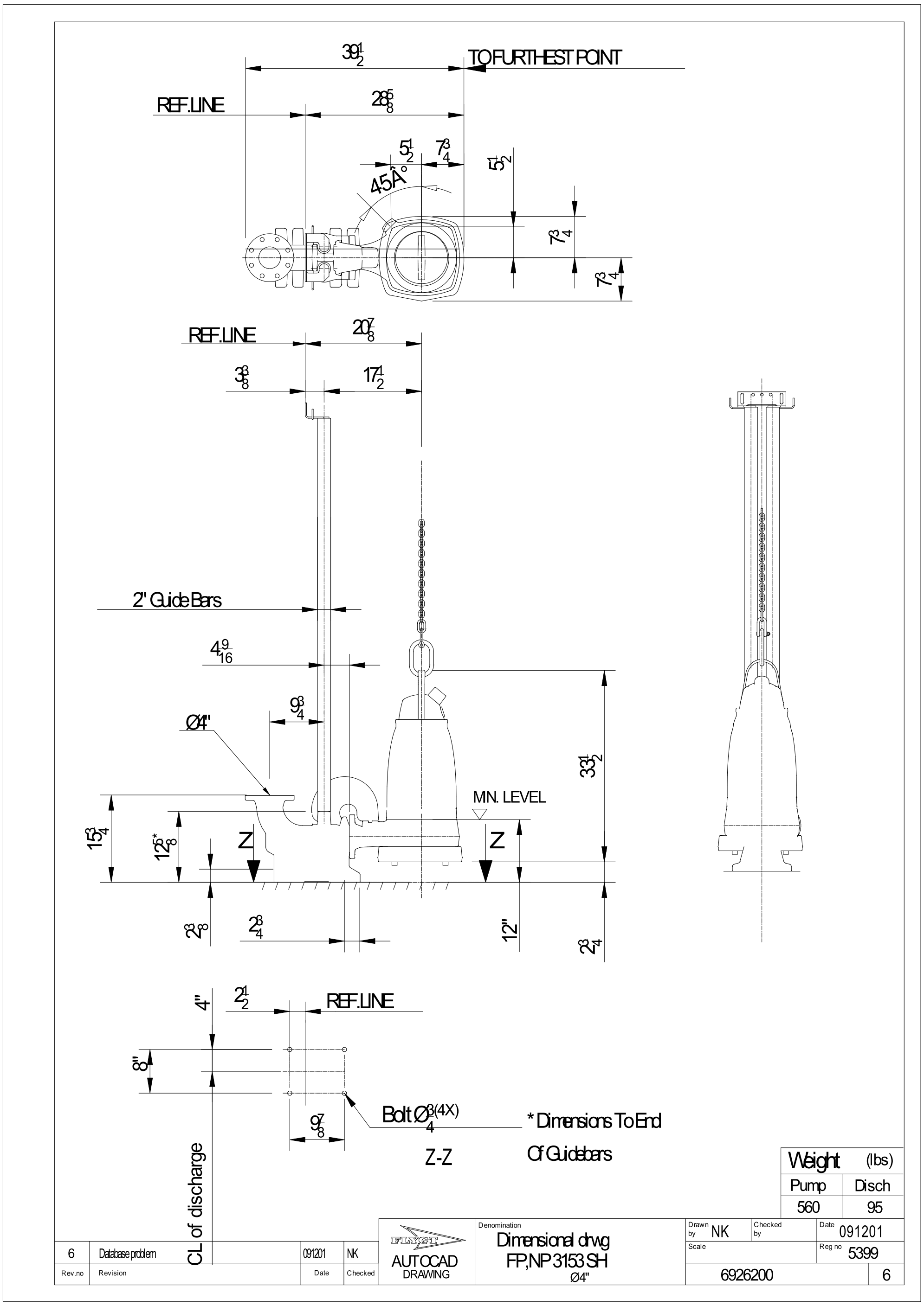
Operating Characteristics

Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	60 Hz	566 US g.p.m.	90.3 ft	22 hp	566 US g.p.m.	90.3 ft	22 hp	58.8 %	529 kWh/US MG	23.2 ft
1	55 Hz	507 US g.p.m.	78.4 ft	16.9 hp	507 US g.p.m.	78.4 ft	16.9 hp	59.4 %	451 kWh/US MG	19.5 ft
1	50 Hz	448 US g.p.m.	67.4 ft	12.7 hp	448 US g.p.m.	67.4 ft	12.7 hp	60.1 %	386 kWh/US MG	16 ft
1	45 Hz	386 US g.p.m.	57.5 ft	9.25 hp	386 US g.p.m.	57.5 ft	9.25 hp	60.7 %	328 kWh/US MG	12.7 ft
1	40 Hz	320 US g.p.m.	48.7 ft	6.46 hp	320 US g.p.m.	48.7 ft	6.46 hp	61.2 %	280 kWh/US MG	9.62 ft

Project		**Created by**		**Last update**
Block		**Created on**	5/21/2019	

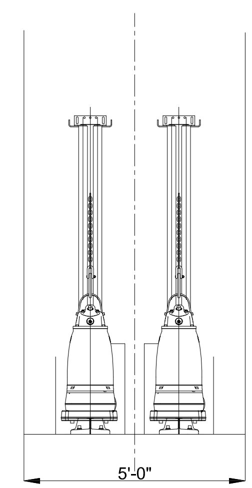
NP 3153 SH 3~ 274

Dimensional drawing

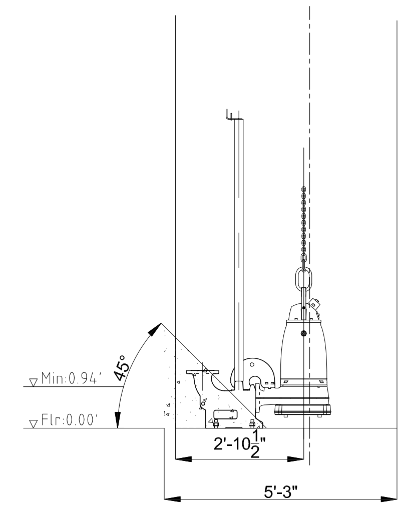


Project		Created by		Last update
Block		Created on	5/21/2019	

A-A

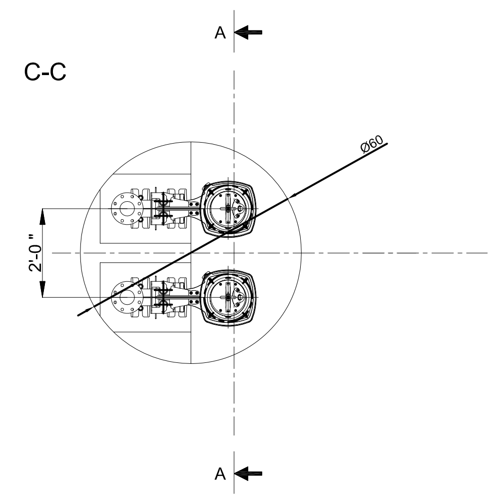


B-B



* If any pump in the sump are to be equipped with a flush valve this benching may need to be modified.
Please contact Flygt for detailed advice.

C-C



SECAD™ 5.2.6.5 (5.2) Standard

Autosump Midrange	
Number of pumps	2
Pump	NP 3153 SH DN 100
Max. flow pump [USgpm]	565
Configuration	Circular sump

Start/Stop -levels (Sequence I)						
Vol	Pump	Alt	Flow [USgpm]	V [ft³]	Start [ft]	Stop [ft]
V1	1-A	Y	565	38	2.1	1.0
V2	2-A	Y	1130	38	2.6	1.4

Disclaimer
The accuracy of the output is based on the accuracy of the input data, and it is the responsibility of those supplying that information to verify that this data is correct. The drawing is supplied for reference only, based on Flygt equipment, and is meant for preliminary sump design and system evaluation. A professional engineer, licensed in the appropriate field of engineering, should always conduct the final evaluation of the application if there are liabilities involved.

A1

Designed by	EX approved by	Draft	Weight	A-class	M-class
Checked by	Date 5/21/2019	Denomination Conceptual drawing		Material	
Drawn/Redrawn by				Blank	
Applicable to				Treatment	
xylem Let's Solve Water		This document may not, without our permission, be copied, shown or handed out to competitors or any other unauthorized persons.		Scale 1/2"=1'	
		Approval	Drawing No Autosump Midrange[2]		Rev

APPENDIX C: COST ESTIMATES

COLLECTION SYSTEM IMPROVEMENTS

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 1 SW 2nd St.	**Length:**	**340**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 12,300	$ 12,300
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 7,300	$ 7,300
10" Dia. Gravity Sewer	340	LF	$ 190	$ 64,600
Manholes	4	EA	$ 10,000	$ 40,000
Surface Removal & Replacement (Sewer Main)	340	LF	$ 35	$ 11,900
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	6	EA	$ 3,000	$ 18,000
			Construction	$ 167,600
			Contingency	$ 25,200
			Engineering, Bidding, CM	$ 33,600
			Admin. / Legal	$ 4,200
			Total Project Cost	$ 230,600

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 2 SW Beech St.	**Length:**	**265**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 9,600	$ 9,600
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 5,700	$ 5,700
8" Dia. Gravity Sewer	265	LF	$ 175	$ 46,375
Manholes	4	EA	$ 10,000	$ 40,000
Surface Removal & Replacement (Sewer Main)	265	LF	$ 35	$ 9,275
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	4	EA	$ 3,000	$ 12,000
			Construction	$ 136,450
			Contingency	$ 20,500
			Engineering, Bidding, CM	$ 27,300
			Admin. / Legal	$ 3,500
			Total Project Cost	$ 187,750

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 3 SW Beech St.	Length:	290		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 10,500	$ 10,500
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 6,300	$ 6,300
10" Dia. Gravity Sewer	290	LF	$ 190	$ 55,100
Manholes	4	EA	$ 10,000	$ 40,000
Surface Removal & Replacement (Sewer Main)	290	LF	$ 35	$ 10,150
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	5	EA	$ 3,000	$ 15,000
			Construction	$ 150,550
			Contingency	$ 22,600
			Engineering, Bidding, CM	$ 30,200
			Admin. / Legal	$ 3,800
			Total Project Cost	$ 207,150

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 4 Thomas Creek	Length:	300		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 40,000	$ 40,000
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 50,000	$ 50,000
6" Dia. Gravity Sewer	300	LF	$ 250	$ 75,000
Manholes	2	EA	$ 10,000	$ 20,000
Replacement (Sewer Main)	300	LF	$ 150	$ 45,000
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
			Construction	$ 243,500
			Contingency	$ 36,600
			Engineering, Bidding, CM	$ 48,700
			Admin. / Legal	$ 6,100
			Total Project Cost	$ 334,900

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 4	Length:	300		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 5,000	$ 5,000
Mobilization	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 10,800	$ 10,800
6" Dia. Gravity Sewer	300	LF	$ 50	$ 15,000
Inversion Lining	300	LF	$ 100	$ 30,000
Debris Removal	1	LS	$ 10,000	$ 10,000
			Construction	$ 80,800
			Contingency	$ 12,200
			Engineering, Bidding, CM	$ 16,200
			Admin. / Legal	$ 2,100
			Total Project Cost	$ 121,300

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 5 Main St.	**Length:**	**725**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 26,100	$ 26,100
Temporary Protection and Direction of Traffic	1	LS	$ 20,000	$ 20,000
Demolition & Site Prep	1	LS	$ 15,600	$ 15,600
10" Dia. Gravity Sewer	725	LF	$ 190	$ 137,750
Manholes	4	EA	$ 10,000	$ 40,000
Surface Removal & Replacement (Sewer Main)	725	LF	$ 35	$ 25,375
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	16	EA	$ 3,000	$ 48,000
			Construction	$ 316,400
			Contingency	$ 47,500
			Engineering, Bidding, CM	$ 63,300
			Admin. / Legal	$ 8,000
			Total Project Cost	$ 435,200

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 6 NE Ash/Main St.	**Length:**	**250**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 9,000	$ 9,000
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 5,400	$ 5,400
8" Dia. Gravity Sewer	250	LF	$ 175	$ 43,750
Manholes	1	EA	$ 10,000	$ 10,000
Surface Removal & Replacement (Sewer Main)	250	LF	$ 35	$ 8,750
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	6	EA	$ 3,000	$ 18,000
			Construction	$ 108,400
			Contingency	$ 16,300
			Engineering, Bidding, CM	$ 21,700
			Admin. / Legal	$ 2,800
			Total Project Cost	$ 149,200

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 7 SE 1st Ave.	**Length:**	**150**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 5,400	$ 5,400
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 3,300	$ 3,300
8" Dia. Gravity Sewer	150	LF	$ 175	$ 26,250
Manholes	1	EA	$ 10,000	$ 10,000
Surface Removal & Replacement (Sewer Main)	150	LF	$ 35	$ 5,250
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	2	EA	$ 3,000	$ 6,000
			Construction	$ 69,700
			Contingency	$ 10,500
			Engineering, Bidding, CM	$ 14,000
			Admin. / Legal	$ 1,800
			Total Project Cost	$ 96,000

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 8 SE Ash/Main St.	**Length:**	**410**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 14,800	$ 14,800
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 8,800	$ 8,800
8" Dia. Gravity Sewer	410	LF	$ 175	$ 71,750
Manholes	2	EA	$ 10,000	$ 20,000
Surface Removal & Replacement (Sewer Main)	410	LF	$ 35	$ 14,350
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	6	EA	$ 3,000	$ 18,000
			Construction	$ 161,200
			Contingency	$ 24,200
			Engineering, Bidding, CM	$ 32,300
			Admin. / Legal	$ 4,100
			Total Project Cost	$ 221,800

City of Scio		Collection System Improvements		
Project 202.01				
Cost Estimate: Project 9 SE Ash St.	**Length:**	**295**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 10,600	$ 10,600
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 6,400	$ 6,400
8" Dia. Gravity Sewer	295	LF	$ 175	$ 51,625
Manholes	2	EA	$ 10,000	$ 20,000
Surface Removal & Replacement (Sewer Main)	295	LF	$ 35	$ 10,325
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	7	EA	$ 3,000	$ 21,000
			Construction	$ 133,450
			Contingency	$ 20,100
			Engineering, Bidding, CM	$ 26,700
			Admin. / Legal	$ 3,400
			Total Project Cost	$ 183,650

City of Scio		Collection System Improvements		
Project 202.01				
Cost Estimate: Project 10 SE Birch St.	**Length:**	**520**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 18,700	$ 18,700
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 11,200	$ 11,200
8" Dia. Gravity Sewer	520	LF	$ 175	$ 91,000
Manholes	2	EA	$ 10,000	$ 20,000
Surface Removal & Replacement (Sewer Main)	520	LF	$ 35	$ 18,200
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	10	EA	$ 3,000	$ 30,000
			Construction	$ 202,600
			Contingency	$ 30,400
			Engineering, Bidding, CM	$ 40,600
			Admin. / Legal	$ 5,100
			Total Project Cost	$ 278,700

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 11 NW Cherry St.	**Length:**	**720**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 25,900	$ 25,900
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 15,500	$ 15,500
10" Dia. Gravity Sewer	720	LF	$ 190	$ 136,800
Manholes	3	EA	$ 10,000	$ 30,000
Surface Removal & Replacement (Sewer Main)	720	LF	$ 35	$ 25,200
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	13	EA	$ 3,000	$ 39,000
			Construction	$ 285,900
			Contingency	$ 42,900
			Engineering, Bidding, CM	$ 57,200
			Admin. / Legal	$ 7,200
			Total Project Cost	$ 393,200

City of Scio			Collection System Improvements	
Project 202.01				
Cost Estimate: Project 12 NE Ash St.	**Length:**	**500**		
Item	**Quantity**	**Unit**	**Unit Cost ($)**	**Total Cost ($)**
Temp. Facilities and Control	1	LS	$ 18,000	$ 18,000
Temporary Protection and Direction of Traffic	1	LS	$ 10,000	$ 10,000
Demolition & Site Prep	1	LS	$ 10,800	$ 10,800
8" Dia. Gravity Sewer	500	LF	$ 175	$ 87,500
Manholes	1	EA	$ 10,000	$ 10,000
Surface Removal & Replacement (Sewer Main)	500	LF	$ 35	$ 17,500
Foundation Stabilization Rock	20	CY	$ 75	$ 1,500
Rock Excavation	20	CY	$ 100	$ 2,000
Service Lateral Replacement	9	EA	$ 3,000	$ 27,000
			Construction	$ 184,300
			Contingency	$ 27,700
			Engineering, Bidding, CM	$ 36,900
			Admin. / Legal	$ 4,700
			Total Project Cost	$ 253,600

MANHOLE REPAIRS

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Mobilization & Demobilization	LS	All	$ 12,000	$ 12,000
2	Manhole Repair	EA	80	$ 1,500	$ 120,000

Construction Cost	$	132,000
Contingency Cost	$	19,800
Admin	$	10,600

Total Project Cost	**$**	**162,400**

BEECH ST. PUMP STATION UPGRADE

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 39,800	$ 39,800
2	Demo / Site Prep	LS	All	$ 26,500	$ 26,500
4	Bypass System	LS	All	$ 50,000	$ 50,000
5	Wet Well Repair	LS	All	$ 25,000	$ 25,000
6	New Submersible Pumps	EA	2	$ 30,000	$ 60,000
7	New Controls	LS	1	$ 75,000	$ 75,000
8	Electrical	LS	1	$ 20,000	$ 20,000
9	Piping & Valve Vault	LS	1	$ 35,000	$ 35,000

Construction Cost	$	331,300
Contingency Cost	$	49,700
Admin	$	26,600
Engineering	$	66,300

Total Project Cost	**$**	**473,900**

BEECH ST. PUMP STATION REPLACEMENT

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 93,600	$ 93,600
2	Demolition & Site Preparation	LS	All	$ 62,400	$ 62,400
3	Excavation	LS	All	$ 50,000	$ 50,000
5	Gravity Influent	LF	300	$ 250	$ 75,000
6	Concrete Pad	LS	All	$ 15,000	$ 15,000
7	Influent Manhole	LS	All	$ 30,000	$ 30,000
8	New Wet Well	LS	All	$ 58,000	$ 58,000
9	Submersible Duplex PS	EA	2	$ 40,000	$ 80,000
10	Rail Guides	EA	2	$ 10,000	$ 20,000
11	Effluent Valve Vault (Piping & Valves)	LS	All	$ 35,000	$ 35,000
12	Bypass System	LS	All	$ 50,000	$ 50,000
13	6" Effluent Force Main	LF	50	$ 175	$ 8,750
14	New Controls	LS	All	$ 75,000	$ 75,000
15	Meter Relocation	LS	All	$ 15,000	$ 15,000
16	Misc. Piping & Utility Station	LS	All	$ 10,000	$ 10,000
17	Mechanical	LS	All	$ 17,000	$ 17,000
18	New Fencing & Gate	LS	All	$ 15,000	$ 15,000
19	Electrical	LS	All	$ 40,000	$ 40,000
20	Landscaping	LS	All	$ 15,000	$ 15,000
21	Telemetry System	LS	All	$ 15,000	$ 15,000

Construction Cost	$ 453,800
Contingency Cost	$ 69,000
Admin	$ 36,400
Permitting	$ 100,000
Engineering	$ 90,800

Total Project Cost	**$ 750,000**

LAGOON DREDGING

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Mobilization & Demobilization	LS	All	$ 15,000	$ 15,000
2	Dredging / Solids Removal	TON	150	$ 350	$ 52,500
3	Solids Disposal	LS	All	$ 10,000	$ 10,000

Construction Cost	$ 77,500
Contingency Cost	$ 11,700
Admin	$ 6,200

Total Project Cost	**$ 95,400**

INFLUENT SCREEN

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 43,133	$ 43,133
2	Demo / Site Prep	LS	All	$ 28,755	$ 28,755
3	Excavation	CY	125	$ 50	$ 6,250
4	Foundation Stabilization	LS	All	$ 10,000	$ 10,000
5	Concrete Structure	CY	120	$ 1,200	$ 144,000
6	Screw Screen	LS	1	$ 70,800	$ 70,800
7	Safety Grate	SF	70	$ 50	$ 3,500
8	6" D.I. Transfer Line	LF	20	$ 150	$ 3,000
9	Precast Electrical Trough	LS	1	$ 5,000	$ 5,000
10	Electrical	LS	1	$ 25,000	$ 25,000
11	Mechanical and Installation	LS	1	$ 20,000	$ 20,000

Construction Cost	$ 359,500
Contingency Cost	$ 54,000
Admin	$ 28,800
Engineering	$ 71,900

Total Project Cost	**$ 514,200**

AERATION / MIXER UNITS

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 19,980	$ 19,980
2	Site Prep	LS	All	$ 13,320	$ 13,320
3	Mixer Units	LS	1	$ 103,200	$ 103,200
4	Electrical	LS	All	$ 5,000	$ 5,000
5	Anchoring System	LS	1	$ 15,000	$ 15,000
6	Mechanical and Installation	LS	1	$ 10,000	$ 10,000

Construction Cost	$ 166,500
Contingency Cost	$ 25,000
Admin	$ 13,400
Engineering	$ 25,000

Total Project Cost	**$ 229,900**

LAGOON BAFFLES

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 4,300	$ 4,300
2	Demo / Site Prep	LS	All	$ 2,900	$ 2,900
3	Waste Water Baffle	EA	2	$ 9,600	$ 19,200
4	Baffle Post Connection	EA	4	$ 1,250	$ 5,000
5	Steel Post Bridle	EA	4	$ 150	$ 600
6	Winch Block	EA	2	$ 2,000	$ 4,000

Construction Cost	$ 36,000
Contingency Cost	$ 5,400
Admin	$ 2,900
Engineering	$ 7,200

Total Project Cost	**$ 51,500**

SBR

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 337,400	$ 337,400
2	Demo / Site Prep	LS	All	$ 225,000	$ 225,000
Sequencing Batch Reactor (SBR)					
3	SBR Headworks with Grit Removal	LS	All	$ 1,200,000	$ 1,200,000
4	Geotextile Fabric	SY	1100	$ 2	$ 2,200
5	SBR Equipment	LS	All	$ 437,500	$ 437,500
6	Excavation	CY	9200	$ 30	$ 276,000
7	Structural Backfill	CY	60	$ 75	$ 4,500
8	Concrete SBR Walls	CY	123	$ 1,000	$ 123,000
9	Concrete SBR Slab	CY	200	$ 800	$ 160,000
10	Concrete SBR Walkway Slab	CY	80	$ 1,200	$ 96,000
11	Access Ports	EA	2	$ 30,000	$ 60,000
12	Effluent Valve Vault (Piping & Valves)	LS	All	$ 12,000	$ 12,000
13	WAS Piping and Flow Meter	EA	1	$ 5,000	$ 5,000
14	Telescoping Valve	EA	2	$ 6,000	$ 12,000
15	Handrails	LF	1000	$ 60	$ 60,000
16	Misc. Piping & Utility Station	LS	All	$ 5,000	$ 5,000
17	Electrical	LS	1	$ 50,000	$ 50,000
18	Lighting	LS	All	$ 10,000	$ 10,000
19	Instrumentation, Controls and Telemetry	LS	1	$ 25,000	$ 25,000
20	Flow Meter Enclosure	LS	1	$ 5,000	$ 5,000
	Subtotal:	$ 2,543,200			

SBR (CONTINUED)

Facultative Sludge Lagoon (FSL) & Pump Station								
21	Wet Well Excavation	LS	All	$	36,700	$	36,700
22	Sludge Removal	LS	All	$	25,000	$	25,000
23	Berm Backfill (struc.)	CY	8000	$	40	$	320,000
24	Surface Aerator & Anchor	EA	2	$	40,000	$	80,000
25	Inlet structure	LS	1	$	10,000	$	10,000
26	Outlet Structure	LS	1	$	10,000	$	10,000
27	6" Effluent to SBR	LF	1200	$	100	$	120,000
28	Safety Equipment	LS	All	$	10,000	$	10,000
29	Access Road	LS	All	$	150,000	$	150,000
30	Misc. Equipment	LS	1	$	10,000	$	10,000
31	New Wet Well	LS	All	$	57,900	$	57,900
	Subtotal:	$			829,600		
Electrical and Controls							
32	Submersible Duplex PS	CY	All	$	36,000	$	36,000
33	Electrical	LS	All	$	25,000	$	25,000
34	Telemetry	LS	All	$	15,000	$	15,000
	Subtotal:	$			76,000		

Construction Cost	$	4,011,200
Contingency Cost	$	601,700
Admin	$	320,900
Engineering	$	802,240
Review Fees	$	10,000
Collection	$	5,000
Rural Development	$	204,500

Total Project Cost	**$**	**5,955,540**

WWTP UPGRADE SHORT LIVED ASSETS

Description	Existing Equipment	Quantity	Replacement Value	Replacement Frequency (Years)	Annual Cost
Influent Fine Screen					
Screen Basket		1	$ 2,700	10	$ 270
Rubber/Neoprene Seals		1	$ 200	5	$ 40
Brush Kit		1	$ 700	3	$ 233
Replaceable Wear Bars		1	$ 1,040	3	$ 347
1.0 hp, TEFC-XP 1800 rpm Motor and Gear Reducer		1	$ 1,850	10	$ 185
Brass Solenoid Valves		2	$ 695	5	$ 139
Isolation Ball Valve		2	$ 90	5	$ 18
3/4" Bronze Strainer, 80-mesh		1	$ 230	5	$ 46
				TOTAL	**$ 1,278.00**
SB10000 v20 Mixer					
Photovoltaic Modules		3	$ 995.00	25	$ 39.80
Brushless Motor (Reconditioned)		1	$ 4,833.26	12.5	$ 386.66
Onboard Battery		1	$ 894.00	8	$ 111.75
Digital Controller		1	$ 2,484.55	12.5	$ 198.76
Brain Board		1	$ 750.75	12.5	$ 60.06
Charge Controller		1	$ 507.50	12.5	$ 40.60
Motor Controller		1	$ 465.00	12.5	$ 37.20
Shaft Coupling		1	$ 186.05	25	$ 7.44
Impeller		1	$ 749.71	25	$ 29.99
Impeller Shaft		1	$ 84.50	10	$ 8.45
Shaft Coupling Sleeve		1	$ 35.00	10	$ 3.50
Hose		1	$ 1,142.29	7	$ 163.18
Float Arms		3	$ 398.77	25	$ 15.95
Floats		3	$ 218.97	15	$ 14.60
				TOTAL	**$ 1,117.95**
SB2500 v20 Mixer					
Photovoltaic Modules		3	$ 995.00	25	$ 39.80
Brushless Motor (Reconditioned)		1	$ 4,833.26	12.5	$ 386.66
Onboard Battery		1	$ 894.00	8	$ 111.75
Digital Controller		1	$ 2,484.55	12.5	$ 198.76
Brain Board		1	$ 750.75	12.5	$ 60.06
Charge Controller		1	$ 507.50	12.5	$ 40.60
Motor Controller		1	$ 465.00	12.5	$ 37.20
Shaft Coupling		1	$ 84.27	25	$ 3.37
Impeller		1	$ 597.38	25	$ 23.90
Impeller Shaft		1	$ 84.50	10	$ 8.45
Shaft Coupling Sleeve		1	$ 35.00	10	$ 3.50
Hose		1	$ 1,037.90	7	$ 148.27
Float Arms		3	$ 398.77	25	$ 15.95
Floats		3	$ 218.97	15	$ 14.60
				TOTAL	**$ 1,092.87**
Lagoon Baffles					
		2	$ 1,250	50	$ 25
				TOTAL	**$ 25.00**

APPENDIX D: POPULATION & FUNDING

Linn County and Smaller Sub-Areas – Forecast Population and AAGR

	2017	2035	2067	AAGR (2017-2035)	AAGR (2035-2067)
Linn County	123,626	146,481	182,399	0.9%	0.7%
Brownsville UGB	1,740	2,084	2,567	1.0%	0.7%
Gates UGB (Linn)	40	42	47	0.3%	0.3%
Halsey UGB	925	1,134	1,547	1.1%	1.0%
Harrisburg UGB	3,770	4,332	5,077	0.8%	0.5%
Idanha UGB (Linn)	58	61	65	0.2%	0.2%
Lyons UGB (Linn)	1,254	1,369	1,549	0.5%	0.4%
Mill City UGB (Linn)	1,736	2,109	2,390	1.1%	0.4%
Millersburg UGB	1,795	2,974	5,147	2.8%	1.7%
Scio UGB	938	1,027	1,099	0.5%	0.2%
Sodaville UGB	341	370	424	0.5%	0.4%
Tangent UGB	1,286	1,466	1,688	0.7%	0.4%
Waterloo UGB	232	257	297	0.6%	0.5%
Outside UGBs	34,376	35,891	35,319	0.2%	-0.1%
Larger UGBs	75,135	93,365	125,183	1.2%	0.9%

Source: Forecast by Population Research Center (PRC)

Note: Larger UGBs are those with populations equal to or greater than 7000 in forecast launch year

Linn County and Sub-Areas – Historical and Forecast Populations, and Average Annual Growth Rates (AAGR)

	2000	2010	AAGR (2000-2010)	2017	2035	2067
Linn County	103,069	116,672	1.2%	123,626	146,481	182,399
Albany UGB (Linn)	36,967	44,690	1.9%	46,469	58,134	77,255
Brownsville UGB	1,471	1,682	1.3%	1,740	2,084	2,567
Gates UGB (Linn)	42	40	-0.5%	40	42	47
Halsey UGB	724	906	2.3%	925	1,134	1,547
Harrisburg UGB	2,842	3,665	2.6%	3,770	4,332	5,077
Idanha UGB (Linn)	85	57	-3.9%	58	61	65
Lebanon UGB (Linn)	15,981	18,308	1.4%	19,416	24,498	34,628
Lyons UGB (Linn)	1,065	1,215	1.3%	1,254	1,369	1,549
Mill City UGB (Linn)	1,376	1,680	2.0%	1,736	2,109	2,390
Millersburg UGB	670	1,329	7.1%	1,795	2,974	5,147
Scio UGB	719	884	2.1%	938	1,027	1,099
Sodaville UGB	288	308	0.7%	341	370	424
Sweet Home UGB	8,068	8,978	1.1%	9,250	10,733	13,300
Tangent UGB	1,066	1,233	1.5%	1,286	1,466	1,688
Waterloo UGB	238	229	-0.4%	232	257	297
Outside UGBs	31,467	31,468	0.0%	34,376	35,891	35,319

Sources: U.S. Census Bureau, 2000 and 2010 Censuses; Forecast by Population Research Center (PRC).

FINANCIAL SUMMARY - 2018 -2019 BUDGET YEAR		
REVENUES/RESOURCES	**Proposed Budget**	**Adopted Budget**
	This Yr's 2018-19	**2018-19 Fiscal Yr.**
Beginning Fund Balances		
General Fund	322,837	248,830
Road Fund	118,470	119,193
Water Fund	273,401	283,386
Sewer Fund	98,120	102,504
Total	**812,828**	**753,913**
Fees, Licenses, Permits, Fines, Assessments & Charges		
General Fund	25,000	25,000
Road Fund	20,000	20,000
Water Fund	278,780	281,140
Sewer Fund	189,000	191,000
Total	**512,780**	**517,140**
Federal, State , Grants, Gifts, Misc. Donations		
General Fund	53,131	53,131
Road Fund	103,000	103,000
Total	**156,131**	**156,131**
Interfund Transfers In		
General Fund	100,000	100,000
Total	**100,000**	**100,000**
Other Resources/Reserve Accounts		
Water Reserve	190,325	190,333
Sewer Reserve	86,200	86,200
Equipment Reserve	102,732	93,386
Total	**379,257**	**369,919**
Current Year Property Taxes Estimated (2018-2019) Total	**240,000**	**240,000**
TOTAL REVENUES FOR 2018-2019 BUDGET YEAR	**2,200,996**	**2,137,103**

FINANCIAL SUMMARY - 2018-2019 BUDGET YEAR		
EXPENDITURES/REQUIREMENTS	Proposed Budget	Adopted Budget
	This Yr's 2018-19	2018-19 Fiscal Yr.
Personnel Service Expenses (Salaries/Taxes/Benefits)		
1.52 FTE - General Fund	102,947	102,947
0.40 FTE - Road Fund	30,101	30,101
1.59 FTE - Water Fund ($10,000 misc. labor)	125,455	125,455
1.59 FTE - Sewer Fund ($10,000 misc. labor)	125,455	125,455
5.1 **Total**	**383,958**	**383,958**
Materials & Service Expenses		
General Fund	170,396	170,396
Road Fund	14,095	14,095
Water Fund	73,270	73,270
Sewer fund	71,420	71,420
Total	**329,181**	**329,181**
Capital Outlay		
General Fund	27,800	177,800
Road Fund	65,500	65,500
Water Fund	11,000	11,000
Sewer Fund	76,000	76,000
Total	**180,300**	**330,300**
Debt Service		
Water Fund	25,500	25,500
Total	**25,500**	**25,500**
Interfund Transfer Expenses		
General Fund	0	0
Road Fund	75,000	75,000
Water Fund	160,000	160,000
Sewer Fund	0	0
Total	**235,000**	**235,000**
Contingencies		
General Fund	75,000	75,000
Road Fund	35,000	35,000
Water Fund	80,000	80,000
Sewer Fund	14,245	20,629
Total	**204,245**	**210,629**
Special Payments		
Water Fund - $25,000 water loan payment Dec 2017 - Principal Only	25,000	25,000
Total	**25,000**	**25,000**

Unappropriated Ending Balance		
General Fund	364,825	140,818
Road Fund	21,774	22,497
Water Fund	51,956	64,301
Sewer Fund	0	0
	438,555	**227,616**
Other Resources/Reserve Accounts		
Water Reserve	190,325	190,333
Sewer Reserve	86,200	86,200
Equipment Reserve	102,732	93,386
Total	**379,257**	**369,919**
TOTAL EXPENDITURES FOR 2018-2019 BUDGET YEAR	**2,200,996**	**2,137,103**
TOTAL REVENUES	**2,200,996**	**2,137,103**
TOTAL EXPENDITURES	**2,200,996**	**2,137,103**
BALANCE	**0**	**0**

FORM LB-1

NOTICE OF BUDGET HEARING

A public meeting of the Scio City Council will be held on June 11, 2018 at 6:00 pm at 38957 NW 1st Avenue, Scio, Oregon. The purpose of this meeting is to discuss the budget for the fiscal year beginning July 1, 2018 as approved by the City of Scio Budget Committee. A summary of the budget is presented below. A copy of the budget may be inspected or obtained at 38957 NW 1st Avenue, Scio, between the hours of 8:00 a.m. and 4:30 p.m. or online at http://ci.scio.or.us. This budget is for an annual budget period. This budget was prepared on a basis of accounting that is the same as the preceding year. If different, the major changes and their effect on the budget are:

Contact: Virginia A. Allen, City Manager   Telephone: (503) 394-3342   Email: ci.scio.v.allen@smt-net.com

FINANCIAL SUMMARY - RESOURCES			
TOTAL OF ALL FUNDS	Actual Amount 2016-2017	Adopted Budget This Year 2017-2018	Approved Budget Next Year 2018-2019
Beginning Fund Balance/Net Working Capital	668,941.00	795,947.00	753,913.00
Fees, Licenses, Permits, Fines, Assessments & Other Service Charges	472,100.00	511,800.00	517,140.00
Federal, State and all Other Grants, Gifts, Allocations and Donations	105,300.00	75,500.00	156,131.00
Revenue from Bonds and Other Debt	0.00	0.00	0.00
Interfund Transfers / Internal Service Reimbursements	28,500.00	0.00	100,000.00
All Other Resources Except Current Year Property Taxes	14,450.00	464,684.00	369,919.00
Current Year Property Taxes Estimated to be Received	215,000.00	225,000.00	240,000.00
Total Resources	**1,504,291.00**	**2,072,931.00**	**2,137,103.00**

FINANCIAL SUMMARY - REQUIREMENTS BY OBJECT CLASSIFICATION			
Personnel Services	382,080.00	347,360.00	383,958.00
Materials and Services	353,263.00	336,730.00	329,181.00
Capital Outlay	94,500.00	27,500.00	330,300.00
Debt Service	81,174.00	25,500.00	25,500.00
Interfund Transfers	28,500.00	221,000.00	235,000.00
Contingencies	136,705.00	177,100.00	210,629.00
Special Payments	0.00	25,000.00	25,000.00
Unappropriated Ending Balance and Reserved for Future Expenditure	428,069.00	912,741.00	597,535.00
Total Requirements	**1,504,291.00**	**2,072,931.00**	**2,137,103.00**

FINANCIAL SUMMARY - REQUIREMENTS AND FULL-TIME EQUIVALENT EMPLOYEES (FTE) BY ORGANIZATIONAL UNIT OR PROGRAM *			
Name of Organizational Unit or Program **FTE** for that unit or program			
General Fund			
FTE	1.60	1.50	1.52
Road Fund			
FTE	0.70	0.42	0.40
Water Fund			
FTE	1.40	1.39	1.59
Sewer Fund			
FTE	1.40	1.39	1.59
Not Allocated to Organizational Unit or Program			
FTE			
Total Requirements	**1,504,291.00**	**2,072,391.00**	**2,137,103.00**
Total FTE	**5.30**	**4.70**	**5.25**

STATEMENT OF CHANGES IN ACTIVITIES and SOURCES OF FINANCING *

PROPERTY TAX LEVIES			
	Rate or Amount Imposed 2016-2017	Rate or Amount Imposed This Year 2017-2018	Rate or Amount Approved Next Year 2018-2019
Permanent Rate Levy (rate limit 4.9057 per $1,000)	4.9057	4.9057	4.9057
Local Option Levy			
Levy For General Obligation Bonds			

STATEMENT OF INDEBTEDNESS		
LONG TERM DEBT	Estimated Debt Outstanding on July 1.	Estimated Debt Authorized, But Not Incurred on July 1
General Obligation Bonds		
Other Bonds		
Other Borrowings		
Total	$263,596.98	$263,596.98

* If more space is needed to complete any section of this form, insert lines (rows) on this sheet. You may delete blank lines.

150-504-073-2 (Rev. 02-14)

APPENDIX E: PHOTOS

INFLUENT SAMPLER

EFFLUENT SAMPLER

GRINDER

RECIRCULATION PUMP

LAGOON CELLS

CHLORINE CONTACT

DECHLORINATION

BEECH ST. PUMP STATION

APPENDIX F: HISTORICAL TV INSPECTION PICTURES

Deficiencies from Historical TV Inspections

The City of Scio has major wastewater collection system issues. Many of the aged concrete gravity lines were not constructed well, and show signs of disrepair. I/I testing conducted by the Dyer Partnership revealed locations of potential I/I sources. In addition, the City has some historical TV inspection footage that shows serious root growth problems, backed up areas, and potential exfiltration spots. The report below summarizes each video inspection and provides pictures of the deficiency.

List of Videos

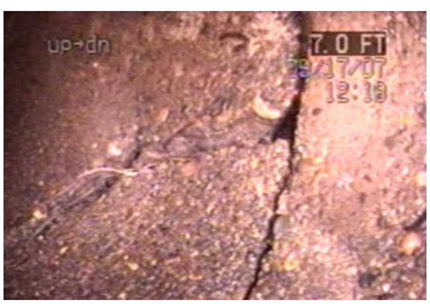
- Beech St. Wet Well Leak, Dual 6-inch (2005)
- Scio Spot TV Inspections (2007)
- Multiple Spot Checks (2011)
- Main St. High School – South (2011)
- Oregon TV Video Inspection (Date Unknown)
- DWC Inc. Camera Cleaning (2017)
- City of Scio (2019)

Beech St. Wet Well Leak, Dual 6-inch

Steady leakage directly underneath dual 6-inch inverted siphon pipes.

Scio Spot TV Inspections

N. Main St.



Fracturing of Pipe Wall (7.0 ft.)

Broken Pipe Wall Allowing for Exfiltration of Waste (37.5 ft.)

Root Growth (96.6 ft.)

Root Growth (108.6 ft.)

Significant Root Growth (114.5 ft.)

Major Root Growth (124.1 ft.)

Significant Root Blockage (141.5 ft.)

Root Growth (149.4 ft.)

Root Growth (151.3 ft.)

Root Growth (154.7 ft.)

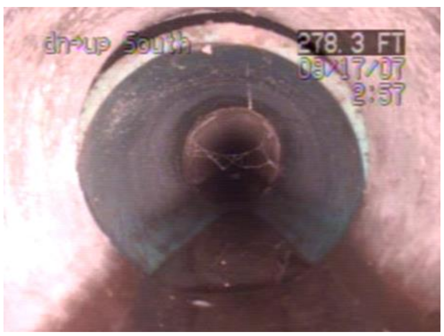
Root Growth (157.6 ft.)

Root Growth (163.2 ft.)

Root Growth (169.4 ft.)

Easement St.

Broken Pipe Wall (272.3 ft.)



Disjointed PVC to Concrete Pipe Transition (278.3 ft.)

Root Growth (274.2 ft.)

Multiple Spot Checks

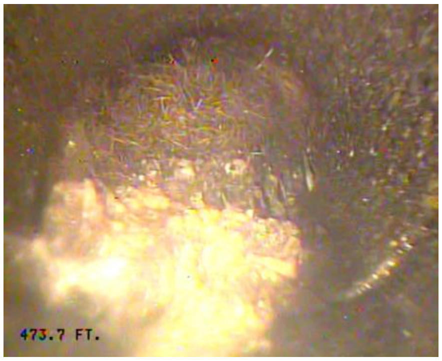
2nd and Birch St. Intersection Headed South

Root Growth (441.8 ft.)

Significant Root Growth (469.5 ft.)

Significant Buildup of Solid Waste (494.8 ft.)

Longnecker West to Ennes



Major Root and Solid Waste Blockage (473.7 ft.)

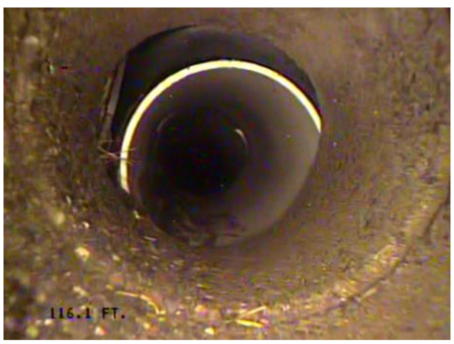
Purdy Apartments Headed South

Protruding Concrete Wall (63.5 ft.)

Missing Section in Top of Pipe Along with Fractures (88.7 ft.)

Fractured Pipe Wall (110.2 ft.)

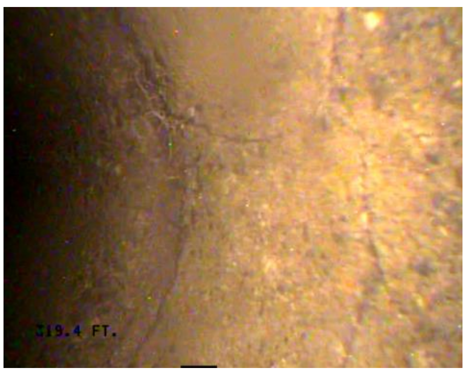

Section of Pipe Wall Missing, Exposed Line (113.5 ft.)



Disjointed PVC and Concrete Pipe Connection (116.1 ft.)

Alley Behind Bank Headed North

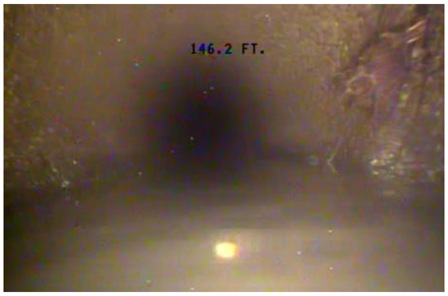
Broken Pipe with Repair Above (5.0 ft.)



Fractured Pipe Walls (319.4 ft.)

Root Growth in Service Lateral (340.5 ft.)

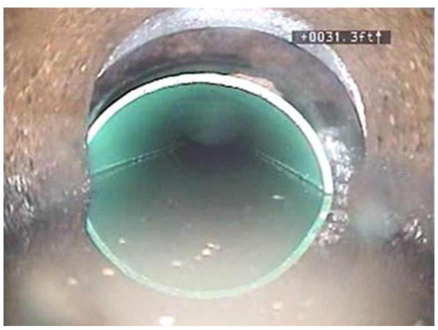
Main St. High School



Minor Root Protrusion (146.2 ft.)

Oregon TV Video Inspection

NW 1st Ave (City Hall)



Disjointed PVC Pipe, Exposed Gasket (31.3 ft.)

NW 1st Ave (Library)

Broken Top of Concrete Pipe

Alder St. / NW Beech St.

Broken Section of Pipe Wall (167.5 ft.)

Holes in Pipe Joint on Either Side (199.4 ft.)

Fracture at Top of Pipe (284.4 ft.)

Birch St. and SE 2nd Ave.

Fracture around Circumference of Pipe (75.7 ft.)

Root Masses Protruding into Pipe (438.7 ft.)

Complete Root and Solid Waste Blockage (451.6 ft.)

Birch St. and SE 1st Ave.

Root Protrusion (37.1 ft.)

Major Root Blockage (94.6 ft.)

Heavy Root Blockage (96.2 ft.)

Birch St. and SE 4^{th} Ave.

Major Root Blockage (38.8 ft.)

<u>DWC Inc. Camera Cleaning</u>

NE Ash St. Alley


Disjointed PVC and Concrete Pipes (28.8 ft.)


Root Growth at Lateral (58.6 ft.)

Apparent Flat Area near Cleanout (464.6 ft.)

City of Scio

38960 NW 1st Alley

Broken Pipe with Visible Signs of Repair (2.9 ft.)

Circumferential Crack in Pipe (57 ft.)

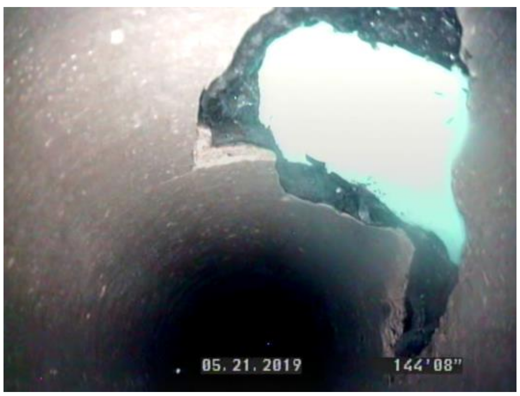
Cracking Near Joint (144.8 ft.)

Creaking Near Joint (271 ft.)

Broken Bottom of Pipe (352 ft.)

Buildup inside Pipe, Large Hole in Bottom of Pipe at Cleanout Location (427 ft.)

North Ash St. in Alley



Broken Pipe at Cleanout Location (144 ft.)

Untitled Location

Disjointed Concrete / PVC Connection (22 ft.)

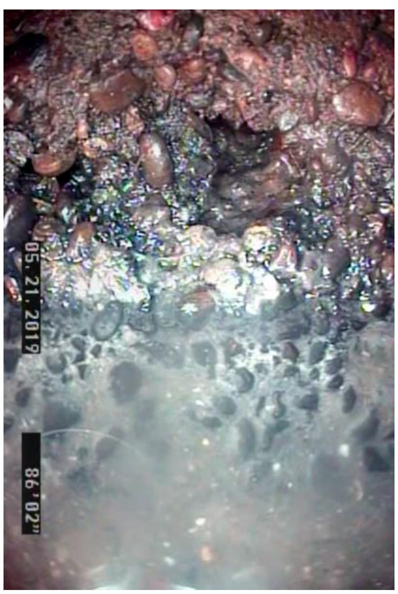
Beech and 2nd St.

Broken Sides of Concrete Pipe Exposing Soil (125 ft.)

Cracks in Pipe Wall (136.8 ft.)

Alley Between N. Ash and Main

Crack in Pipe Exposing Soil (55 ft.)



Eroded Pipe Wall (86 ft.)

Large Crack in Pipe Exposing Outside Soil (86.8 ft.)

Circumferential Cracks in Pipe Wall (157 ft.)