

CITY OF MISSOULA



2019 | WASTEWATER FACILITY PLAN

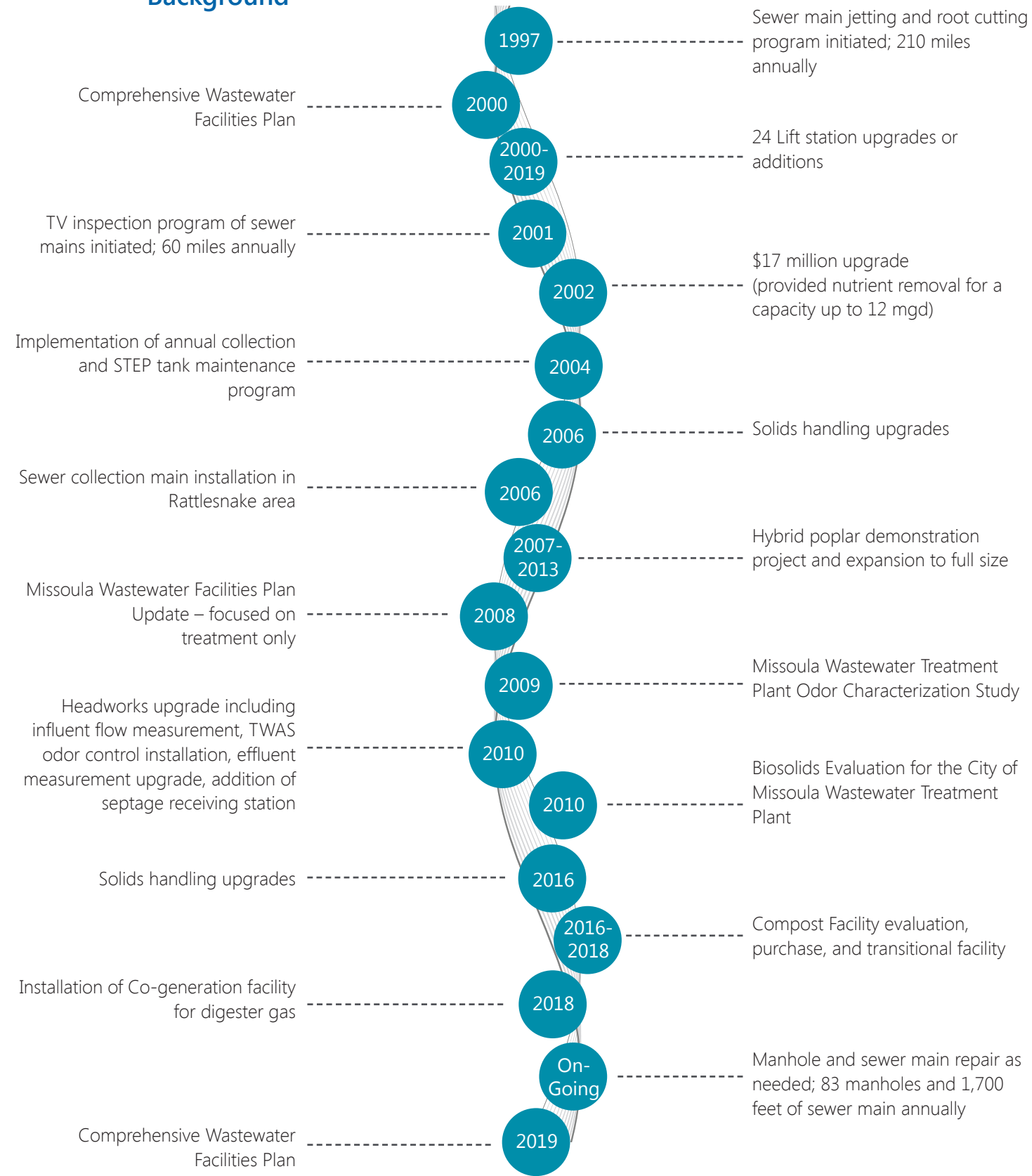
Executive Summary



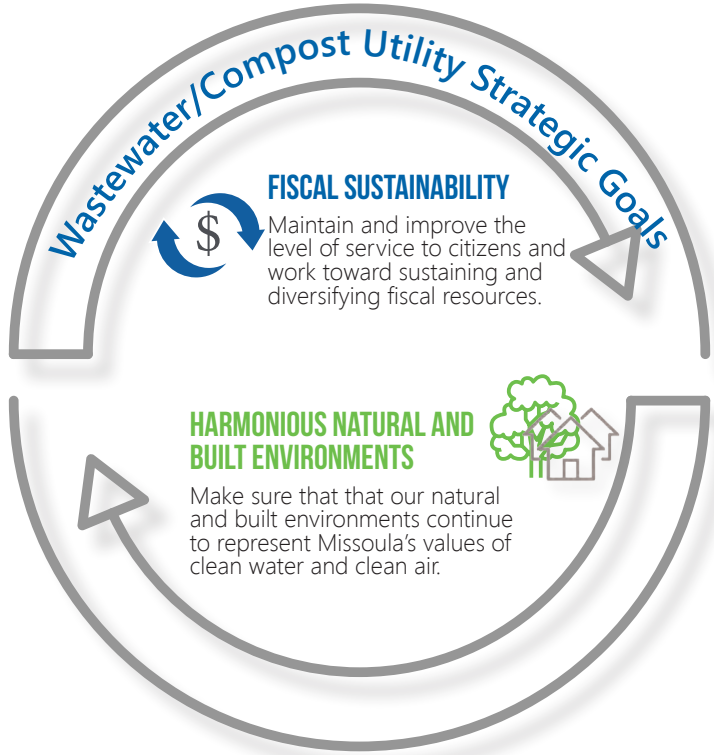
BACKGROUND, DRIVERS, PURPOSE, OBJECTIVES

The City of Missoula has owned and operated the wastewater utility since 1962. Throughout its operation, the utility has been well managed, maintained and currently has one of the lowest sewer rates in the state. Over the past 20 years, the City has completed a number of planning, design, and construction projects that have continued the City’s investment in its wastewater facilities.

Background



Drivers

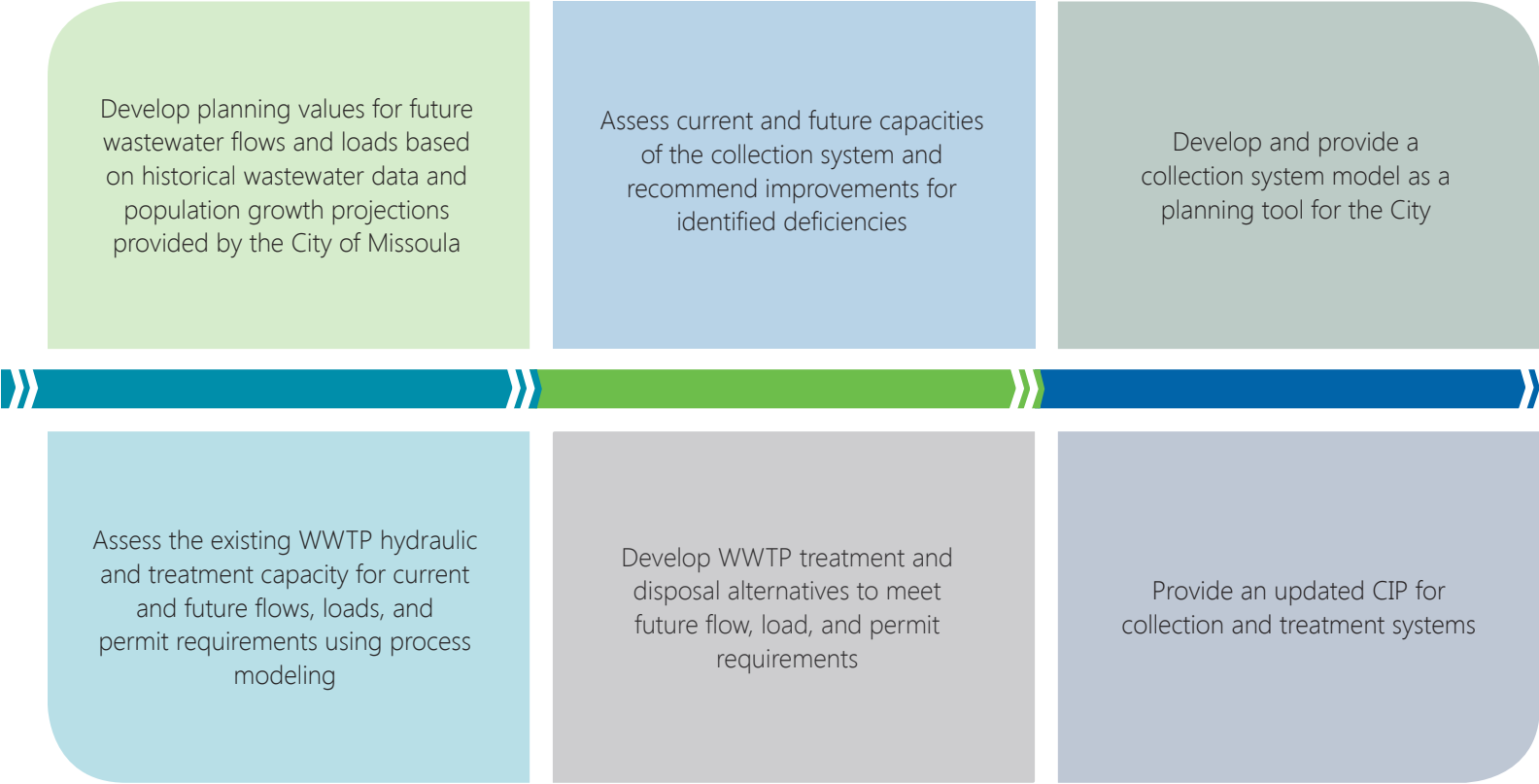


Purpose

The Wastewater Facility Plan provides the foundation and guidance for identification of needed maintenance and upgrade projects for the collection system and wastewater treatment plant in the fulfillment of the utility strategic goals.

The Plan helps prioritize projects to be completed within the next five years and identify areas that will require further study in the context of actual future conditions before implementation within ten or fifteen years.

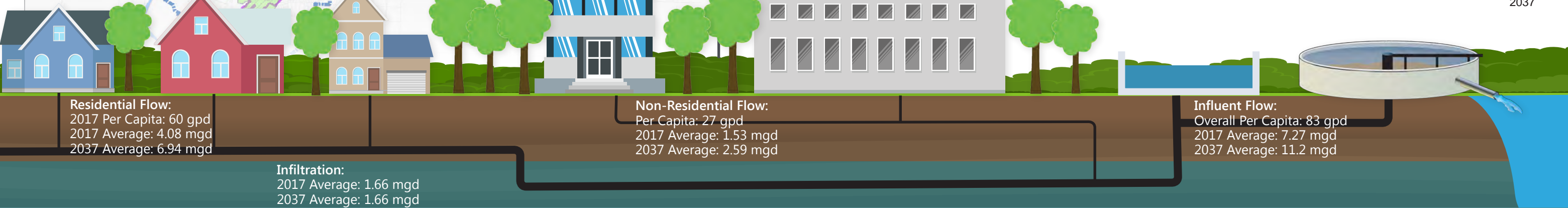
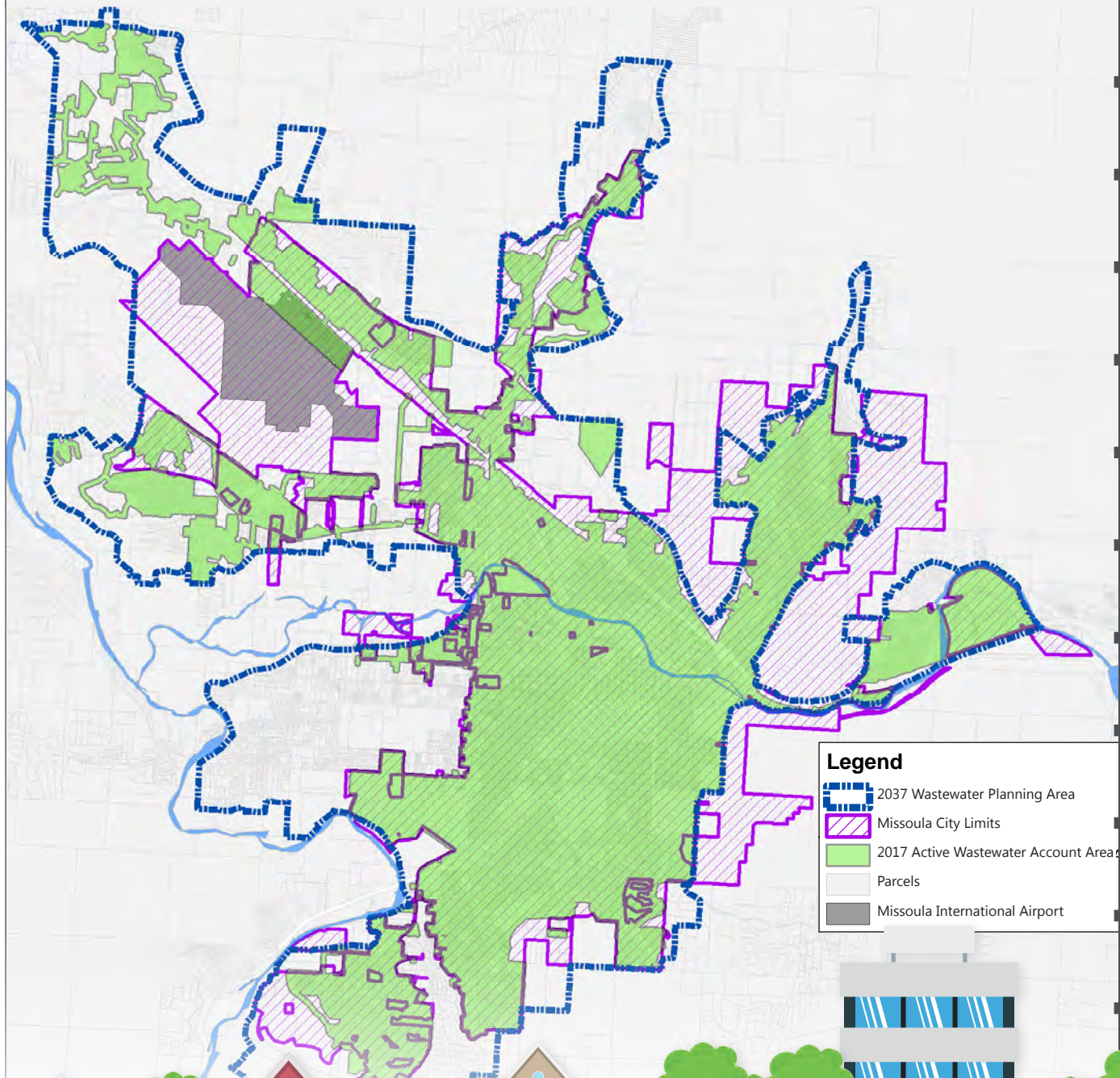
Objectives



BASIS OF PLANNING

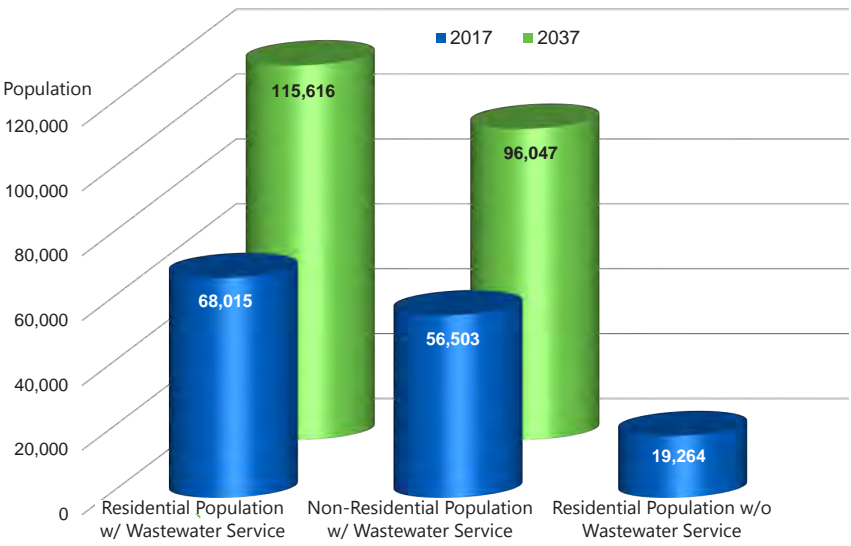
Study Area

It was assumed that by 2037, the City would serve all residents within the 2037 Wastewater Planning Area.



Population

The current and future population estimates were based on the City's 2015 Long Range Transportation Plan. Available GIS data was used to distinguish between residential and non-residential (commercial, industrial) populations. Estimates were developed and used as a base for wastewater flow and load projections.

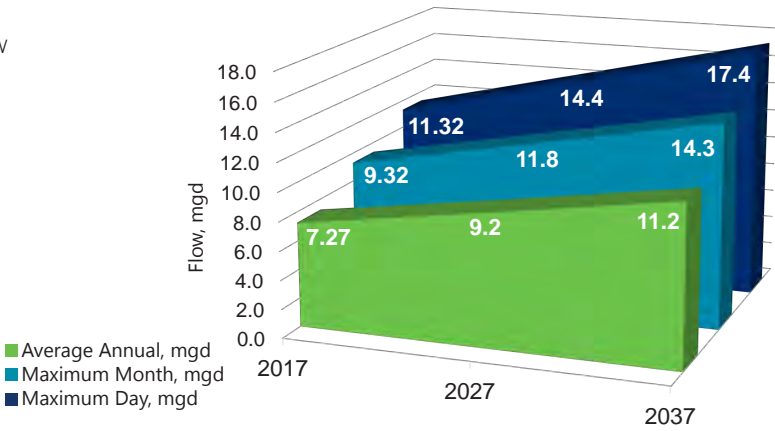


Regulatory Requirements

- WWTP discharge is permitted through MDEQ.
- The plant has been meeting all limits with few exceptions.
- There are no regulatory concerns for the near future.
- MDEQ may develop stricter nutrient limits within the next decade.
- Alternatives addressing treatment for stricter nutrient limits were explored in this Facility Plan.

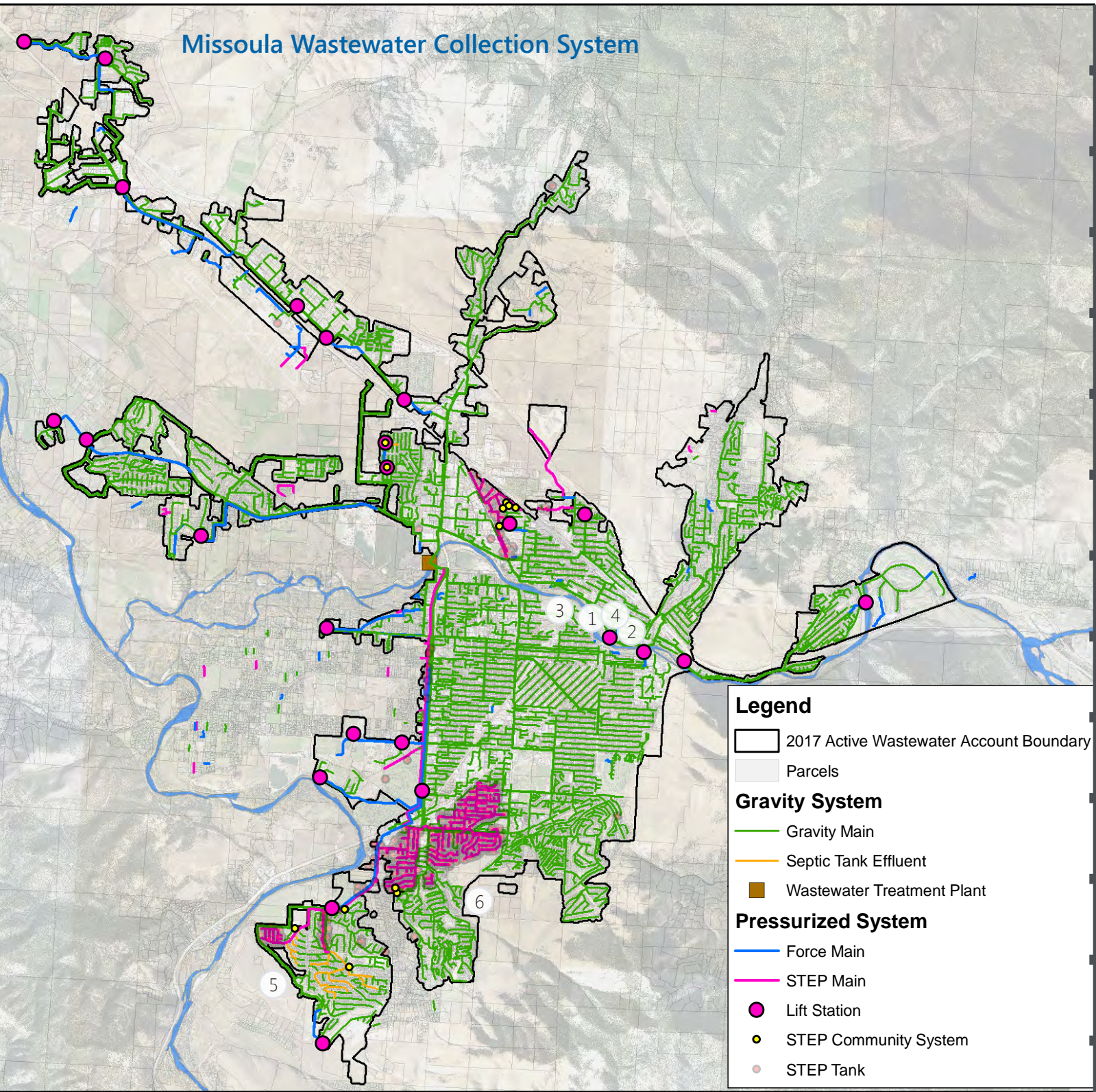
Wastewater Flows

- 2017 Wastewater Flows:
- Based on WWTP Influent for 2015-2017
 - Expressed as per capita values for residential & non-residential population
- 2037 Wastewater Flows:
- Based on projected 2037 population and 2017 per capita flow



0.39 miles	0.41 miles	59 miles	268 miles	39 number of	7 number of	1,442 number of	13 number of	12 years	1,700 feet	83 number of	210 miles
36" South Interceptor	30" & 42" North Interceptor	12" and greater Trunk Mains	10" and smaller Laterals	City-Owned Lift Stations	Privately-Owned Lift Stations	Active STEP Systems	Active Community Tanks	STEP System Cleaning Frequency	Annual Sewer Main Repairs	Annual Manhole Repairs	Annual Sewer Main Cleaning

EXISTING COLLECTION SYSTEM DESCRIPTION & ANALYSIS RESULTS



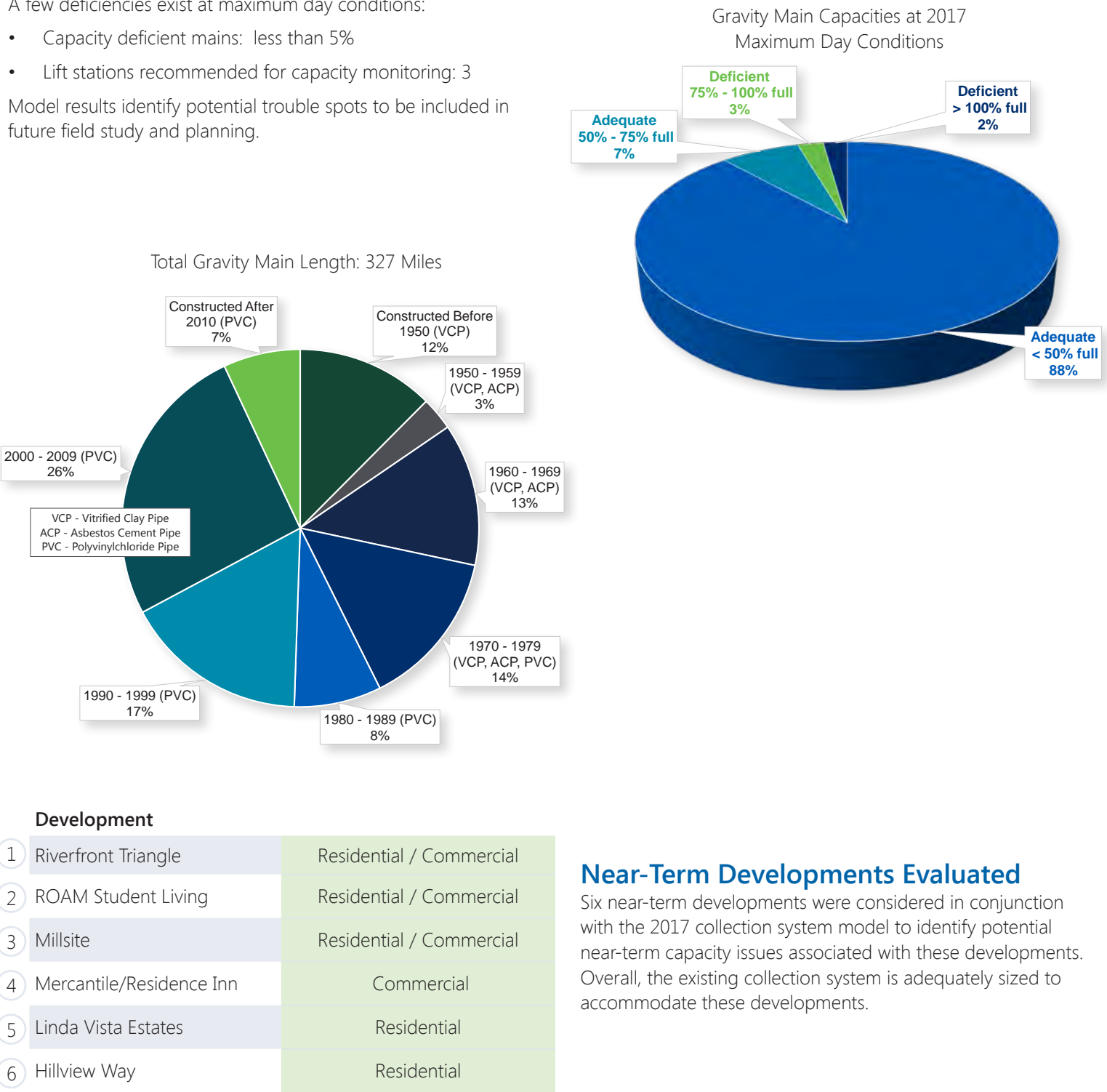
Collection System by the Numbers

Capacity Analysis

Overall, the existing collection system mains and lift stations are adequately sized to convey the average day and maximum day flows. A few deficiencies exist at maximum day conditions:

- Capacity deficient mains: less than 5%
- Lift stations recommended for capacity monitoring: 3

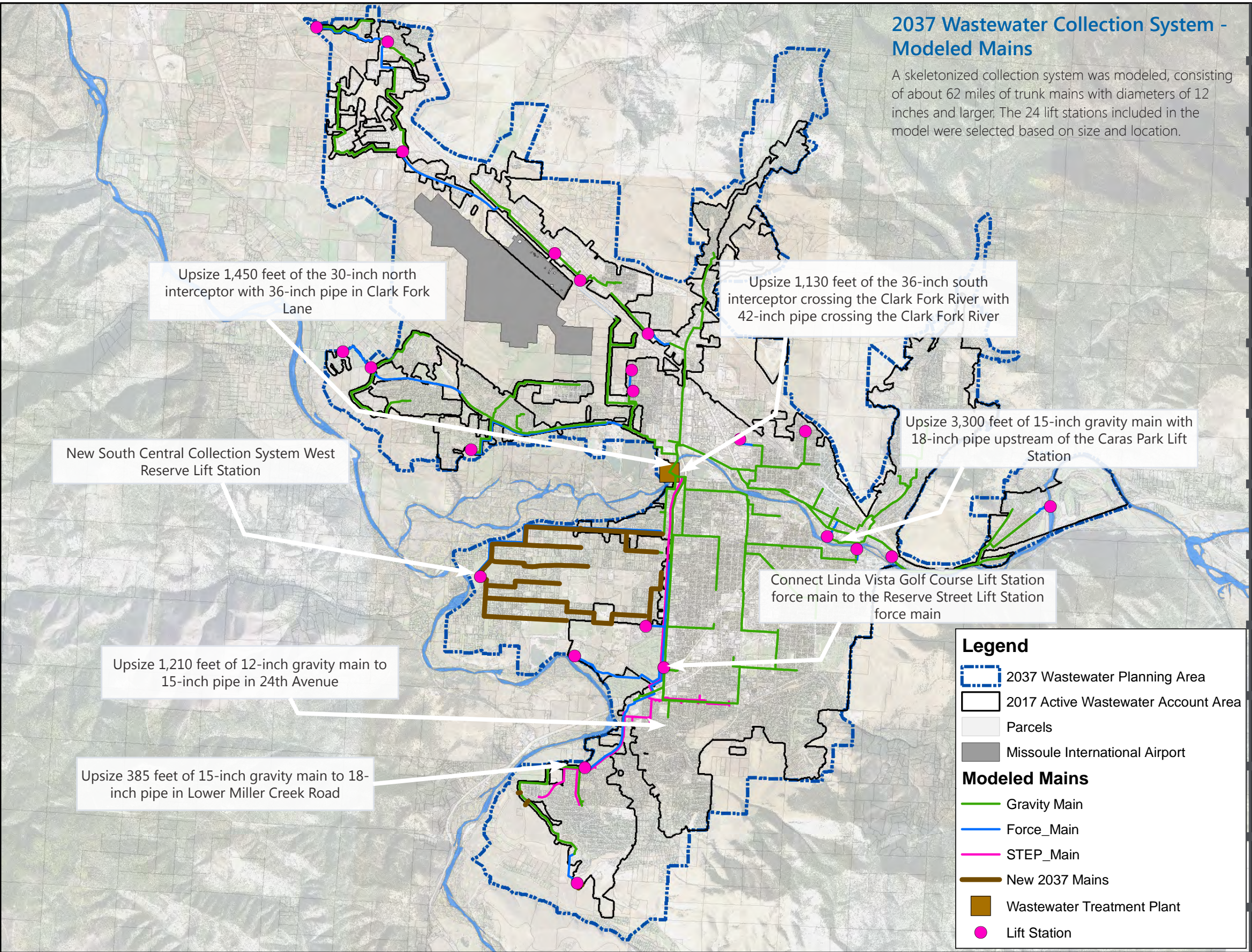
Model results identify potential trouble spots to be included in future field study and planning.



Near-Term Developments Evaluated

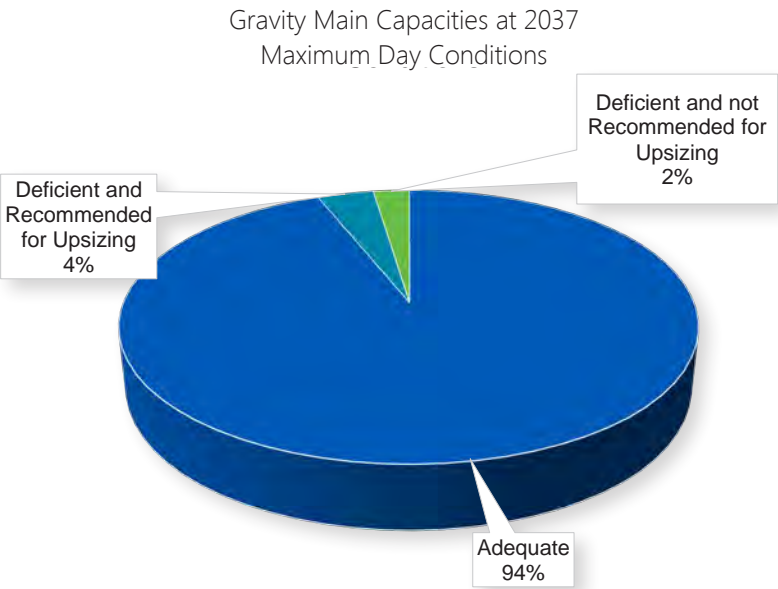
Six near-term developments were considered in conjunction with the 2017 collection system model to identify potential near-term capacity issues associated with these developments. Overall, the existing collection system is adequately sized to accommodate these developments.

2037 COLLECTION SYSTEM ANALYSIS & RECOMMENDATIONS



Modeled Capacity

Overall, gravity mains are adequately sized for 2037 conditions, with deficiencies only increasing by 1% when compared to 2017. Model results identify capacity issues that need to be monitored and addressed as the City is growing. Lift station capacity is predicted to be affected more strongly, with seven lift stations recommended for capacity monitoring.



Near-Term Costs

Included in CIP

Long-Term Costs



Long term costs will depend on the outcome of additional recommended studies and have not been determined yet.

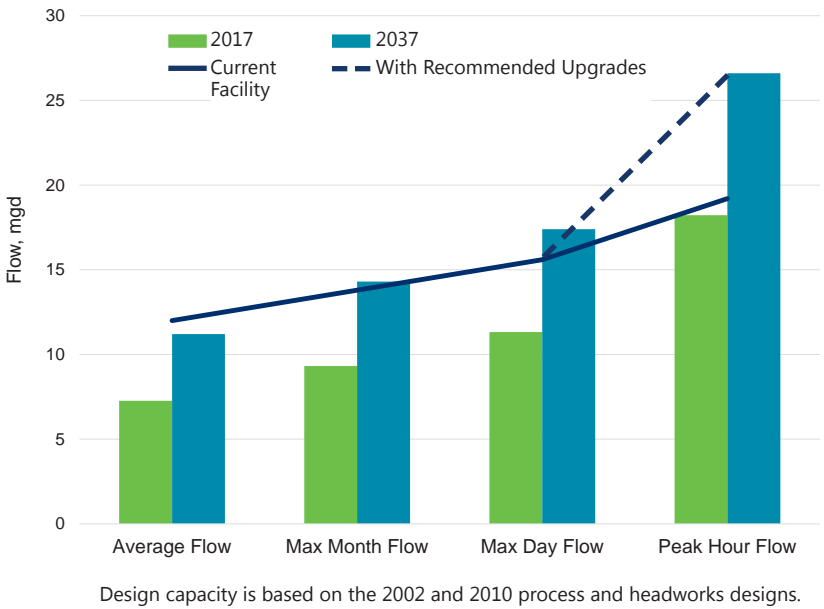
EXISTING WASTEWATER TREATMENT PLANT EVALUATION FOR 2017 AND 2037 CONDITIONS

The Missoula Wastewater Treatment Plant has been in this location since its construction in 1962 as a simple primary treatment system. Since then, the plant has grown through multiple upgrades into a nutrient removal plant capable of consistently meeting current MPDES effluent limits. The majority of the effluent is discharged to the Clark Fork River. A portion is diverted during the irrigation season to irrigate a hybrid poplar plantation and provide resource recovery.



Hydraulic Capacity

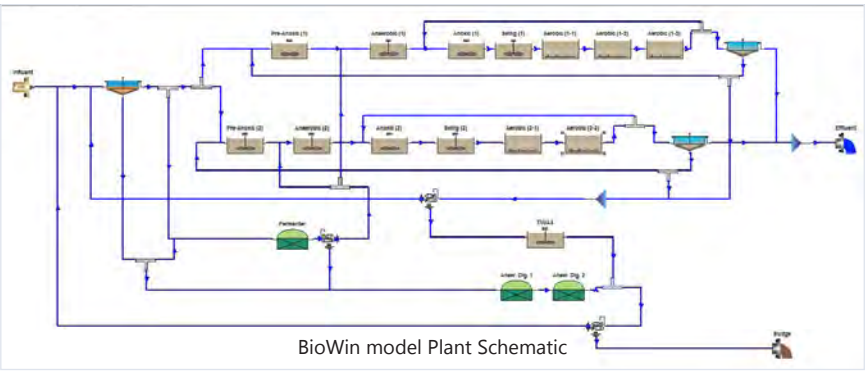
The hydraulic capacity of the existing plant overall is adequate to treat 2037 average and maximum month flows. While the design hydraulic capacity of the plant is lower than the projected 2037 peak hour flows, hydraulic calculations show that only a few pinch points will require upgrades to increase overall plant hydraulic capacity for the projected 2037 flows.



Treatment Capacity

Current plant performance was determined based on available effluent and process data. Future plant performance was approximated using BioWin modeling.

The existing plant has ample capacity for treatment of conventional pollutants (BOD, TSS) through 2037. Potential changes in operational strategies and planning for process upgrades will need to begin when flows and loads increase to about half of the projected 2037 values or about 9.2 mgd.



Near-Term

Process Equipment Improvements Timeline

Longer-Term

Influent lift pumps capacity - currently being addressed	Smaller primary effluent lift pump capacity - address within 5 years	UV disinfection system hydraulic capacity - address within 5 years	UV disinfection system treatment capacity - address within 5 years	WAS thickening equipment age - address within 5 years	Side 2 clarifier hydraulic capacity for 2037 - re-evaluate in 10 years
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FUTURE TREATMENT PLANT ALTERNATIVE ANALYSIS & RECOMMENDATIONS

Evaluation Matrix for Alternative Development

The drivers for long-term process upgrades are increases in influent flows and loads and future permit limits. Both are unknown at this time. A combination of drivers was used to develop alternatives. In addition, alternatives to replace aging and underperforming equipment were developed.

Evaluation Scenarios		Flow and Load Conditions	
		2037 Process Alternatives	2037 Hydraulic Alternatives
Effluent Quality Conditions	Current Nutrient Limits	1. Alternatives for Compliance with Current Permit Limits at 2037 Flows & Loads	--
	Stricter Nutrient Limits	2. Alternatives for Compliance with Stricter Nutrient Limits at 2037 Flows and Loads	--
	Other	3. Alternatives for Compliance with E. Coli Limits at 2037 Flows	4. Alternatives for Meeting Plant Hydraulic Capacity Requirements

Number of Developed Alternatives:

6

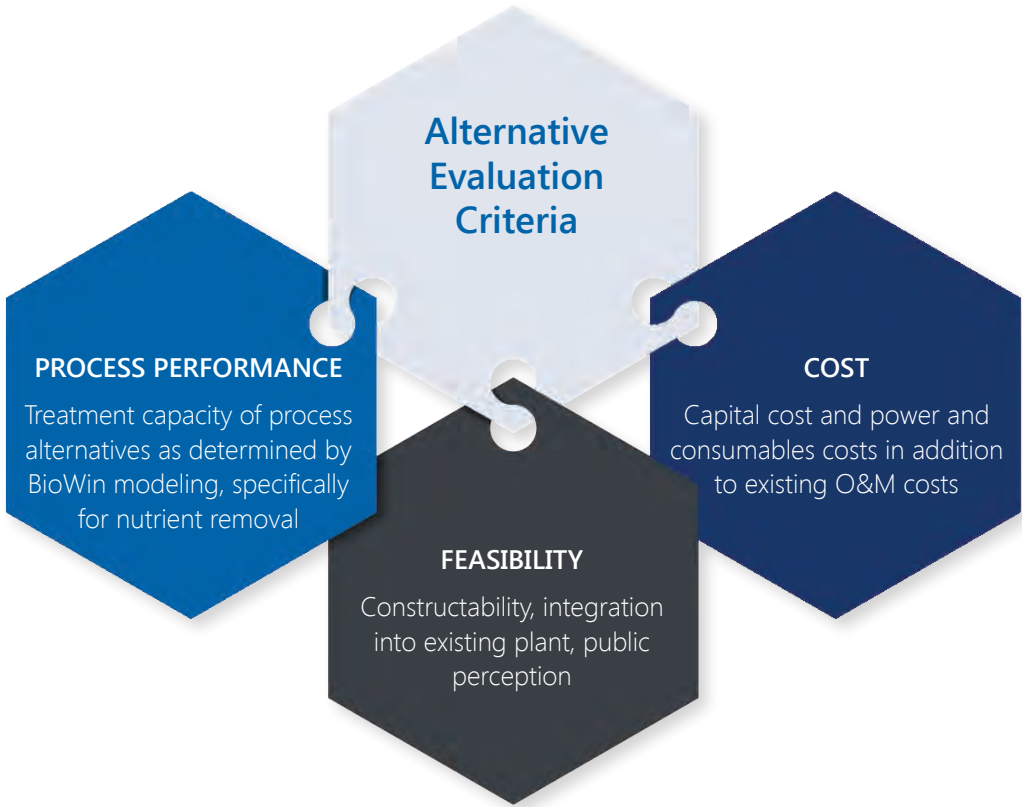
 Process Alternatives

2

 Discharge Alternatives

6

 Equipment Alternatives



Recommendations

With few exceptions, the existing WWTP equipment is adequate for providing reliable service through the planning period. With the diversion of irrigation water to the poplar farm, overall permit compliance with nutrient limits is predicted to be achievable until flows and loads reach about half of the projected 2037 levels. Planning for nutrient removal upgrades should begin as triggered by conditions summarized below.

Ongoing	<ul style="list-style-type: none"> Monitor the Montana 303(d) list for any new impairment listings for the Clark Fork River
2020-2024	<ul style="list-style-type: none"> Replacement/modification of equipment as scheduled on the Missoula CIP
2022	<ul style="list-style-type: none"> Check the MDEQ schedule for TMDL development to see if the Middle Clark Fork is included for development of new nutrient TMDLs; call DEQ staff to confirm; repeat 5 years later if not listed

Trigger Event 1: MDEQ listing of Clark Fork for Nutrient TMDL development	Trigger Event 2: Annual average flows are nearing 9.2 mgd or 2027	Trigger Event 1 and/or 2 or 2027
<ul style="list-style-type: none"> Establish ongoing communication with appropriate MDEQ personnel to be well-informed on progress and permit implications of new TMDLs Check on Circular DEQ-12B and current Variance nutrient limits Evaluate the value of a river study for showing impact of WWTP influent on river quality to be used in application for individual variance 	<ul style="list-style-type: none"> Evaluate the plant's nutrient removal performance Re-evaluate projected growth rates and associated rates of increase in plant flow and load 	<ul style="list-style-type: none"> Begin planning for plant upgrades to ensure continued adequate nutrient removal capacity Select a nutrient treatment upgrade strategy and initiate the funding/pre-design/design process

Near-Term Costs

Included in CIP

Long-Term Costs

The illustration shows a person in a business suit holding a briefcase, standing next to a large gear mechanism. A lightbulb is part of the gear system, and a dollar sign is at the end of the chain of gears, symbolizing the connection between ideas, engineering, and cost.

2037 Process Alternatives for Current Nutrient Limits

Capital Cost:	\$0.26 million - \$7.47 million
Additional Annual O&M Cost:	\$0 - \$124,000

2037 Process Alternatives for Stricter Nutrient Limits

Capital Cost:	\$11.8 million - \$52.2 million
Additional Annual O&M Cost:	\$61,000 - \$375,000

CAPITAL IMPROVEMENTS PLAN, 2020-2024

This CIP includes items recommended by the Facility Plan, as well as items developed by the City. Collection system improvements were based on a combination of known issues and deficiencies identified in the Facility Plan.

Capital Improvements		Total	FY20 ²		FY21		FY22		FY23		FY24	
			CIP	Sewer Dvlpmt Fund	CIP	Sewer Dvlpmt Fund	CIP	Sewer Dvlpmt Fund	CIP	Sewer Dvlpmt Fund	CIP	Sewer Dvlpmt Fund
Wastewater Treatment Plant	Wastewater Lab Expansion	\$295,000		\$295,000								
	Influent Pump Replacement	\$204,545	\$100,000		\$51,500		\$53,045					
	Wastewater Facility Roof Replacement	\$150,000	\$150,000									
	UV Lamp Upgrade	\$156,560			\$156,560							
	Primary Effluent Overflow Basin Adjustable Weir	\$82,400			\$82,400							
	Atlas Copco Compressor Replacement	\$41,200			\$41,200							
	Side 2 Primary Effluent Lift Pump	\$114,577					\$114,577					
	UV Level Control Gates	\$360,706					\$360,706					
	Miscellaneous Improvements	\$1,035,071	\$269,502		\$231,750		\$206,876		\$169,373		\$157,571	
	60" Effluent Pipe	\$257,884							\$257,884			
	Thickening and Solids Handling Upgrade	\$2,127,212									\$2,127,212	
	Treatment Plant Total	\$4,825,155	\$519,502	\$295,000	\$563,410		\$735,204		\$427,256		\$2,284,783	
Garden City Compost	Trommel Screen	\$355,000	\$355,000									
	Replace #350 Cat Loader (not leased)	\$248,000	\$248,000									
	Miscellaneous Improvements	\$90,300	\$80,000		\$10,300							
	Garden City Compost Phase 2	\$4,713,369							\$458,945		\$3,545,353	\$709,071
	Garden City Compost Total	\$5,406,669	\$683,000		\$10,300				\$458,945		\$3,545,353	\$709,071
Collection System	Collection System Immediate Priorities											
	University FM Replacement	\$284,000		\$284,000								
	DJA Building Sewer Extension (W. Broadway & Maple)	\$336,000		\$336,000								
	Reserve St LS Replacement	\$1,038,000	\$519,000	\$519,000								
	Grant Cr LS Improvements	\$488,230	\$34,000		\$131,325	\$322,905						
	Momont #2 LS Replacement	\$638,178			\$51,500		\$164,461	\$422,217				
	STEP Decommissioning Projects											
	Southpointe/Marias STEP Decommissioning	\$180,860	\$180,860									
	Lameroux Ln & Birdie Ct STEP Decommissioning	\$306,157			\$306,157							
	Maloney Ranch/Bigfork Rd STEP Decommissioning	\$239,395							\$239,395			
	DJ Drive/Linda Vista Blvd STEP Decommissioning	\$282,836					\$282,836					
	Longer Term Priorities											
	Fort Missoula Lift Station Rehabilitation	\$193,084					\$193,084					
	Upstream of Momont #1 LS Gravity Main Upsizing	\$1,248,910									\$424,629	\$824,280
	East Broadway LS Force Main Extension	\$1,174,900							\$399,466	\$775,434		
	River Front Triangle Main Upsize	\$175,100				\$175,100						
	South Ave Gravity Main Extension	\$412,000				\$412,000						
	Infiltration/Inflow Study	\$103,000			\$103,000							
	Annual Needs											
	Sewer Main Rehabilitation Program ³	\$6,727,737	\$1,267,200		\$1,305,216		\$1,344,372		\$1,384,704		\$1,426,245	
	Miscellaneous System Improvements	\$1,327,284	\$250,000		\$257,500		\$265,225		\$273,182		\$281,377	
	Collection System Total	\$15,155,670	\$2,251,060	\$1,139,000	\$2,154,698	\$910,005	\$2,249,978	\$422,217	\$2,296,746	\$775,434	\$2,132,251	\$824,280
Wastewater/Compost Utility Total		\$25,206,982	\$3,453,562	\$1,434,000	\$4,675,108	\$910,005	\$2,985,182	\$422,217	\$3,182,948	\$775,434	\$5,835,175	\$1,533,351
CIP Total / Sewer Development Fund Total		\$20,131,975 / \$ 5,075,007										
Cost Projection Factor (3% / year) ¹			1.000		1.030		1.061		1.093		1.126	

¹ Estimates of probable cost in 2019 dollars. Costs presented include the cost projection factor of 3% inflation per year.

²Fiscal year 2020 from July 2019 - June 2020

³Assumes 0.5% of total collection system (1.6 miles of gravity main) replacement per year at a cost of \$150 per lineal foot.

