City of Saratoga Springs

Sewer Capital Facilities Plan

Project No. 305-19-04

Prepared by:

BOWEN COLLINS & ASSOCIATES

October 2020

SEWER CAPITAL FACILITIES PLAN

October 2020

Prepared for:

SARATOGA SPRINGS

Prepared by:

BOWEN COLLINS & ASSOCIATES

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CHAPTER 1
INTRODUCTION AND BACKGROUND

INTRODUCTION

The City of Saratoga Springs has retained Bowen Collins & Associates (BC&A) to prepare an updated sewer capital facilities plan (CFP) for the City's wastewater collection system. The primary purpose of this Sewer Capital Facilities Plan is to provide recommended improvements to resolve existing and projected future deficiencies in the City of Saratoga Springs wastewater collection system based on the City's adopted General Plan. As part of this process, an Impact Fee Facilities Plan following the requirements of Section 11-36a of Utah code will be created, but it is included in a separate report.

This report was last updated in June of 2018. Since that time, the City has experienced significant growth and it has also completed several large sewer projects, which significantly affect planning. Given the amount of change that has occurred recently, an update was necessary to make sure the City is adequately prepared for the future.

SCOPE OF SERVICES

The general scope of this project involved a thorough analysis of the City of Saratoga Spring's sewer system and its ability to meet the present and future wastewater needs of its residents. As part of this project, BC&A completed the following tasks:

Task 1.1: Collect and review existing information pertinent to the City's existing sewer system including revised annexation plans.

Task 1.2: Project future growth in the City and use gathered information to update the City's sewer system models. This includes an existing conditions model, a 10-year growth model, and a buildout conditions model, which were used to identify existing deficiencies, predict future deficiencies, and evaluate possible improvement projects to remedy identified deficiencies.

Task 1.3: Perform system analysis described in Task 1.2 and develop conceptual cost estimates for the identified projects. Coordinate with City staff to coordinate on the projects and add any maintenance related projects that should be identified.

Task 1.4: Use the City's existing sewer inventory to update the documented existing facilities in the Impact Fee Facilities Plan (separate report).

Task 1.5: Develop a Capital Facilities Plan (this report) that can be used by City personnel for budgeting and planning purposes. Meet with City personnel to develop project prioritization criteria for recommended improvements and to develop a recommended implementation schedule.

Task 1.6: Attend progress and coordination meetings for the project and attend a City Council meeting to answer questions regarding the plans before adoption of the Impact Fee Facilities Plan.

Task 1.7: Prepare for and attend a meeting for stakeholders at which comments from the stakeholders are obtained. Assist City staff in addressing stakeholder comments.

Task 2: Develop an Impact Fee Facilities Plan and document it in the Impact Fee Facilities Plan report. (See the separate Impact Fee Facilities Plan report for additional information.)

Task 3: Develop an Impact Fee Analysis and document it in the Impact Fee Analysis report. (See the separate Impact Fee Analysis report for additional information.)

This document is a working document. Some of the recommended improvements identified in this report are based on the assumption that development and/or potential annexation will occur in a certain manner. If future growth or development patterns change significantly from those assumed and documented in this report, the recommendations may need to be revised.

AUTHORIZATION

The initial draft facility plan study and associated report were completed in April 2020. The final plan was completed October 2020.

PROJECT STAFF

The project work was performed by the BC&A team members listed below. Team member's roles on the project are also listed. The project was completed in BC&A's Draper, Utah office. Questions may be addressed to Justin Dietrich, Project Manager at (801) 495-2224.

Keith Larson	Principal-In-Charge
Justin Dietrich	Project Manager
Wyatt Andersen	Staff Engineer

CHAPTER 2
EXISTING SYSTEM DESCRIPTION

SERVICE AREA

The City of Saratoga Springs, which first incorporated in 1997, is bounded to the west by the Lake Mountains and Eagle Mountain City and to the east and northeast by Utah Lake and Lehi City. Figure 2-1 shows the approximate planning extent of Saratoga Springs along with the City's major collection system components. The topography of the majority of the City slopes west to east toward either Utah Lake or the Jordan River. For the purposes of this report, it has been assumed that the future service area of the City's wastewater collection system will be limited to the annexation boundaries of the City as shown in Figure 2-1.

For convenience and to match the convention of the last CFP, the City's overall area has been divided into three general areas for the identification of projects. These are shown in Figure 2-1 and include the North Area, South Area, and Teguayo Area. Generally, properties currently flowing to the Posey Lift Station are included in the North Area and properties currently flowing to the Inlet Park Lift Station are included in the South Area. Areas to the far south that will require the construction of a new lift station are included in the Teguayo Area.

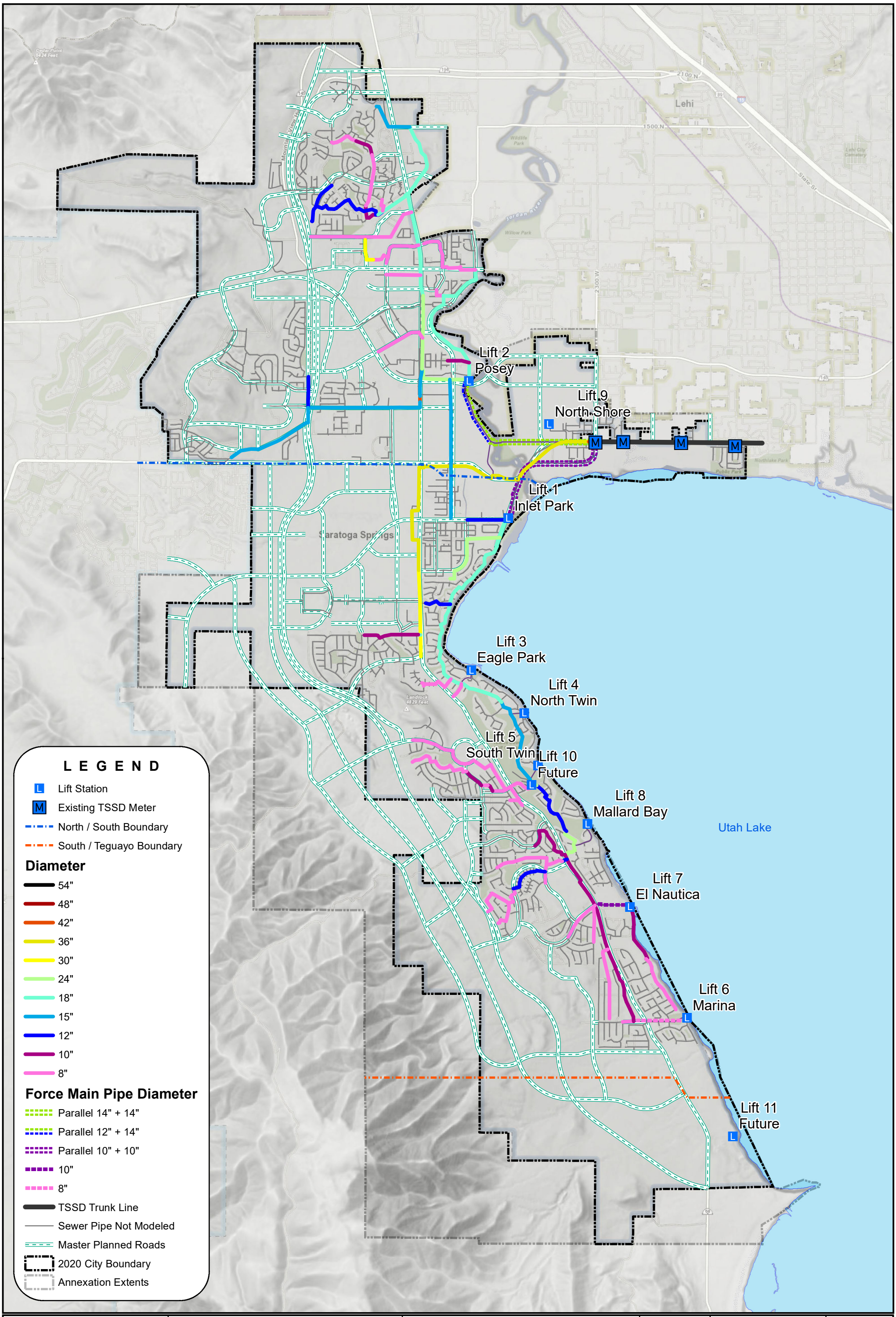
EXISTING FACILITIES

When the City was new, much of its existing infrastructure was built by developers as part of individual developments. This infrastructure was then turned over to the City as the developments were incorporated into the City. Because of how the system was constructed, much of the sewer collection infrastructure currently owned by the City originally had associated obligations to be paid to the developers who built the infrastructure as new development connected to the facilities. These obligations, referred to as pioneering agreements, have long been a big part of past City infrastructure evaluations and have required detailed consideration in the past. Today however, almost all of the pioneering agreements have been retired.

LIFT STATIONS

The City's entire sewer production is currently treated at the Timpanogos Wastewater Treatment Plant (WWTP), which is owned by the Timpanogos Special Services District (TSSD). This plant is located near the northeast corner of Utah Lake at a slightly higher elevation than the shoreline of the lake that runs the length of much of the City. As a result, much of the City's service area must be pumped to gravity pipelines that flow to the treatment plant.

The Posey Lift Station collects flow from the north end of the City while the Inlet Park Lift Station collects flow from the south end. Both of these lift stations have historically pumped through force mains to discharge into a TSSD 54-inch main at approximately 7350 North Saratoga Road (Lehi City address system). However, a large new section of gravity outfall has been constructed that will shorten the force mains associated with these lift stations (especially for Inlet Park). This new gravity outfall is also part of a larger system of improvements that will capture and convey by



BOWEN COLLINS & ASSOCIATES

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

EXISTING SEWER COLLECTION SYSTEM

NORTH:

SCALE: 0 2,000 4,000 Feet

FIGURE NO. 2-1

P:\Saratoga Springs\305-19-03 2019 Sewer CFP, IFFP & IFA Update\4.0 GIS\Figure 2-1 Existing Collection System.mxd wandersen 9/17/2020

gravity a number of areas that currently draining to the Posey and Inlet Park Lift Stations. While the lift stations will continue to be needed after these gravity improvements are completed, but the amount of effluent these lift stations will need to pump will diminish significantly.

There are six other smaller lift stations that discharge into the City's Inlet Park sewer trunk main. This trunk begins at Harbor Park Way and Redwood Road and flows north to the Inlet Park Lift Station.

Table 2-1 summarizes some of the characteristics of each lift station. Lift station capacity is based on the reliable capacity of each station. Reliable capacity is defined as the capacity with one pump out of service. (e.g. For a pump station with three pumps, reliable capacity is the capacity of two pumps running; the other is a standby.)

Table 2-1
Existing Public Lift Stations

Lift Station	Address[a]	Impeller Size	Wet Well Volume[c] (gallons)	Pump Count & Motor Size (HP)	Design Flow (gpm)	Design Head (ft)
1 – Inlet Park	400 S. Saratoga Rd	14"	4,600	3 – 40	3,650[b]	72
2 – Posey	Pioneer Crossing, Jordan River	15"	5,200	3[d] – 50	3,300[b]	78
3 – Eagle Park	1448 S. Cottonwood Lane	4"	2,500	2[d] – 7 ½	110	
4 – North Twin	1800 S. Centennial Blvd	4"	2,500	2 – 7 ½	110	
5 – South Twin	2170 S. Centennial Blvd	4"	2,500	2 – 7 ½	110	
6 – Marina	275 E. Cascade Court	4"	2,500	2[d] – 25	350	140
7 – El Nautica	100 W. 3000 S. (Harbor Bay)	6"	3,500	3 – 20	550[b]	140
8 – Mallard Bay	2590 S. Shorewood Drive	4"	575	2 – 15	225	91
9 – North Shore	900 E. 400 N.	11"	3,500	3 – 20	825	48

[a] Addresses are approximate
[b] Estimated capacity with two pumps running
[c] Values shown represent approx. effective wet well volume based on as-built drawings and wet well level settings
[d] Lift stations indicated include provisions to add an additional pump on the existing manifold

All of the City's lift stations are connected to the City's SCADA system. The SCADA system currently provides real time data collection at each station for items such as pump status and wet well level.

COLLECTION SYSTEM

Table 2-2 lists the recorded length of pipe in the City's collection system as documented in the City's geographic database as of September 2020.

Table 2-2
Saratoga Springs Collection System Pipe Lengths

Diameter (in)	Length (ft)	Length (mi)
Gravity Mains		
Unknown	4,295	0.81
6	1,042	0.20
8	540,418	102.35
10	38,234	7.24
12	34,006	6.44
15	21,676	4.11
18	29,357	5.56
21	5,504	1.04
24	12,588	2.38
36	15,059	2.85
42	4,264	0.81
46	2,127	0.40
Total	**708,570**	**134.19**
Pressure Force Mains		
Unknown	6,331	1.20
4	3,222	0.61
6	3,548	0.67
8	1,022	0.19
10	12,963	2.46
12	3,246	0.61
14	13,180	2.50
Total	**43,512**	**8.24**
Total All Pipes	**752,082**	**142.43**

It should be noted that because of the rapid growth in the City, there are some portions of the existing collection system that have not yet been inventoried as part of the City's geographic database. The City is continuously collecting data to inventory its sewer manholes and sewer mains as part of its asset management program. As it moves forward, the City is also requiring developers to submit manhole and sewer main data in a compatible geographic database and format to aid in the collection of asset management data. It should be emphasized that those areas with missing manhole and pipeline data consist strictly of smaller diameter collection piping for individual project level improvements. As a result, none of the data remaining to be collected is necessary for the completion of this study. All the data required to evaluate larger diameter system level improvements is included in the City's geographic database.

METERING STATIONS

At the downstream end of the collection system, the City's sewer flow is metered before being discharged into TSSD's 54-inch trunk line. Table 2-3 summarizes the characteristics of the four existing metering stations serving the City.

Table 2-3
TSSD Sewer Metering Stations for Saratoga Springs

Meter Station	Address	Size	Count	Type
Saratoga Road	145 North Saratoga Road	24" with nested 12"	1	Parshall Flume with Radar
Willow Glen	1850 E 145 N	3"	1	Parshall Flume with Radar
Loch Lomond	575 W 145 N	3"	1	Parshall Flume with Radar
Perelle	2230 E 145 N	3"	1	Parshall Flume with Radar

TREATMENT

All of the City's wastewater is treated at the Timpanogos Wastewater Treatment Plant (WTP). TSSD is responsible for all capacity and treatment requirements from the discharge point of the Posey and Inlet Park lift stations. However, Saratoga Springs does monitor odor produced in the City's collection system and adds odor reducing bacteria as needed throughout the collection system to reduce odor problems as it gets further down the system to the TSSD WTP.

CHAPTER 3
PROJECTED WASTEWATER SYSTEM GROWTH

In order to do any kind of future planning, it is necessary to project wastewater flows increases in the future. The purpose of this chapter is to project future wastewater flows associated with City growth.

EQUIVALENT RESIDENTIAL CONNECTIONS

Existing development in Saratoga Springs was quantified using an Equivalent Residential Connection (ERC). ERCs are a way to provide a common unit of measurement for both residential and non-residential development to provide a development total for the City. ERCs in Saratoga Springs are based on average wastewater production for a typical residential unit as defined subsequently in this chapter.

EXISTING DEVELOPMENT

As of July 2019, the City had approximately 8,385 active ERC's. For the same period, the Kem C. Gardner Policy Institute at the University of Utah estimated the population of the City to be 34,628. This equates to just over 4.1 persons per ERC. Projections for 2020 have not yet been released but the number of existing ERCs in the City system is 9,035.

GROWTH PROJECTIONS

Growth in the City has been projected based on projections prepared by Zions Public Finance. Zions Public Finance has provided growth projects in ERUs for Saratoga Springs between the years 2019 and 2035, which can be see in Appendix A. Beyond 2035, growth has been estimated using a logistic growth curve and a projected buildout number of ERCs at buildout of 71,500. This value has been estimated using the City's General Plan and expected development densities. The planned buildout density within the City is shown later in this report (see Figure 6-1).

Detailed short-term growth projections for the City are summarized in Table 3-1. Longer term projections are summarized in Table 3-2.

Table 3-1
Short-term ERC Growth Projections – 10-Year Planning Window

Year	Total Projected ERCs	Annual Projected Growth Rate
2020	9,035	-
2021	9,635	6.64%
2022	10,235	6.23%
2023	10,785	5.37%
2024	11,335	5.10%
2025	11,885	4.85%
2026	12,435	4.63%
2027	12,985	4.42%
2028	13,535	4.24%
2029	14,085	4.06%
2030	14,635	3.90%

Table 3-2
Long-term ERC Growth Projections – Through Buildout

Year	Total Projected ERCs	Average Annual Growth Rate
2020	9,035	-
2025	11,885	6.31%
2030	14,635	4.63%
2035	17,385	3.76%
2040	20,135	3.16%
2045	22,885	2.73%
2050	25,635	2.40%
2055	28,385	2.15%
2060	31,135	1.94%
Buildout	71,500	-

ESTIMATING EXISTING SEWER FLOWS

Utah Administrative Code R317-3-2 indicates that, "New sewer systems shall be designed on the basis of an annual average daily rate of flow of 100 gallons per capita per day (0.38 cubic meter per capita per day) unless there are data to indicate otherwise." A review of available flow monitoring data for the system would indicate a lower design flow rate is merited.

Although the City is still relatively young, it has a record of discharge flow rates at its main sewer outfall that has been collected by Timpanogos Special Service District (TSSD) since the City's inception. During the first several years of the City's existence, metered flow results varied significantly from month to month and year to year. This is believed to be the result of meter inaccuracies at the connection points to TSSD. In 2008, however, new meters were

installed, and consistent results have been observed since that time. The District also has many other member entities with even longer flow records from which average flow can be calculated.

For the purposes of establishing historic sanitary sewer flow rates, BC&A examined available TSSD records of average monthly flow as part of the District's 2019 CFP. Based on these records, calculated peak month, average day flow per ERC in the District is 205.8 gpd for domestic flow and 33.3 gpd for infiltration. This equates to a total for all flow of 239 gpd/ERC. It is recommended that this be used at the basis for planning in the City. This represents a modest decrease form the City's historic standard of 255 gpd per ERC and is likely the result of ongoing conservation efforts.

Tables 3-3 and 3-4 summarize the projected wastewater flows in Saratoga Springs based on projected ERC growth as identified above and recommended planning flow rates. Table 3-3 includes annual projections for the next 10 years. Table 3-4 looks at longer term projections through buildout.

Table 3-3
Short-term Peak Month, Average Day Flow Projections – 10-Year Planning Window

Year	Projected Domestic Flow (mgd)	Projected Infiltration (mgd)	Projected Total Flow (mgd)
2020	1.72	0.30	2.02
2021	1.83	0.32	2.15
2022	1.94	0.34	2.29
2023	2.05	0.36	2.41
2024	2.15	0.38	2.53
2025	2.26	0.40	2.65
2026	2.36	0.41	2.78
2027	2.47	0.43	2.90
2028	2.57	0.45	3.02
2029	2.68	0.47	3.15
2030	2.78	0.49	3.27

Table 3-4
Long-term Peak Month, Average Day Flow Projections – Through Buildout

Year	Projected Domestic Flow (mgd)	Projected Infiltration (mgd)	Projected Total Flow (mgd)
2020	1.72	0.30	2.02
2025	2.26	0.40	2.65
2030	2.78	0.49	3.27
2035	3.30	0.58	3.88
2040	3.83	0.67	4.50
2045	4.35	0.76	5.11
2050	4.87	0.85	5.72
2055	5.39	0.95	6.34
2060	5.92	1.04	6.95
Buildout	14.70	2.38	17.08

CHAPTER 4
HYDRAULIC MODELING

The Saratoga Springs sanitary sewer system was evaluated as part of this study using a hydraulic modeling computer program. A hydraulic computer model is a mathematical representation of the pipes, manholes, pumps, and wastewater flows found in the sewer collection system. Hydraulic computer models are useful because they allow the user to simulate operation of large, complex sewer systems and consider how future changes in flow will affect those systems.

MODELING SOFTWARE

The computer modeling software used in this study was Innovyze's InfoSWMM. InfoSWMM was chosen as the computer modeling software because of ability to simulate the full profile of sewer flows under gravity, pressure, and surcharging conditions.

GEOMETRIC MODEL DEVELOPMENT

There are two major types of data required to create a hydraulic model of a sewer system: geometric data and flow data. Geometric data consists of all information in the model needed to represent the physical characteristics of the system.

Modeled Pipelines

For the purposes of this study, it was only necessary to include the City's primary conveyance trunk lines as part of the hydraulic model. These system level improvements include those pipelines that serve more than a single development project and are consequently eligible for inclusion in impact fee calculations. In the future, the City could consider adding smaller, project level collection mains to the hydraulic model for inventory purposes. However, the more refined the analysis becomes, the more time, effort, and expense are needed to assemble and calibrate the model. Hence, it is important to consider the required accuracy and available budget when selecting sewer lines to model.

The major sewer mains included in the hydraulic model were shown in Figure 2-1 (see Chapter 2). The final selection of sewer lines included in this model was reviewed and approved by Saratoga Springs personnel. As part of the 2020 update, a number of additional pipelines were added to the model. This includes new pipelines that have been built since the last study or are currently being built. It also includes a number of additional existing pipelines at the south end of the system that have been added to the model to evaluate the City's options for conveying flow in this area.

Information on the physical characteristics of the pipes included in the model were collected and assembled by Saratoga Springs personnel. A basic framework for the model was developed using Saratoga Springs geographic information system (GIS) records. The City's GIS database includes information on the diameter, length, and location of each pipe to be included in the model. Some, but not all inverts are available in the City's GIS database. However, between the elevation data

available in the GIS database along with the survey data obtained by the City as part of this and previous master planning efforts, sufficient data was available to model main City trunklines, which is the extent of the scope of this plan.

Modeled Lift Stations

The four largest lift stations in the Saratoga Springs collection system were simulated as part of the hydraulic model. This includes the Posey, Inlet Park, El Nautica, and Marina lift stations. The other four existing lift stations serve relatively small service areas that are nearly built-out. Instead of modeling these three individual pump stations, their discharge flows were simply assigned as an inflow at their corresponding discharge manholes. Details for existing lift station characteristics were summarized in Chapter 2.

FLOW MODEL DEVELOPMENT

The second type of data required by the hydraulic model is sewer flow into the pipes being modeled. Required information includes magnitude of flow, point of entry into the system, and a description of how flow varies with time (to establish peak demand and consider the effects of flow travel time in the system).

Sewer flows for existing and future conditions were calculated based on projections of ERCs as estimated in the City's general plan and land use projections. Existing flows were distributed to the nearest manholes in the hydraulic model. Future flows were distributed into the collection system based on the nearest available collection lines or future collection lines that will be installed. The location of future pipes are indicated as part of the system improvements discussed in Chapter 6.

A distribution of flow over time was accomplished using two composite diurnal curves as shown in Table 4-1 and Table 4-2. Table 4-1 and Table 4-2 summarize the ratio of flow to average day flow over 24 hours. See Figure 4-1 for a visual representation of these diurnal patterns. These curves are based on flow monitoring within Utah County municipalities similar to Saratoga Springs. The curves estimate the average effect of all development including residential, commercial, and industrial demands. The curves in Table 4-1 and Table 4-2 include a maximum peaking factors of 2.5 (Pattern 1) and 2.15 (Pattern 2), respectively, to match the required peaking factor for interceptor and outfall sewers in State of Utah requirements. For this sewer collection system model, the curve with a peaking factor of 2.5 was used for pipes that are less than or equal to 15-inches in diameter, whereas the curve with a peaking factor of 2.15 was used for pipes that are greater than 15-inches in diameter.

These diurnal curves are applied at the nodes where flow is added to modeled system pipes, which is typically at the most upstream end of the smaller modeled pipes in the collection system. Additional attenuation occurs as flow from the city consolidates lower and lower in the system, which properly lowers the observed peaking in lower system pipes. The 2.15 peaking factor curve was calibrated such that large diameter, lower system pipes would see a peaking factor of 2.00 as per City standards and State of Utah requirements.

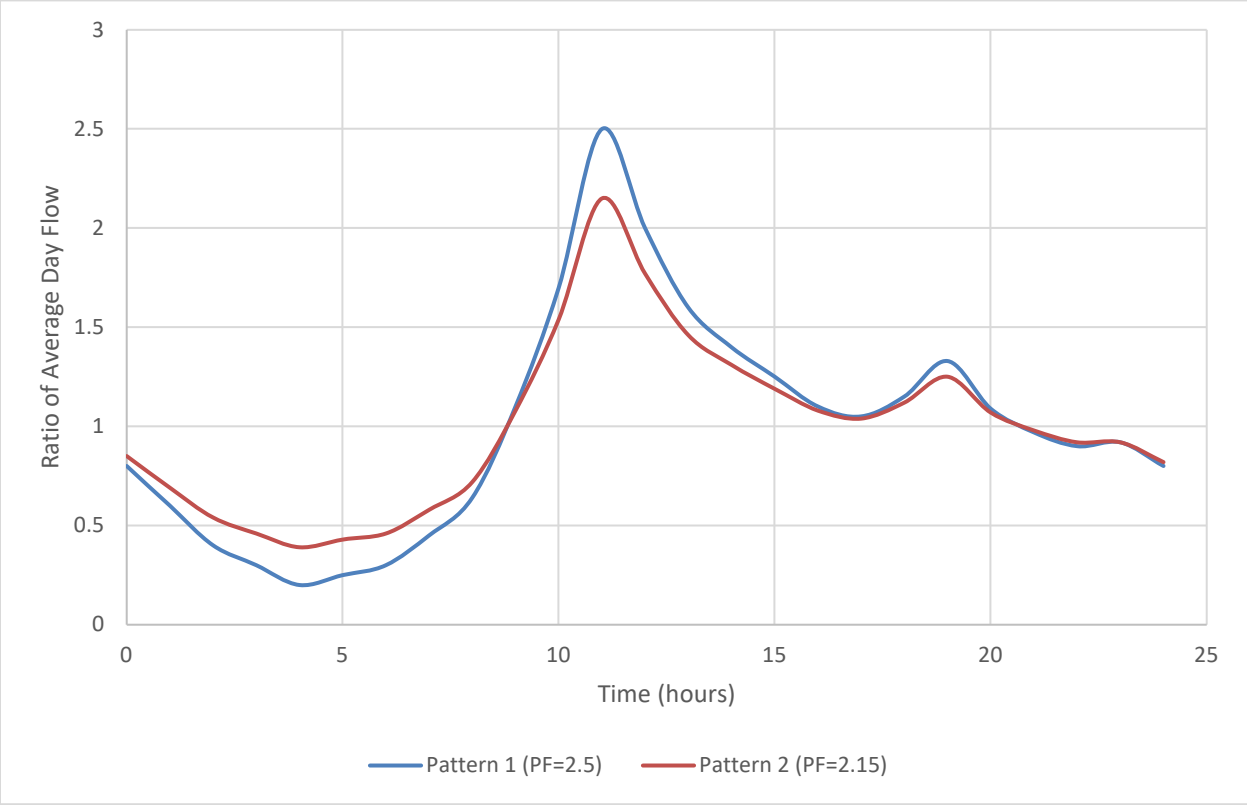
Table 4-1
Interceptor Hydraulic Model Diurnal Pattern 1 (Diameters 0-15")

Hour	Ratio of Average Day Flow
0	0.80
1	0.60
2	0.40
3	0.30
4	0.20
5	0.25
6	0.30
7	0.45
8	0.64
9	1.10
10	1.70
11	2.50
12	2.00
13	1.60
14	1.40
15	1.25
16	1.10
17	1.05
18	1.15
19	1.33
20	1.09
21	0.97
22	0.90
23	0.92
24	0.80

Table 4-2
Outfall Hydraulic Model Diurnal Pattern 2 (Diameters >15")

Hour	Ratio of Average Day Flow
0	0.85
1	0.69
2	0.54
3	0.46
4	0.39
5	0.43
6	0.46
7	0.58
8	0.72
9	1.08
10	1.54
11	2.15
12	1.77
13	1.46
14	1.31
15	1.19
16	1.08
17	1.04
18	1.12
19	1.25
20	1.07
21	0.98
22	0.92
23	0.92
24	0.82

Figure 4-1
Hydraulic Model Diurnal Pattern 1 and 2



CHAPTER 5
SYSTEM EVALUATION

With the development and calibration of a hydraulic sewer model, it is possible to simulate sewer system operating conditions for both present and future conditions. The purpose of this chapter is to evaluate hydraulic performance of the collection system and identify potential hydraulic deficiencies.

EVALUATION CRITERIA AND LEVEL OF SERVICE

In evaluating the performance of the collection system, it is necessary to first define the required level of service for the various components of the system. This level of service is the same for both existing and future customers:

Sewer Main Level of Service

Saratoga Springs Engineering Standards and Specifications (adopted July 2019) require that all sewer mains be designed such that the peak daily flow in the pipe is less than or equal to 80 percent of the pipe's full flow capacity. This design standard will be used as the level of service for system evaluation. Note that the capacity of a pipe at 80 percent full (peak flow to full flow capacity) is nearly equal to the hydraulic capacity of the pipe (depth to diameter) at 68 percent full.

Force Main Level of Service

Saratoga Springs Engineering Standards and Specifications require that lift station force mains should be designed such that peak velocity through the force main does not exceed 7 ft/sec. By eliminating excessive pipeline velocities, this standard optimizes pump efficiency, limits potential for hydraulic surge issues, and maximizes the life of the force main. It is also required that all force mains have a minimum diameter of 6 inches and that the maximum distance between clean outs along the pipeline be no greater than 1,200 feet. This is to facilitate cleaning of the force mains using the City's jet truck equipment (max reach of approximately 600 feet).

Lift Station Level of Service

Based on industry standards and good design practice, it is recommended that peak daily flow to a lift station not exceed 85 percent of the lift station's hydraulic pumping capacity. Allowing for a modest amount of capacity above projected flows accounts for unknowns associated with flow projections and mechanical wear at each lift station. The minimum design level of service for lift stations has correspondingly been established at 15 percent higher than estimated peak flows at build-out.

The minimum wet well volume for lift stations should be large enough to prevent excessive cycling of lift station pumps. Based on manufacture recommendations for pump operation, the maximum number of cycles per hour should be six or less. Exceeding this value will significantly shorten the

lifespan of the lift station pumps. The number of cycles that will occur at a lift station can be calculated using one of the following two equations:

Equation 1: $V_{min} \geq \frac{60 \times Q_D(Q_P - Q_D)}{N \times Q_P}$ When $Q_D < 0.5 * Q_p$

Equation 2: $V_{min} \geq \frac{15 \times Q_P}{N}$ When $Q_D \geq 0.5 * Q_p$

Where:

N – Maximum number of cycles per hour
Q_D – Peak design flow into the wet well
Q_P – Pump capacity out of wet well
V_{min} – Minimum wet well volume

Table 5-1 lists a summary of the evaluation criteria used in this capital facilities plan.

Table 5-1
Evaluation Criteria for System Level of Service

Criteria	Value
Design Sewer Flow Allowance per ERC including I&I (gpd)	239
Design Flow Peaking Factor for pipes less than or equal to 15 inches in diameter	2.5
Design Flow Peaking Factor for pipes greater than 15 inches in diameter	2.0
Maximum Allowable Peak Flow to Capacity Ratio for Peak Flow conditions	0.80
Maximum Velocity in Force Mains (ft/sec)	7.0
Maximum Distance Between Force Main Cleanouts (ft)	1,200
Maximum Allowable Peak Flow to Pump Capacity Ratio at Lift Stations	0.85
Maximum Cycles Per Hour at Lift Station (as a result of wet well volume)	6
Minimum Force Main Diameter (inches)	6

EXISTING COLLECTION SYSTEM ANALYSIS

Figure 5-1 shows the performance of the sewer system under existing flow conditions. Pipes in the figures are color coded to show the ratio of peak flow in the pipe to the pipe's full flow capacity. As can be seen in the figure, the existing collection system performs well under current conditions throughout the City. All lift stations appear to have adequate capacity to convey peak flow under existing conditions.

FUTURE COLLECTION SYSTEM ANALYSIS

For allocating future resources in this analysis, Saratoga Springs identified the location and magnitude of likely growth in the City. From these projections, BC&A developed short term (growth expected to occur in the next 1 to 10 years) and long-term (growth beyond the next 10 years) collection system models. These models were used to calculate the effect of projected growth on the performance of the Saratoga Springs collection system.

Short Term Development Analysis

Figure 5-2 shows the performance of the existing sewer system with additional loading from expected short term growth. The resultant deficiencies identify the immediate needs of the system. As can be seen in the figures, much of the collection system in the City continues to perform well, even with the growth expected to occur in the short term. However, there are some pipes that do not meet the level of service standards if the expected short-term growth was to occur. Capital improvement projects will be required to satisfy this growth.

The projects proposed to bring these pipelines up to the required level of service have been identified and described in Chapter 6. Figure 5-3 was created to help the City identify where existing bottlenecks are in the collection system, as of January 1st 2020, and help determine when the proposed projects will be needed based on the short-term growth that the City experiences. It should be noted that this figure does not account for recorded plats.

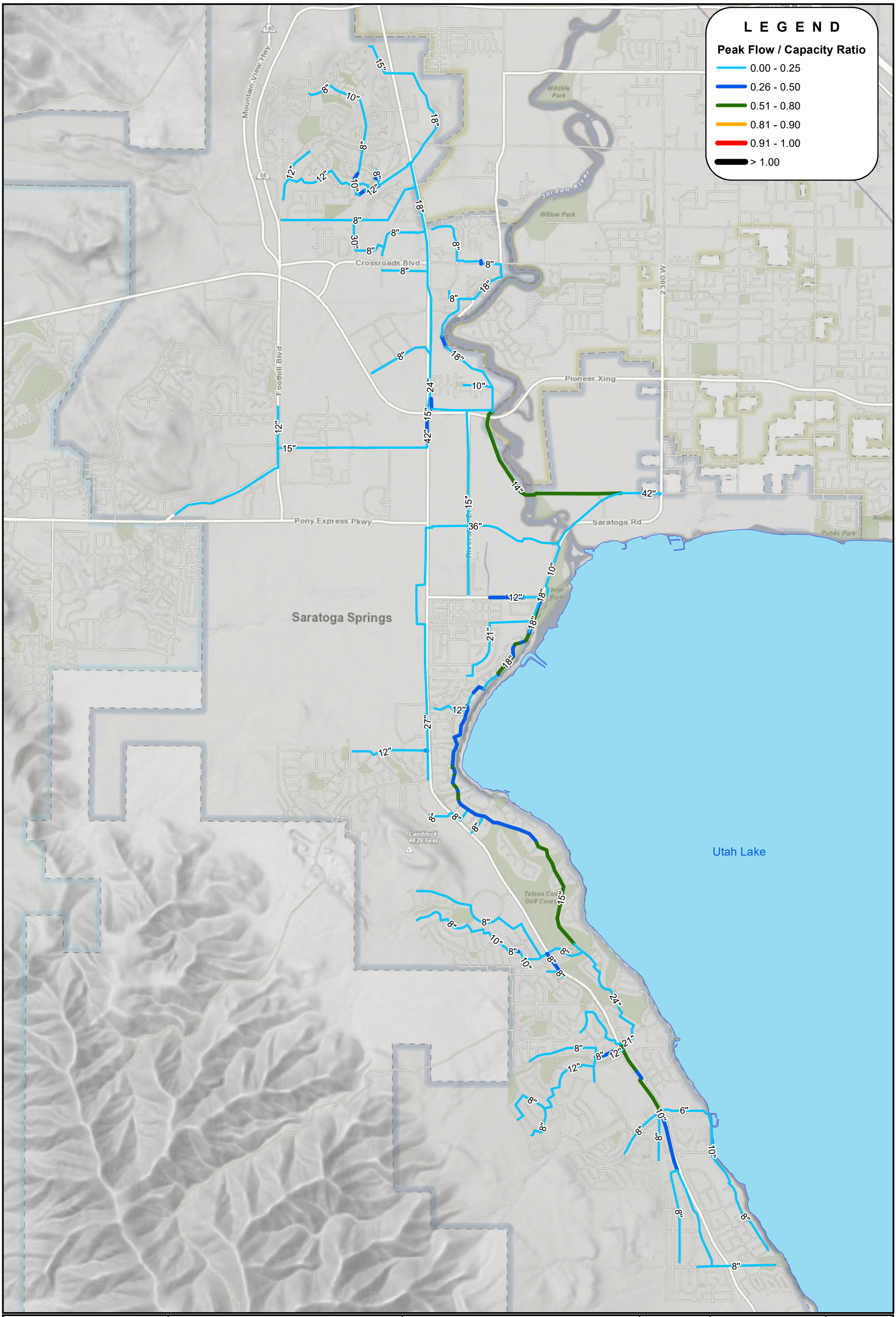
Growth Beyond Short Term

With the additional future growth projected in Saratoga Springs, it is expected that a number of improvements will be required to meet buildout conditions in the City. Additional trunks will need to be constructed to new areas and some existing trunks will need to be replaced with larger diameter pipes. Chapter 6 discusses conceptual improvements that will be needed to continue to serve growth in Saratoga Springs.

Lift Station Analysis

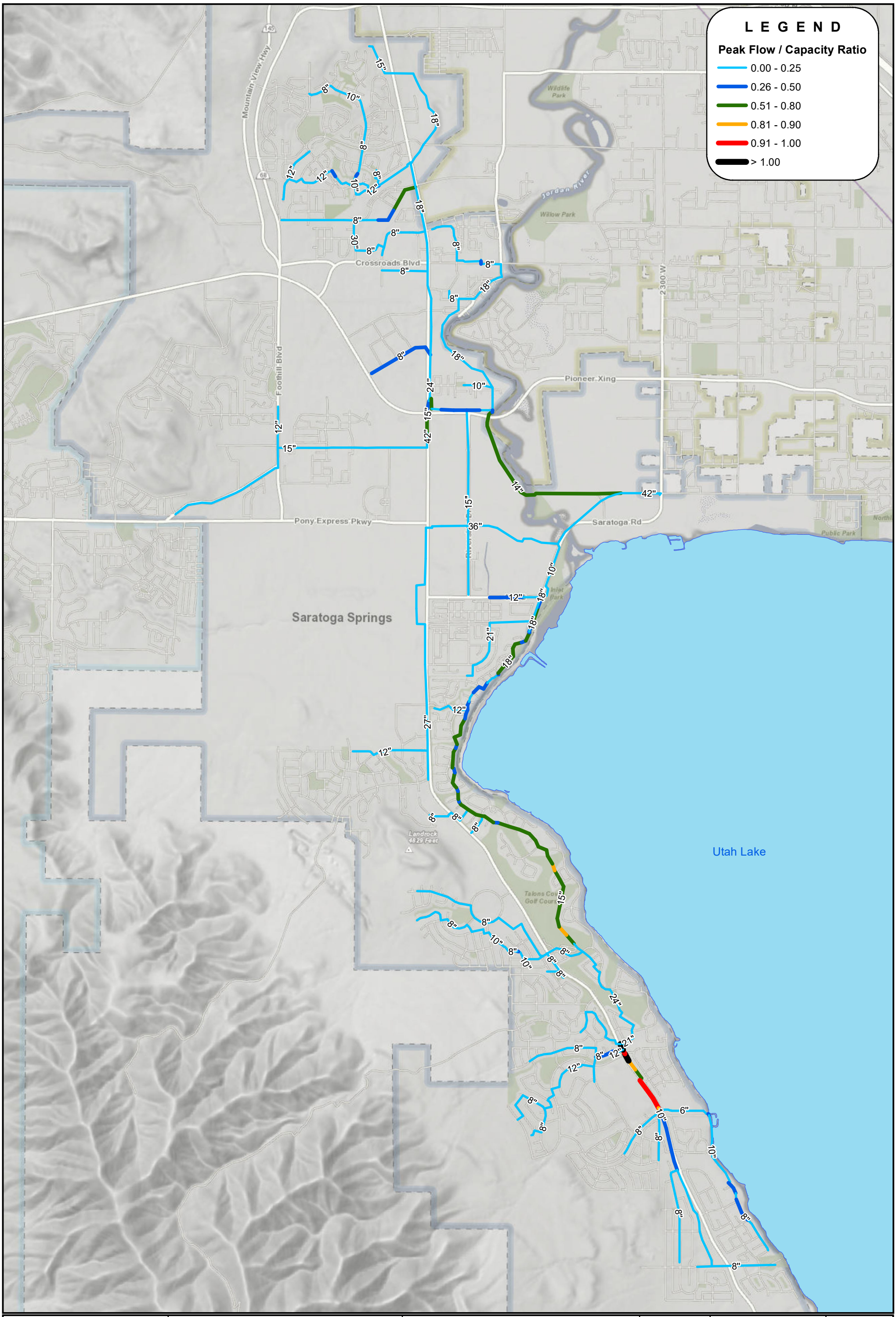
Table 6-3 in Chapter 6 compares the capacity at each lift station against the required capacity in the future conditions. All lift stations and force mains have capacity to serve expected growth in the future.

However, it should be noted that the future condition in which the Posey Lift Station has sufficient capacity depends on the completion of planned improvements in the upstream collection system (i.e. “the gravity improvements”) which purpose is to unload many parts of the City from the Posey Lift Station service area. The Posey Lift Station does not have sufficient capacity to handle projected 10-year growth without the completion of those projects. The timing of when this will occur depends on the pattern and pace of actual development over the next few years. Because of this pending capacity restriction, actual remaining capacity in the Posey Lift Station should be monitored closely as development within its service area continues. All force mains have sufficient capacity for the expected future loading at all lift stations.



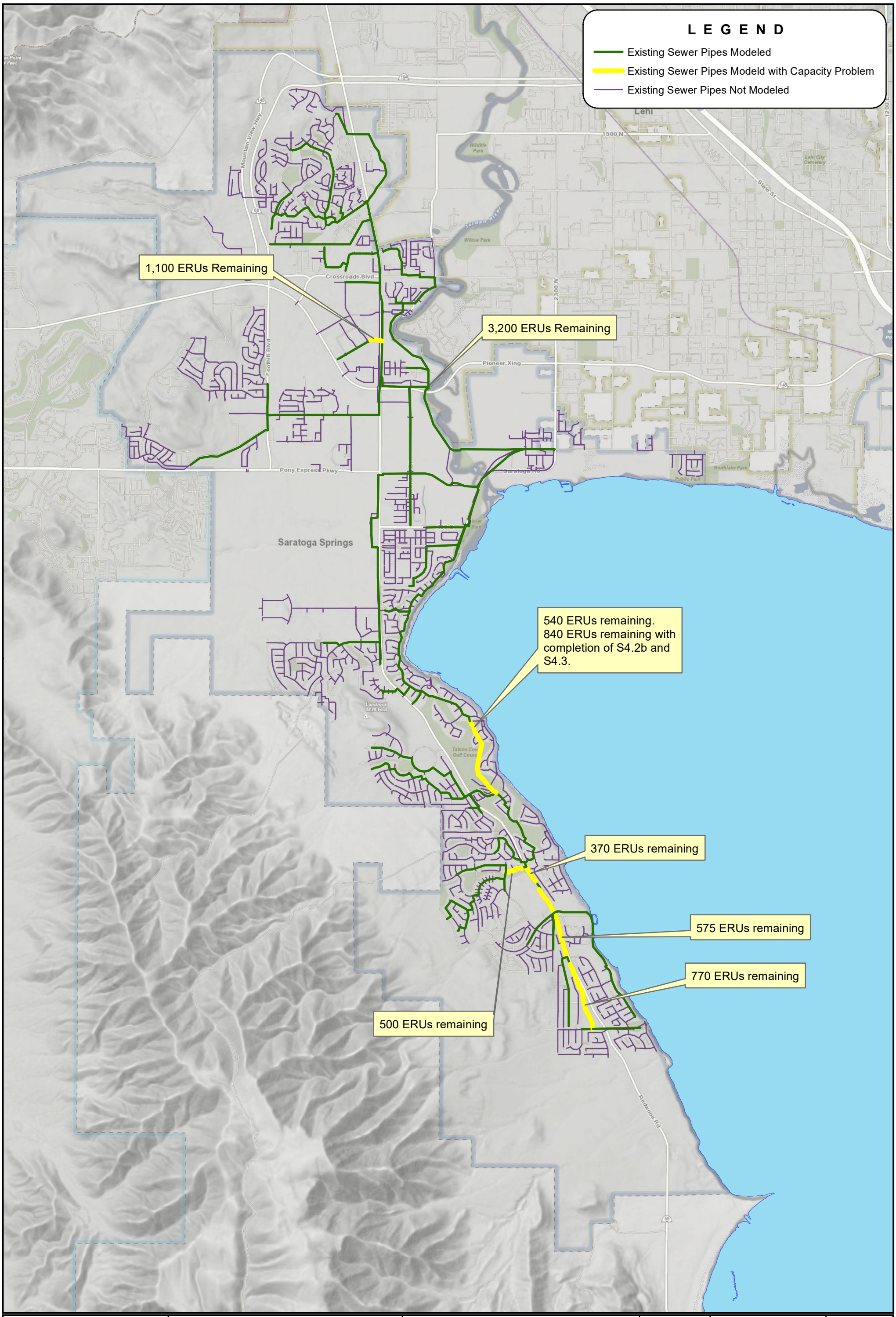
BOWEN COLLINS & ASSOCIATES	SARATOGA SPRINGS SEWER CAPITAL FACILITIES PLAN	EXISTING COLLECTION SYSTEM CAPACITY	NORTH: NORTH	SCALE: 0 1,500 3,000 Feet	FIGURE NO. 5-1

P:\Saratoga Springs\305-19-03 2019 Sewer CFP, IFFP & IFA Update\4.0 GIS\Figure 5-1 Existing Deficiencies.mxd wandersen 9/25/2020



BOWEN COLLINS & ASSOCIATES	SARATOGA SPRINGS SEWER CAPITAL FACILITIES PLAN	CAPACITY OF EXISTING SYSTEM WITH 10-YEAR GROWTH	NORTH: NORTH	SCALE: 0 1,500 3,000 Feet	FIGURE NO. 5-2

P:\Saratoga Springs\305-19-03 2019 Sewer CFP, IFFP & IFA Update\4.0 GIS\Figure 5-2 10 Year Deficiencies.mxd wandersen 9/21/2020



BOWEN COLLINS & ASSOCIATES

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

REMAINING CAPACITY

NORTH:

SCALE: 0 2,000 4,000 Feet

FIGURE NO. 5-3

P:\Saratoga Springs\305-19-03 2019 Sewer CFP, IFFP & IFA Update\4.0 GIS\Figure 5-3 Remaining Capacity.mxd wandersen 10/2/2020

CHAPTER 6
SYSTEM IMPROVEMENTS

The hydraulic model was used to evaluate various alternatives for servicing growth under projected short term and buildout conditions. For the purposes of this report, buildout is defined as full development of all property in the service area at current planning densities as defined in the City's land use element of the General Plan. The buildout densities used are shown in Figure 6-1. The following chapter describes the preferred conveyance option for accommodating flows from future growth.

SYSTEM IMPROVEMENT APPROACH

There are several different approaches that could be used to service future growth in Saratoga Springs. Prior to developing a recommended approach, BC&A and Saratoga Springs personnel examined previous master plan alternatives and several new alternatives identified during the course of the analysis supporting this capital facilities plan. In developing a preferred conveyance alternative, several issues were considered:

- **Cost –** A primary goal in developing a preferred conveyance alternative was to minimize overall cost. The sizing and alignment of future pipelines were optimized to convey projected flows in the most efficient manner possible. Projects have also been phased to defer projects that are more expensive where possible to try to achieve the lowest present worth cost of improvements.
- **Maintenance and Reliability –** Facilitating maintenance and providing maximum reliability was another important goal in developing a preferred alternative. Based on experience, one of the best ways to accomplish this goal is to minimize reliance on future lift stations. Both lift stations and force mains are the source of frequent maintenance. Lift stations are also vulnerable to power interruption and mechanical failure. They also require ongoing electrical pumping costs that add to the overall cost of operating the system. The improvements recommended here include the continuation of the approach to construct several new gravity mains that will allow as much of the City as possible to be conveyed to TSSD by gravity. This will significantly reduce the size of the collection areas currently served by the Inlet Park and Posey Lift Stations.
- **Disruption to Existing Residents –** Where possible, construction of new sewer mains through existing neighborhoods and paved roadways was avoided. By minimizing work in developed rights-of-way, disruption to traffic and residents can be minimized.

After considering these various issues, a preferred alternative for meeting future growth was identified as recommended below.

OVERALL RECOMMENDED IMPROVEMENTS

Figure 6-2 shows the approximate location of improvements recommended to meet future growth in Saratoga Springs through buildout. It should be noted that proposed sizes for pipes have been estimated based on projected flow, estimated pipe slopes developed using 5-meter digital elevation data, and the City's minimum slope criteria for sanitary sewer mains. Once detailed design of sewer mains commences, the pipeline sizes should be reviewed with design

pipe capacity based on the projected buildout flows in upstream sub-basins. Also shown in Figure 6-2 is the approximate collection area associated with each major trunk line improvement. It should also be noted that collection basins and pipeline alignments shown are approximate based on current understanding of projected development patterns and future road alignments. As the time for completion of each project approaches, the City should review each collection area and pipeline alignment in detail to optimize the location and functionality of each improvement.

As discussed in Chapter 2, the City can be separated into three areas, a north area (north of Pony Express and east of the Jordan River), a south area (south of Pony Express), and an additional area surrounding the proposed Teguayo development at the southernmost end of the City. Project planning for each of the areas are described below. The descriptions below have been arranged such that the main trunklines each have a single description even if that trunkline has been split into several different projects in this CFP (e.g. Trunkline S4 consists of projects S4.2b and S4.3 but only an overall S4[1] description has been included below). This has been done to avoid large blocks of repeated information and to concisely identify overall CFP recommendations. When necessary, additional "sub-project" information and project interdependencies have been identified.

North Area

N1. North Trunk – N1 is the last major component of the effort to meet the goal of connecting as much of the City service area as possible to pipelines that can drain to TSSD by gravity in the north area. This improvement will include a new gravity trunk line from Riverside Drive just south of Pioneer Crossing to the stubbed connection just west of the utility bridge at the Jordan River. The utility bridge is located just north of the Saratoga Road Jordan River crossing. Once this improvement is completed, a large portion of the north service area will be able to bypass the Posey Lift Station. While the river crossing and main trunkline east of the river were recently completed, 100 percent of the north service area will continue flowing through the Posey Lift Station until N1 is completed. After it is completed, the collection area for the Posey Lift Station will be reduced to the area shown in Figure 6-2.

One additional note is that the completion of the gravity lines described above will provide opportunity for the Posey Lift Station force main to be significantly reduced in length by connecting it to the new gravity trunk lines west of the river. This will increase the capacity of the lift station while at the same time reducing loading on it. The results of these effects are additional available lift station capacity to handle future growth and a significant reduction in long term pumping costs.

Project Interdependencies:

- N1c must be in place before N1e or N1f can be completed.
- N1f should be completed in conjunction with N1c.

[1] For reference, Projects S4.1 and S4.2a have already been completed and are therefore not shown in this CFP as a future project. There are many instances like this.

- N2a can be completed prior to N1c, but may require some temporary connections to the active trunkline in Redwood Road until N1c is completed.

N2. Exchange Drive Trunk – The remaining segment of a new trunk line between Market Street and Redwood Road is needed to collect wastewater from future development.

N3. 1400 North Extension – A new trunk line will need to be constructed along and parallel to 1400 North (SR73) to collect wastewater from future development in the area. An upstream segment of this outfall has already been completed, but this project is needed to complete the system.

N7. 145 North Collector at Outfall 1 – Expected development along 145 North will require trunklines to convey flow to the TSSD approved metering stations and outfalls. The recommended new pipeline projects meet this need.

N8. 145 North Collector at Outfall 2 – Expected development along 145 North will require trunklines to convey flow to the TSSD approved metering stations and outfalls. The recommended new pipeline projects meet this need.

South Area

S1. River Crossing Trunk – With the addition of the Teguayo Area to the City's collection system, additional conveyance at the bottom of the City system might be required in the future. If the assumptions regarding growth and future system loading are correct, a parallel trunkline will eventually be required. It should be emphasized that this project will not be needed until far into the future. This will give the City plenty of time to monitor growth and water use patterns to determine if the additional capacity is actually needed.

S2. Inlet Park Sewer Trunk Upgrade – Some of the existing Inlet Park Sewer Trunk that starts along Redwood Road at the south end of the City and continues north following the shoreline of Utah Lake will need to be upgraded to accommodate future wastewater flows. There are some sections which will be reaching critical capacity and must be upsized or bypassed within the next five years. These have been identified herein as well as in separate coordination with City staff. In this iteration of the CFP, the projects which make up S2 have been optimized to minimize disruption to existing streets in order to save cost and minimize disruptions to citizens.

S3. New Trunkline north of Beacon Point – A new trunk is recommended to be constructed from west to east at approximately 900 South (tying into Redwood Road at School House Road). The purpose of this project is to convey the flows down from future development on the Lake Mountain benches.

S4. New Gravity Outfall from Ring Road – These improvements consist of a series of new trunk lines to be constructed from near Ring Road north along Redwood Road to Grandview Blvd. Once these trunklines are constructed, the maximum practical area to flow out of the city from the South Area by gravity will be captured. Thereby, the Inlet Park Lift Station loading (and the amount of flow

conveyed by the lift station's upstream trunklines) will be minimized. Of particular concern are the trunklines upstream of the Inlet Park Lift station. These trunklines do not show sufficient capacity to serve the expected buildout growth. When the short term S4 improvements are constructed (along with Project L10), these critical trunklines will be unloaded and then able to handle projected growth long into the future.

S5. Foothill Trunk – A new trunk is recommended along the future Foothill Blvd to collect areas along the western edge of the City and to convey flow from the Teguayo Area. Construction of this pipeline will allow all developed areas above Foothill Blvd to be conveyed by gravity to TSSD.

Project Interdependencies:

- Connections to S5 cannot be made until S3 has been constructed

S6. Trunk North of Tickville Gulch – A new trunk is recommended between Pony Express Parkway and the future 400 South roadway (approximate). Construction of this pipeline will allow all upstream areas to be conveyed by gravity to the new gravity outfall on Redwood Road.

S7. Silver Fox Lane Upsize – The existing 8-inch sewer line in Silver Fox Lane appears to have just shy of needed capacity to convey projected future flows at buildout. It should be noted that the deficiency at this location is very small and will only occur if development occurs at maximum planning densities. As a result, this project has been included for informational purposes, but should not be completed any time soon. Instead, it is recommended that the City monitor development in the area to determine if the project is ultimately necessary.

L10. New Fairway Blvd Lift Station (Lift 10) – A new lift station is recommended at Fairway Blvd and Watson Drive. This lift station will intercept flows that would go to the Inlet Park Lift station and instead pump them up into the new gravity system (requires Trunk S4). This preserves capacity at the Inlet Park Lift Station and in all the conveyance lines between the proposed lift station and Inlet Park and thereby saves expensive and disruptive improvement projects from being required.

Project Interdependencies:

- S4.2b must be constructed before L10 can be turned on.

Teguayo Area

In previous master plans, the Teguayo area was identified as an area to be served by a future sewer treatment plant. After carefully considering the benefits and costs associated with a new treatment plant at the south end of the City, the City decided to change planning for this area. The new plan is to convey future flows (there is no current development in the area yet) through the City collection system to TSSD.

Initial development in this area is being driven by a single development concept currently being discussed under the name "Teguayo". Specifics with respect to development in this area are not yet available. Therefore, specific projects have not been identified in this CFP. However, specific qualitative direction for project planning is described as follows. It is

recommended that when development in this area begins to materialize, that City staff work closely with the developer to ensure that proposed and constructed improvements adhere to the approach of this master plan.

Some key components of sewer conveyance for the Teguayo area are as follows:

1. The planned point of connection for all sewer flows from the Teguayo area is the upstream end of Project S5 (see description above and Figure 6-2).
2. City planning currently expects 9,000 ERUs at buildout in this service area. To avoid confusion, it should be noted that this total includes all properties in the service area designated at the south end of the City and not just the primary property holder that has been using the name Teguayo. ERUs currently planned for the property historically identified as Teguayo are only about half of this total.
3. All improvements in the area should be designed to convey the full portion of ERUs which the particular improvement is intended to serve or be made easily expandable to serve the full portion in the future.
4. Depending on the timing of development in the Teguayo Area relative to the progression of development and sewer projects in the South Area, the existing system may or may not have infrastructure in place to receive flow from the Teguayo area. Most immediately, this type of concern will revolve around Projects S5 and S3. Obviously, both[2] will eventually need to be in place for a connection at the upstream end of S5 to be sustainable. Long-term, some concern will likely revolve around conveyance capacity in Projects S4 and S1. While the existing S4 and S1 trunklines have sufficient capacity for many years of future growth, they do not have sufficient capacity for all projected growth at full buildout (see S4 and S1 descriptions above). Projects to remedy these future deficiencies have been identified in this CFP, but project timing is fully dependent on future growth patterns and timing.
5. For discussion purposes, the approximate location of a sewer lift station and force main serving the Teguayo area is shown in Figure 6-2. This is a project level improvement shown for information purposes only and will not be eligible for impact fee reimbursement.
6. It should be noted that if the developer installs a new diversion to send flows down the existing 8-inch pipe on Spinnaker Bay Drive to divert flows from the existing 10-inch pipe on Starlight Drive, the City can free up capacity to divert about 120 more ERUs from the Teguayo Area to the Marina Lift Station.

[2] While permanent conveyance from the Teguayo area needs to be routed through future Projects S5 and S3, the City recognizes the large amount of infrastructure this represents for the first connection. Therefore, as part of this planning effort, various options for temporary capacity (options that don't require all infrastructure to be in place initially) have been evaluated. The results of this evaluation are shown in Figure 6-2. As stated directly on the figure, the information provided represents estimates only, and any temporary connection (or permanent connection for that matter) requires approval of the City Engineer. Additional evaluation will be needed prior to finalizing plans to utilize a temporary connection.

DETAILED RECOMMENDED IMPROVEMENTS

Detailed lists of identified capital projects and related information such as preliminary sizing, design flows, lengths, and timing, as well as other appropriate details have been identified in this CFP as follows. These projects have been organized by project type.

Collection System Pipe Improvements

Tables 6-1 and 6-2 summarize the collection system pipe improvements, along with estimated project length, pipe diameter, and design capacity.

Table 6-1
Short-Term (0-10 Years) Collection System Pipe Improvements

Project Identifier	Project Description	Proposed Pipe Length (ft)	Proposed Diameter (inches)	Required Design Capacity[1] (gpm)
N2a	Market Street to Redwood Rd. Extension	855	24	2,700
S2.6	Redwood Rd. Replacement north of Wildlife Blvd. and south of Silver Fox Lane	2,950	21	2,330
S2.7	Redwood Rd. Replacement from Lake Mountain Drive to Wildlife Blvd.	2,185	18	890
L10	Fairway Blvd. Lift Station (Lift 10) Force Main	3,695	16	12,980
N1f	Complete Connection of 15” from 400 N to 42” at Redwood Rd./500 N.	-	-	-
N1c	New 48” from Riverside Drive to Existing Stub west of Jordan River	5,685	48	8,990
N3b	New SR 73 Trunk from the Springs/Wildflower to Tractor Supply	3,120	15 to 21	1,680
S4.2b	New Redwood Rd. Trunk from 2015 South to Grandview Blvd.	5,040	21 to 27	3,100
S4.3	Ring Road, Colt Drive, and Hunter Road Connections	1,400	8	350
N1e	Reroute Posey Lift Station (Lift 2) Force Main	1,400	18	1,770

[1] Design Capacities shown are the modeled peak flows. Additional safety factors have not been applied.

Table 6-2
Long-Term (>10 Years) Collection System Pipe Improvements

Project Identifier	Project Description	Proposed Pipe Length (ft)	Proposed Diameter (inches)	Required Design Capacity[1] (gpm)
S7	Silver Fox Lane Replacement from Village Court Road to Redwood Road	800	12	570
N7c	New 145 North Trunk East of Reagan Drive	850	12	120
N7d	New 145 North Trunk East of 9150 West (Lehi)	1,500	12	110
N8b	New 145 North Trunk East of Perelle Connection	1,200	12	770
N8c	New 145 North Trunk West of Perelle Connection	1,100	12	170
N9b	West North Shore Collector	5,000	15	160
S1.4	New Parallel Trunk from Legacy Parkway/Redwood Rd. to TSSD Outfall	13,350	27 to 33	9,200
S3	New West to East Trunk North of Beacon Point	7,200	24	5,520
S5	New Foothill Blvd. Trunk to South End of City	28,200	24	4,850
S6	New West to East Trunk North of Tickville Gulch	7,100	15	1,570

[1] Design Capacities shown are the modeled peak flows. Additional safety factors have not been applied.

Lift Station Improvements

Table 6-3 lists the future recommended wet well volume and hydraulic capacity of lift stations in Saratoga Springs at buildout.

Table 6-3
Required Capacity at Lift Stations

Lift Station	Address[1]	Existing Wet Well Volume (gallons)	Future Required Wet Well Volume (gallons)	Existing Hydraulic Capacity (gpm)	Future Required Hydraulic Capacity (gpm)
1 – Inlet Park	400 S. Saratoga Rd	4,600	2,730	3,650	1,090
2 – Posey	Pioneer Crossing, Jordan River	5,200	4,800	3,300[2]	1,920[3]
3 – Eagle Park	1448 S. Cottonwood Lane	2,500	190	110[2]	75
4 – North Twin	1800 S. Centennial Blvd	2,500	250	110	100
5 – South Twin	2170 S. Centennial Blvd	2,500	250	110	100
6 – Marina	275 E. Cascade Court	2,500	930	350[2]	370
7 – El Nautica	100 W. 3000 S. (Harbor Bay)	3,500	1,100	550	440
8 – Mallard Bay	2590 S. Shorewood Drive	575	190	243	175
9 – North Shore	900 E. 400 N.	3,500	3,500	825	1,410
10 – Lift 10 (Future)	Fairway Blvd (east of Redwood)	--	7,530	--	3,010

[1] Addresses are approximate
[2] Lift stations indicated include provisions to add an additional pump on the existing manifold
[3] This future required capacity is for the expected buildout condition with the gravity improvement projects completed. The required hydraulic capacity at the Posey Lift Station will be more than this until those projects are installed. See Chapter 5 for additional information.

Table 6-4 lists the costs associated with lift station improvements recommended to meet future collection system needs at buildout.

Table 6-4
Lift Station Improvement Projects

Project ID	Estimated Construction Schedule	Project Description	Design Capacity[1] (gpm)
L10	5-10 years	Fairway Blvd. Lift Station (Lift 10)	3,440

[1] Design Capacities shown are the modeled peak flows plus a 15% safety factor per *Lift Station Level of Service* in Chapter 5.

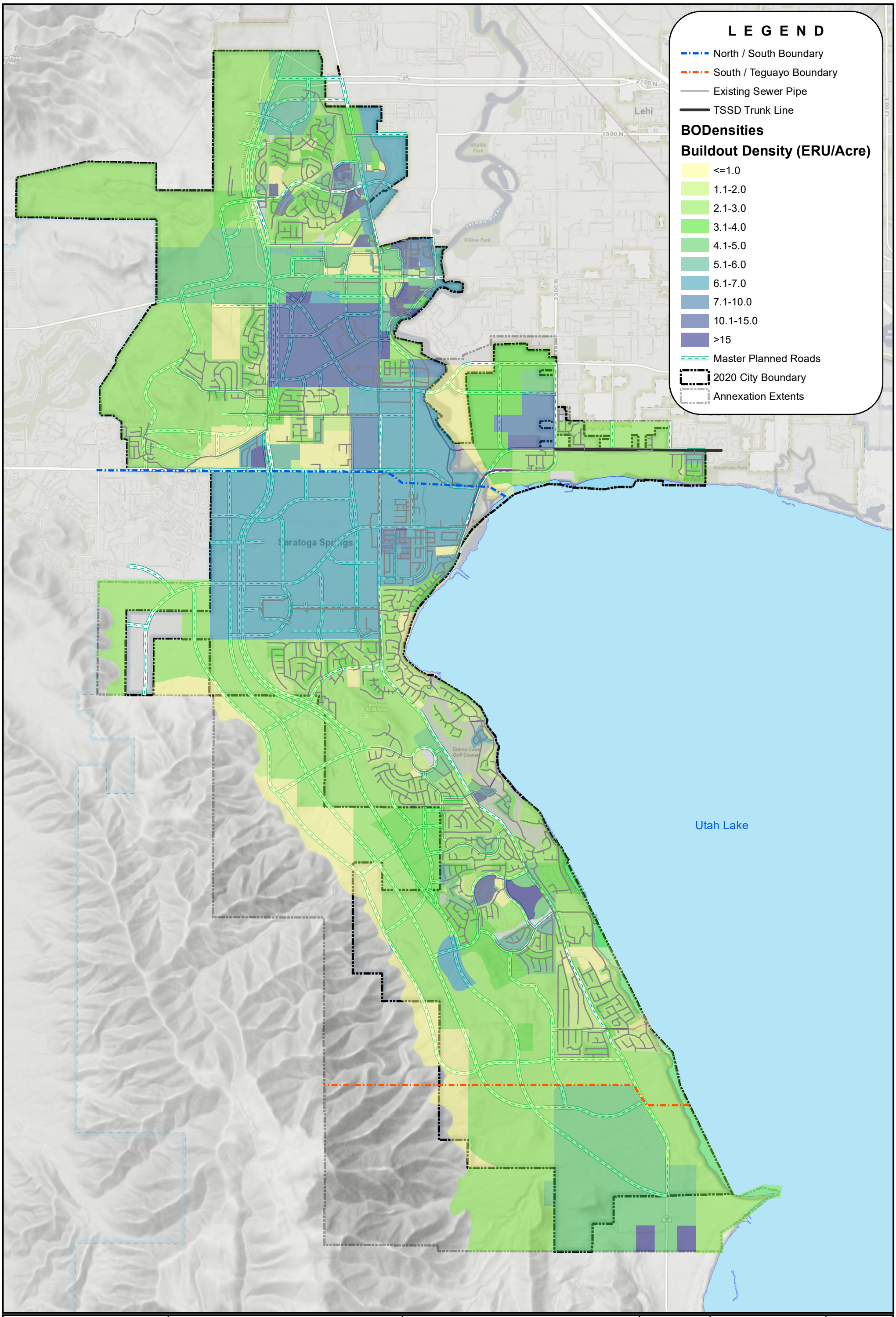
PROJECT COSTS

The anticipated cost and the expected timing of each project described above are shown in Table 6-5. Note that development will be the primary motivation for most of the projects, and the timing of projects (especially beyond the short-term planning window) may be expedited or deferred depending on the rate of development. Project costs are presented in 2020 dollars.

It should also be noted that the costs contained in this chapter are total project costs and do not include any division between existing and future users. As described above, some of the recommended improvements identified in this plan will benefit existing users. A division of cost between existing and future users based on proportionate share of capacity is contained in the Impact Fee Facilities Plan (separate document). Appendix B and Appendix C contain individual detailed cost estimates and project worksheets for each of the proposed projects. Appendix D contains the sewer lift station collection areas for the City's sewer system.

Table 6-5
Capital Facilities Plan and Estimated Costs

Project ID	Estimated Construction Year	Project Description	Estimated Cost (2020 dollars)
North End Projects			
N2a	0-5 years	Market Street to Redwood Rd. Extension	$423,000
N1f	5-10 years	Complete Connection of 15" from 400 N to 42" at Redwood Rd./500 N.	$50,000
N1c	5-10 years	New 48" from Riverside Drive to Existing Stub west of Jordan River	$3,160,000
N3b	5-10 years	New SR 73 Trunk from the Springs/Wildflower to Tractor Supply	$1,180,000
N1e	5-10 years	Reroute Posey Lift Station (Lift 2) Force Main	$235,000
N7c	10+ years	New 145 North Trunk East of Reagan Drive	$297,000
N7d	10+ years	New 145 North Trunk East of 9150 West (Lehi)	$523,000
N8b	10+ years	New 145 North Trunk East of Perelle Connection	$419,000
N8c	10+ years	New 145 North Trunk West of Perelle Connection	$384,000
N9b	10+ years	West North Shore Collector	$1,802,000
South End Projects			
S2.6	0-5years	Redwood Rd. Replacement north of Wildlife Blvd. and south of Silver Fox Lane	$1,601,000
L10	0-5 years	Fairway Blvd. Lift Station (Lift 10)	$3,409,000
S4.2b	0-5 years	New Redwood Rd. Trunk from 2015 South to Grandview Blvd.	$2,120,000
S4.3	0-5 years	Ring Road, Colt Drive, and Hunter Road Connections	$544,000
S2.7	5-10 years	Redwood Rd. Replacement from Lake Mountain Drive to Wildlife Blvd.	$1,037,000
S7	10+ years	Silver Fox Lane Replacement from Village Court Road to Redwood Road	$413,000
S1.4	10+ years	New Parallel Trunk from Legacy Parkway/Redwood Rd. to TSSD Outfall	$9,267,000
S3	10+ years	New West to East Trunk North of Beacon Point	$3,100,000
S5	10+ years	New Foothill Blvd. Trunk to South End of City	$12,142,000
S6	10+ years	New West to East Trunk North of Tickville Gulch	$2,558,000
Maintenance and Planning			
	Annually	$40,000 annually for Master Planning Updates	-
TOTAL			**$44,664,000**



BOWEN COLLINS & ASSOCIATES

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

PLANNED BUILDOUT DENSITIES

NORTH:

SCALE: 0 2,000 4,000 Feet

FIGURE NO. 6-1

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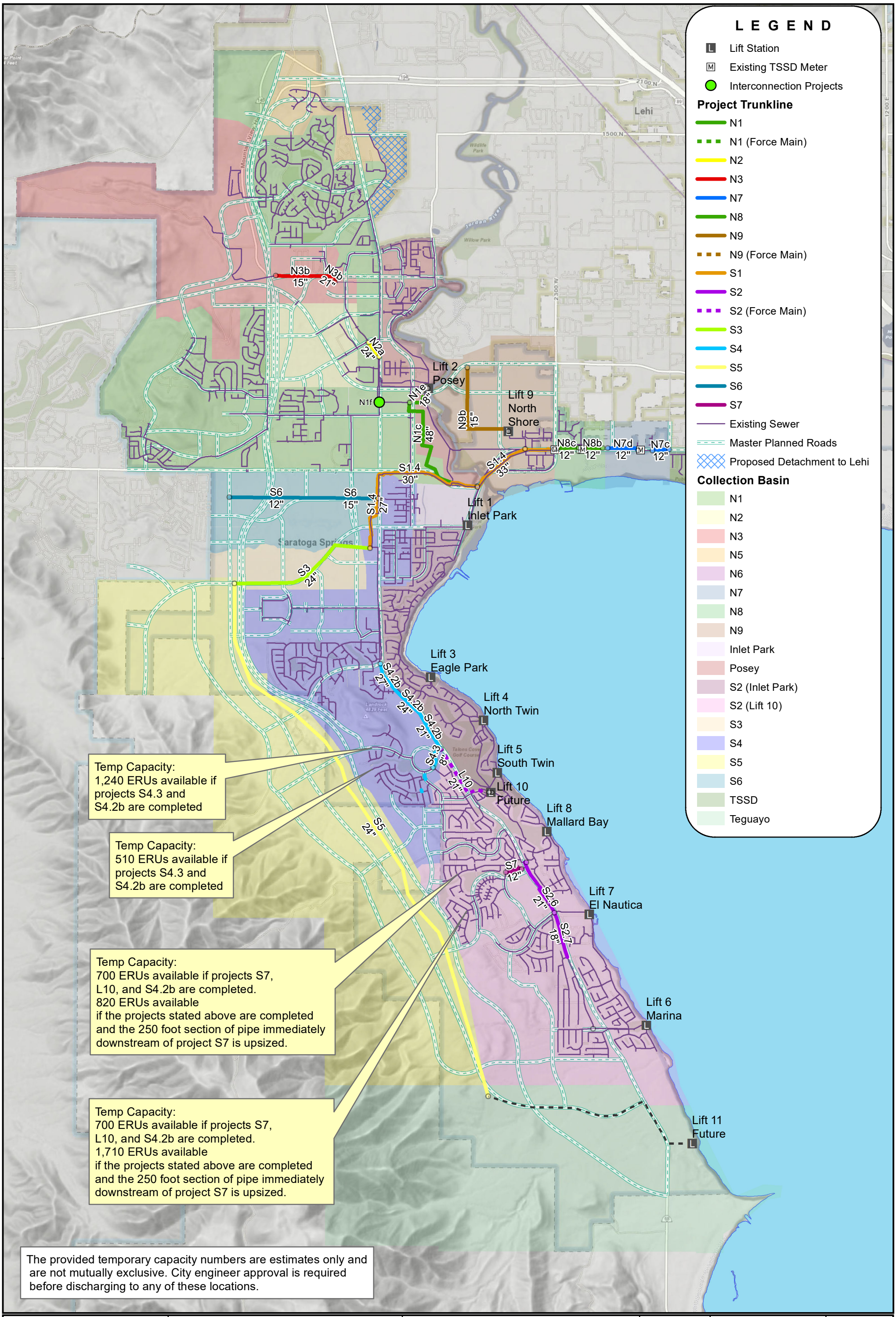

BOWEN COLLINS & ASSOCIATES

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

BUILDOUT
SYSTEM IMPROVEMENTS

NORTH:

SCALE: 0 2,000 4,000 Feet

FIGURE NO.
6-2

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APPENDIX A
GROWTH PROJECTIONS MEMO

ZIONS PUBLIC FINANCE, INC.

GROWTH PROJECTIONS MEMORANDUM

Historic Growth

Saratoga Springs has been experiencing extremely rapid growth over the past 20 years, growing by an average of 429 Equivalent Residential Units (ERUs) per year since 2000. Growth has been even more rapid in recent years, with an average increase of 551 ERUs since 2015. In 2019, the City increased by 642 ERUs; and in the first half of 2020 alone the City has seen 550 ERUs. Interestingly, there has been no discernible slowdown yet from COVID-19.

TABLE 1: HISTORIC GROWTH IN ERUS

Year	Historic ERUs	AAGR*	ERU Increase per Year
7/1/2000	235		
7/1/2001	582	148%	347
7/1/2002	896	54%	315
7/1/2003	1,223	36%	326
7/1/2004	1,655	35%	432
7/1/2005	2,109	27%	454
7/1/2006	2,656	26%	548
7/1/2007	3,167	19%	511
7/1/2008	3,938	24%	771
7/1/2009	4,238	8%	301
7/1/2010	4,399	4%	160
7/1/2011	4,569	4%	170
7/1/2012	4,771	4%	202
7/1/2013	5,097	7%	325
7/1/2014	5,630	10%	534
7/1/2015	6,097	8%	467
7/1/2016	6,603	8%	506
7/1/2017	7,150	8%	547
7/1/2018	7,743	8%	593
7/1/2019	8,385	8%	642

*AAGR = average annual growth rate

Projected Growth

Based on trends over the past two years, a sensitivity analysis of future growth has been projected first based on an average of 550 and then 600 ERUs per year. The recommended approach then uses a blend of these two assumptions, plus actual anticipated growth of 650 ERUs in 2020 (based on the record number of permits pulled halfway through 2020). Even though the City has seen increasing numbers of ERUs over the past few years, this model conservatively assumes somewhat smaller growth in 2021 and

2022 (600 ERUs per year) followed by growth of 550 ERUs per year through 2035. While the effects of the COVID-19 pandemic event are not known at this time, the growth projections included in this document reflect our best current estimate of the impact COVID-19 will have on system growth to reflect the expected slowdown in the economy associated with current conditions.

TABLE 2: PROJECTED GROWTH IN ERUS

Projected Growth	550 ERU Growth	600 ERU Growth	Recommended Growth Projections	AAGR, Recommended Growth Projections
7/1/2019	8,385	8,385	8,385	
7/1/2020	8,935	8,985	9,035	8%
7/1/2021	9,485	9,585	9,635	7%
7/1/2022	10,035	10,185	10,235	6%
7/1/2023	10,585	10,785	10,785	5%
7/1/2024	11,135	11,385	11,335	5%
7/1/2025	11,685	11,985	11,885	5%
7/1/2026	12,235	12,585	12,435	5%
7/1/2027	12,785	13,185	12,985	4%
7/1/2028	13,335	13,785	13,535	4%
7/1/2029	13,885	14,385	14,085	4%
7/1/2030	14,435	14,985	14,635	4%
7/1/2031	14,985	15,585	15,185	4%
7/1/2032	15,535	16,185	15,735	4%
7/1/2033	16,085	16,785	16,285	3%
7/1/2034	16,635	17,385	16,835	3%
7/1/2035	17,185	17,985	17,385	3%

Other Considerations

As part of this analysis, we have reviewed the availability of vacant land in Saratoga Springs and have found that there is sufficient land available that there are no constraints to development taking place or that would slow the historic growth experienced in the City.

APPENDIX B
COST ESTIMATES

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: N2a Market Street to Redwood Rd. Extension	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$32,010.00	$32,010
2	Misc. Unlisted Items	5%	Lump	$16,000.00	$16,000
3	24-inch Pipeline - Installed	855	LF	$252	$215,819
4	Manholes	8	EA	$5,000	$40,000
5	Bypass Pumping	1	LS	$20,000	$20,000
6	Traffic Control	1	LS	$5,000	$5,000
7	New Connection in Existing Manhole	1	LS	$5,000	$5,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$20,000	$20,000
9	Asphalt and Base	185	LF	$77	$14,262
	Subtotal				**$368,091**
	Engineering - Design	6%			$22,100
	Engineering - Construction Management	6%			$22,100
	Legal and Admin. (ROW, Financing, etc.)	3%			$11,100
	TOTAL CONCEPTUAL COST				**$423,391**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-27-20*
Project: N1f Complete Connection of 15" from 400 N to 42" at Redwood Rd./500 N.	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	0.25	Lump	$8,680.00	$8,680
2	New Manhole in Road	1	LS	$10,000	$10,000
3	Asphalt and Base	1	LS	$14,000	$14,000
4	Traffic Control	1	LS	$10,700	$10,700
	Subtotal				**$43,380**
	Engineering - Design	6%			$2,700
	Engineering - Construction Management	6%			$2,700
	Legal and Admin. (ROW, Financing, etc.)	3%			$1,400
	TOTAL CONCEPTUAL COST				**$50,180**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: N1c New 48" from Riverside Drive to Existing Stub west of Jordan River	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	1	Lump	$150,000.00	$150,000
2	Misc. Unlisted Items	5%	Lump	$122,990.00	$122,990
3	Utility Relocation/Reconstruction	1	LS	$0	$0
4	48-inch Pipeline - Installed	5,685	LF	$405	$2,302,425
5	Additional Costs Associated with Depth	1	LS	$50,000	$50,000
6	Manholes	16	EA	$5,000	$80,000
7	Asphalt and Base	250	LF	$109	$27,300
	Subtotal				**$2,732,715**
	Engineering - Predesign and Design	6%			$180,846
	Engineering - Construction Management	6%			$164,000
	Legal and Admin. (ROW, Financing, etc.)	3%			$82,000
	TOTAL CONCEPTUAL COST				**$3,159,561**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: N3b New SR 73 Trunk from the Springs/Wildflower to Tractor Supply	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$89,210.00	$89,210
2	Misc. Unlisted Items	5%	Lump	$44,610.00	$44,610
3	15-inch Pipe Installed	2,310	LF	$211	$487,170
4	21-inch Pipe Installed	810	LF	$252	$204,460
5	Manholes	9	EA	$5,000	$45,000
6	Additional Costs Associated with MVC Crossing	1	Lump	$100,000	$100,000
7	Asphalt and Base	720	LF	$77	$55,506
	Subtotal				**$1,025,957**
	Engineering - Design	6%			$61,600
	Engineering - Construction Management	6%			$61,600
	Legal and Admin. (ROW, Financing, etc.)	3%			$30,800
	TOTAL CONCEPTUAL COST				**$1,179,957**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: N1e Reroute Posey Lift Station (Lift 2) Force Main	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$17,780.00	$17,780
2	Misc. Unlisted Items	5%	Lump	$8,890.00	$8,890
3	14-inch HDPE force main	1,400	LF	$127	$177,800

		$204,470
Engineering - Design	6%	$12,300
Engineering - Construction Management	6%	$12,300
Legal and Admin. (ROW, Financing, etc.)	3%	$6,200
TOTAL CONCEPTUAL COST		**$235,270**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: S2.6a Redwood Rd. Replacement north of Wildlife Blvd.	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$22,320.00	$22,320
2	Misc. Unlisted Items	5%	Lump	$11,160.00	$11,160
3	Utility Relocation/Reconstruction	1	LS	$0	$0
4	21-inch Pipeline - Installed	535	LF	$296	$158,527
5	Manholes	3	EA	$5,000	$15,000
6	Bypass Pumping	1	LS	$30,000	$30,000
7	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$12,000	$12,000
8	Asphalt and Base	100	LF	$77	$7,709
	Subtotal				**$256,717**
	Engineering - Design	6%			$15,500
	Engineering - Construction Management	6%			$15,500
	Legal and Admin. (ROW, Financing, etc.)	3%			$7,800
	TOTAL CONCEPTUAL COST				**$295,517**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-27-20*
Project: S2.6b Redwood Rd. Replacement south of Silver Fox Lane (~2,450 LF)	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$98,640.00	$98,640
2	Misc. Unlisted Items	5%	Lump	$49,320.00	$49,320
3	Utility Relocation/Reconstruction	1	LS	$163,909	$163,909
4	21-inch Pipeline - Installed	2,415	LF	$296	$715,596
5	Manholes	8	EA	$5,000	$40,000
6	Lateral Reconnections	4	EA	$1,614	$6,456
7	Bypass Pumping	1	LS	$35,000	$35,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$10,000	$10,000
9	Asphalt and Base	200	LF	$77	$15,418

Subtotal		**$1,134,339**
Engineering - Design	6%	$68,100
Engineering - Construction Management	6%	$68,100
Legal and Admin. (ROW, Financing, etc.)	3%	$34,100
TOTAL CONCEPTUAL COST		**$1,304,639**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: L10 Fairway Blvd. Lift Station (Lift 10) Force Main	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$83,600.00	$83,600
2	Misc. Unlisted Items	5%	Lump	$41,800.00	$41,800
3	Utility Relocation/Reconstruction	1	LS	$10,000	$10,000
4	16-inch HDPE Force Main Installed	3,695	LF	$127	$469,265
5	Polymer Discharge Manhole	1	EA	$17,000	$17,000
6	Bypass Pumping	1	LS	$33,000	$33,000
7	Redwood Crossing (trenchless)	140	LF	$800	$112,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$100,000	$100,000
9	Asphalt and Base	1,300	LF	$73	$94,756

Subtotal		**$961,421**
Engineering - Design	6%	$57,700
Engineering - Construction Management	6%	$57,700
Legal and Admin. (ROW, Financing, etc.)	3%	$28,900
TOTAL CONCEPTUAL COST		**$1,105,721**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: L10 Fairway Blvd. Lift Station (Lift 10)	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	1	Lump	$150,000	$150,000
2	Misc. Unlisted Items	5%	Lump	$80,150	$80,150
3	Building	1	Lump	$477,000	$477,000
4	Pumps Installed with Controls	1	Lump	$297,000	$297,000
5	Other Mechanical (heat, metering, piping, etc.)	1	Lump	$233,000	$233,000
6	Backup Generator	1	Lump	$95,000	$95,000
7	Bypass Pumping	1	Lump	$28,000	$28,000
8	Bypass Vault	1	Lump	$48,000	$48,000
9	Inlet Vault with Grinder (including controls)	1	Lump	$85,000	$85,000
10	Other Electrical (power feed, building wiring, etc.)	1	Lump	$85,000	$85,000
11	Site Work	1	Lump	$223,000	$223,000
12	Landscaping	1	Lump	$32,000	$32,000

Subtotal		**$2,003,133**
Engineering - Design	6%	$120,200
Engineering - Construction Management	6%	$120,200
Legal and Admin. (ROW, Financing, etc.)	3%	$60,100
TOTAL CONCEPTUAL COST		**$2,303,633**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-28-20*
Project: S4.2b New Redwood Rd. Trunk from 2015 South to Grandview Blvd.	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$160,290.00	$160,290
2	Misc. Unlisted Items	5%	Lump	$80,140.00	$80,140
3	Utility Relocation/Reconstruction	1	LS	$0	$0
4	21-inch Pipe Installed	2,535	LF	$252	$639,885
5	24-inch Pipe Installed	1,010	LF	$288	$291,365
6	27-inch Pipe Installed	1,495	LF	$328	$490,088
7	Manholes	17	EA	$5,000	$85,000
8	Bypass Pumping	1	LS	$30,000	$30,000
9	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$53,000	$53,000
10	Asphatl and Base	160	LF	$85	$13,525

Subtotal		**$1,843,293**
Engineering - Design	6%	$110,600
Engineering - Construction Management	6%	$110,600
Legal and Admin. (ROW, Financing, etc.)	3%	$55,300
TOTAL CONCEPTUAL COST		**$2,119,793**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-27-20*
Project: S4.3 Ring Road, Colt Drive, and Hunter Road Connections	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$41,100.00	$41,100
2	Misc. Unlisted Items	5%	Lump	$20,550.00	$20,550
3	Utility Relocation/Reconstruction	1	LS	$0	$0
4	8-inch Pipe Installed	1,400	LF	$195	$272,308
5	Manholes	5	EA	$5,000	$25,000
6	Bypass Pumping	1	Lump	$18,000	$18,000
7	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	Lump	$10,000	$10,000
8	Asphalt and Road Base	1,400	LF	$61	$85,680
	Subtotal				**$472,638**
	Engineering - Design	6%			$28,400
	Engineering - Construction Management	6%			$28,400
	Legal and Admin. (ROW, Financing, etc.)	3%			$14,200
	TOTAL CONCEPTUAL COST				**$543,638**

Preliminary Cost Estimate

Capital Facilities Plan	*Date: 04-27-20*
Project: S2.7 Redwood Rd. Replacement from Lake Mountain Drive to Wildlife Blvd.	*Prepared by: WA/JD*
Owner: City of Saratoga Springs	

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization/Demobilization	10%	Lump	$78,370.00	$78,370
2	Misc. Unlisted Items	5%	Lump	$39,190.00	$39,190
3	18-inch Pipeline - Installed	2,185	LF	$281	$614,767
4	Manholes	8	EA	$5,000	$40,000
5	Lateral Reconnections	20	EA	$1,614	$32,279
6	Bypass Pumping	1	LS	$35,000	$35,000
7	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$50,000	$50,000
8	Asphalt and Base	160	LF	$73	$11,662
	Subtotal				**$901,268**
	Engineering - Design	6%			$54,100
	Engineering - Construction Management	6%			$54,100
	Legal and Admin. (ROW, Financing, etc.)	3%			$27,100
	TOTAL CONCEPTUAL COST				**$1,036,568**

APPENDIX C
IMPROVEMENT PROJECT SUMMARY

Improvement Project Summary

Saratoga Springs

Project Map

Project ID:	N2a
Project Name: Market Street to Redwood Rd. Extension	
Description: Construct a new 24-inch gravity pipeline extending from Market Street to Redwood Road.	

Project Components

Quantity	*Size*	*Design Flow**
855 LF	24-inch	2,700 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $423,000

Project Need:

Capacity for Future Growth. Projected growth associated with the northwest section of the City will exceed existing capacity of the 8-inch trunkline.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the 8-inch trunkline exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on growth in teh northwest quadrant beyond the remaining amount of capacity in the pipeline or risk flooding.

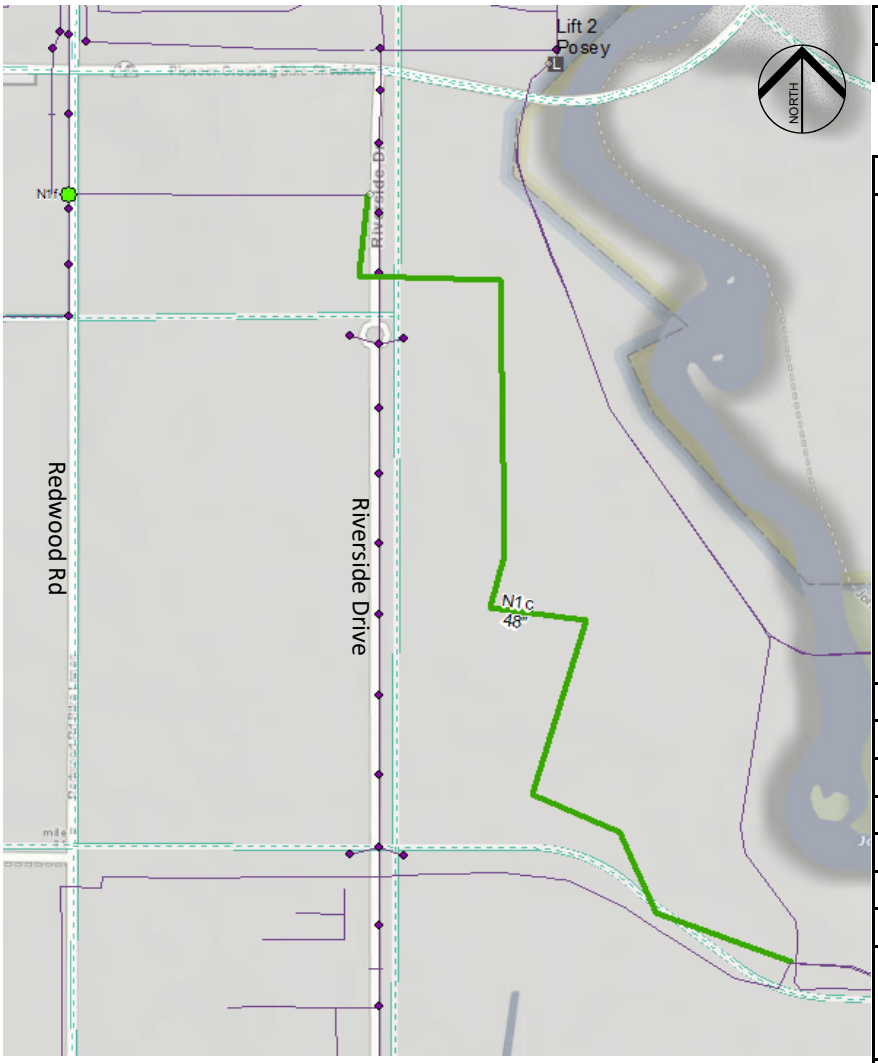
Project Triggers:

Project must be in place once peak hour, dry weather flow in existing 8-inch trunkline exceeds 540 gpm. Existing peak hour, dry weather flow in existing 8-inch trunkline is 85 gpm. This means there are about 1,100 ERCs of capacity remaining in the existing pipeline.

Current Estimated Project Completion Year:	0-5 years

Improvement Project Summary

Saratoga Springs



Project Map

Project ID:	N1c and N1f
Project Name:	New 48" from Riverside Drive to Existing Stub west of Jordan River

Description:

N1c - Construct a new 48-inch gravity pipeline from the discharge of the new Posey Force Main at Riverside Drive to the existing stub west of the Jordan River.

N1f - Complete a connection on Redwood Road to divert flow into the new gravtiy outfall created by Project N1c.

Project Components

Quantity	*Size*	*Design Flow**
5,685 LF	48-inch	8,990 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $3,210,000

Project Need:

Reduce Pumping Need. Flows from the Posey Lift Station are sent in a long force main across the Jordan River and discharge into an existing gravity pipeine near the City's public works buildings.

Capacity for Future Growth. The Posey Lift Station has limited capacity for future growth. This project, in conjunction with Projects N1e and N1f, will reduce the amount of flow that reaches the Posey Lift Station and significanlty reduce the length that the Posey Lift Station needs to pump. This in turn frees up capacity for future development.

Potential Consequences of Failing to Complete Project:

The existing Posey Lift Station force main is reaching capacity and the City is pumping flow from the Posey Lift Station unecessarily far, so the City would like to optimize their sewer collection system to reduce pumping costs and increase capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the Posey Lift Station or risk flooding.

Project Triggers:

This means there are about 3,200 ERCs of capacity remaining in the existing lift station.

Current Estimated Project Completion Year:	5-10 years

Improvement Project Summary

Saratoga Springs

Project Map

Project ID:	N3b
Project Name:	New SR 73 Trunk from the Springs/Wildflower to Tractor Supply
Description:	Construct a new 12 to 21-inch gravity pipeline along Crossroads Blvd. from the Springs and Wildflower to the Tractor Supply.

Project Components

Quantity	*Size*	*Design Flow**
1,650 LF	12 to 21-inch	1,680 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $1,180,000

Project Need:

Capacity for Future Growth. Projected growth associated with the northwest section of the City will need the existing trunkline to be extended to service the growth.

Potential Consequences of Failing to Complete Project:

Growth in the northwest section of the City will not be able to be serviced by the City's sewer collection system if there is not a pipeline that collects the sewer from this area of interest.

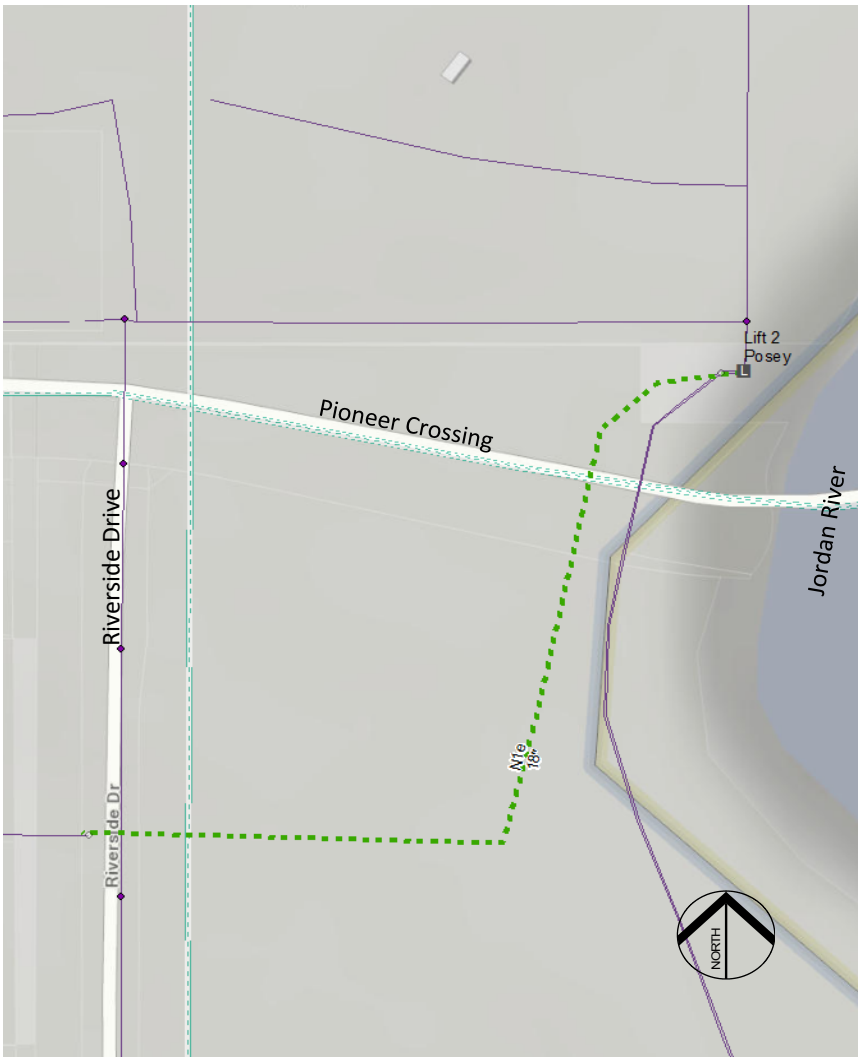
Project Triggers:

Project must be in place once the first users in the northwest section of the City are needing service from the City's sewer collection system.

Current Estimated Project Completion Year: 5-10 years

Improvement Project Summary

Saratoga Springs



Project Map

Project ID:	N1e
Project Name:	
Reroute Posey Lift Station (Lift 2) Force Main	
Description:	
Construct a new 18-inch force main from Posey Lift Station (Lift 2) to Riverside Drive. This project cannot be completed until the new gravity outfall from the North is complete (Project N1c).	

Project Components

Quantity	*Size*	*Design Flow**
1,400 LF	18-inch	1,770 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $235,000

Project Need:

Reduce Pumping Need. Flows from the Posey Lift Station are sent in a long force main across the Jordan River and discharge into an existing gravity pipeline near the City's public works buildings. This project will significantly reduce the length that the Posey Lift Station needs to pump, in turn freeing up capacity for the pumps.

Potential Consequences of Failing to Complete Project:

The existing Posey Lift Station force main is reaching capacity and the City is pumping flow from the Posey Lift Station unecessarily far, so the City would like to optimize their sewer collection system so that pumping costs are not so high.

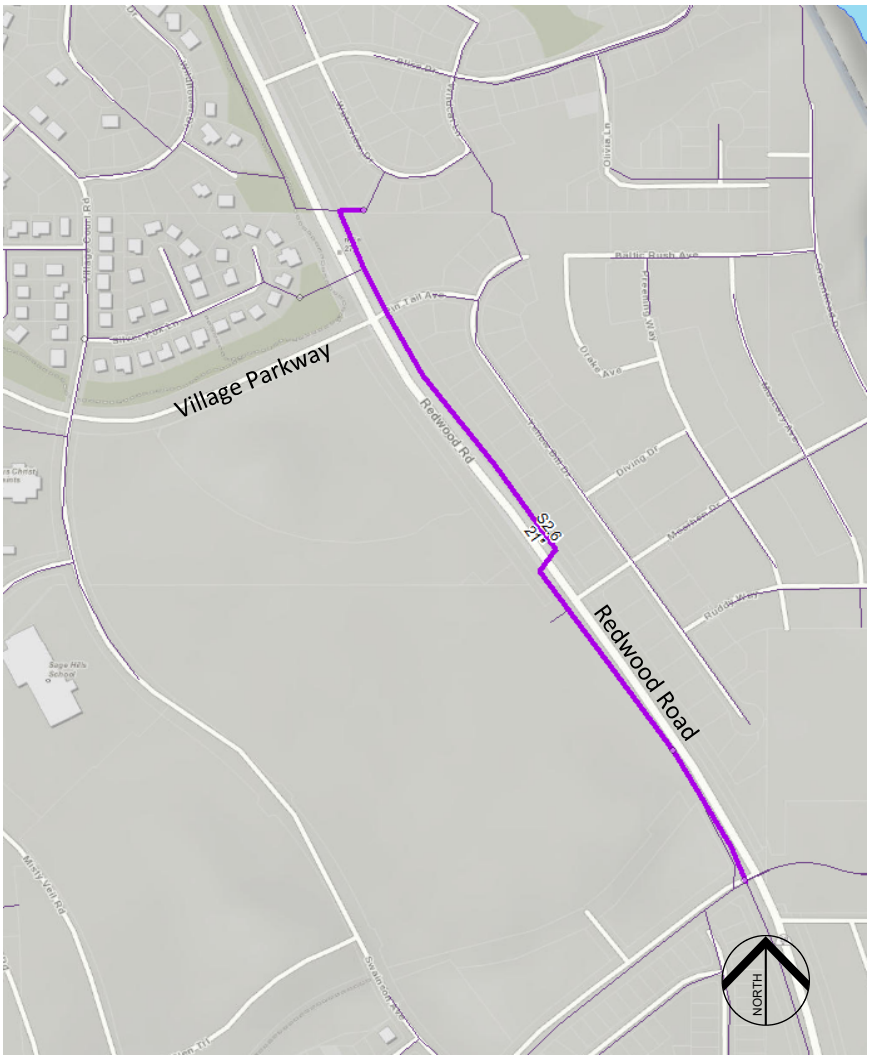
Project Triggers:

This project can be constructed any time after Project N1c is completed. The sooner that this force main is constructed, the sooner the City can improve their pumping costs with a shorter force main. Construction may be necessitated by development in the area of the existing force main.

Current Estimated Project Completion Year: 5-10 years

Improvement Project Summary

Saratoga Springs



Project Map

Project ID:	S2.6
Project Name:	Redwood Rd. Replacement north of Wildlife Blvd. and south of Silver Fox Lane
Description:	Replace and upsize the existing gravity pipeline adjacent to Redwood Road to a 21-inch gravity pipeline from Wildlife Blvd. north about 550 linear feet and south of Silver Fox Lane about 2,450 linear feet.

Project Components

Quantity	*Size*	*Design Flow**
550 LF	21-inch	1,440 gpm
2,450 LF	21-inch	2,330 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $1,601,000

Project Need:

Capacity for Future Growth. Projected growth associated with the southernmost portion of the City will exceed existing capacity of the 10-inch trunkline.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the 10-inch trunkline exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the pipeline or risk flooding.

Project Triggers:

Project must be in place once peak hour, dry weather flow in existing 8-inch trunkline exceeds 440 gpm. Existing peak hour, dry weather flow in existing 8-inch trunkline is 285 gpm. This means there are about 370 ERCs of capacity remaining in the existing pipeline.

Current Estimated Project Completion Year: 0-5 years

Improvement Project Summary

Saratoga Springs

Project Map

Project ID:	L10
Project Name:	
Fairway Blvd. Lift Station (Lift 10) and Force Main	
Description:	
Construct a new lift station and force main near Fairway Blvd. To lift flows up to Redwood Road to divert from the gravity pipeline near the lake shore.	

Project Components		
Quantity	***Size***	***Design Flow****
3,695 LF	16-inch	12,980 gpm
1 Lift Station		3,440 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $3,409,000

Project Need:

Capacity for Future Growth. Projected growth associated with the southernmost portion of the City will exceed existing capacity of the downstream trunkline leading to the Inlet Park Lift Station.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the downstream trunkline leading to Inlet Park Lift Station exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the Inlet Park pipeline or risk flooding.

Project Triggers:

Project must be in place once peak hour, dry weather flow in existing trunkline exceeds 1,090 gpm. Existing peak hour, dry weather flow in existing trunkline is 870 gpm. This means there are about 540 ERCs of capacity remaining in the existing pipeline. If projects S4.2b and S4.3 are completed, about 300 more ERUs of capacity will become available in addition to the 540 ERUs noted here. See Project S4.3 for additional details.

Current Estimated Project Completion Year: 0-5 years

Improvement Project Summary

Saratoga Springs

Project Map

Project ID:	S4.2b
Project Name:	New Redwood Rd. Trunk from 2015 South to Grandview Blvd.
Description:	Construct a new 21 to 27-inch gravity pipeline extending from the new L10 force main discharge at Grandview Blvd. and Redwood Rd. to 2015 South. This will become the outfall for both development immediately to the east as well as the new L10 Lift Station.

Project Components

Quantity	*Size*	*Design Flow**
5,040 LF	21 to 27-inch	3,100 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $2,120,000

Project Need:

Capacity for Future Growth. Projected growth associated with the southern half of the City will exceed existing capacity of the trunkline leading to the Inlet Park Lift Station.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the trunkline leading to Inlet Park Lift Station exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the pipeline or risk flooding.

Project Triggers:

Project must be in place once before either Project L10 or Project S4.3 can be completed. See project triggers for those projects for additional details regarding remaining capacity.

Current Estimated Project Completion Year:	0-5 years

Improvement Project Summary

Saratoga Springs

Project Map

Project ID:	S4.3
Project Name:	Ring Road, Colt Drive, and Hunter Road Connections

Description:

Connect the existing gravity pipelines (from Ring Road, Savage Avenue to Colt Drive, and Remington Avenue to Hunter Road) to the new gravity outfall created with the construction of Project S4.2b. This project will allow about 300 ERUs that have historically flowed east of Redwood and down into the Inlet Park Outfall to be captured in the City's new gravtity outfall on Redwood Road (Project S4.2b).

Project Components

Quantity	*Size*	*Design Flow**
1,400 LF	8-inch	350 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $544,000

Project Need:

Capacity for Future Growth. Projected growth associated with the southernmost portion of the City will exceed existing capacity of the trunkline leading to the Inlet Park Lift Station.

Reduce Pumping Costs. By making these improvements, 300 units can flow by gravity instead of being pumped at Inlet Park.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the trunkline leading to Inlet Park Lift Station exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the pipeline or risk flooding.

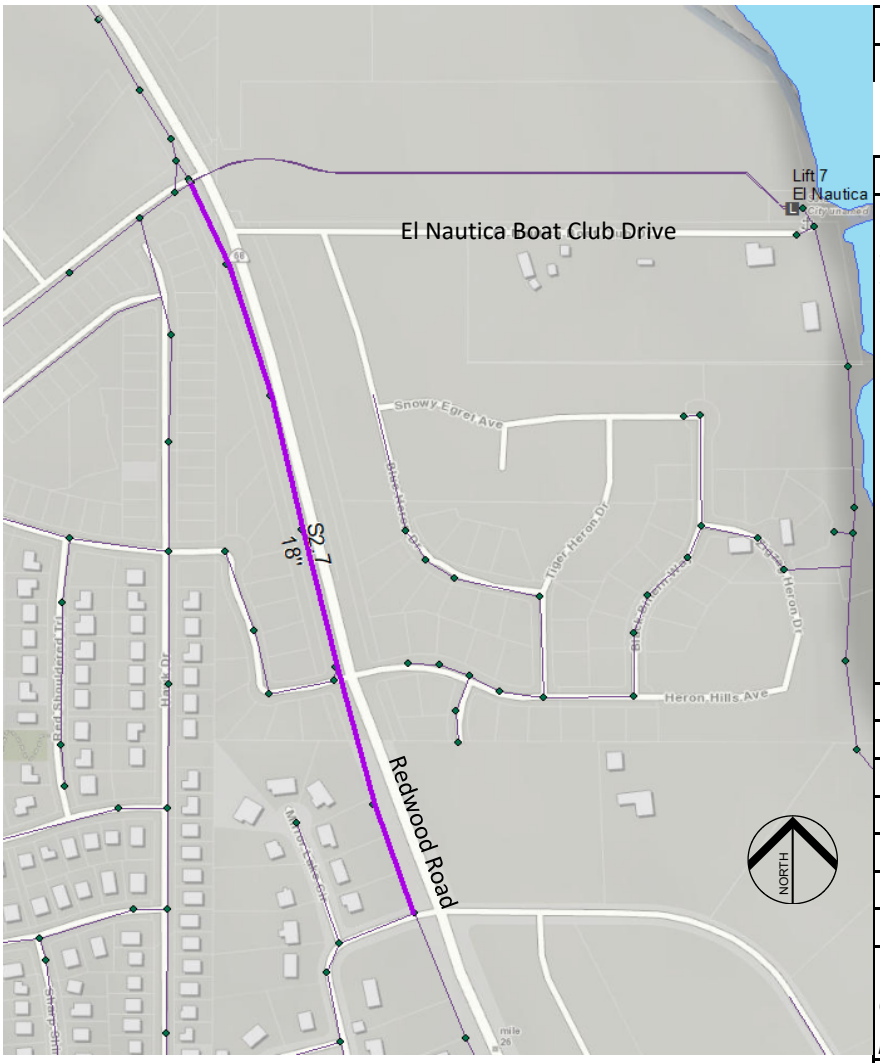
Project Triggers:

Project must be in place once peak hour, dry weather flow in existing trunkline exceeds 1,090 gpm. Existing peak hour, dry weather flow in existing trunkline is 870 gpm. This means there are about 540 ERCs of capacity remaining in the existing pipeline. Project S4.2b must be complete before this project can be implemented.

Current Estimated Project Completion Year: 0-5 years

Improvement Project Summary

Saratoga Springs



Project Map

Project ID:	S2.7
Project Name:	Redwood Rd. Replacement from Lake Mountain Drive to Wildlife Blvd.
Description:	Replace and upsize the existing gravity pipeline adjacent to Redwood Road to a 18-inch gravity pipeline from Lake Mountain Drive to Wildlife Blvd.

Project Components

Quantity	*Size*	*Design Flow**
2,185 LF	18-inch	890 gpm

** Design flow is based on full flow capacity of pipe and includes all peaking and safety factors for projected flows.*

Cost Estimate (2019 $s): $1,037,000

Project Need:

Capacity for Future Growth. Projected growth associated with the southernmost portion of the City will exceed existing capacity of the 10-inch trunkline.

Potential Consequences of Failing to Complete Project:

Projected growth will result in flows in the 10-inch trunkline exceeding design capacity. If this project is not completed, the City will either need to issue a moritorium on all growth beyond the remaining amount of capacity in the pipeline or risk flooding.

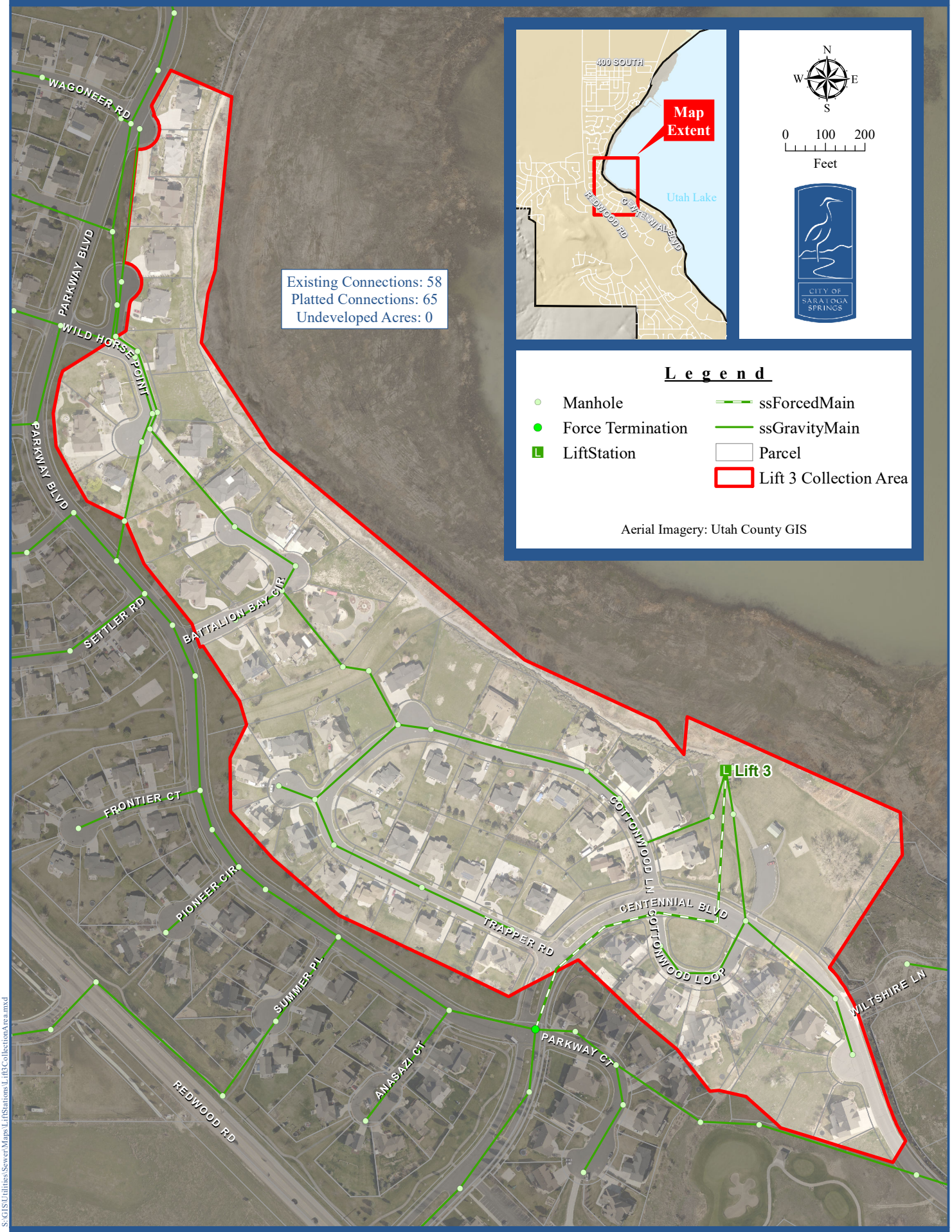
Project Triggers:

Project must be in place once peak hour, dry weather flow in existing 8-inch trunkline exceeds 420 gpm. Existing peak hour, dry weather flow in existing 8-inch trunkline is 180 gpm. This means there are about 575 ERCs of capacity remaining in the existing pipeline.

Current Estimated Project Completion Year:	5-10 years

APPENDIX D
SEWER LIFT STATION COLLECTION AREAS

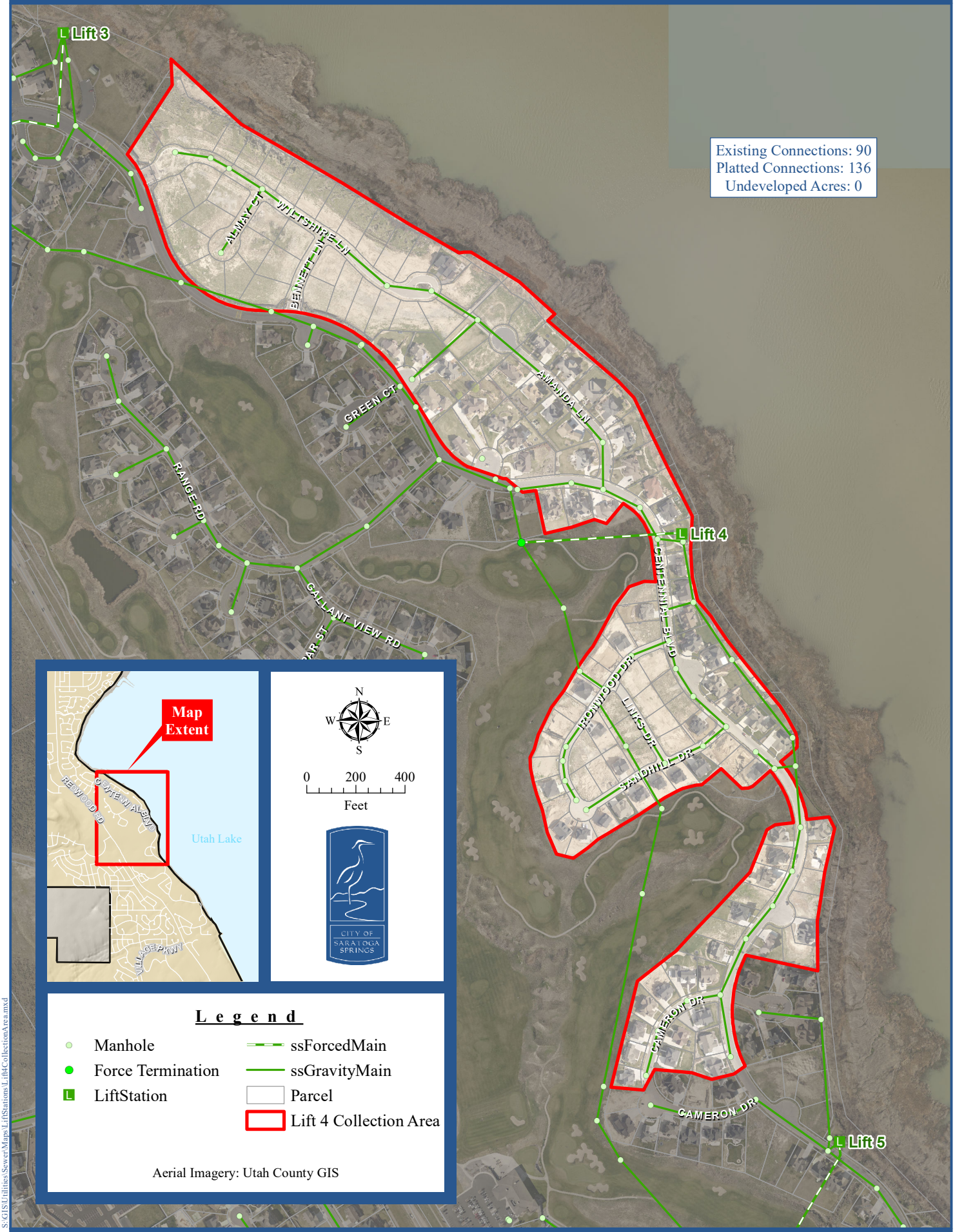
Sewer Lift 3 Collection Area



S:\GIS\Utilities\Sewer Maps\LiftStations\Lift3CollectionArea.mxd

22 May 2018

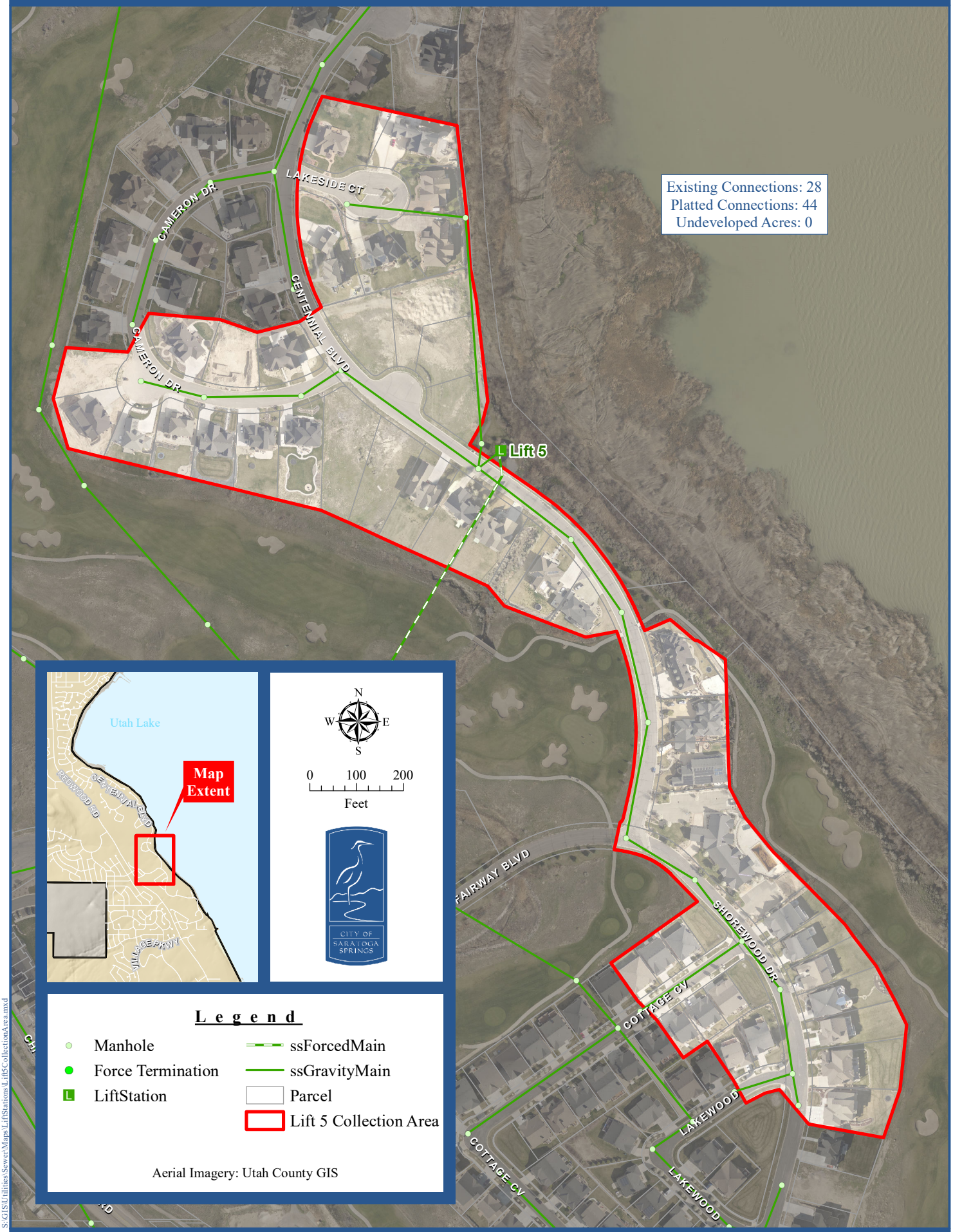
Sewer Lift 4 Collection Area



S:\GIS\Utilities\Sewer Maps\LiftStations\Lift4CollectionArea.mxd

22 May 2018

Sewer Lift 5 Collection Area



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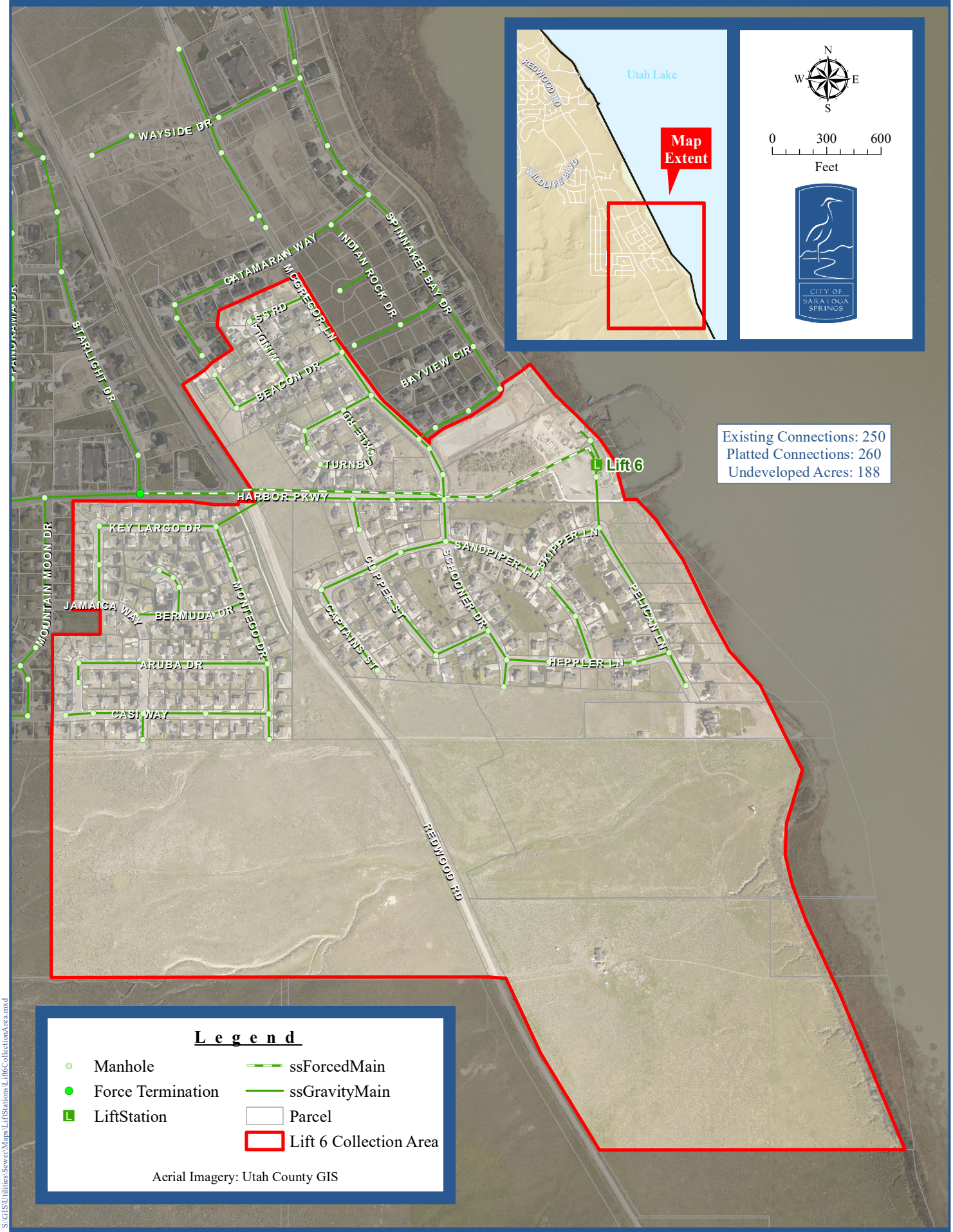
22 May 2018

Sewer Lift 6 Collection Area



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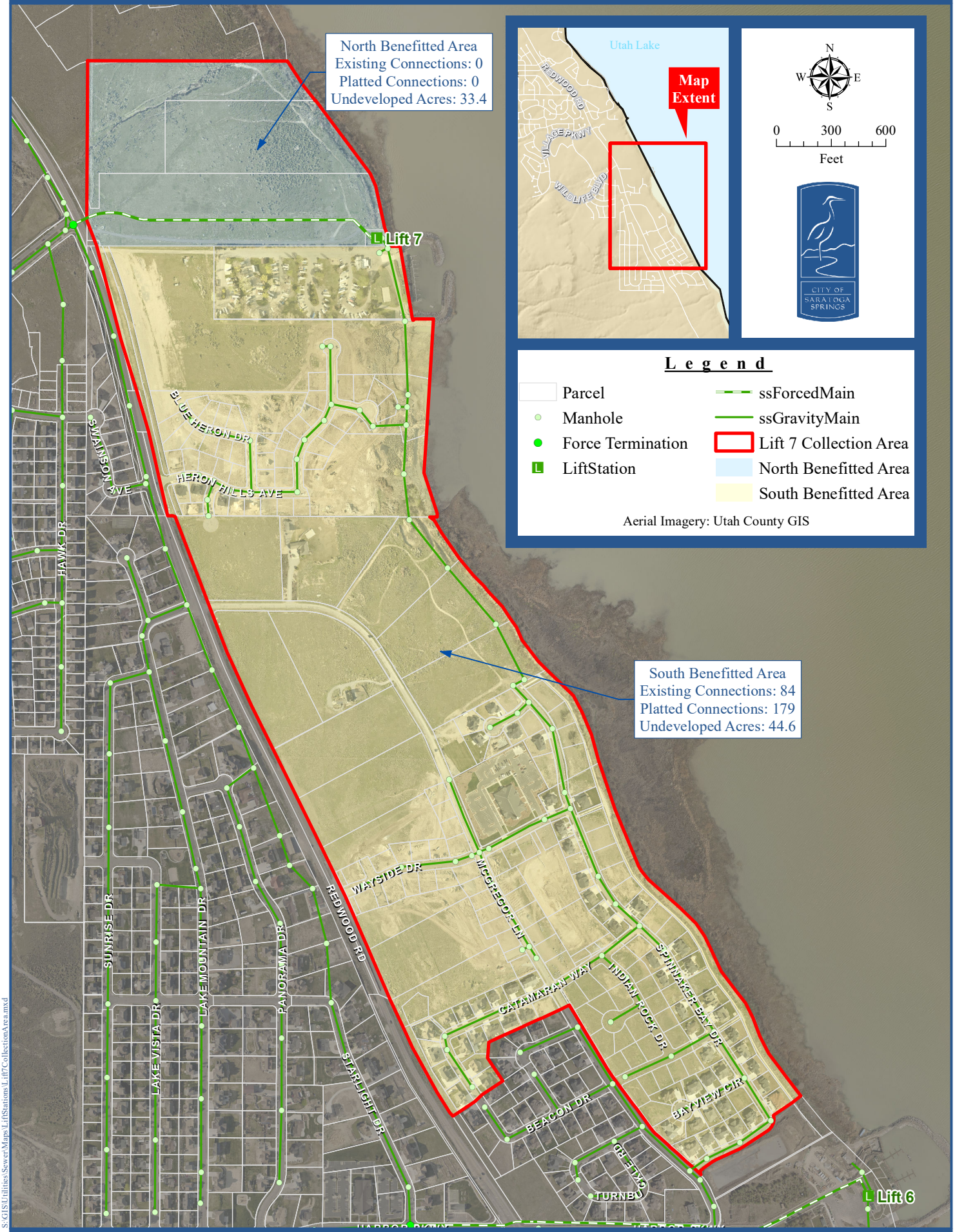
22 May 2018

Sewer Lift 7 Collection Area



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Sewer Lift 8 Collection Area

S:\GIS\Utilities\Sewer Maps\LiftStations\Lift8CollectionArea.mxd

23 May 2018

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