Columbus
City Utilities

Master Plan

Executive Summary

We believe that the implementation of this master plan will not only address **current challenges** but also lay the foundation for a more **sustainable** and **resilient** water and sewer system that meets the needs of our community **now and in the future.**

Master Plan Introduction

Columbus City Utilities is pleased to present the 2024 Water and Sewer Master Plan, a comprehensive strategy developed to ensure the provision of clean water and sanitary sewer services to our community while promoting sustainable infrastructure development.

Water and sewer systems are vital components of our infrastructure, essential for public health, environmental protection, and economic development. As such, it is imperative that we proactively manage these systems, address aging infrastructure, and plan for future growth and resilience.

The Water and Sewer Master Plan outlines key objectives, including:

- Ensuring water quality and accessibility for all residents and industries
- Enhancing infrastructure resilience to withstand natural disasters and other challenges
- Promoting sustainability and efficiency in water and sewer operations
- Striving for uniformity in providing services to our customers
- Maintaining compliance with regulatory standards and guidelines

To achieve these objectives, the master plan proposes strategic initiatives such as infrastructure upgrades, green infrastructure integration, leak detection, and water loss prevention measures, along with water and wastewater treatment plant modernization.

We believe that the implementation of this master plan will not only address current challenges but also lay the foundation for a more sustainable and resilient water and sewer system that meets the needs of our community now and in the future.

We welcome your feedback and collaboration as we work towards the successful implementation of the Water and Sewer Master Plan. Together, we can ensure that our community has access to clean water and sanitary sewer services, promoting health, prosperity, and environmental stewardship.

Sincerely,

Roger Kelso
Executive Director

Ashley Getz, P.E.
Associate Director Engineering

Community Data

Exploring Columbus City Utilities' service area and planning jurisdiction within Bartholomew County.

Planning Area

Figure ES-1 presents the water utility planning area for this report and identifies the current corporate boundaries and 2-mile planning jurisdiction for reference. The figure also shows the approximate service area boundaries for Eastern Bartholomew Water and Southwest Bartholomew Water, which limits the growth of the CCU water system. The analysis and recommendations in this report are based on Eastern Bartholomew Water providing domestic water supply and fire flow for new developments in the service area boundary shown. If this situation were to change, then this report would need to be re-evaluated.

Columbus City Utilities is actively working to improve aging **infrastructure**, meet future **regulations**, and serve continued **growth** in the service area.

Figure ES-2 presents the wastewater utility planning area for this report and identifies the current corporate boundaries and 2-mile planning jurisdiction for reference. The only other wastewater utility in the planning area is Driftwood Utilities, which serves an area northwest of the City and south of the Town of Edinburgh. The former Eastern Bartholomew Rural Sewer District (EBRSD) service area is also highlighted on the figure. CCU took over the EBRSD collection system in 2009 and currently owns and operates all wastewater infrastructure in this area. Wastewater from Driftwood Utilities and the former EBRSD is treated at CCU's Wastewater Treatment Plant (WWTP).

Population Data and 2042 Planning Population

Both the water and wastewater utilities have a projected planning population of 61,397 in 2042. This represents an increase of approximately 5,000 people for the water utility and 1,500 people for the wastewater utility in comparison to the original master plan. **Table ES-1** summarizes the different population determinations.

Method	2020 Population	2042 Population	Total % Increase
Projection of 2010 to 2020 Population Growth	50,474	61,397	21.6%
STATS Indiana Population Projection	50,474	54,648	8.3%
Selected Planning Population	50,474	61,397	21.6%

Table ES-1, Population Projections Summary

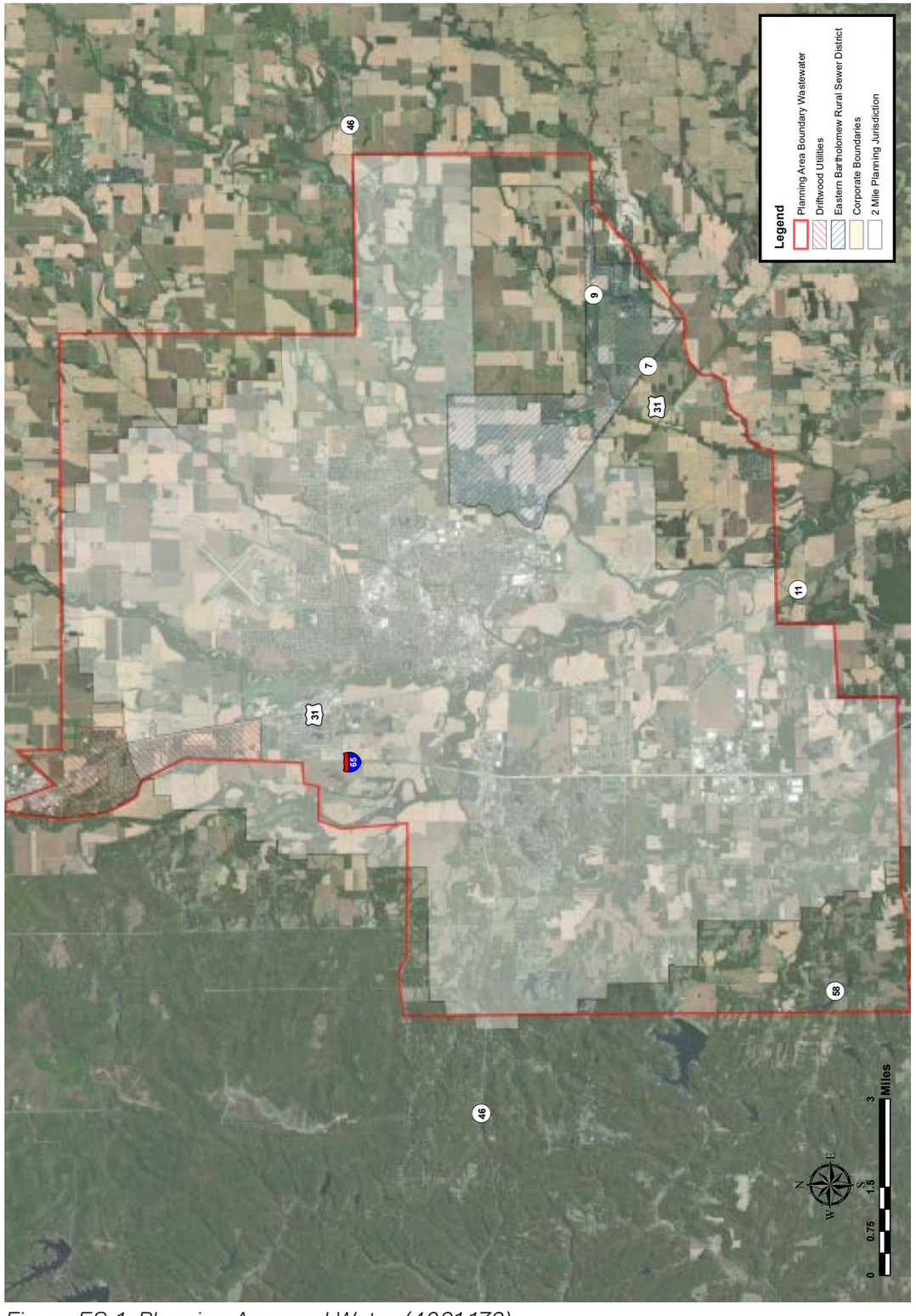


Figure ES-1: Planning Area and Water (4021.172)

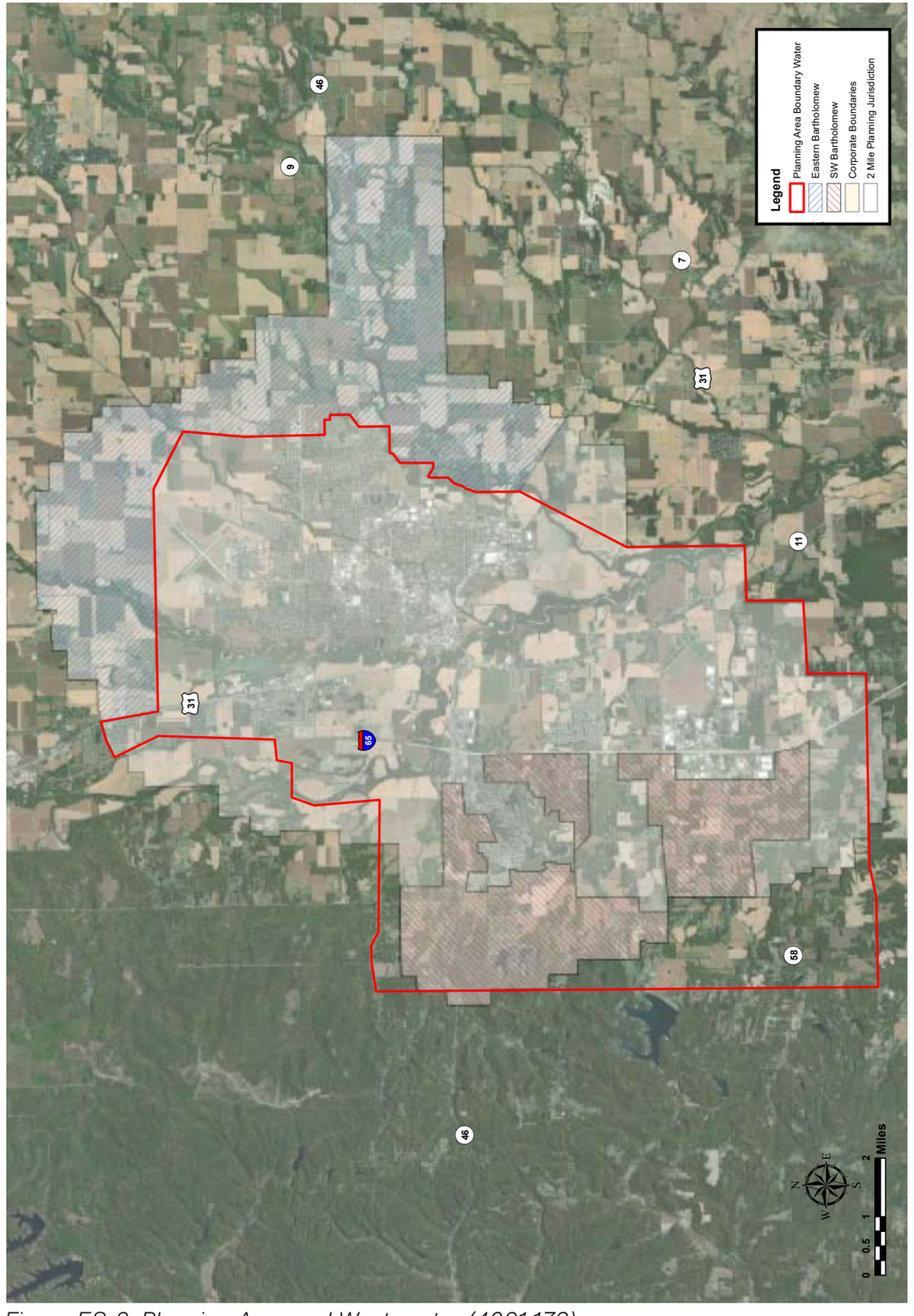


Figure ES-2: Planning Area and Wastewater (4021.173)

Water Utility

Analyzing our current water usage to estimate future usage rates.

Existing Facilities

The utility has 22 wells (at this time) that are in service. Seven wells are at the Lincoln Park wellfield with a total capacity of 6.8 MGD with the largest well, Well No. 9, out of service. Fifteen wells are in operation at the WTP No. 2 wellfields. Of these 15 wells, three are only used for emergency purposes. These wellfields have a total capacity of 12.5 MGD for 20 hours of run time with the largest well, Well No. 17, out of service.

The distribution system for the CCU water utility is comprised of nearly 300 miles of pipe. The treated water piping ranges between 1- and 30-inches in diameter. If raw water piping is included, the piping increases to a maximum of 42 inches. The oldest pipe in the system was installed in the late 1800s. In addition to the piping, the distribution system contains five water storage tanks and two booster stations. The water storage tanks have a total volume of 3.7 million gallons, but because one of the tanks is a large standpipe, the reliable volume of water storage in the system is approximately 2.7 million gallons. Each booster station has a firm capacity of 800 gallons per minute (gpm), and they serve the western pressure zone of the system.

Utility Analysis

Water Pumping and Meter Use Records

The pumping and meter use records were reviewed to establish existing water demands. Future projections for water demand and water supply were then completed. Based on these projections, the 2042 average daily water customer demand is approximately 9 MGD; the peak month average daily demand is approximately 12 MGD; and the drought month average daily demand is approximately 15 MGD. These are the projected amounts of water that CCU would be selling to the customers. Based on a simplified calculation of comparing the amount of water annually pumped from the aquifer and the amount of water that CCU sells on an annual basis, CCU averages approximately 22 percent of the treated water produced becoming nonrevenue water. Based on this, it would be reasonable to project that average daily treated water supply needed to meet 2042 demands will be approximately 11.8 MGD; the peak month daily water supply will be approximately 16.5 MGD; and the drought month daily water supply will be approximately 21 MGD. The entire water system should be planned around these supply requirements. The WTPs and booster stations should be capable of providing water throughout the drought month average daily water supply requirement of 21 MGD. The storage for the system should be based on the 11.8 MGD average daily water supply.

Water Supply Analysis

The number of additional wells required for each WTP was determined, as well as recommended replacements for aging wells. The hydrologic model of the aquifer was also updated to include the recent marked increase in irrigation wells to evaluate drought vulnerability. Historically, CCU has not experienced problems related to water levels in water supply wells from the additional decline in regional groundwater levels of 3 to 4 feet during drought conditions. The CCU wells are constructed approximately 90 feet deep with 20 to 25 feet of screen at the base of the aquifer allowing sufficient static water level to maintain well pumping. However, this requires that wells are maintained and cleaned with sufficient frequency to maintain adequate specific capacities to prevent excessive drawdown or by replacing those wells that demonstrate poor performance. CCU has emphasized well cleaning in recent years when the specific capacity of a well drops below 80 percent of the original capacity. This practice should continue. The updated model results indicate that a drought could produce additional drawdowns at the northern well field wells between 10 and 20 feet. The static water levels at the southern well fields may decrease an additional 5 to 10 feet. Static water levels should be closely monitored in drought conditions but the decline in the static water level should be manageable by CCU. There may be localized concerns at the southern well fields at Marr-Glick well field from interference from local irrigation wells.

Water Distribution System Analysis

A capacity evaluation was completed to review the elevated water storage and booster pumping station capacity requirements to meet maximum demand requirements and fire flow requirements. Alternatives were modeled to achieve a system hydraulic grade so that CCU could maintain a minimum water pressure of approximately 50 pounds per square inch.

In addition to storage and pumping, the distribution system piping was evaluated, and alternatives were reviewed using the model. Critical raw water and finished water transmission main needs were determined. A water main replacement program was recommended, with zones established based on age and pipe material. Specific projects were also identified to improve fire flow capabilities, replace lead service lines, and provide for future residential and industrial development.

Table ES-2 shows the typical useful life for water distribution infrastructure around the City.

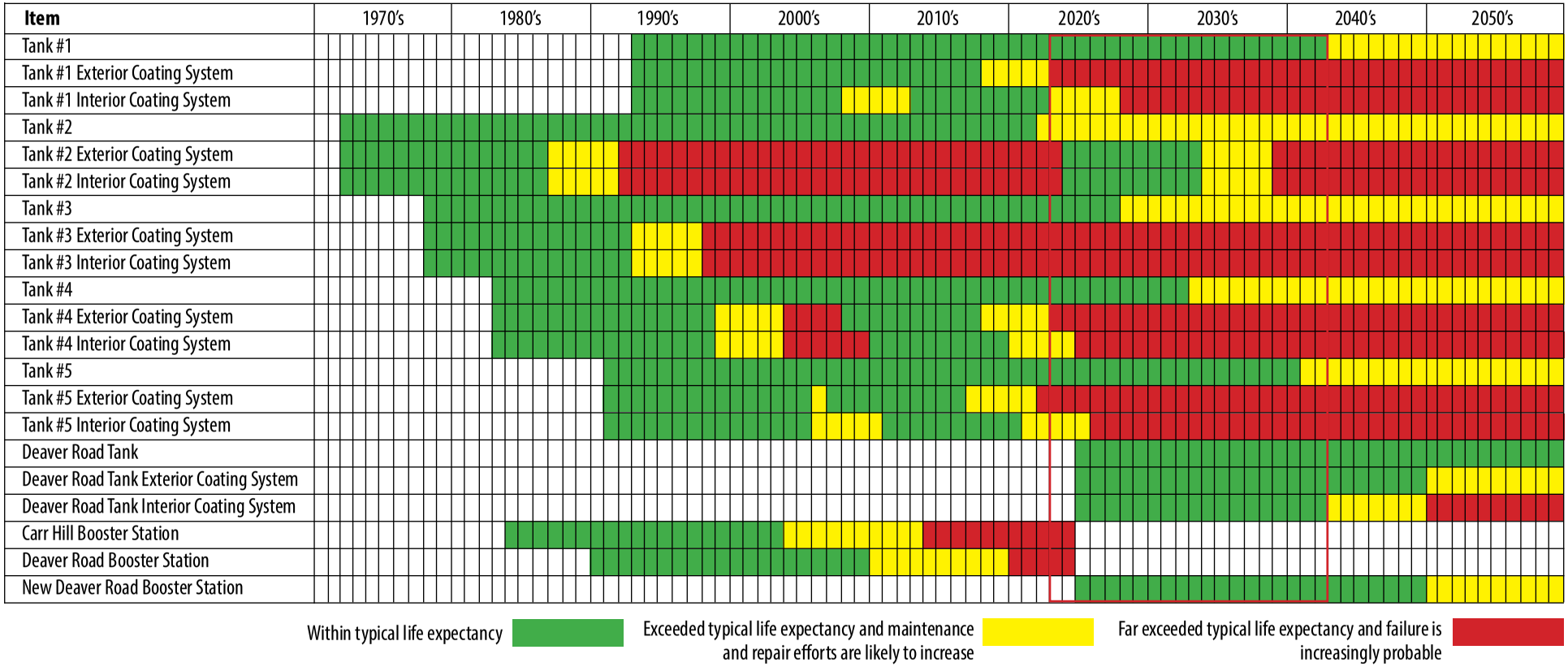


Table ES-2, Existing Condition Timeline Distribution System

Proposed Capital Improvements – Water Utility

Water Supply Wells

CCU should consider the construction of a new raw water main and eight supply wells in the wellfields that provide water to WTP No. 2. These eight wells include four new wells and four replacement wells. The new raw water main is proposed to be a 30-inch water main constructed between the confluence of wellfields and WTP No. 2.

Water Treatment Plants

The WTPs were reviewed in two separate studies. WTP No. 1 improvements include updates to its high service pumping, backwash process and disinfection processes that would allow it to increase its capacity to approximately 6 MGD. WTP No. 2 improvements include a number of projects that would allow for the treatment plant to increase its reliable capacity to more than 18 MGD and instantaneous capacities up to 24 MGD. The improvements at WTP No. 2 would prepare it to reliably provide water to the City beyond the planning period.

Water Distribution System

- **Water Storage**–In addition to the new 2.0-million-gallon tank being constructed along Deaver Road, it is recommended that CCU raise Water Tank Nos. 1 and 2 to the same elevation as the new tank.
- **Booster Station**–A new booster station replacing Carr Hill and Deaver Road Booster Stations is in the process of being constructed to provide water to the western portion of the water system. In addition to this new booster station, it's recommended that CCU consider installing booster stations in three locations around the City to increase pressure in specific neighborhoods. These include Oakridge Trail, Rushmore Drive and Shoshonee Drive.
- **Distribution System Piping**–It is recommended that CCU consider four groups of projects proceeding forward. The first group of projects considers replacement of water mains under Haw Creek. The second group are those projects related to water transmission. The third group is related to eliminating lead services and improving fire flows. The fourth group is water main replacement. Oftentimes these last two groups could be combined.

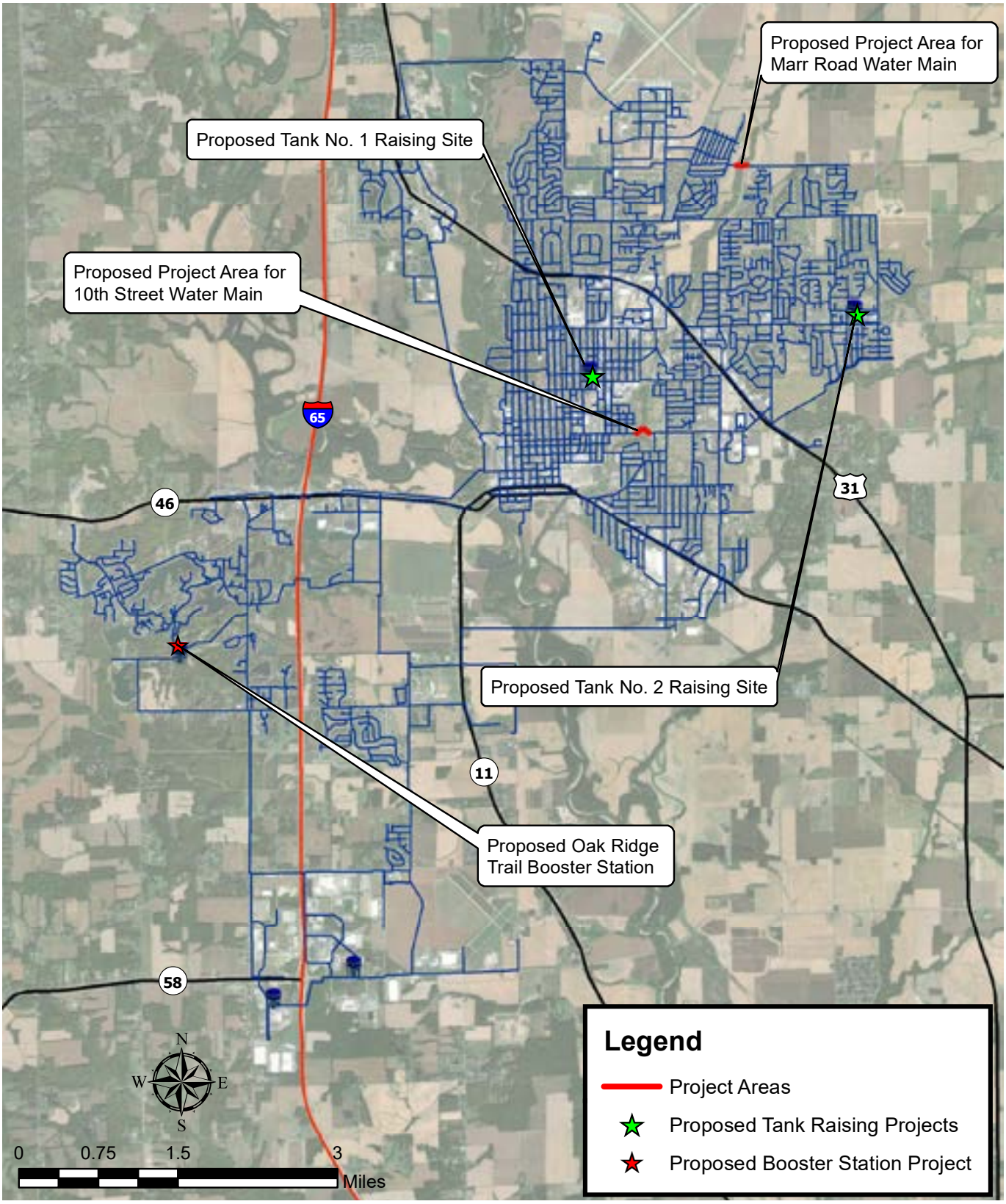
The Distribution System Improvements can be found in **Figures ES-4 and -5**. Project Priority List (**Table ES-4**) presents the 53 projects that have been recommended with each of the reports. Timeline of Improvements (**Figure ES-5**) presents a potential timeline for CCU to complete each of the recommended projects. The timeline is loosely based on the project priority list with budgetary constraints being considered as well. A listing of anticipated studies has been developed so that CCU can accurately plan for these regularly occurring studies. **Table ES-3** shows the frequency of these studies for planning purposes.

Study	Years Recurring
Asset Management Plan Update	5
New Asset Management Plan	10
Rate Study	4
Tank Observation Study	5
Hydraulic Model Update	5
Master Plan Update	5 to 7
New Master Plan	20
IURC Rate Case	4 to 6
Risk and Resilience Plan Update	4 to 5
Water Loss Validation	2
Standards Update	5
Emergency Response Plan Update	5
Tank Inspections (5 Tanks)	5

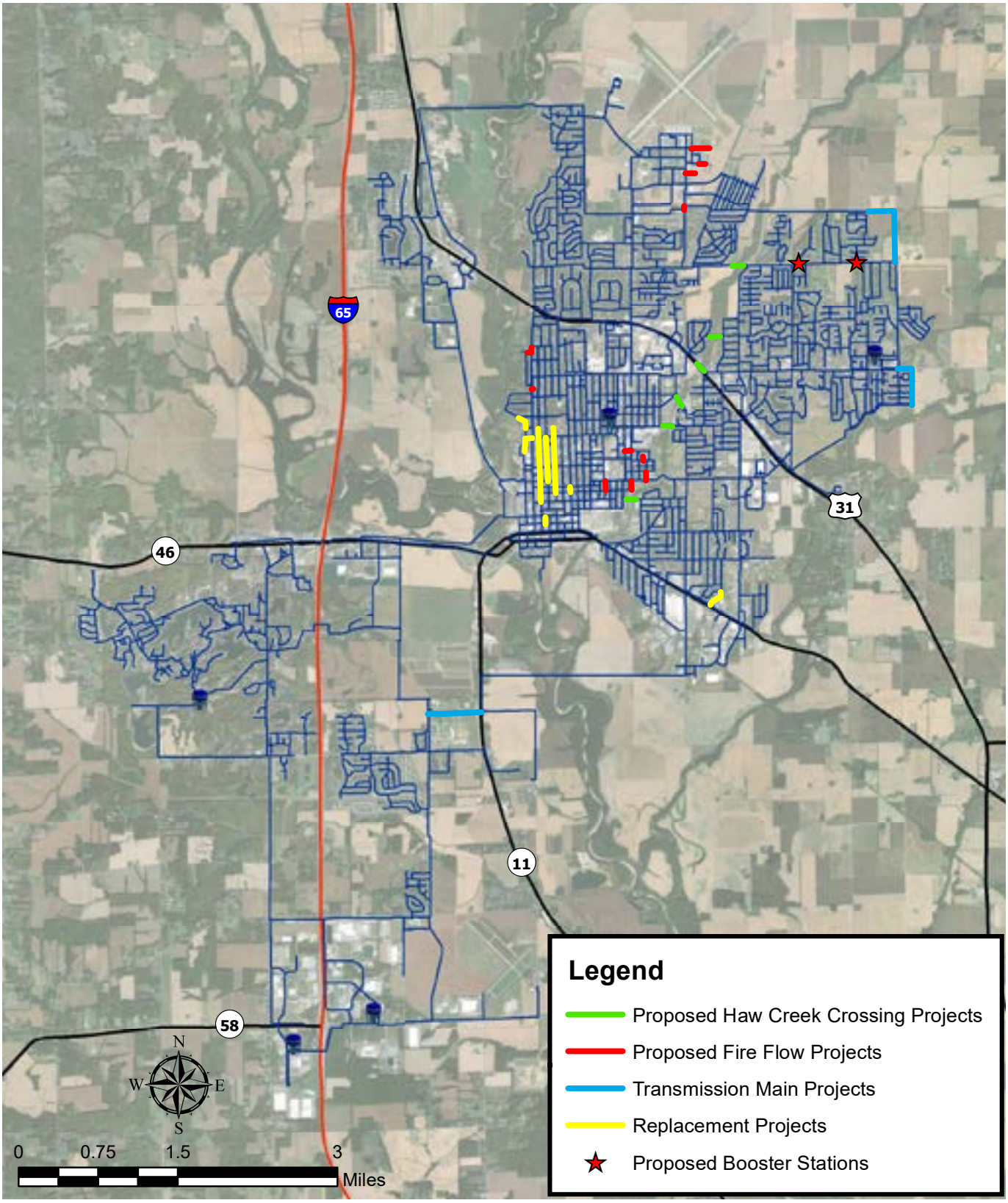
Table ES-3, Study Frequencies

Priority	Project	Cost	Reasoning
1	WTP No. 2 SCADA - Project 1	$ 130,000	Needed for continuing operation of WTP and 4-Log
2	WTP No. 1 Improvements	$1,390,000	Necessary to increase treatment capacity during large WTP No. 2 Project
3	WTP No. 2 SCADA - Project 2	$200,000	Needed for continuing operation of WTP and 4-Log
4	WTP No. 2 Chemical Improvements*	$2,940,000	Abandon the chlorine gas process
5	WTP No. 2 Backwash Process - Option 2*	$7,560,000	Necessary to remove sanitary issues in WTP No. 2
6	WTP No. 2 Full Filter Rehabilitation*	$30,800,000	Necessary to provide long-term reliability for water supply
7	WTP No. 2 - Connect HSPs to Redundant Water Main*	$279,000	Provide redundancy for the finished water main
8	WTP No. 2 Raw Water Main Replacement	$2,142,000	Provide redundancy from main source of water to WTP No. 2
9	WTP No. 2 HSP Replacement*	$11,270,000	Necessary to adjust pumps to work with new system storage more efficiently
10	WTP No. 2 - Bottom Channel Redundancy*	$475,000	Provide redundancy to connection between clearwells and HSPs
11	16"Transmission Main (HDD) - Marr Road	$405,000	Provide reliability to the northeast area of system
12	16"Transmission Main (HDD) - 10th Street	$608,000	Provide redundancy to the northeast area of system
13	Pressure Reducing Valves	$540,000	Improves service to the west side of the system
14	WTP No. 2 - ADA Restroom Improvements*	$63,000	Provide ADA restrooms as required to allow for building improvements
15	WTP No. 2 - New Steps and ADA Access*	$326,000	Provide ADA access to the WTP and access to FW and RQ pipes
16	Raise Tank One 20 LF	$1,500,000	Necessary to increase system storage
17	Raise Tank Two 20 LF	$1,800,000	Necessary to increase system storage
18	4 Additional New Groundwater Wells for WTP #2	$2,750,000	Increase raw water capacity to WTP No. 2
19	Install 30 GPM Booster Station - Oak Ridge Trail	$102,000	Increase pressure above 50 psi
20	12"Water Main - North National Road (HDD)	$287,000	Reduce the likelihood of a break in Hawcreek
21	12"Water Main - 7th Street (HDD)	$287,000	Reduce the likelihood of a break in Hawcreek
22	12"Water Main - Rocky Ford Road (HDD)	$314,000	Reduce the likelihood of a break in Hawcreek
23	WTP No. 2 - New Roof	$420,000	Needed for continued treatment at WTP No. 2
24	Valve Replacement (ongoing)	$1,688,000	Continuous maintenance to allow for more control over system
25	WTP No. 2 - New 3 MG Clearwell	$5,850,000	Allow for the demolition of WTP No. 1
26	Install 120 GPM Booster Station - Rushmore Drive	$675,000	Increase pressures in the northeast portion of system above 50 psi
27	Install 20 GPM Booster Station - Shoshonee Drive	$102,000	Increase pressures on one street to above 50 psi
28	10"Water Main - 30th Street (HDD)	$287,000	Reduce the likelihood of a break in Hawcreek
29	Replace 4 Groundwater Wells for WTP #2	$2,200,000	Replace aging groundwater wells
30	WTP No. 2 - New Back Exit*	$216,000	Provide additional exits from WTP No. 2
31	8"Water Main - 23rd Street	$41,000	Improve fire flow in under-served areas
32	6"Water Main - Court Street	$68,000	Improve fire flow in under-served areas
33	6"Water Main - Chestnut Street	$81,000	Eliminate lead service connections
34	8"Water Main - 14th Street	$95,000	Improve fire flow in under-served areas
35	8"Water Main - Lafayette Street	$108,000	Eliminate lead service connections
36	8"Water Main - Washington Street	$108,000	Improve fire flow in under-served areas
37	8"Water Main - Werner Avenue	$135,000	Improve fire flow in under-served areas
38	8"Water Main - Central Avenue	$135,000	Improve fire flow in under-served areas
39	8"Water Main - Iowa Street	$135,000	Improve fire flow in under-served areas
40	8"Water Main - Off Lincoln Park Drive (HDD)	$252,000	Reduce the likelihood of a break in Hawcreek
41	6"Water Main - Coovert Street	$257,000	Eliminate lead service connections
42	8"Water Main - 17th Street (HDD)	$275,000	Reduce the likelihood of a break in Hawcreek
43	6 & 8"Water Mains - Lawton Avenue	$459,000	Eliminate lead service connections
44	8"Water Main - Lafayette Street	$594,000	Eliminate lead service connections
45	8"Water Main - Pearl Street	$878,000	Eliminate lead service connections
46	4 to 16"Reconnections - Franklin Street	$1,788,000	Eliminate lead service connections
47	16"Water Main - Middle Road	$81,000	Improve service to airport area for economic development
48	8"Water Main - Verhulst Street	$95,000	Improve service to airport area for economic development
49	8"Water Main - Grissom Street	$141,000	Improve service to airport area for economic development
50	8"Water Main - Arnold Street	$270,000	Improve service to airport area for economic development
51	16"Water Main - Regency Drive	$1,094,000	Provide redundancy around the entire system
52	WTP No. 2 Administration Area Improvements*	$1,260,000	Improve the facilities at WTP No. 2
53	16"Transmission Main - Talley Road	$1,637,000	Provide redundancy around the entire system
	Total	**$87,593,000**	*These projects could be completed concurrently as a part of a larger project at WTP No. 2

Table ES-4, Project Priority List



5-Year Projects (Figure ES-4, 4021.172)



20-Year Projects (Figure ES-5, 4021.172)

Project	Priority	Cost
WTP No. 2 SCADA - Project 1	1	$130,000
WTP No. 1 Improvements	2	$1,390,000
WTP No. 2 SCADA - Project 2	3	$200,000
WTP No. 2 Chemical Improvements*	4	$2,940,000
WTP No. 2 Backwash Process - Option 2*	5	$7,560,000
WTP No. 2 Full Filter Rehabilitation*	6	$30,800,000
WTP No. 2 - Connect HSPs to Redundant Water Main*	7	$279,000
WTP No. 2 Raw Water Main Replacement	8	$2,142,000
WTP No. 2 HSP Replacement*	9	$11,270,000
WTP No. 2 - Bottom Channel Redundancy*	10	$475,000
16" Transmission Main (HDD) - Marr Road	11	$405,000
16" Transmission Main (HDD) - 10th Street	12	$608,000
Pressure Reducing Valves	13	$540,000
WTP No. 2 - ADA Restroom Improvements*	14	$63,000
WTP No. 2 - New Steps and ADA Access*	15	$326,000
Raise Tank One 20 LF	16	$1,500,000
Raise Tank Two 20 LF	17	$1,800,000
4 Additional New Groundwater Wells for WTP #2	18	$2,750,000
Install 30 GPM Booster Station - Oak Ridge Trail	19	$102,000
12" Water Main - North National Road (HDD)	20	$287,000
12" Water Main - 7th Street (HDD)	21	$287,000
12" Water Main - Rocky Ford Road (HDD)	22	$314,000
WTP No. 2 - New Roof	23	$420,000
Valve Replacement (ongoing)	24	$1,688,000
WTP No. 2 - New 3 MG Clearwell	25	$5,850,000
Install 120 GPM Booster Station - Rushmore Drive	26	$675,000
Install 20 GPM Booster Station - Shoshonee Drive	27	$102,000
10" Water Main - 30th Street (HDD)	28	$287,000
Replace 4 Groundwater Wells for WTP #2	29	$2,200,000
WTP No. 2 - New Back Exit*	30	$216,000
8" Water Main - 23rd Street	31	$41,000
6" Water Main - Court Street	32	$68,000
6" Water Main - Chestnut Street	33	$81,000
8" Water Main - 14th Street	34	$95,000
8" Water Main - Lafayette Street	35	$108,000
8" Water Main - Washington Street	36	$108,000
8" Water Main - Werner Avenue	37	$135,000
8" Water Main - Central Avenue	38	$135,000
8" Water Main - Iowa Street	39	$135,000
8" Water Main - Off Lincoln Park Drive (HDD)	40	$252,000
6" Water Main - Coovert Street	41	$257,000
8" Water Main - 17th Street (HDD)	42	$275,000
6 & 8" Water Mains - Lawton Avenue	43	$459,000
8" Water Main - Lafayette Street	44	$594,000
8" Water Main - Pearl Street	45	$878,000
4 to 16" Reconnections - Franklin Street	46	$1,788,000
16" Water Main - Middle Road	47	$81,000
8" Water Main - Verhulst Street	48	$95,000
8" Water Main - Grissom Street	49	$141,000
8" Water Main - Arnold Street	50	$270,000
16" Water Main - Regency Drive	51	$1,094,000
WTP No. 2 Administration Area Improvements*	52	$1,260,000
16" Transmission Main - Talley Road	53	$1,637,000

Table ES-5, Water Utility Timeline of Improvements

Wastewater Utility

Analyzing and enhancing our wastewater systems.

Existing Facilities

Wastewater Collection

The existing sanitary sewer collection system was constructed starting in the 1890s and is comprised of 6-inch through 108 inch diameter sewer lines, approximately 5,500 manholes, and 82 lift stations. The older downtown portion of the system has combined sewer system that collects both stormwater and sanitary sewer flow. All wastewater flow is collected at one of two main lift stations, Haw Creek Headworks and Southside Lift Station, and is pumped to the WWTP.

The majority of the CCU wastewater collection system is within the City's corporate boundaries. CCU accepts and treats flow from Driftwood Utilities, which serves an area northwest of the City. The CCU service area also extends southeast of City boundaries where the former EBRSD was located. CCU took over control of the EBRSD sewer system, which primarily consists of low-pressure sewer systems, in 2009.

Wastewater Treatment

CCU owns and operates one WWTP located at 3465 South Jonesville Road and one wet weather treatment facility (WWTF) located at the Mariah Basins just south of downtown Columbus. The Utility provides wastewater treatment to customers within the CCU collection system service area, in addition to treatment of hauled waste from areas outside of the service area in Bartholomew County and the surrounding counties.

The CCU WWTP, a Class IV, 14 MGD activated sludge treatment facility constructed in 2011, discharges to the East Fork of the White River at Outfall 011 under National Pollutant Discharge Elimination System (NPDES) Permit No. IN0032573, effective April 1, 2020. Forward flow treatment units include influent screening and grit removal, two oxidation ditches, four final clarifiers, ultraviolet disinfection (UV), and cascade aeration. Sludge handling treatment units include a solids holding tank, solids centrifuges with polymer feed equipment and covered dewatered biosolids storage. Dewatered biosolids are either land applied or landfilled.

The Mariah Basins WWTF discharges to the East Fork of the White River at Outfall 010 under NPDES Permit No. IN0032573. The basins fill when the WWTP exceeds its peak hourly design rate of 39 MGD, but only discharge when they are full, and flow is still incoming. Discharge from Outfall 010 receives screening at the Haw Creek Headworks, and primary settling, chlorine disinfection, and dechlorination at the WWTF.

Utility Analysis

Wastewater Collection System Modeling

A computerized hydraulic wastewater collection system model was developed by importing CCU's geographical information system (GIS) infrastructure into XPSWMM 2016.1 and augmenting it with record drawings, elevation data derived from the 2011 to 2013 Indiana Statewide Light Detection and Ranging (LiDAR) dataset, and limited field survey data. Dry weather sanitary flows were developed using 2020 census data, City zoning information, water billing data, and known ratios of residential flow in respect to commercial and industrial flows provided by CCU. Rainfall data was

taken from local rain gauges registered with Weather Underground, and total rainfall depths were cross-referenced with daily rainfall depth data provided by CCU from a rainfall gauge at the WWTP. Calibrations for dry and wet weather conditions were made using flow metering data recorded at the Haw Creek Headworks and Southside lift stations over the period from May 1 through May 17, 2017. Additional dry weather calibration was completed for October 1 through October 17, 2022. **Figure ES-7** shows the sanitary system model basin delineation and identified flow nodes.

Wastewater Collection System Analysis

The wastewater collection system model was then used to evaluate existing capacity constraints and the impacts on existing infrastructure expected due to extension of sewer service to new developments. Each area of potential growth was evaluated in terms of how best to serve these areas, including gravity sewer systems and new or modified lift stations. **Table ES-5** summarizes those locations that were identified in the model as being future hydraulic constraints.

In addition, recommendations were made to eliminate lift stations and to complete improvements at many of the existing lift stations. Recommendations were made to address known problem areas such as sewers located under buildings, exposed creek crossings, and sewers under major roads. **Figure ES-8** shows several of the priority lift stations for CCU to plan on replacing during the planning period.

A sanitary sewer and manhole rehabilitation plan was also recommended, continuing and expanding the existing sewer lining program and focusing on the downtown area as it is the oldest area in the City.

Wastewater Treatment Plant Analysis

The WWTP was evaluated in relation to two main categories. One was upcoming and potential regulations and initiatives, such as nutrient limits. The other was an assessment of the sludge and biosolids-related processes and their capacity. An overall review of the facilities in the WWTP was also conducted and recommendations were made for capital projects, maintenance requirements, and operational changes. **Table ES-6** identifies the primary WWTP facility needs during the planning period.

General Area	Specific Location	Timeframe	Related Upstream Improvements
Southeast	Clifty Lift Station interceptor on Marr Road between State Street and Indiana Avenue	Long-term (20 years or more)	Southeast Regional Lift Station construction
South	Woodside South Lift Station	Short-term (5 years or more)	Industrial development west of I-65
South	Walesboro Lift Station	Short-term	Woodside South Lift Station upgrade; Walesboro industrial development
Southwest	Southside Lift Station	Long-term	Growth along Denois Creek interceptor cooridor; increased capacity of Walesboro Lift Station; Increased capacity of SR 46 West Lift Station
West	SR 46 West Lift Station	Current/Short-term	Growth in SR 46 West Lift Station basin
West	SR 46 West Interceptor to I-65	Current/Short-term	Growth in SR 46 West Lift Station basin
North	8th Street Lift Station	Short-term	Residential and industrial growth
North/Downtown	Noblitt Interceptor	Current/Short-term	Growth west and south of airport and increased capacity of 8th Street Lift Station
North/Downtown	Maple Grove Interceptor	Current/Short-term	Growth east and north of airport

Table ES-5, Wastewater Collection System Hydraulic Constraints for Future Growth

Facility Deficiency	Facility Need	Related Operational Recommendations	Master Plan Reference Section
Significantly higher than expected sludge yield (0.9 vs. 0.3)	Aerobic Digestion, additional sludge dewatering and biosolids handling capacity.		7.06.E
Seasonal fluctuation in Biological Phosphorus Removal efficiency resulting in effluent phosphorus > 1.0 mg/L	Backup Chemical Phosphorus Removal facilities to provide chemical polishing during the late summer months.	Reduce Solids Retention Time going into the summer months.	7.06.B.1
H_2S corrosion of the influent screen covers	Continue to monitor and budget to coat and/or replace covers as needed.	Consider limiting influent hydrogen sulfide with nitrate addition.	6.04.C.2
Oxidation Ditch bearing/coupling failure	Budget to replace. Can be replaced as needed, or as part of larger construction project.		7.06.C
SCUM pumping issue		Continue adding disinfected effluent water to wet wells as needed. Evaluate MLSS concentrations and sludge age to reduce "popping" of solids in clarifier, which are collected via the scum beach. Increase the amount of water flushed by each pass of the scum arm.	6.04.C.4
Broken cascade aeration weirs		This does not appear to be impacting performance, continue to monitor for reduced performance and address as necessary.	6.05.C.5
Interchange Tanks and ASH Tank equipment failure	Replace/repair piping. Replace, repair, remove floating mixer apparatus as desired.	Dewatering of the Interchange Tanks will be difficult for the Utility to complete while maintaining necessary daily dewatering operations. Repairs will need to take place as part of a larger capital project.	6.04.C.6

Table ES-6, Wastewater Treatment Plant Facility Needs

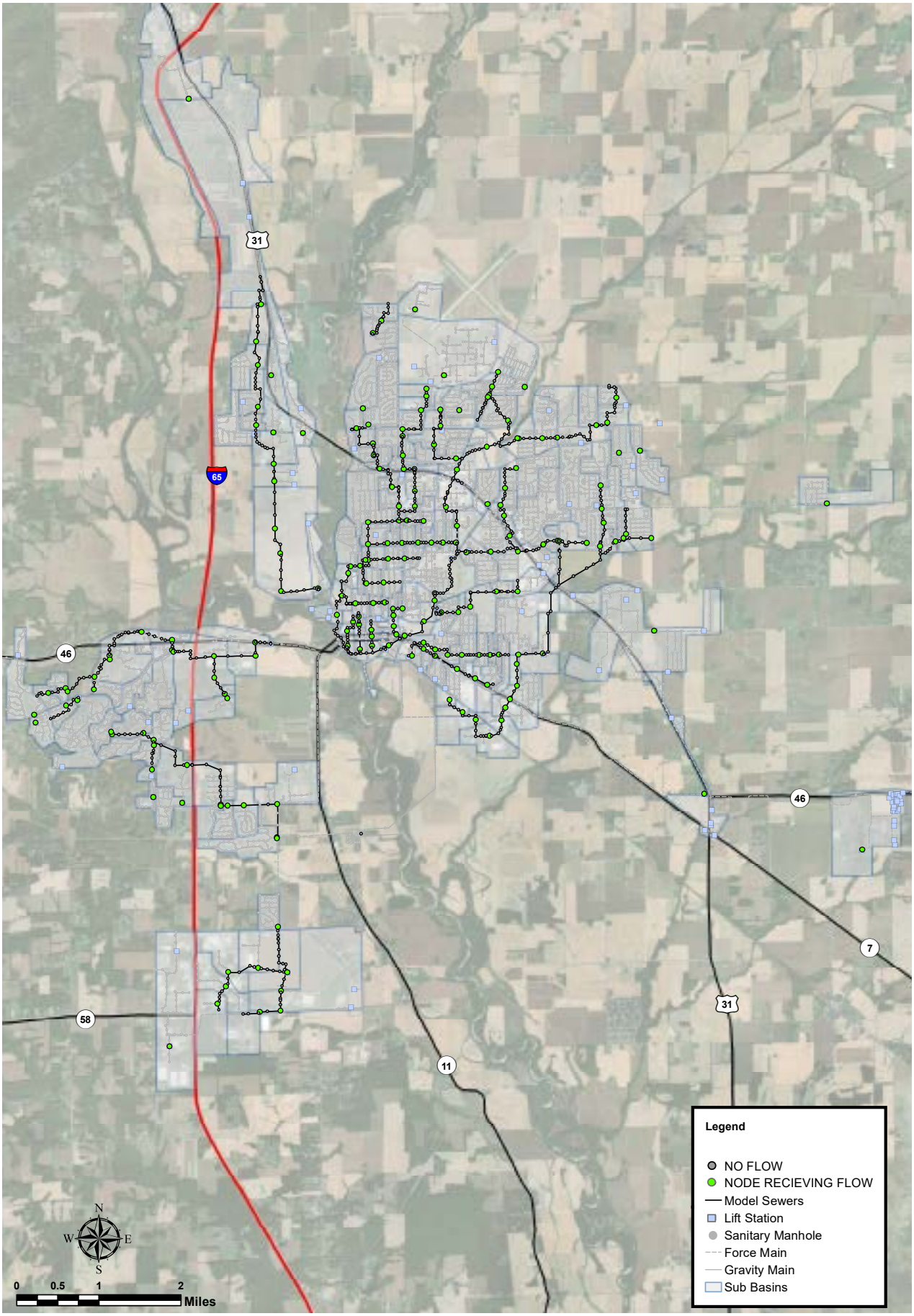


Figure ES-7: Sanitary System Model Basin Delineation and Flow Nodes (4021.173)

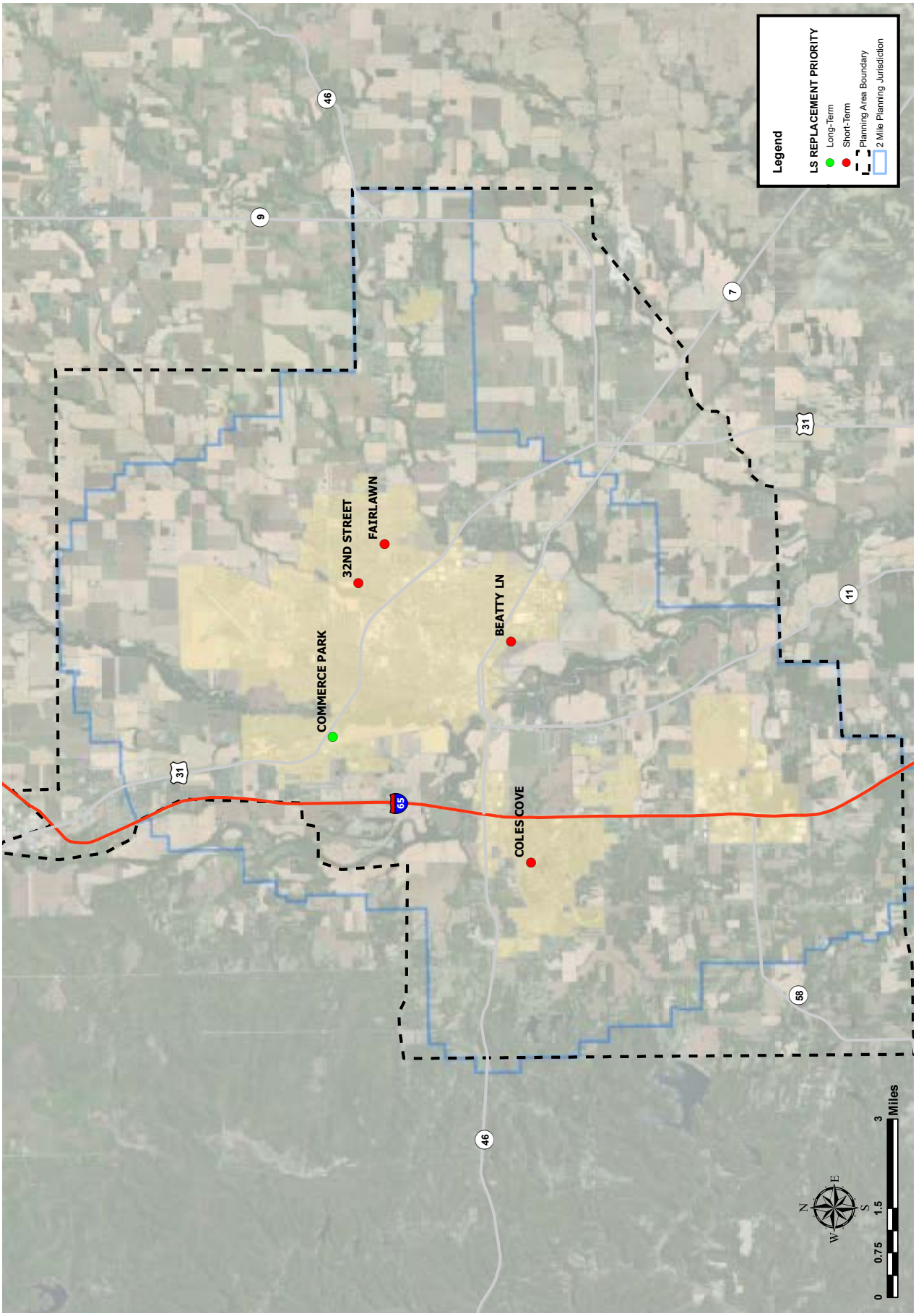


Figure ES-8: Lift Station Replacement Priority (4021.173)

Proposed Capital Improvements – Wastewater Utility

Wastewater Collection System – Projects were identified for infrastructure improvements to serve new development and to eliminate lift stations and address high risk areas.

It is recommended that CCU continue its annual lining program and focus on the downtown area and high-risk areas. Additional rehabilitation recommendations include manhole lining, televising, and lining large interceptors in the downtown area, and replacing 4- and 6-inch mainline sewers.

Lift station upgrades were recommended based on capacity issues and lift station site visits. Full upgrades or replacements are recommended at several lift stations, including Beatty Lane, Fairlawn, Baseline Road, 32nd Street, Cole's Cove, Commerce Park, and Clifty Creek. The upgrade could simply require a pump replacement in an existing wet well, but could also require electrical upgrades, new rails, new piping, a new hatch, or even a new wet well.

Costs were developed for needs identified during the lift station site visits and condition timeline development. Costs were developed for each of four categories: piping and valve replacement, electrical upgrades, concrete repair, and full replacement. Different costs were developed for small, duplex stations and larger, triplex stations.

These projects are shown in **Figures ES-9 through 13** which summarize the collection system improvements throughout the City.

WWTP – Recommended improvements at the WWTP include the addition of chemical phosphorus removal facilities, oxidation ditch improvements, conversion of the Cannibal tanks to aerobic digestion, standby power improvements at the Haw Creek Headworks, and improvements to the dewatering facilities.

Project Priority List – **Table ES-7** presents the 55 projects that have been recommended with each of the reports.

Timeline of Improvements – **Figure ES-14** presents a potential timeline for CCU to complete each of the recommended projects. The timeline is loosely based on the project priority list with budgetary constraints being considered as well.

Priority	Project	Cost	Reasoning
1	Oxidation Ditch Improvements Phase 1	$3,214,600	Increased Loading/Oxygen Deficiency
2	Annual Lining Program-Current Budget	$10,000,000	Annual Maintenance
3	Annual Lining Program-Additional Budget	$7,000,000	Annual Maintenance
4	Walesboro Lift Station Upgrade	$1,831,000	Lift Station Maintenance/Replacement
5	SR 46 Lift Station Rehabilitation	$1,870,000	Lift Station Maintenance/Replacement
6	Westside Interceptor and Southside Lift Station Upgrades	$19,603,650	New Development
7	SR 11 Force Main Rerouting to Westside Interceptor	$978,000	New Development
8	45-Day SRT Aerobic Digestion Phase 1	$11,810,000	Insufficient Biosolids Handling Capacity
9	Woodside South Lift Station Upgrade	$996,740	Lift Station Maintenance/Replacement
10	Lift Station Remoting Monitoring Improvements	$337,500	Lift Station Improvements
11	Clifty Creek Lift Station Upgrade	$1,870,000	Lift Station Maintenance/Replacement
12	Chemical Phosphorus Removal Facilities	$1,581,100	Backup for Biological Phosphorus Removal to meet limits
13	Baseline Road Lift Station Rehabilitation	$580,000	Lift Station Maintenance/Replacement
14	32nd Street Lift Station Full Replacement	$587,400	Lift Station Maintenance/Replacement
15	Beatty Lane Lift Station Full Replacement	$882,450	Lift Station Maintenance/Replacement
16	Commerce Park Lift Station Full Replacement	$682,700	Lift Station Maintenance/Replacement
17	7th Street Lift Station Equipment Replacement	$145,800	Lift Station Maintenance/Replacement
18	Stonehaven Interceptor Sewer Upgrade	$864,100	New Development
19	Talley Lift Station Equipment Replacement	$182,250	Lift Station Maintenance/Replacement
20	Eastridge Lift Station Equipment Replacement	$434,700	Lift Station Maintenance/Replacement
21	Fairlawn Lift Station Full Replacement	$881,100	Lift Station Maintenance/Replacement
22	Cole's Cove Lift Station Full Replacement	$682,700	Lift Station Maintenance/Replacement
23	Amberly Lift Station Rehabilitation	$500,000	Lift Station Maintenance/Replacement
24	Goeller Lift Station Equipment Replacement	$72,900	Lift Station Maintenance/Replacement
25	Breakaway Trails Lift Station Equipment Replacement	$182,250	Lift Station Maintenance/Replacement
26	8th Street Lift Station Upgrade	$1,870,000	Lift Station Maintenance/Replacement
27	Haw Creek Headworks Standby Power Generator	$2,268,000	Backup Power Improvements
28	Day's Trucking Lift Station Equipment Replacement	$200,000	Lift Station Maintenance/Replacement
29	Northbrook Lift Station Equipment Replacement	$182,250	Lift Station Maintenance/Replacement
30	Woodside Sanitary Sewer Extension	$601,760	New Development
31	Merchant Mile Gravity Sewer Upgrade	$5,688,260	New Development
32	Haw Creek Crossing Removal-Inverted Siphon	$1,027,000	Eliminate LS/High Risk Areas
33	Oxidation Ditch Improvements Phase 2	$12,840,000	Increased Loading/Oxygen Deficiency
34	Westlake Lift Station Elimination	$299,284	Eliminate LS/High Risk Areas
35	45-Day SRT Aerobic Digestion Phase 2	$12,470,000	Insufficient Biosolids Handling Capacity
36	Walesboro - Eastern Gravity Sewer	$744,180	New Development
37	SR 58 West Lift Station and Force Main	$1,760,860	New Development
38	CR 50 West Regional Lift Station and Force Main	$2,798,000	New Development
39	Walesboro Lift Station Force Main to Southside Lift Station	$3,049,060	Lift Station Maintenance/Replacement
40	SR 58 West - Northern Gravity Sewer	$1,090,320	New Development
41	SR 58 West - Southern Gravity Sewer	$1,131,960	New Development
42	Arvin Lift Station Elimination	$808,500	Eliminate LS/High Risk Areas
43	Carr Hill and I-65 Lift Station Elimination	$987,220	Eliminate LS/High Risk Areas
44	Goeller Lift Station Elimination	$895,880	Eliminate LS/High Risk Areas
45	W-8 Gravity Sewer Extension	$1,136,260	New Development
46	W-9 Gravity Sewer Extension	$862,060	New Development
47	CR 50 West - Western Gravity Sewer	$1,538,580	New Development
48	Woodside South Force Main Replacement	$1,468,740	Lift Station Maintenance/Replacement
49	East Interceptor Extension to Talley Road	$8,846,450	New Development
50	CR 50 West - Eastern Gravity Sewer	$706,260	New Development
51	Woodside South FM to Walesboro LS - Gravity Sewer Upgrade	$2,898,360	New Development
52	Denios Creek Interceptor	$23,261,850	New Development
53	CR 50 West Lift Station Upgrade	$767,720	Lift Station Maintenance/Replacement
54	SR 58 West Lift Station Upgrades and Force Main Extension	$2,439,320	Lift Station Maintenance/Replacement
		$162,409,074	

Table ES-7, Wastewater Project Priority List

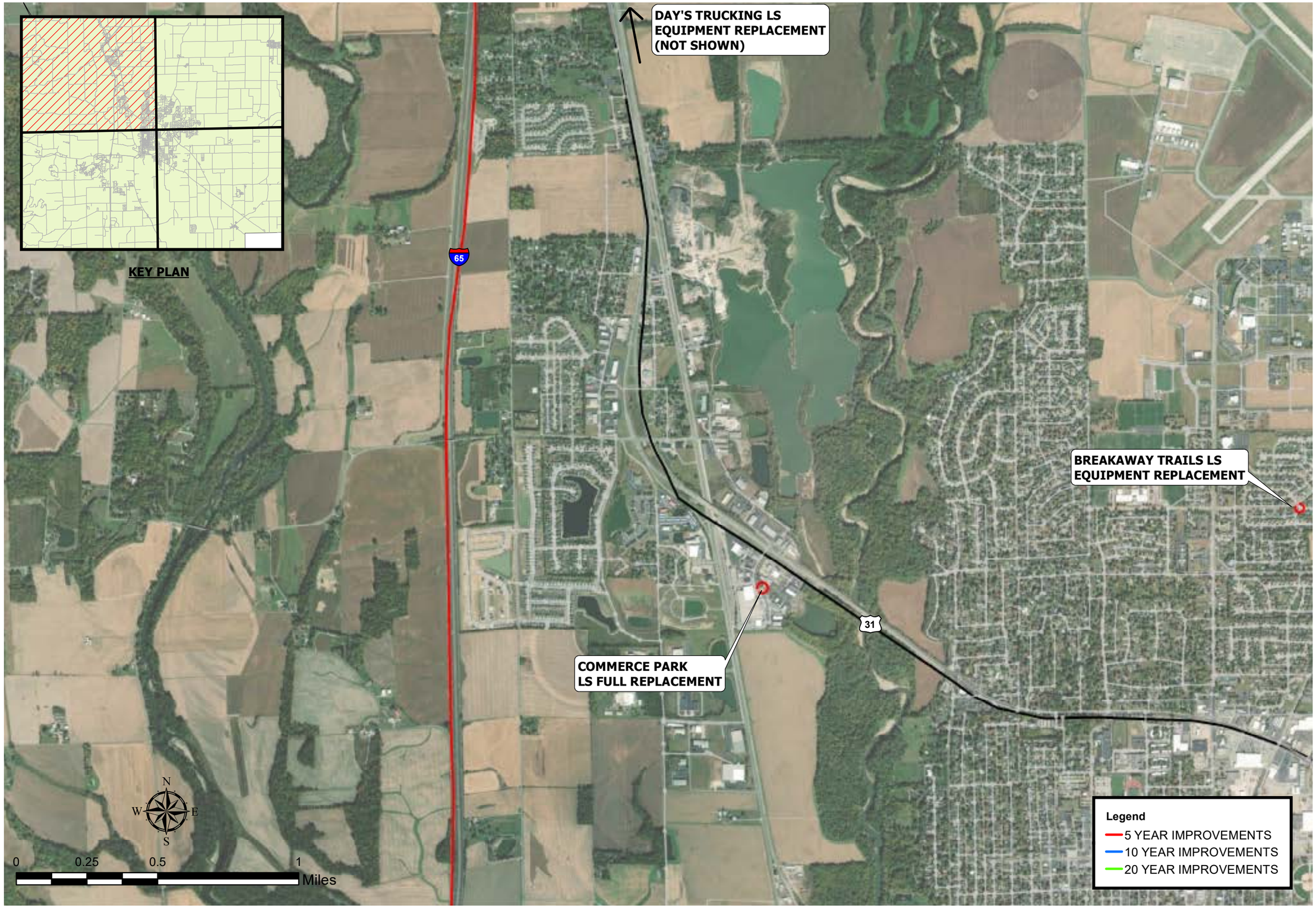


Figure ES-12: Recommended Improvements; Northwest Quadrant (4021.173)

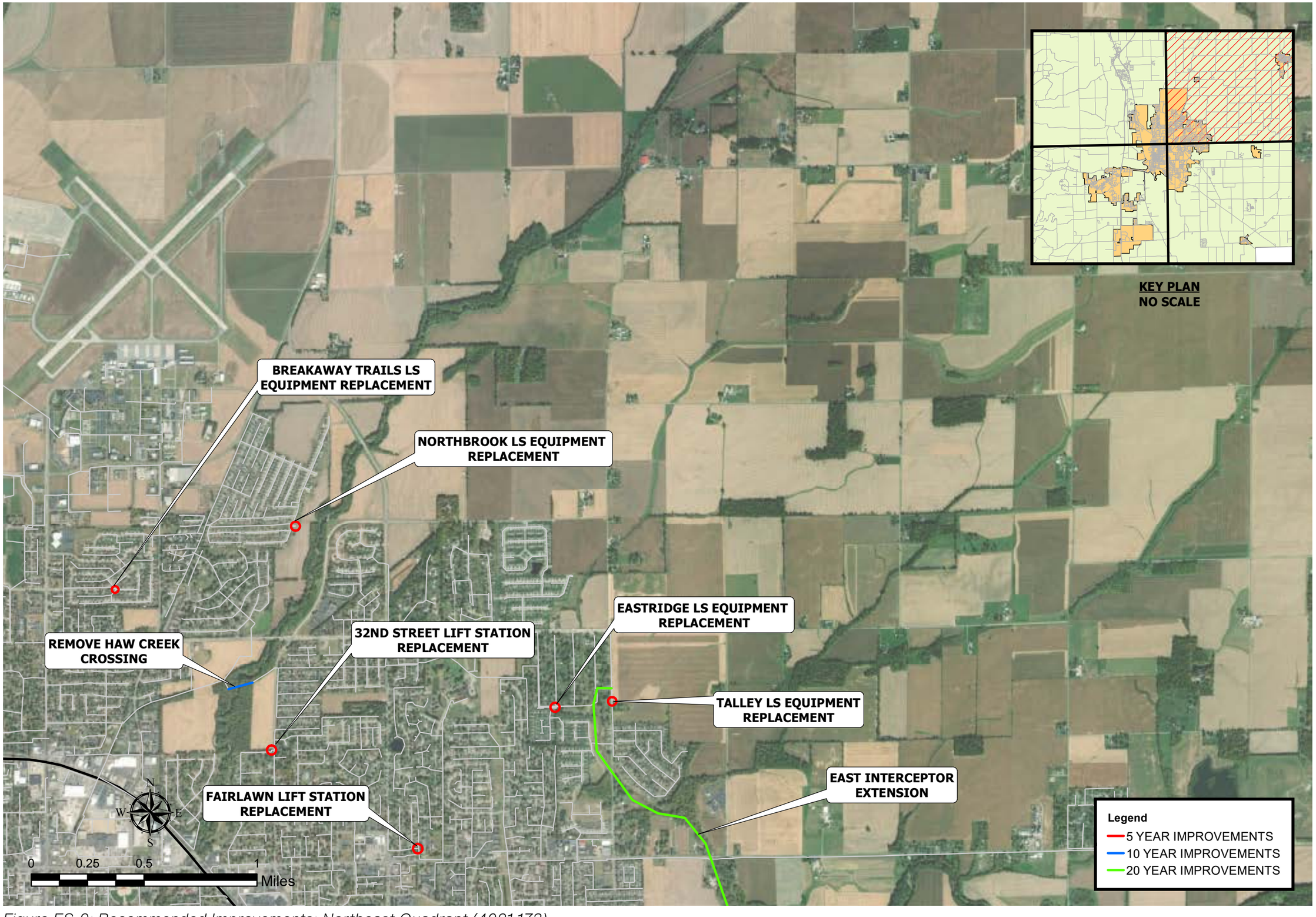


Figure ES-9: Recommended Improvements; Northeast Quadrant (4021.173)

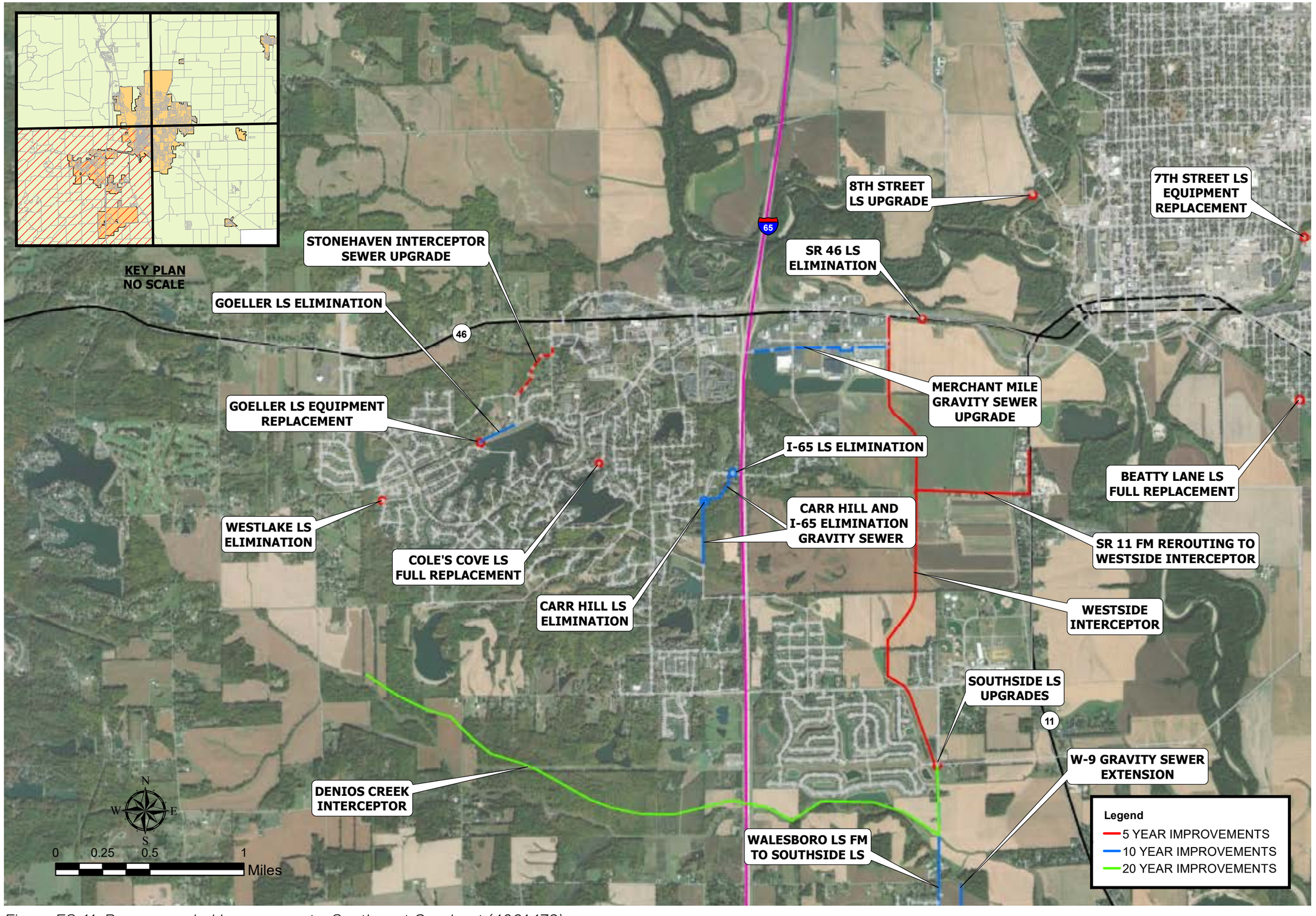


Figure ES-11: Recommended Improvements; Southwest Quadrant (4021.173)

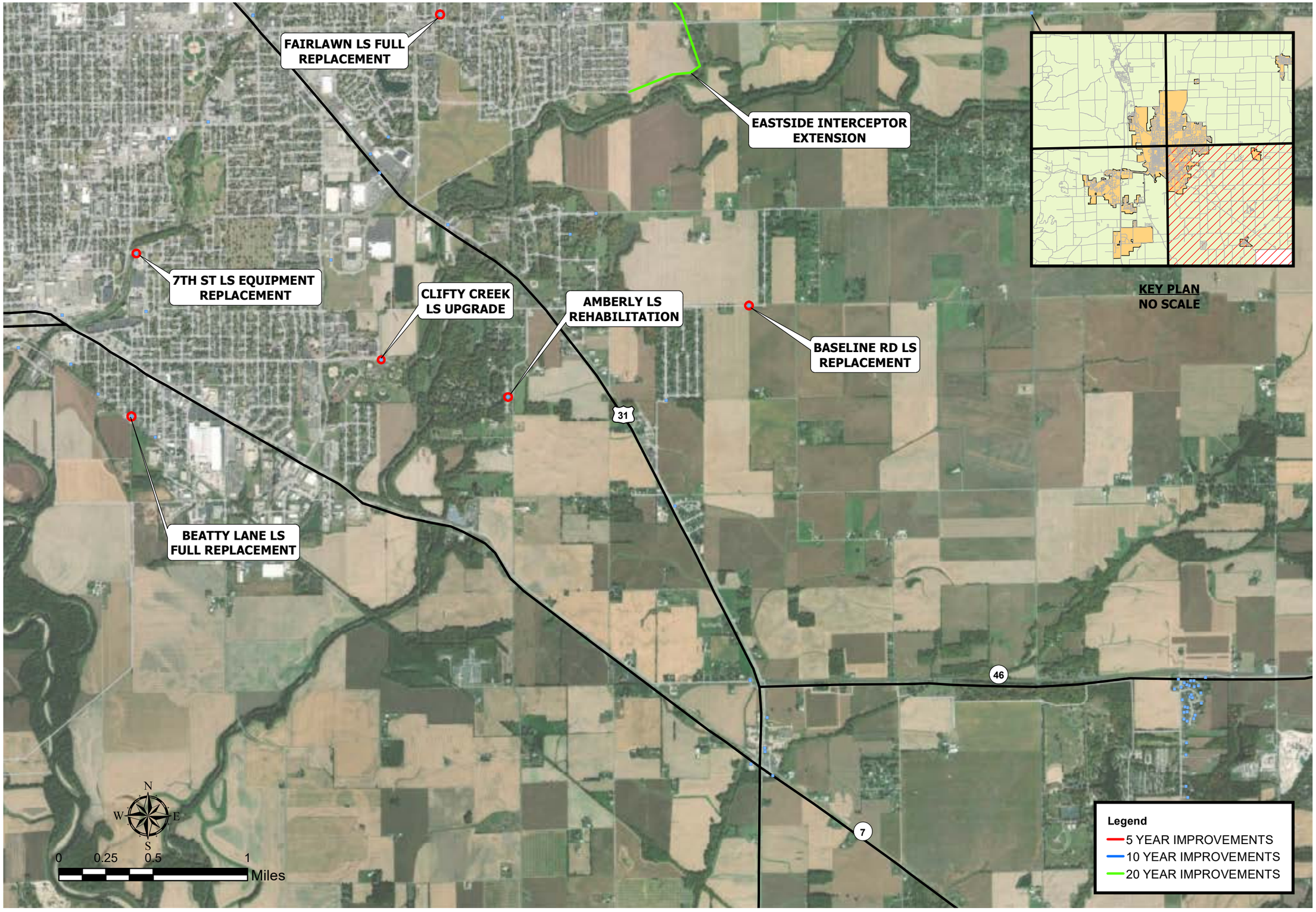


Figure ES-10: Recommended Improvements; Southeast Quadrant (4021.173)

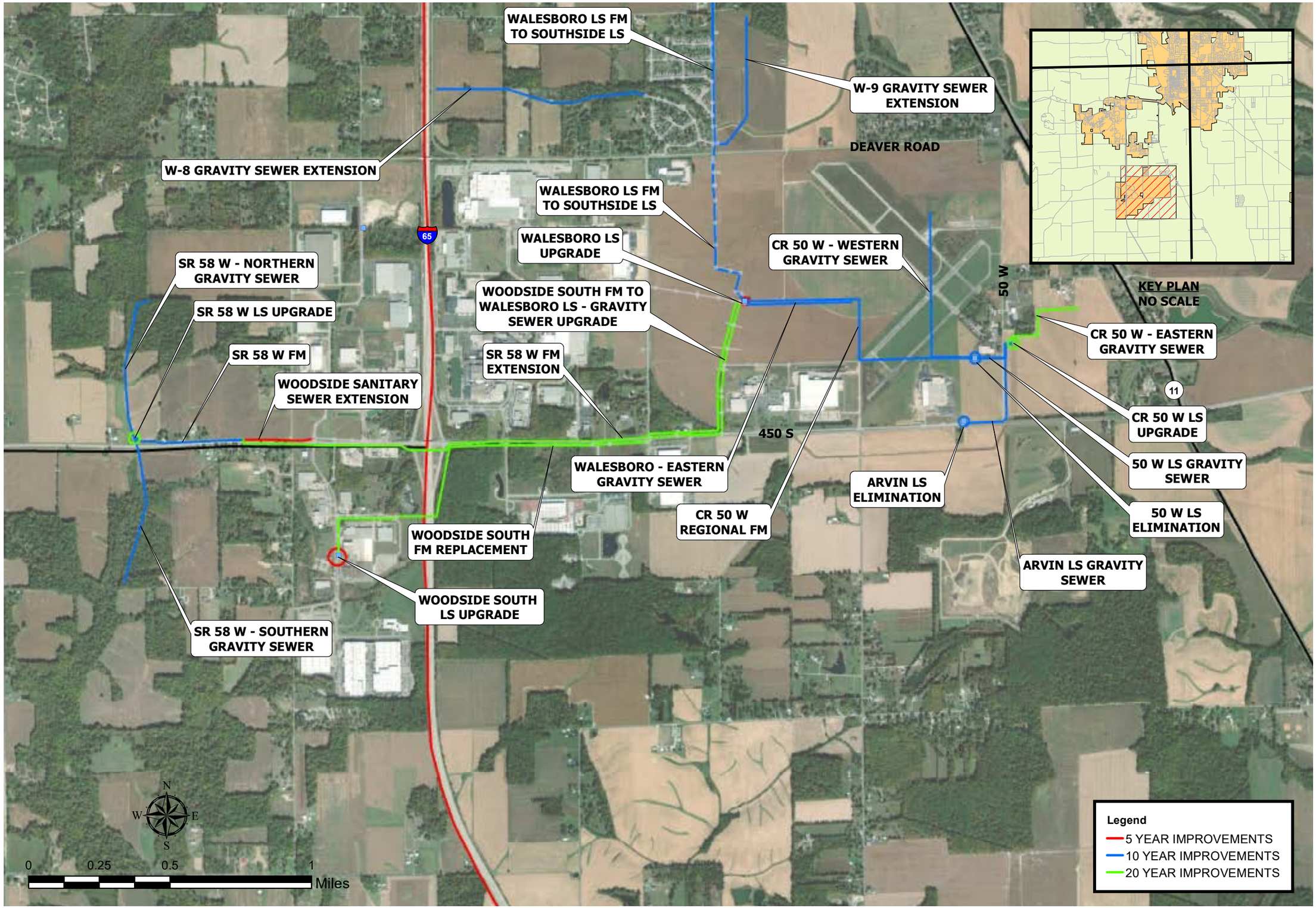


Figure ES-13: Recommended Improvements; Walesboro Area (4021.173)

Project	Priority	Cost
Oxidation Ditch Improvements Phase 1	1	$3,214,600
Annual Lining Program-Current Budget	2	$10,000,000
Annual Lining Program-Additional Budget	3	$7,000,000
Walesboro Lift Station Upgrade	4	$1,831,000
SR 46 Lift Station Rehabilitation	5	$1,870,000
45-Day SRT Aerobic Digestion Phase 1	6	$11,810,000
Westside Interceptor and Southside Lift Station Upgrades	7	$19,603,650
SR 11 Force Main Rerouting to Westside Interceptor	8	$978,000
Woodside South Lift Station Upgrade	9	$996,740
Lift Station Remoting Monitoring Improvements	10	$337,500
Chemical Phosphorus Removal Facilities	11	$1,581,100
Clifty Creek Lift Station Upgrade	12	$1,870,000
Baseline Road Lift Station Rehabilitation	13	$580,000
32nd Street Lift Station Full Replacement	14	$587,400
Beatty Lane Lift Station Full Replacement	15	$882,450
Commerce Park Lift Station Full Replacement	16	$682,700
7th Street Lift Station Equipment Replacement	17	$145,800
Stonehaven Interceptor Sewer Upgrade	18	$864,100
Talley Lift Station Equipment Replacement	19	$182,250
Eastridge Lift Station Equipment Replacement	20	$434,700
Fairlawn Lift Station Full Replacement	21	$881,100
Cole's Cove Lift Station Full Replacement	22	$682,700
Amberly Lift Station Rehabilitation	23	$500,000
Goeller Lift Station Equipment Replacement	24	$72,900
Breakaway Trails Lift Station Equipment Replacement	25	$182,250
8th Street Lift Station Upgrade	26	$1,870,000
Day's Trucking Lift Station Equipment Replacement	27	$200,000
Haw Creek Headworks Standby Power Generator	28	$2,268,000
Northbrook Lift Station Equipment Replacement	29	$182,250
Woodside Sanitary Sewer Extension	30	$601,760
Merchant Mile Gravity Sewer Upgrade	31	$5,688,260
Haw Creek Crossing Removal-Inverted Siphon	32	$1,027,000
Westlake Lift Station Elimination	33	$299,284
Oxidation Ditch Improvements Phase 2	34	$12,840,000
Walesboro - Eastern Gravity Sewer	35	$744,180
SR 58 West Lift Station and Force Main	36	$1,760,860
45-Day SRT Aerobic Digestion Phase 2	37	$12,470,000
CR 50 West Regional Lift Station and Force Main	38	$2,798,000
Walesboro Lift Station Force Main to Southside Lift Station	39	$3,049,060
SR 58 West - Northern Gravity Sewer	40	$1,090,320
SR 58 West - Southern Gravity Sewer	41	$1,131,960
Arvin Lift Station Elimination	42	$808,500
Carr Hill and I-65 Lift Station Elimination	43	$987,220
Goeller Lift Station Elimination	44	$895,880
W-8 Gravity Sewer Extension	45	$1,136,260
W-9 Gravity Sewer Extension	46	$862,060
CR 50 West - Western Gravity Sewer	47	$1,538,580
Woodside South Force Main Replacement	48	$1,468,740
East Interceptor Extension to Talley Road	49	$8,846,450
CR 50 West - Eastern Gravity Sewer	50	$706,260
Woodside South FM to Walesboro LS - Gravity Sewer Upgrade	51	$2,898,360
Denios Creek Interceptor	52	$23,261,850
CR 50 West Lift Station Upgrade	53	$767,720
SR 58 West Lift Station Upgrades and Force Main Extension	54	$2,439,320
		$162,409,074

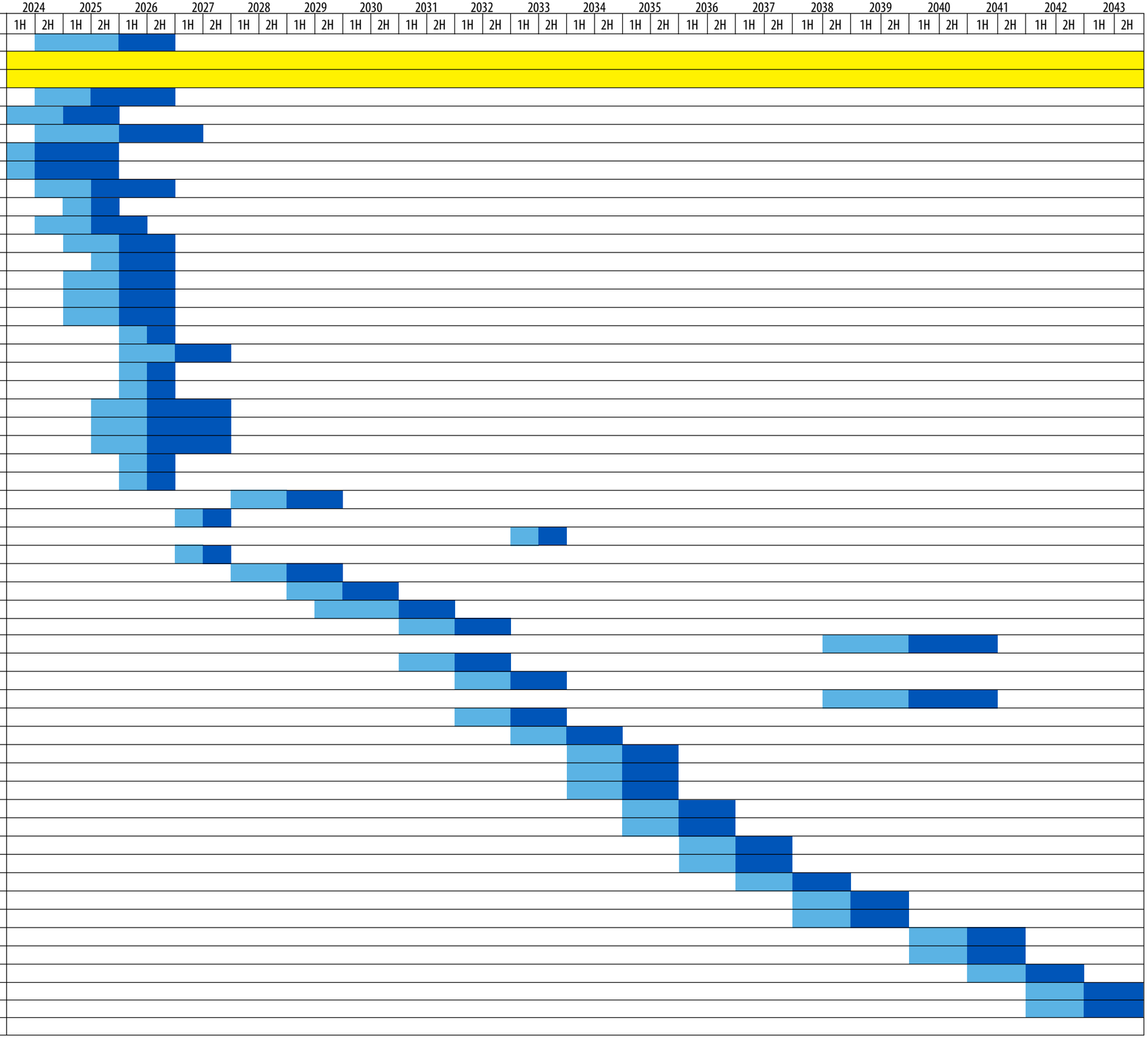
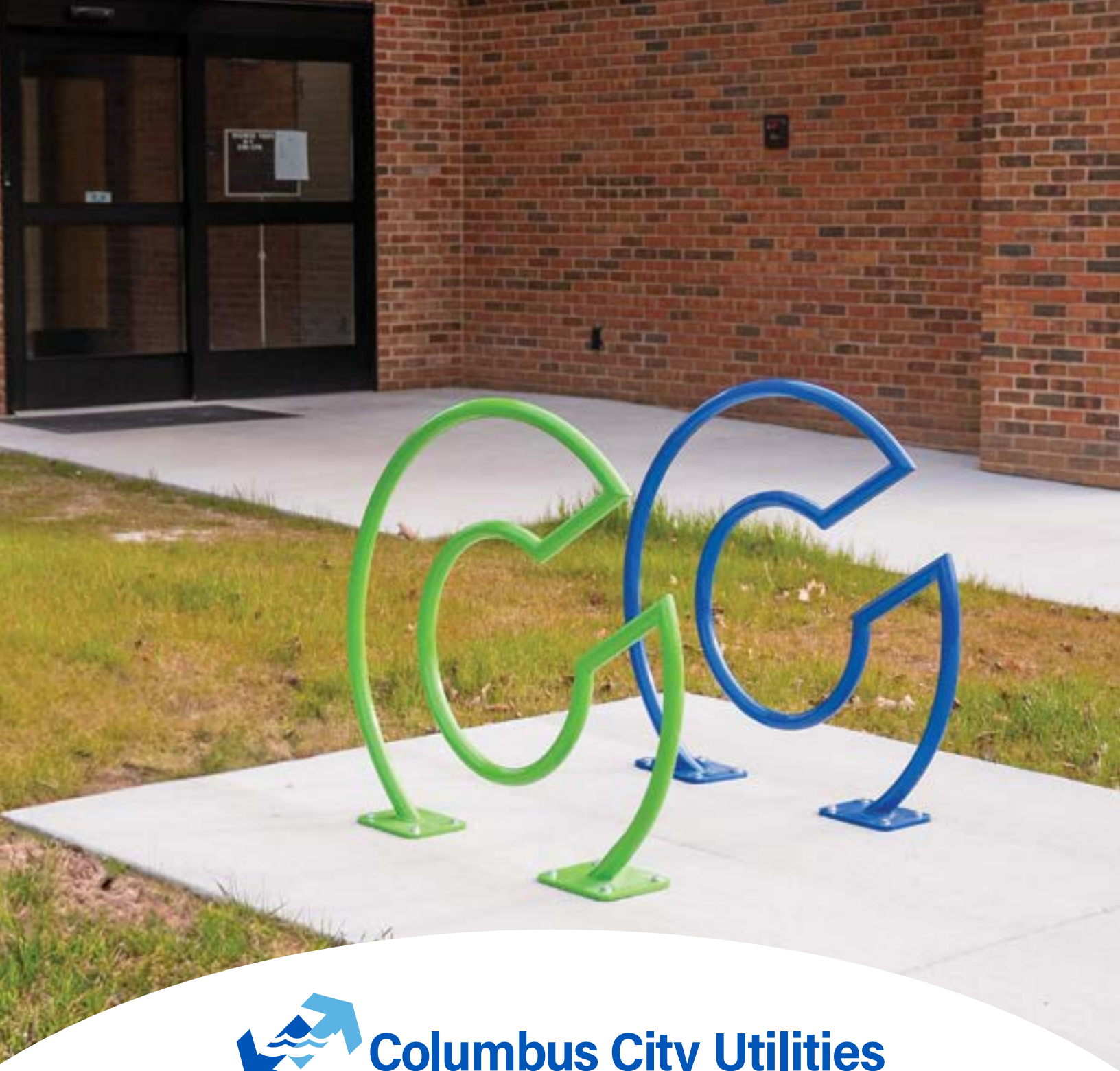


Table ES-8, Wastewater Utility Timeline of Improvements

Glossary of Terms

EBRSD Eastern Bartholomew Rural Sewer District
GIS geographical information system
gpm gallons per minute
H_2S hydrogen sulfide
LIDAR Light Detection and Ranging
MGD million gallons per day
mg/L milligrams per liter
MLSS mixed liquor suspended solids
NPDES National Pollutant Discharge Elimination System
SRT solids retention time
WTP water treatment plant
WWTF wet weather treatment facility
WWTP wastewater treatment plant



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Report, maps, figures and tables created by Strand Associates.