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Auburn Wastewater Facilities Plan

Report

City of

Auburn, KY

August 2017

Reissued with Final

Approval–May 2018

STRAND ASSOCIATES®

Report for
City of Auburn, Kentucky

Auburn Wastewater Facilities Plan

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SECTION 1
FACILITY PLAN SUMMARY

1.01 INTRODUCTION AND BACKGROUND

The City of Auburn Regional Wastewater Facilities Plan (Facilities Plan) is a comprehensive plan for the management of wastewater collection and treatment facilities. Planning is intended to define the most appropriate "local" solution to providing wastewater service (collection and treatment) for a defined planning area over a defined period of time. The goal of the plan is to protect our environment and human health by providing reliable wastewater collection and treatment for areas of greatest need. The plan is ultimately reviewed and approved by the Kentucky Division of Water (KDOW). KDOW requires a checklist to be submitted with the completed Facilities Plan, which is enclosed in Section 12 for reference. Review and approval considers environmental and state clearinghouse reviews in addition to a technical review.

Auburn is located in Logan County, Kentucky. Auburn hired McGhee Engineering, Inc. (McGhee) and Strand Associates, Inc.® (Strand) to prepare a Facilities Plan to evaluate its current wastewater collection, conveyance, and treatment needs for a 20-year planning period. The addition of a new industrial customer, foreseen growth, and an aging existing facility prompted development of this Facilities Plan.

1.02 PURPOSE OF THE PLAN

The purpose of this plan is to identify the improvements required to meet the projected needs in the planning area for the next 20 years. This study evaluates the existing wastewater collection, conveyance, and treatment facilities, evaluates alternatives, and develops design and construction schedules and budgets for the recommended plan.

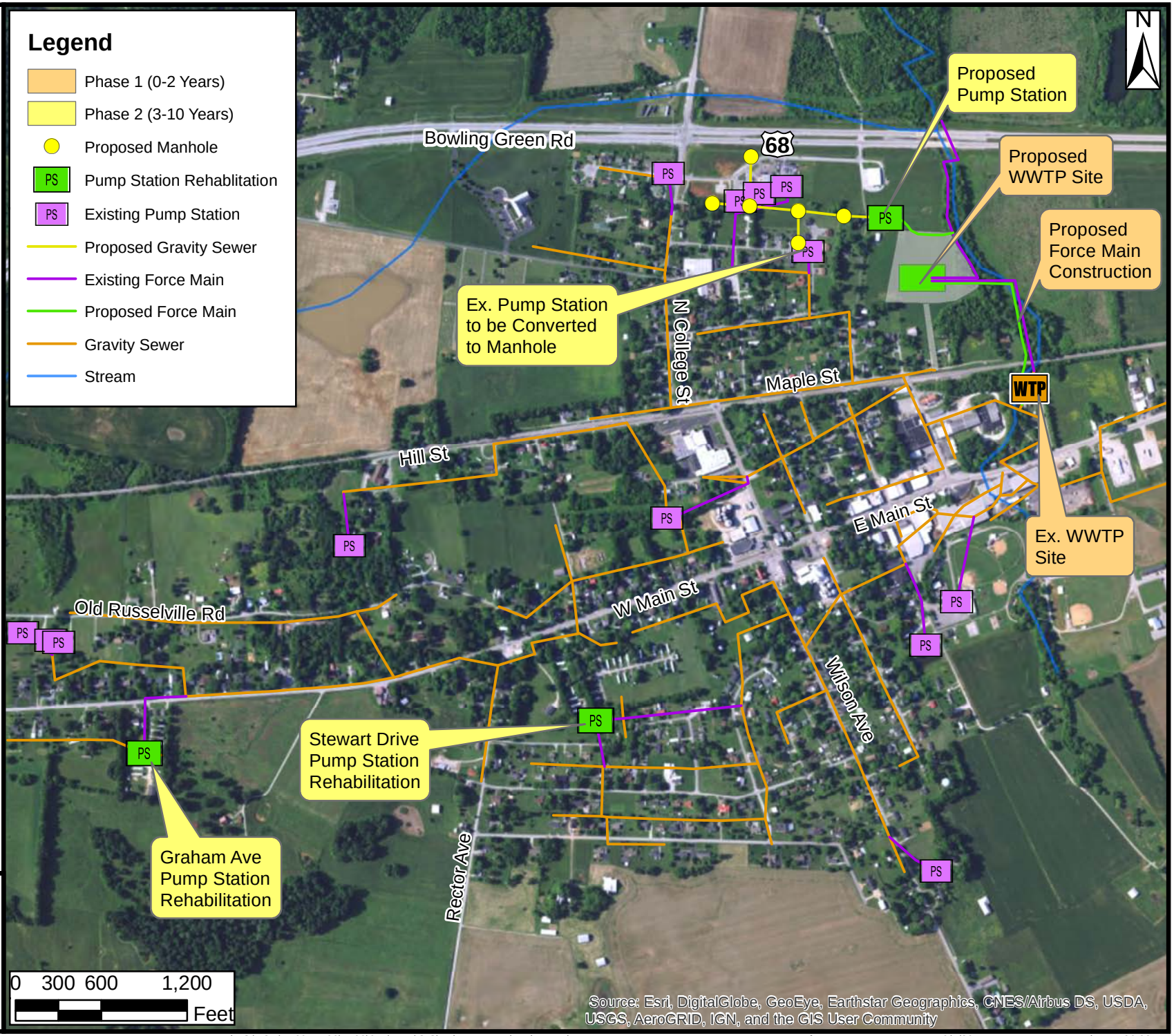
1.03 RECOMMENDED ALTERNATIVE

The recommended alternative (Alternative B) for treatment facility improvements includes construction of a new Auburn wastewater treatment plant (WWTP) with an average daily treatment capacity of 0.4 million gallons per day (mgd) and a peak hourly flow of 1.6 mgd. New facilities will be located on a new site and some facilities at their existing treatment plant will be reused or repurposed. A new preliminary treatment facility is proposed with a capacity of 2.4 mgd in order to handle the ultimate design peak flow. Carousel oxidation ditches and final clarification are recommended for secondary treatment, while peracetic acid is recommended for disinfection. New solids dewatering equipment will also be constructed.

In addition, the recommended plan includes several improvements at the existing treatment facility. These include an influent pump station and converting the existing aeration basin to an equalization tank. Furthermore, the plan includes the installation of gravity sewers and a new pump station. The plan also includes reconstruction of two aged pump stations.

Figures 1.03-1 and 1.03-2 show the recommended improvements to the Auburn wastewater system.

Auburn has the authority and capacity to implement the recommended plan and to operate the upgraded system.



OVERVIEW OF RECOMMENDED PLAN

AUBURN WWTP FACILITIES PLAN

CITY OF AUBURN

AUBURN, KY

STRAND ASSOCIATES®

FIGURE 1.03-1

5109.015

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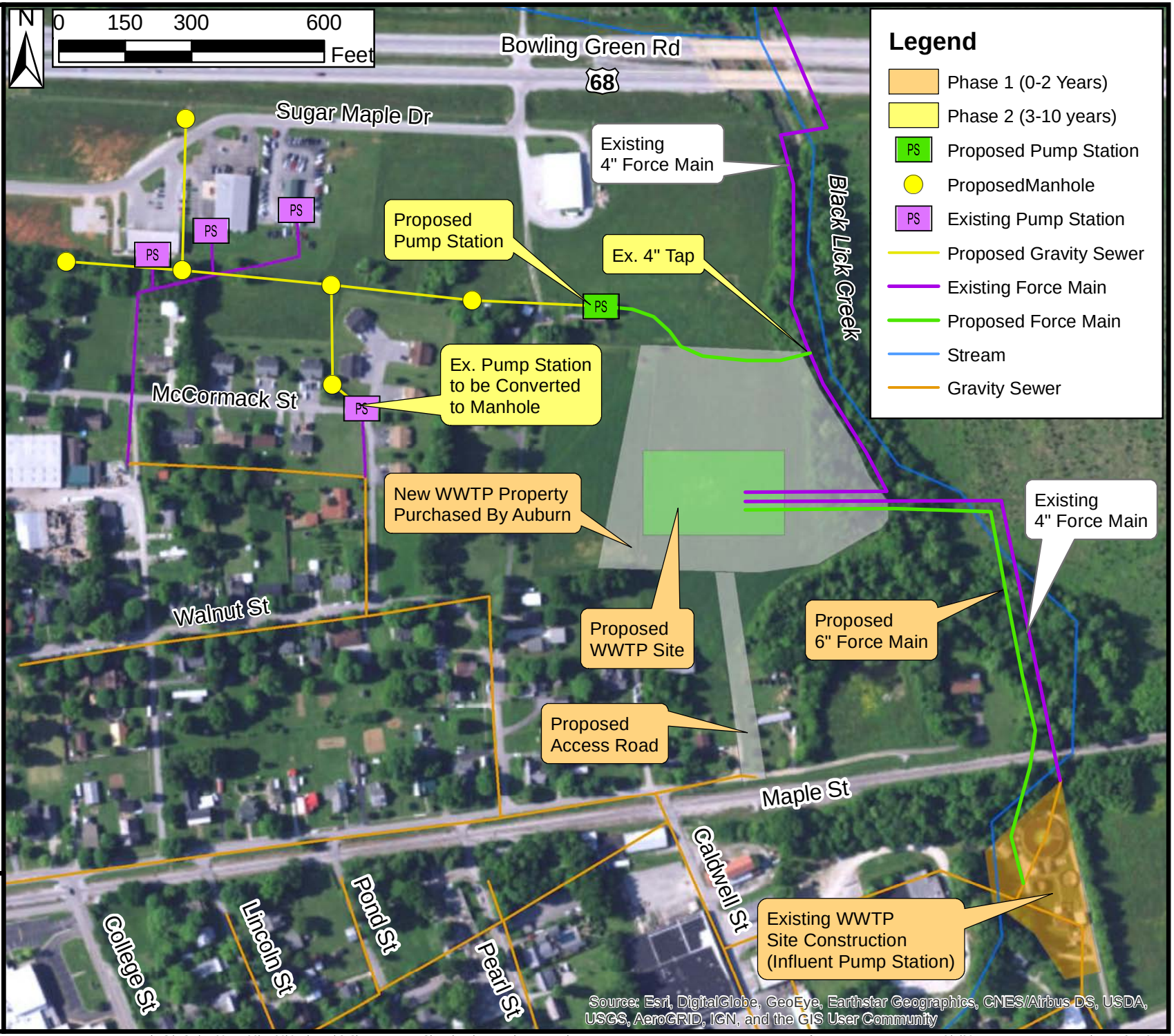

OVERVIEW OF NEW WWTP
IN THE RECOMMENDED PLAN

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 1.03-2
5109.015

Path: S:\LOU\5100--5199\5109\015\Data\GIS\New WWTP Site Planning-Landscape.mxd User: Benf Date: 9/1/2017 Time: 1:21:56 PM

1.04 COST OF PROPOSED PLAN

The construction cost opinion for the Auburn WWTP expansion is about $5,200,000. This cost includes a new headworks structure, a set of Carrousel oxidation ditches and final clarifiers, a peracetic acid disinfection tank, sludge holding and dewatering equipment, and bonds and insurance. With the addition of construction contingencies and technical services, the total project cost opinion is $7,200,000. The City plans to advance project funding that totals $6,600,000.

Funding for the Phase 1 WWTP construction project is being provided from a variety of sources including:

Economic Development Administration Grant	$1,500,000
Community Development Block Grant	$1,500,000
USDA Rural Development Grant	$1,100,000
USDA Rural Development Loan	$2,500,000

Additional funding, if required will be obtained from USDA Rural Development or from other sources.

The construction cost opinion for the Phase 2 collection system projects totals $1,000,000. These projects will be pursued in the 3- to 10-year time frame.

1.05 PLANNING AGENCY COMMITMENTS TO IMPLEMENT THE PLAN

All recommended projects will be reviewed and approved by KDOW before the construction permits can be issued. Comments from cross-cutter agencies and clearinghouse agencies will be addressed prior to construction.

1.06 SCHEDULE OF IMPLEMENTATION FOR RECOMMENDED PROJECTS

Figure 1.06-1 shows the schedule for implementing the recommended Phase 1 WWTP project.

	2017				2018				2019				2020			
Task	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Design				■	■											
Approval						■	■									
Bidding and Award							■	■								
Construction									■	■	■	■	■	■		
Commission															■	

Figure 1.06-1 Implementation Schedule for Auburn WWTP Phase 1 (0 to 2 year) Project

The Phase 2 collection system projects will be pursued in the 3- to 10-year time frame.

1.07 ABBREVIATIONS AND DEFINITIONS

ADD	Water Supply–Kentucky Area Development District
ADF	Average Daily Flow
BNR	Biological Nutrient Removal
BOD_5	five-day biochemical oxygen demand
$CBOD_5$	carbonaceous five-day biochemical oxygen demand
DMR	Discharge Monitoring Report
DNR	Department of Natural Resources
F	Fahrenheit
Facilities Plan	Regional Wastewater Facilities Plan
fps	feet per second
ft	feet
ft^2	square feet
GIS	geographical information system
gpcd	gallons per capita per day
gpd/ft	gallons per day per foot
gpd/ft^2	gallons per day per square foot
gpm	gallons per minute
hp	horsepower
I/I	infiltration and inflow
in	inches
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KHC	Kentucky Heritage Council
KPDES	Kentucky Pollutant Discharge Elimination System
KRS	Kentucky Revised Statutes
kWh	kilowatt hour
lbs/day	pounds per day
McGhee	McGhee Engineering, Inc.
mgd	million gallons per day
mg/L	milligrams per Liter
MSL	mean sea level
NH_3-N	ammonia nitrate
NRCS	Natural Resource Conservation Service
O&M	operation and maintenance
PHF	peak hourly flow
$PM_{2.5}$	particulate matter
psi	pounds per square inch
PVC	polyvinyl chloride
Qtr	quarter
RAS	return activated sludge
SBR	Sequencing Batch Reactor
SCFM	standard cubic feet per minute
SPEAR	*State Planning and Environment Assessment Report*
Strand	Strand Associates, Inc.®

SSO	sanitary sewer overflow
SWAPP	Source Water Area Protection Plans
SWD	sidewater depth
TDH	total dynamic head
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VFD	variable frequency drive
WLA	waste load allocation
WHPA	Wellhead Protection Area
WWTP	wastewater treatment plant

SECTION 2
STATEMENT OF PURPOSE AND NEED

2.01 INTRODUCTION

This Facilities Plan for the Auburn Wastewater System has been prepared in anticipation of major improvements to the collection and treatment system and to replace and update the previous Facilities Plan that was prepared in 2001. This plan was prepared as a collaborative effort between Auburn's lead engineering consultant, McGhee Engineering, Inc. of Guthrie, Kentucky, and Strand Associates, Inc.® of Louisville, Kentucky.

2.02 PURPOSE AND SCOPE

The purpose of this Facilities Plan is to develop a cost-effective, environmentally sound, and implementable strategy for meeting the wastewater collection, treatment, and disposal needs of the planning area for the Auburn Wastewater System. Pursuant to 401 KAR 5:006, Section 2, this Facilities Plan is required due to the proposal of a new WWTP within the existing planning area. The Facilities Plan is intended to provide guidance for improvement and further development of the system for the 2016 to 2036 planning period.

Specific goals of this Facilities Plan include the following:

1. Document, review, and evaluate the existing wastewater collection, treatment, and disposal systems in terms of condition, serviceability under present conditions, and suitability for continued service.

2. Project future demands to be placed on the system.

3. Evaluate current and projected regulatory issues and their impact on the system.

4. Develop potential alternatives for collecting, treating, and disposing of wastewater.

5. Investigate the various alternatives and develop a recommended plan for future improvements.

6. Provide for input from the public, operations personnel, system management, regulatory agencies, and other interested parties into the development of this plan.

2.03 KENTUCKY DIVISION OF WATER CONSIDERATIONS

The Auburn Wastewater System is regulated at the state level primarily by the KDOW. Although input is expected and welcomed from all interested parties, KDOW will be the agency most involved with the review and implementation of this plan. KDOW is considered the lead agency.

2.04 DEFINE PLANNING AREA

The most recent Facilities Plan addressing Auburn was prepared in 2001 (2001 Plan). In the years since the development of the 2001 Plan, the Champion Pet Foods Manufacturing Facility has been built in the service area and the hosiery mill that was previously in operation has ceased operation. The planning area as previously defined and recorded with the KDOW is still applicable. The planning area encompasses all the areas necessary for consideration in this Facilities Plan.

2.05 REFERENCES

A number of sources were accessed to obtain information necessary for the completion of this Facilities Plan. These sources are listed as follows.

GIS Mapping of the Auburn Sewer System, Barren River Area Development District, Bowling Green, Kentucky, 2016.

Recommended Standards for Water Works, Great Lakes–Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (a.k.a. “the Ten States Standards”), 2003.

Regional Facilities Plan, Auburn, KY, Quest, Lexington, Kentucky, January 2001.

Water and Sewer Feasibility Study, City of Auburn, KY, Water Management Services, Nashville, Tennessee, August 1988.

Sewage Treatment Plant Additions, City of Auburn, KY, Water Management Services, Nashville, Tennessee, May 1989.

SECTION 3
PHYSICAL CHARACTERISTICS

3.01 INTRODUCTION

The following section discusses the physical characteristics of the Facilities Plan for Auburn, Kentucky. This information is intended to provide a basic knowledge of the planning area in relation to its existing layout and general topographical features. The topics to be covered include describing the planning area itself, discussing geology and groundwater conditions, and noting general topographical features. Characteristics of the current use of land will be covered along with a delineation of the 100-year floodplain.

3.02 PLANNING AREA

Auburn is located in the northeastern region of Logan County, adjacent to Black Lick Creek, in the southwestern portion of the state. The city limits include an area of approximately 1.8 square miles. It is located approximately 135 miles from Louisville, Kentucky, and 60 miles north of Nashville, Tennessee. Some of its nearest neighbors include Russellville, Hopkinsville, Franklin, and Bowling Green, Kentucky.

Auburn has a population of 1,346 (United States Census Bureau, 2014 estimate), while Logan County has a total population of 26,867 (United States Census Bureau, 2014 estimate).

A discussion of the rationale behind the planning area delineation is presented in Section 2. Figure 3.02-1 shows the planning area for this Facilities Plan. The Auburn planning area encompasses approximately 23 square miles. It is generally bounded by the Russellville Municipal Sewer Department and Warren County Water District planning areas on the west and east, respectively, and the Logan County Line on the south. The planning area has not changed from the area used in prior studies.

Figure 3.03-1 shows the location of existing wastewater collection, conveyance and treatment assets and their relation to groundwater supply areas. There are no public drinking water supply intakes in the planning area.

3.03 GEOLOGY AND GROUNDWATER

The U.S. Soil Conservation Service publishes soil surveys for every county. The survey for Logan County indicates that the predominant soil type for the Auburn planning area is the Pembroke-Crider association. This association contains deep, nearly level to sloping, well-drained soils, with underlying deposits of limestone. It has streams that drain into sinks, thereby moving into underground drainageways. Subsoils are loamy or clayey in nature.

The geophysical and hydrologic characteristics of the planning area require site-by-site engineering investigations to determine impacts on wastewater treatment and collection facilities.

Logan County has a large karst area in the southern portion of the county. The Auburn planning area generally lies to the east of this karst area. Most of the groundwater in the planning area is derived from aquifers in Mississippian Age rocks of Chester or Maramec Age. Groundwater wells in the planning area generally yield five gallons or less per minute. Groundwater tends to be hard and of a less than optimum quality. Since the planning area is generally served by public water systems, groundwater does not play a significant role in Auburn's development.

Legend

- Auburn WWTP
- KY Streams
- County Boundaries
- Logan County
- Auburn Sewer Lines

Roads

- US Highway
- State Highway

Planning Area

- AUBURN SEWER DEPARTMENT
- RUSSELLVILLE MUNICIPAL SEWER DEPARTMENT
- WARREN COUNTY WATER DISTRICT

WARREN COUNTY WATER DISTRICT

KY-73

KY-103

WARREN COUNTY

LOGAN COUNTY

US-68

RUSSELLVILLE MUNICIPAL SEWER DEPARTMENT

KY-722

AUBURN SEWER DEPARTMENT

US-68X

BLACK LICK CREEK

SIMPSON COUNTY

KY-663

N

0 2,125 4,250 8,500 Feet

AUBURN PLANNING AREA

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

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FIGURE 3.02 -1
5109.015

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WARREN COUNTY
WATER DISTRICT

RUSSELLVILLE MUNICIPAL
SEWER DEPARTMENT

WARREN
COUNTY

LOGAN
COUNTY

79
103
68
73
240

N

0 0.5 1 2 Miles

Legend

- Public Drinking Water Intakes
- KPDES Outfall
- Lift Station
- Auburn WWTP
- Gravity Sewer
- Force Main
- KY Streams
- Service Area Boundary
- Groundwater Supply Areas
- Groundwater Protection Plan
- Watershed Boundary
- Regional Planning Areas

Roads

- US Highway
- State Highway

GROUNDWATER PROTECTION PLANS

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 3.03-1
5109.015

Path: S:\LOU\5100--5199\5109\015\Data\GIS\Groundwater protection plan.mxd User: Benf Date: 9/1/2017 Time: 2:10:30 PM

Figure 3.03-1 shows the location of known groundwater protection plans in the planning area. There are no groundwater protection plans in the planning area.

3.04 TOPOGRAPHY

The planning area lies in the Pennyroyal Region (Mississippian Plateau). This region is a karst terrain, which is characterized as a limestone plain with numerous sink holes, sinking streams, springs, streamless valleys, and caverns.

The southern half of Logan County is a karst (sinkhole) plain with elevations between 600 and 650 feet. Streams, where present, are incised approximately 50 to 75 feet below the surface. The northern half of the county contains higher elevations and more rugged topography. The two areas are separated by the Dripping Springs Escarpment, which rises 150 feet above the karst plain to an elevation of about 750 feet.

The highest elevations in the county are found in a line of isolated hills and knobs situated just south of U.S. Highway 68, between Auburn and Russellville. These are erosion remnants from the Dripping Springs Escarpment, and many attain elevations in excess of 800 feet. The highest of this group, and the highest point in the county, is a knob just under 5 miles southwest of Auburn with an elevation of almost 890 feet and is just to the west of the planning area boundary.

The elevation of the planning area varies from about 800 feet above mean sea level (MSL) in the northwest corner of the planning area, to about 625 feet above MSL in the north central part of the planning area. The elevation of Auburn is recorded as 642 feet. Please see Figure 3.04-1 for a topographical map view of the planning area.

3.05 100-YEAR FLOODPLAIN

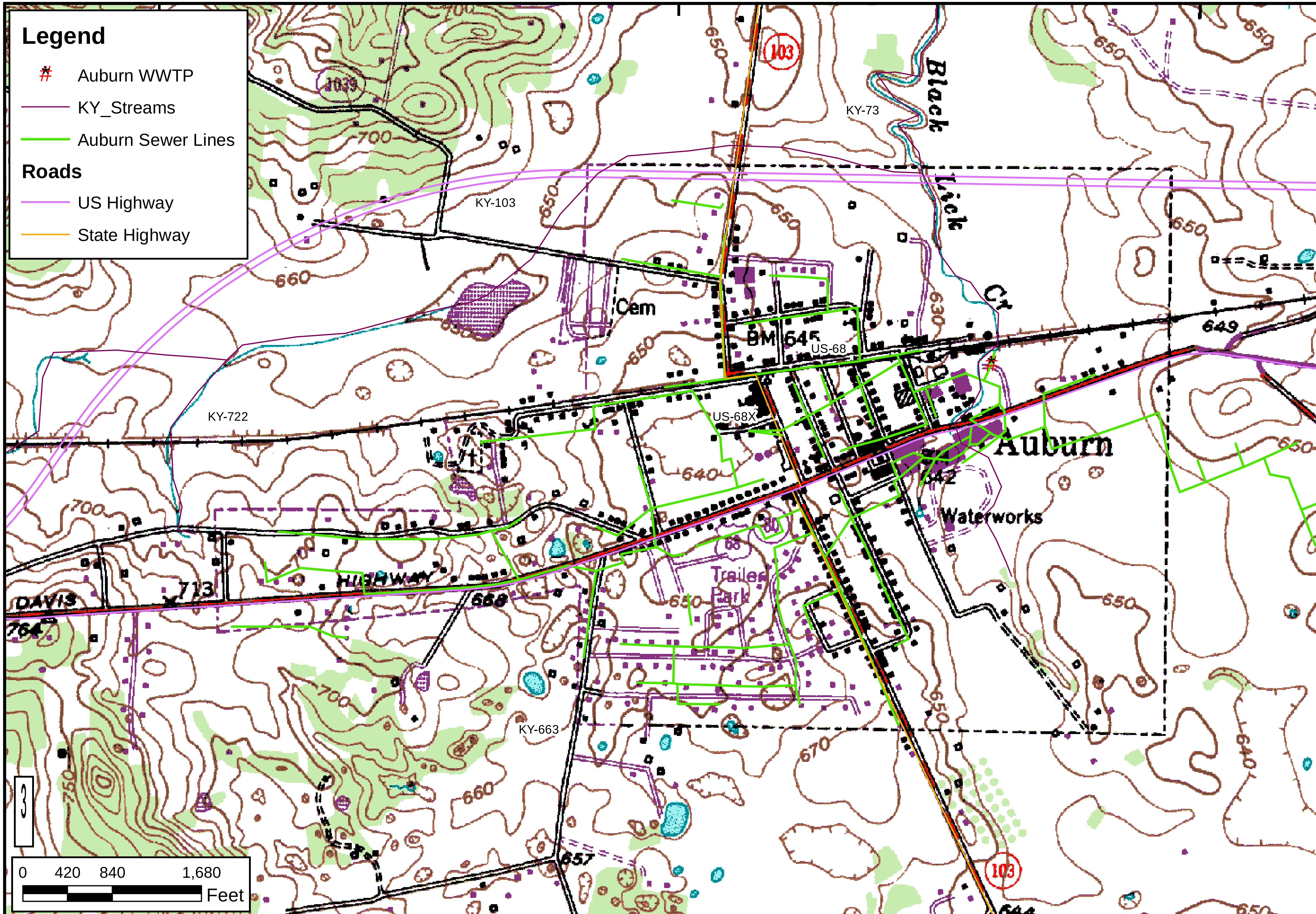
Figure 3.05-1 presents a 100-year floodplain delineation in relation to the planning area and the city limits of Auburn. As would be anticipated, the flood-prone areas are mostly along and adjacent to major drainage courses. The current WWTP is located within the flood zone.

3.06 LAND USE AND CHARACTERISTICS

Auburn covers approximately two square miles of land in Logan County. Residential land use accounts for the largest percentage of the total developed area. Open/agricultural land use accounts for the largest percentage of total land use in the planning area. Auburn is the only city in Logan County that has experienced growth in the last several years.

Based upon observations of current development trends, and in coordination with past development plans and zoning maps for Auburn and for Logan County, areas most likely to realize future development are located to the north of the city, where there is open area for potential industrial development and expansion.

There is no land use planning available to show on a figure, as requested in the Planning Guidance Document.



AUBURN PLANNING AREA TOPOGRAPHY

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

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FIGURE 3.04 -1
5109.015

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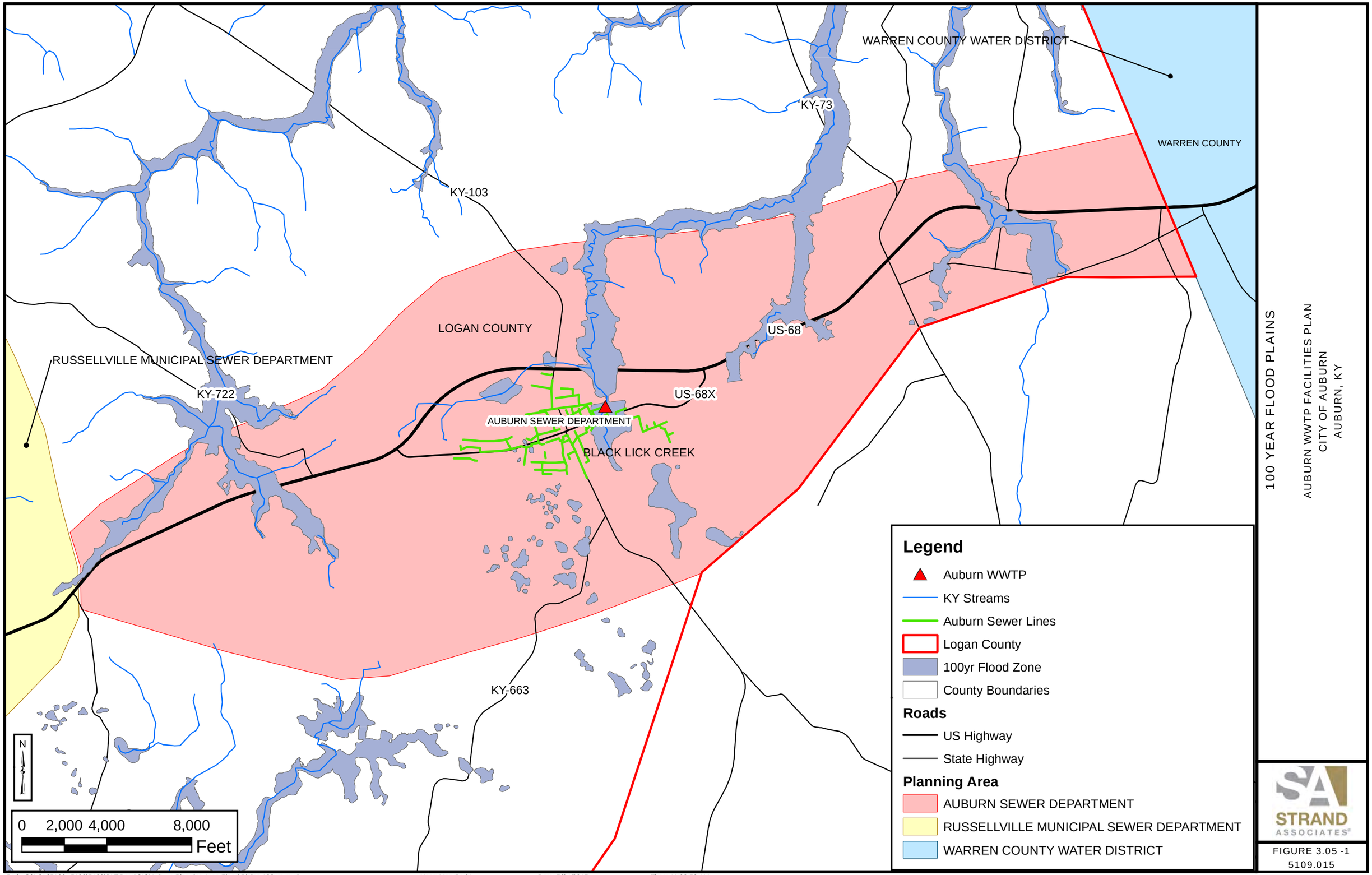

100 YEAR FLOOD PLAINS

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

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FIGURE 3.05 -1
5109.015

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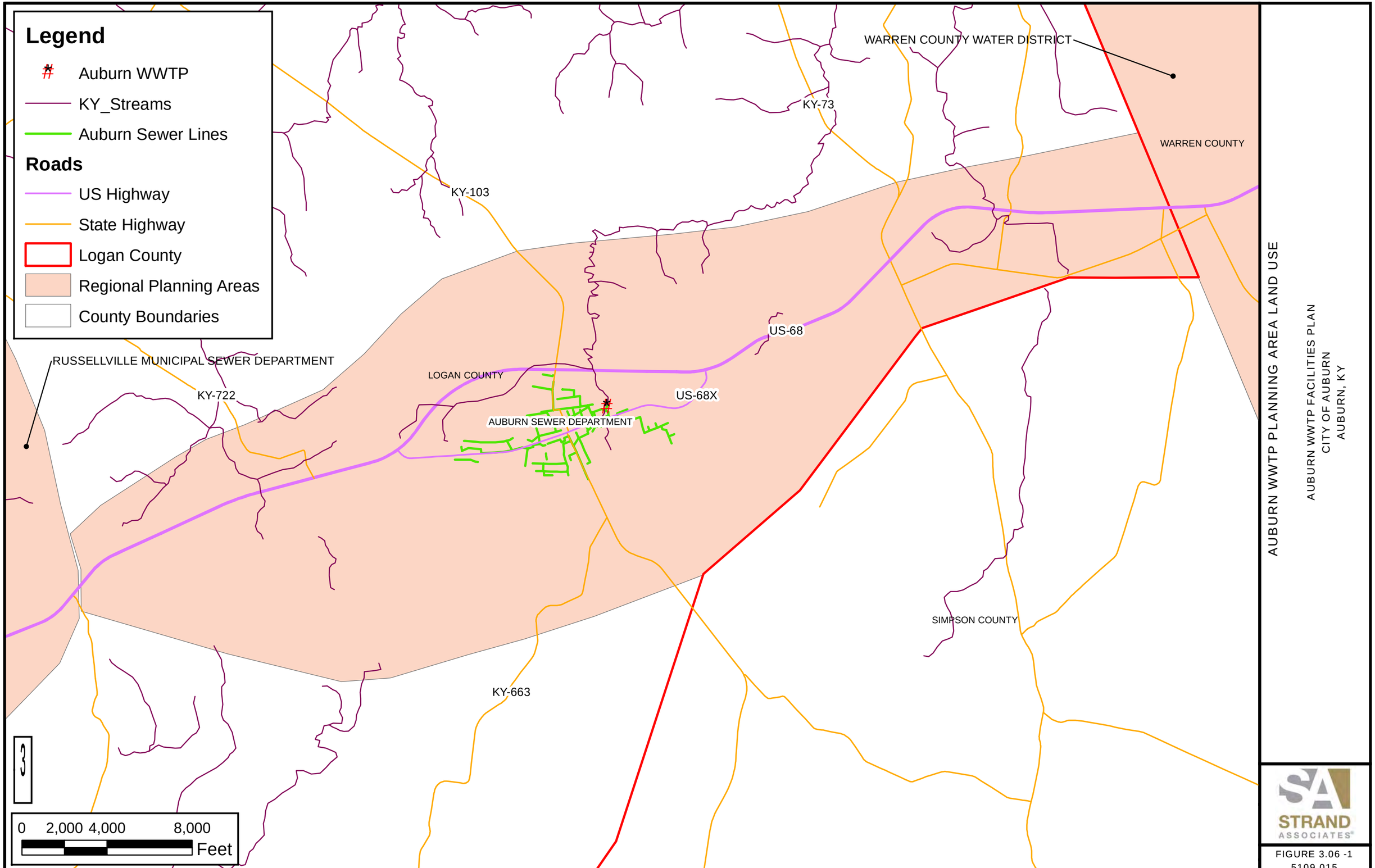

AUBURN WWTP PLANNING AREA LAND USE

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 3.06 -1
5109.015

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SECTION 4
SOCIOECONOMIC CHARACTERISTICS

4.01 HISTORICAL POPULATION DATA

Being a rural community, Auburn's population is not as large as many of Kentucky's more urban areas. Gathered from the 2010 census, the population of Auburn is 1,340. This number shows a decline of 7.2 percent from the previous census population in 2000. Compared to the average growth rate of the state (9.71 percent), Auburn's is considerably lower. The population density of Auburn of 744 people per square mile exceeds the state average of 81 people per square mile.

Table 4.01-1 shows the population of Auburn from 1900 to 2010.

1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
697	681	715	821	955	994	1,013	1,160	1,467	1,273	1,444	1,340

Table 4.01-1 Population of Auburn by Census Year

4.02 FUTURE CONDITIONS AND DEVELOPMENT POTENTIAL

Currently, Auburn has one major industrial user, Champion Petfoods, but there is space to develop this area further. It is also anticipated that Champion Petfoods will increase production at this facility, which could possibly impact population. Population projections show Logan County increasing in population over the next ten years and then declining in population during the following 25 years, which limits the potential for economic growth. It also shows a general need for a catalyst to increase interest in the area as a place to live and conduct business. There is still ample land available for growth on the north side of Auburn.

It is difficult to predict what the future holds for a community like Auburn where one economic factor, such as industrial development, can weigh so heavily on the outlook. Given these conditions, Auburn leaders believe that sewer facility improvement and expansion are necessary to allow future growth and development and that future socioeconomic benefits will be realized from the development of a sound wastewater treatment system capable of handling growth needs in the Auburn planning area.

4.03 POPULATION PROJECTIONS

According to the University of Louisville, Logan County is expected to increase in population for the next 15 years and then gradually decrease in population beyond that. The county had minimal growth between the 2000 and 2010 census and projected populations are as follows:

Census		Projections							
2000	2010	2015	2020	2025	2030	2035	2040	2045	2050
26,573	26,835	27,158	27,382	27,464	27,325	26,997	26,557	26,086	25,624

Table 4.03-1 Logan County Total Population, Census 2000 and 2010, Projections 2015-2050: State, ADDs, and Counties

While Logan County is projected to be about stable in population over the next 20 years, Auburn officials prefer to plan for a growing population. For this Facilities Plan, population in Auburn will be assumed to grow at 10 percent per decade. This projection will be used in determining the future wastewater flows.

4.04 INDUSTRIAL AND COMMERCIAL USER PROJECTION

Several factors influence the growth of a community, such as accessibility, technology, education, water infrastructure, sewer facilities, and jobs. Logan County enjoys access to Interstate 65 being only about 20 miles from Bowling Green. High-speed internet and wireless technology have gradually entered the community, creating greater and easier contact to the rest of the world. The local school system is strong and provides a quality education and quality medical care is readily available.

The area is served by the Logan-Todd Regional Water Commission. An ample supply of water will promote growth, which in turn will call for an increased wastewater treatment system capacity. It is unlikely that the lack of wastewater treatment capacity has impacted growth to date, but failure to plan for possible growth could limit economic expansion. Considering all these factors, it is prudent to plan for modest industrial and commercial growth in Auburn.

4.05 ECONOMIC IMPACT ON THE COMMUNITY

Economic growth is made possible by a number of factors specific to a community. Auburn is poised to realize additional growth because of its location, access to transportation corridors, available workforce, low cost of living and ample water supply. One factor that will limit potential growth is adequate wastewater treatment capabilities. The addition of Champion Petfoods has taken up some of the reserve wastewater treatment capacity Auburn had available. The age and condition of the existing facilities will make compliance with effluent standards difficult in the years to come. Addressing the facility age and capacity will remove this lone barrier to growth.

Completion of a project to modernize and expand the WWTP will result in slightly higher costs for all customers. Rate impacts will be discussed in more detail in Section 10.

SECTION 5
EXISTING ENVIRONMENT

5.01 INTRODUCTION

This section discusses the existing environmental conditions that will either be affected by or may affect the planning of the proposed wastewater system improvements for Auburn. Auburn experiences all four weather seasons, exhibits a multitude of geographical features, and is home to a wide range of flora and fauna. The balance between sustaining the man-made environment and preserving the natural environment is delicate and of great importance in arriving at a viable plan for the future of the area.

5.02 PHYSIOGRAPHY

Lying in the Mississippian Plateau or Pennyroyal Region, Auburn has Mississippian-age strata (believed to be 360 to 325 million years old), which is dominated by limestones, shales, and sandstones. A thick sequence of Mississippian limestone contains numerous oil reservoirs where it occurs beneath the surface; the same limestone is quarried where it occurs at the surface. The limestone also contains large cave systems, including the Mammoth Cave-Flint Ridge cave system, the longest in the world by many miles.

The planning area is comprised of limestone, sandstone, dolomite, sand, and silts.

5.03 HYDROLOGY

The Auburn area has a mild climate. The coldest month is January, with an average low temperature of 25 degrees Fahrenheit (F). The warmest month is July, with an average high temperature of 89 degrees F. Climatic elements of sunlight, precipitation, humidity, and wind occur in moderation, without prolonged extremes. Auburn experiences all four distinct seasons, though moderate temperatures typically prevail.

The area normally receives about 52 inches of precipitation per year, which is higher than the national average of 37 inches. March is the month of highest precipitation, averaging approximately 6 inches. October is normally the driest month, averaging only 2.9 inches of precipitation.

Black Lick Creek, shown in Figure 3.02-1, is the only significant surface water body in town. It flows in a northerly direction, and serves as the receiving water for the Auburn Wastewater Treatment Facility effluent. The designated uses of Black Lick Creek are warm water aquatic habitat and primary/secondary contact recreation. It is classified as an impaired waterway by the KDOW, and is part of the State's Barren River Hydrologic Unit, Number 05110002. The Barren River Hydrologic Unit is classified as a Category IV unit, which means that it has less than 15 percent of its stream miles assessed.

5.04 WATER QUALITY OF STREAMS AND LAKES

The water quality objectives for this Facilities Plan are the same as mandated by the Federal Clean Water Act, which are to prevent degradation and maintain the quality of the area's surface waters. Pursuant to the Kentucky Revised Statutes (KRS) 224.034, the Auburn WWTP must comply with its

Kentucky Pollutant Discharge Elimination System (KPDES) permit. A copy of the current permit is included in Appendix A. The current KPDES permit discharge limits are listed in Table 5.04-1.

Parameter	Quantity or Loading (lb/day)		Quality or Concentration (mg/L)			
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Daily Maximum	Daily Minimum
Flow (mgd)	-----	-----	Report	Report	-----	-----
$CBOD_5$	73	110	25	37.5	-----	-----
TSS	88	131	30	45	-----	-----
Escherichia coli (E. coli)			130 colonies per 100 mL	240 colonies per 100 mL		
NH_3-N	29.2	44	10	10	10	-----
Dissolved Oxygen	-----	-----	-----	-----	-----	2.0
pH, Std. Units	-----	-----	-----	-----	9.0	6.0

[1]Reference current KPDES Permit No. KY0021202 (see Appendix A).

Table 5.04-1 Auburn WWTP Discharge Permit Limits[1]

The Auburn WWTP discharges to Black Lick Creek. The 2014 303(d) list published by KDOW does not identify Black Lick Creek as an impaired waterbody.

5.05 WETLANDS

There are 270 listed wetlands in the planning area. These are categorized as Freshwater Emergent, Freshwater Forested/Shrub, Freshwater Pond, and Riverine Wetlands. Of these 270, 177 are less than 0.5 acres in size each. There are only eight total classified wetlands that lie within the Auburn city limits and only one is near the WWTP. This particular wetland is classified as a Freshwater Forested/Shrub Wetland and is 0.63 acres. Figure 5.05-1 identifies known wetlands within the planning area.

5.06 AIR QUALITY

The air quality in and around Auburn is a key factor in the public health and welfare of living organisms. Natural pollution can occur when a thermal inversion prevents emitted gases, smoke, and particulate matter from escaping the atmosphere by normal diffusion or dispersion. This, in areas of high emissions, can cause unhealthy conditions. Air quality not only affects living organisms, it can, and often does, by way of chemical breakdown, decompose paints and corrode and oxidize various types of man-made structures.

There are no specific air quality monitoring sites in Auburn or Logan County. The nearest locations from monitoring sites lie in Christian, Warren, and Simpson Counties. Given that these locations encircle Logan County, it can be deduced that the same pollutants of concern in these areas would also be in Logan County. Therefore, the most common contributors to air pollution are ozone and fine particulate matter ($PM_{2.5}$), based on the surrounding locations.

Legend

- KY Streams
- KY Wetlands
- Proposed Pump Station
- Auburn Pump Station
- State Roads
- Proposed Force Main
- Proposed Gravity Sewer
- Force Main
- Gravity Sewer
- Property To Purchase
- Exisitng WWTP Site

CHANDLERS RD
BOWLING GREEN RD
BOWLING GREEN RD NC
N COLLEGE ST
COLLEGE ST
E MAIN ST
W MAIN ST
WILSON AVE
DUNCANS CHAPEL RD
LOGAN MIDDLETON RD
FRIENDSHIP RD
SAM HOLLINS RD

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WETLANDS

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 5.05-1
5109.015

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5.07 WASTE LOAD ALLOCATION (WLA) FOR EXISTING FACILITIES

The WLA for the existing wastewater treatment facility in Auburn is described in detail throughout the KPDES Permit included as Appendix A.

The existing facility discharges via a cascade outfall from the plant to the Black Lick Creek. The existing discharge permit provides for the limits shown in Table 5.07-1. The current permit requires 85 percent removal of five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS). The permit also includes mass-based limits based on a design flow of 0.35 mgd.

Overall, the existing WWTP does an adequate job of meeting these limits during normal weather conditions. During wet weather, the system experiences high I/I which, if excessive or not properly managed, can lead to interruptions in the treatment process and permit limit violations. However, Auburn is continuously working to alleviate these issues throughout the collection system.

5.08 BIOLOGICAL

The flora and fauna of the planning area incorporate a wide variety of living organisms. The biological communities present are typical for rural areas of the upper south. The vegetation present within the planning area is highly dependent on the soil type and the availability of water. Most vegetative cover is agriculture related, being either crops or residual grasses from previous agricultural operations. Native vegetation is found in areas that are unsuited for agriculture or are flood prone.

The most common natural plant community is the oak-hardwood associations interspersed with pine and cedar. Natural plant communities occur primarily in alluvial areas adjacent to streams or other low-lying lands. Predominant tree species include black oak, red oak, white oak, water oak, ash, locust, hickory, maple, walnut, hackberry, pine, and cedar. Hardwood lumber is an important economic resource to the planning area.

Wildlife resources include the following birds: waterfowl, geese, hawks, dove, owl, and several varieties of songbirds. Common animals include squirrel, bat, raccoon, white-tailed deer, coyote, fox, otter, mouse, skunk, shrew, beaver, and muskrat. Fish common to the area rivers and streams include channel, blue, and flathead catfish, various chub, gar, eel, carp, smallmouth, largemouth, and spotted bass, crappie, bluegill, stoneroller, sunfish, shiner, redhorse, and various species of darter and minnow.

The planning area lies within that portion of Kentucky designated as habitat for the endangered or threatened species: Gray bat (*Myotis grisescens*), Indiana bat (*Myotis Sodalis*), and Northern long-eared bat (*Myotis septentrionalis*). There are also six clam species that are considered either threatened or endangered, as documented in Appendix D. All planning, design, and construction work must be coordinated with and approved by the Kentucky Department of Fish and Wildlife Resources (KDFWR) and the United States Fish and Wildlife Service (USFWS). According to communication with USFWS, it should be noted that there are no critical habitats in the proposed WWTP site.

5.09 CULTURAL

As of the 2010 census, the population of Auburn was 1,340 people. Auburn has one large manufacturing facility, Champion Petfoods, but otherwise does not have a large industrial or manufacturing base. It does, however, provide workers to nearby communities that do, such as Bowling Green.

Auburn is home to one elementary school, which ranges from kindergarten to eighth grade. Logan County High School is nearby. Some of the notable attractions to the nearby area include the Shaker Museum, the Auburn Museum, the Federal Grove, and sites of Civil War significance. Auburn also has a park and playground and is considering the installation of a spray ground. In nearby Bowling Green, there is a water park and minor league baseball stadium, as well as the Corvette Museum.

5.10 SOILS

Soils within any area may be classified into separate and distinct soil associations. Each association includes a combination of distinct soils in specified fractions, constant throughout a defined geographic area.

Characteristics defining soil associations are: drainage, permeability, slope, depth, type, and amounts of soils in the association. The composition of each association will have an effect on groundwater recharge, drainage, construction methods, and ultimately, development costs.

The U.S. Soil Conservation Service publishes soil surveys for every county. The survey for Logan County indicates that the predominant soil type for the Auburn planning area is the Pembroke-Crider association. This association contains deep, nearly level to sloping, well-drained soils, with underlying deposits of limestone. It has streams that drain into sinks, thereby moving into underground drainageways. Subsoils are loamy or clayey in nature

The geophysical and hydrologic characteristics of the planning area require site-by-site engineering investigations to determine impacts on wastewater treatment and collection facilities.

The most common soil associations within the planning area are Pembroke-Crider and Zanesville-Frondorf-Talbott. Four smaller associations are also noted in the area, but make up a smaller percentage.

A. Pembroke-Crider

These soils are nearly level to sloping, deep, well-drained soils that have a loamy or clayey subsoil and are typically located on uplands. This particular soil association makes up about 37 percent of Logan County and is about 56 percent Pembroke soils and 10 percent Crider soils, while less extensive soils make up the remaining percentage.

Pembroke soils are generally on broad ridgetops and are gently sloping, well-drained, and deep. They have a surface layer of silt loam and clayey subsoil. Crider soils are also on broad ridgetops. These soils are nearly level to sloping, well drained, and deep. They have a surface layer of silt loam. The

upper 20 to 40 inches of these soils formed in loess. The lower part of the subsoil formed in residuum derived from limestone.

This association is well suited to most crops commonly grown in the county. This association is rated as "somewhat limited" to "very limited" in terms of suitability as septic tank absorption fields.

B. Zanesville-Frondorf-Talbott

These soils are gently sloping to steep, deep and moderately deep, well drained and moderately well drained soils that have a loamy or clayey subsoil and are typically located on the uplands. This particular association makes up about 30 percent of the county. It is about 25 percent Zanesville soils, 15 percent Frondorf soils, and 15 percent Talbott soils. Less extensive soils make up the remaining 45 percent.

Zanesville soils commonly are on the broader ridgetops. They are well drained to moderately well drained and are deep over bedrock, but they have a compact, slowly permeable fragipan at a depth of about 28 inches. They are loamy in the upper part and clayey below a depth of 3 feet. Frondorf soils are on the tops and sides of ridges. They are moderately steep and steep, moderately deep, and well drained, and contain coarse fragments that increase with depth and are loamy throughout. Talbott soils are also on the tops and sides of ridges. These soils are well drained, have a clayey subsoil, and are mostly 2 to 4 feet deep over limestone bedrock.

This association is suited to most crops commonly grown in the county. This association is rated as "very limited" in terms of suitability as septic tank absorption fields.

SECTION 6
EXISTING WASTEWATER SYSTEM

6.01 BACKGROUND

This section examines existing wastewater facilities and describes the method of wastewater treatment at the existing Auburn WWTP.

6.02 EXISTING ON-SITE DISPOSAL

The portion of the planning area within the city boundary is generally served by the Auburn Municipal Sewer System. A few houses within Auburn remain on septic systems because of their inaccessible locations. There are a few out-of-city sewer customers, but the area outside the city boundary is generally served by septic systems. Within the planning area, approximately 100 homes are served by on-site disposal systems.

Soil conditions within the planning area vary from “somewhat limited” to “very limited” for septic system development based on percolation rates.

6.03 EXISTING AUBURN WWTP

The Auburn WWTP, which is owned and operated by the City of Auburn, is the only permitted WWTP in the planning area. It is located adjacent to Black Lick Creek, in the eastern portion of the city, and operates under the authority of the KPDES, Permit No. KY0021202. The expiration date of the current permit is January 31, 2021.

The WWTP was originally constructed as a trickling filter WWTP. In 1989, it was upgraded to operate using an extended aeration process. At that time, many of the original facilities, including the trickling filter and anaerobic digester, were decommissioned. A site plan for the existing WWTP is included in Figure 6.03-1.

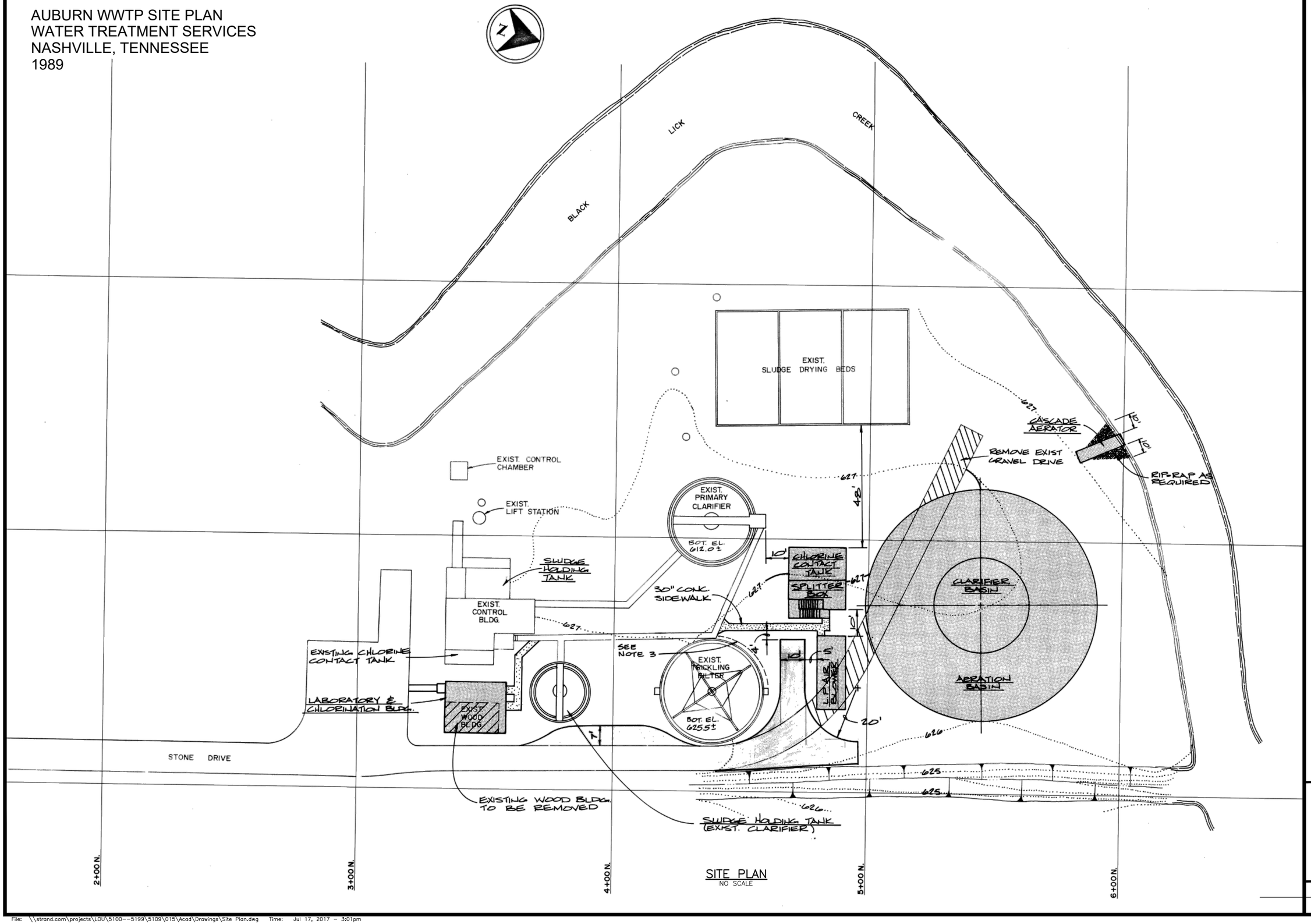
A process schematic of the Auburn WWTP is presented as Figure 6.03-2. The major liquid treatment facilities comprising the current treatment process include the following:

- Manual Bar Screen
- Grit Chamber
- Comminutor
- Influent Pumps
- Extended Aeration Tank
- Final Clarifier
- Chlorine Contact/Dechlorination Tank (now employing peracetic acid)
- Cascade Aerator

Waste solids processing facilities include:

- Aerated Sludge Holding Tank
- Sludge Drying Beds

AUBURN WWTP SITE PLAN
WATER TREATMENT SERVICES
NASHVILLE, TENNESSEE
1989



SITE PLAN
NO SCALE

AUBURN WWTP
SITE PLAN

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 6.03-1
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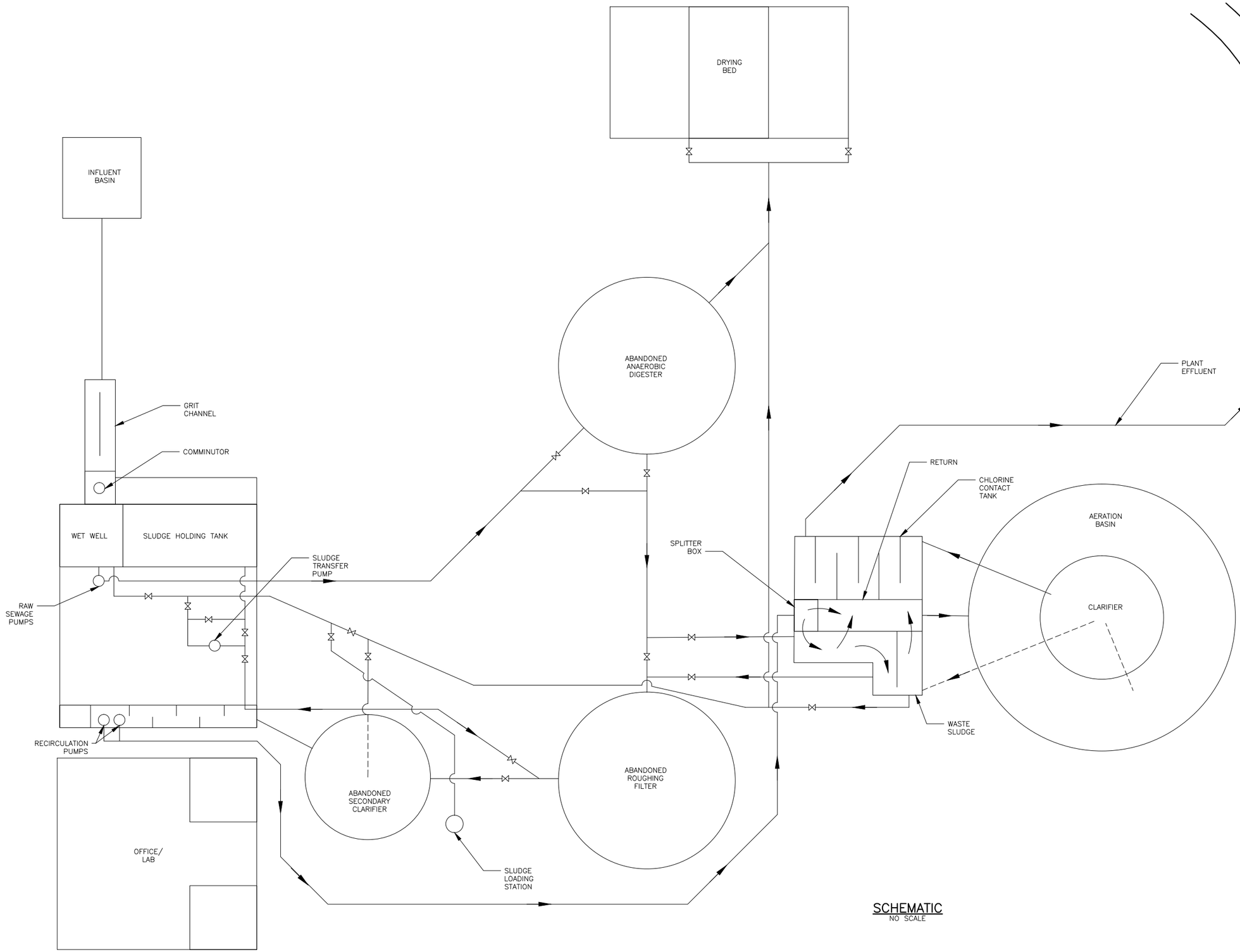

SCHEMATIC
NO SCALE

AUBURN WWTP
SCHEMATIC

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 6.0**3-2**
5109.015

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The Auburn WWTP has a current permitted capacity of 0.35 mgd and a peak hourly capacity of 0.90 mgd. It was designed to treat municipal and industrial wastewaters having the characteristics shown in Table 6.03-1. The facility received an average daily flow of 0.15 mgd.

In 2015, before Champion Petfoods began production, the average influent BOD was 144 pounds per day (lbs/day) and the average influent TSS was 169 lbs/day. Since Champion Petfoods began production in November 2015, effluent loadings from Champion Petfoods have steadily increased as production increased. The waste loading from Champion Petfoods was calculated using the highest measured waste concentration with the highest measured daily flow rate to account for the "worst case" scenario for treatment at the Auburn WWTP. This results in Champion loadings of 248 lbs/day for BOD and 121 lbs/day for TSS. Therefore, the current total loading at the WWTP for BOD and TSS are 392 lbs/day and 290 lbs/day, respectively.

Sanitary and industrial wastewater from the Champion Petfoods plant are pumped directly to the WWTP through a force main. The Champion Petfoods wastewater is discharged into the Headworks Facility where it joins wastewater from Auburn and flows by gravity to a manually cleaned, coarse bar screen. The screened sewage then flows through a dual-channel grit chamber.

The screened, degritted wastewater flows through a comminutor to the raw sewage pump station. The wastewater is pumped to the splitter box, where it combines with return activated sludge (RAS) from the final clarifier. The combined wastestream (mixed liquor) flows by gravity to the extended aeration basin.

Major WWTP process facilities are summarized in Table 6.03-1.

The aeration basin provides air and detention time for the biological removal of oxygen-demanding substances from the wastewater. The mixed liquor flows from the extended aeration basin into the clarifier, where solids are separated from the liquid. The separated solids are returned to either the splitter box for recycle to the extended aeration basin, or diverted to the sludge storage tank for further treatment and disposal.

The clarified effluent flows by gravity into the disinfection contact tank, where peracetic acid solution is mixed with the clarified effluent. The effluent is provided adequate detention for disinfection. At the end of the disinfection contact tank, flow is measured prior to discharge. The disinfected effluent flows by gravity to the cascade aerator, which reaerates the effluent prior to discharge to Black Lick Creek.

Currently, waste activated sludge is transferred from the clarifier to the sludge storage tank. Solids are aerated and periodically decanted for thickening. Thickened sludge is pumped from the sludge storage tank to the sludge drying beds for dewatering prior to disposal in the Hopkins County landfill.

A. Influent Sampling

The influent samples are taken upstream of the manual bar screen. Composite wastewater influent samples are collected by an automatic, refrigerated sampler.

B. Screening

Preliminary treatment is performed by a stationary rack screen with 1/4-inch openings. The process is intended to remove untreatable large solids, such as plastic bags and debris, from the influent wastewater

flow to protect the downstream process equipment. The screened materials are collected and dewatered for disposal at a landfill. The rated capacity of the existing screen is 0.35 mgd.

C. Grit Removal

Grit removal is provided to remove untreatable small, heavy solids such as sand or grit from the influent wastewater flow to protect the downstream process equipment. Grit removal is accomplished using a gravity settling to readily settle heavier solids from wastewater. Grit that settles in the grit collector chamber is shoveled and dewatered. Dewatered grit is disposed of in a landfill.

D. Comminution

Debris in the influent wastewater is ground up by a comminutor upstream of the influent pump station. The comminutor was replaced in 2015.

E. Influent pumping

Influent pumping is accomplished with four dry-pit type centrifugal pumps. Influent is lifted from the wet well to the splitter box near the extended aeration basin. The station contains two small pumps and two large pumps.

F Aeration Basin

There is an extended aeration basin that provides air and detention time for the biological removal of oxygen demanding substances from the wastewater. It has a hydraulic retention time of 1.9 days at the 0.35 mgd design flow and a solids retention time of 25 days. It contains three positive displacement blowers, two with a capacity of 350 scfm, and one with a 700 scfm capacity.

G. Final Clarifier

There is one clarifier, 35-foot diameter and 13.6-foot deep, with a surface settling area of 962 ft^2. The clarifier provides settling or solids/liquid separation of the mixed liquor from the aeration basin.

H. Disinfection

Paracetic acid is used for disinfection. This chemical is fed to the effluent from the clarifier and contact time is provided in the former chlorine contact basin.

I. Cascade Aeration

The effluent, after disinfection, flows by gravity to the concrete cascade aeration structure. From there, the effluent discharges to the Black Lick Creek.

J. Sludge Holding Tank

A sludge holding tank is provided to hold the wasted sludge before sending it to the sludge drying beds.

L. Sludge Drying Beds

The sludge drying beds are used to dewater sludge before sending it to a landfill for disposal.

TABLE 6.03-1 EXISTING DESIGN CRITERIA

Design Flows		
Average Daily Flow	0.35 mgd	
Peak Hourly Flow	0.90 mgd	
Design Loadings		
BOD_5	385 mg/L	1,125 lbs/day
TSS	270 mg/L	785 lbs/day
NH_3-N	25 mg/L	73 lbs/day
Influent Screening		
Number of Channels	1	
Type	Stationary Rack	
Screen Openings	1/4-inch	
Grit Collectors		
Number of Grit Chambers	1	
Collector Types	Gravity	
Design Capacity	0.35 mgd	
Detention Time	40 seconds at average flow	
Influent Pump Station		
Date Constructed	1975	
Type of Pumps	Dry Well Centrifugal	
Number of Pumps	4	
Design Capacity	2 at 0.2 mgd, 2 at 0.5 mgd	
Aeration Basin		
Number of Basins	1	
Process	Extended aeration	
Number of Blowers	3 (2 at 350 scfm and 1 at 700 scfm)	
Blower Type	Positive displacement	
Hydraulic Retention Time	1.9 days	
Solids Retention Time	25 days	
Clarifiers		
Number of Units	1	
Clarifier Diameter	35 feet	
Sidewater Depth	13.6 feet	
Total Surface Area	962 ft^2	
Overflow Rate	364 gpd/ft^2	
Weir Loading Rate	3,183 gpd/ft	

Disinfection

Number of Chambers	1
Volume	10,450 gallons
Detention Time at average flow	43 minutes
Detention Time at peak flow	17 minutes
Disinfection Chemical	Peracetic Acid

Cascade Aerator

Width	3.0 feet
Number of Risers	12 at 6 inches
Total Drop	6.0 feet

Aerated Sludge Storage

Length x Width x Depth	16 feet x 11 feet x 11 feet
Total Volume	14,500 gallons

Drying Beds

Number	3
Length and Width	45 feet x 25 feet, each
Total Area	3,375 ft^2

6.04 EXISTING BIOSOLIDS DISPOSAL

The screenings and grit collected at the Auburn WWTP are disposed of in the Hopkins County Landfill along with the dewatered biosolids.

The activated sludge generated at the WWTP is wasted to the sludge holding tank, where it will be aerated and decanted before being sent to the sludge drying beds. One sludge transfer pump, located in the control building, is used for transferring sludge from the sludge holding tank to the sludge drying beds. The existing facility does not accept hauled waste or septage.

6.05 TREATMENT PLANT OPERATION AND COMPLIANCE

A. Existing KPDES Permits

A KPDES permit KY 0021202 was issued for the Auburn WWTP. The current permit was issued on December 21, 2015, and is in effect from February 1, 2016, until January 31, 2021.

The KPDES permit specifies the effluent limits for the Auburn WWTP. Table 6.05-1 shows the Auburn KPDES effluent limits. In addition to the concentration limits, mass effluent limits are also applied based on the 0.35 mgd rated capacity. The WWTP must achieve at least 85 percent removal of the monthly average concentration for $CBOD_5$ and TSS regardless of the influent flows and loadings. The facility has effluent limits for fecal coliform, minimum and maximum pH, and minimum dissolved oxygen requirements.

Parameter	Quantity or Loading (lb/day)		Quality or Concentration (mg/L)			
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Daily Maximum	Daily Minimum
Flow (mgd)	-----	-----	Report	Report	-----	-----
$CBOD_5$	73	110	25	37.5	-----	-----
TSS	88	131	30	45	-----	-----
E. Coli			130 colonies per 100 mL	240 colonies per 100 mL		
NH_3-N	29.2	44	10	10	10	-----
Dissolved Oxygen	-----	-----	-----	-----	-----	2.0
pH, Std. Units	-----	-----	-----	-----	9.0	6.0

[1]Reference current KPDES Permit No. KY0021202 (see Appendix A).

Table 6.05-1 Auburn WWTP Existing KPDES Permit Limits[1]

B. Existing Auburn WWTP Performance

The Facilities Plan uses flow and pollutant data collected from January 2015 to July 2016 to evaluate the WWTP performance. Table 6.05-2 shows the Auburn WWTP KPDES permit limits and performance over the time period.

Parameter	Influent Average	Effluent Average	Capacity/ Permit Limits	Removal Percentage
Flow, mgd	0.17	0.17	0.35	
$CBOD_5$, mg/L	138	4	25	97%
TSS, mg/L	163	4	30	98%

Table 6.05-2 Summary of Auburn WWTP Performance January 2015 to July 2016

Overall, the Auburn WWTP performs well in terms of BOD and TSS removal.

The Auburn KPDES permit currently requires an 85 percent removal of BOD and TSS on a monthly average basis, which is regularly achieved.

The Auburn WWTP was constructed prior to the adoption of reliability and redundancy requirements in Section 13 of 401 KAR 5:005. The existing facility relies on a single aeration tank and clarifier with no ability to take these units out of service. The facility does not have an adequate redundant power supply (generator). These deficiencies will be addressed in the proposed upgrades.

6.06 EXISTING COLLECTION AND CONVEYANCE SYSTEM

The majority of the Auburn sewered area is served by a conventional gravity sanitary sewer collection system. Figure 6.06-1 is a map that illustrates the existing sewered area within the planning area including the sewers, pump stations, and force mains. Auburn maintains approximately 77,000 linear feet of sanitary sewer lines and nine pump stations, which include the force main and pumping station at the Champion Petfoods facility.

Auburn's nine pump stations are listed in Table 6.06-1. Most pump stations have been constructed or updated in the past few years and generally only serve a few customers each.

Pump Station Name	Rated Capacity where known (gpm)	Year of last Upgrade where known	Forcemain size (inch)	Forcemain length (Feet)
Spring Street		2016		990
Park Street			8	680
Stewart Drive			4	
Graham Avenue			8	650
Auburn City Park			4	630
Apple Street			4	280
McCormick Street			4	130
Gordon Street				520
Champion Petfoods	250	2015	6	14600
The City also maintains 18 residential and 3 commercial grinder pump stations.				

Table 6.06-1 Auburn Pump Stations

Auburn is served by an existing wastewater collection and treatment system that includes gravity sewers, pump stations, and one WWTP. The original collection system was installed around the 1960s to serve what is now the downtown section of Auburn. The majority of this original system is comprised of vitrified clay pipe gravity sewers with brick and mortar or precast manholes. Portions of the system that were built from about the 1970s to the present are all polyvinyl chloride (PVC) with precast manholes, as are lines that have been replaced in that time frame.

Over the past ten years, Auburn has undertaken a program to identify and correct I/I attributable to hydraulic overload. By regularly working on sections of sewer made of clay pipe, Auburn is making progress towards the complete replacement of clay pipe in the system. There is a yearly budget allowance for clay pipe repair and replacement, which covers lining or bursting of 8-inch diameter or greater clay pipe. These improvements decrease the amount of I/I seen through the system and, eventually, at the WWTP.

Legend

- KPDES Outfall
- Lift Station
- Auburn WWTP
- Gravity Sewer
- Forcemain
- KY Streams

Roads

- US Highway
- State Highway

KY-103

US-68

N

0 500 1,000 2,000 Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AUBURN COLLECTION SYSTEM

AUBURN WWTP FACILITIES PLAN
CITY OF AUBURN
AUBURN, KY

STRAND ASSOCIATES®

FIGURE 6.06 - 1
5109.015

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6.07 COLLECTION SYSTEM OPERATION, MAINTENANCE, AND COMPLIANCE

Auburn operates its collection system under the authority of its KPDES discharge permit. Auburn routinely looks for sanitary sewer overflows and reports any to KDOW in accordance with its permit. The last major overflow event was back in 2013 when Auburn had over 10 inches of rain in 28 hours. Three sanitary sewer overflows were reported. Auburn does not have any recurring SSOs. Auburn is not under any state or federal agreed orders.

6.08 INFILTRATION AND INFLOW

The Auburn system has some I/I, but the amount is manageable. This extraneous flow is most likely caused by existing sections of sewer that are older and structurally unstable or failing (e.g., clay pipe, brick, and mortar manholes) and various services lines that are failing or improperly tied in with the main collection system owned by Auburn. Auburn has a yearly budget allotted for the replacement of clay lines, lining, and bursting to help alleviate I/I issues and works through areas of known issues for resolutions.

Actual Auburn flow data was used to identify if I/I are excessive relative to benchmarks. The average daily flow from January 2015 through October 2015 was reviewed because it includes only residential flow. Assuming a population of 1,400 people, the average annual flow per person is 108 gallons per day. This is less than the accepted standard of 120 gallons per capita per day (gpcd), thus infiltration is not considered a problem, even during 2015, which was a very wet year. Another industry benchmark is to check if the maximum day flow exceeds 275 gpcd. Reviewing data from the same period, prior to Champion Petfoods operation, there were 10 days when the 275 gpcd criteria was exceeded. The highest day recorded was 626 gpcd. The total rainfall during those 10 months was 48 inches. During the 10 months there were 17 days when rainfall exceeded 1 inch, four days when rainfall exceeded 2 inches and one day when rainfall exceeded 3 inches. This period of extreme rain likely skewed the daily flow evaluation, but Auburn should review their system for inflow sources during wet weather.

SECTION 7
WASTE LOADS AND FLOW FORECAST

7.01 EXISTING WASTEWATER FLOWS AND LOADINGS

Discharge monitoring reports (DMR) for Auburn WWTP from January 1, 2015 through October 31, 2015, were reviewed to assess the existing flows and loadings to the WWTP. Table 7.01-1 summarizes historical flows and loadings data before the WWTP accepted flows and loadings from Champion Petfoods industry.

Parameter	Flow (mgd)	Loading (lbs/d)	Concentration (mg/L)
EXISTING FLOWS			
Average Daily Flow	0.152	-----	-----
Peak Daily Flow	0.876	-----	-----
EXISTING LOADINGS AVERAGE			
$CBOD_5$		144	115
TSS		169	135
NH_3-N		31	25

[1]Data available from January 1, 2015, through October 31, 2015 before Champion Petfoods discharge.

Table 7.01-1 Historical City of Auburn WWTP Flows and Loadings[1]

The Auburn WWTP has received pretreated wastewater from the Champion Petfoods industry since November 1, 2015. Table 7.01-2 summarizes historical flows and characteristics data from Champion Petfoods industry.

Parameter	Flow (mgd)	Concentration (mg/L)
Highest Historical Daily Flow	0.05	-----
EXISTING HIGHEST PRETREATED WASTEWATER CHARACTERISTICS		
$CBOD_5$	-----	660
TSS	-----	323
NH_3-N	-----	23

[1]Data available from January 1, 2016, through August 31, 2016.

Table 7.01-2 Historical Wastewater Flows and Characteristics from Champion Petfoods[1]

7.02 PROJECTED DAILY WASTEWATER FLOWS

Several problems are encountered in projecting future wastewater flows for Auburn. As with a lot of rural communities, Auburn is projected to lose population over the planning period. This would tend to indicate that the projections for wastewater flow should trend downward as well. However, despite stagnant growth in recent years, wastewater flow has increased steadily in most communities similar to Auburn. This is most likely explained by a combination of factors. First, per capita sewer usage in rural communities continues to increase as residents of these communities adopt more urban usage patterns. The fact that newer homes tend to have more water-consuming appliances (i.e., multiple bathrooms,

dishwashers, garbage disposals) than homes of the past also plays a part. Also contributing to this trend is the aging of sewage infrastructure that allows more extraneous flow to enter the system. Given these considerations, it is probably accurate to assume that wastewater demand will increase in the Auburn system.

Currently, Auburn has one major user, the Champion Petfoods industry, and there is available space for other industries. It is anticipated that Champion Petfoods will increase its production at this facility, which could possibly impact population and thus the wastewater flows. Table 7.02-1 summarizes the projected 2040 wastewater flows and loadings for the Auburn WWTP.

Parameter	Projected Flow	BOD_5		TSS		NH_3-N	
	(mgd)	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d
Existing City of Auburn	0.15	115	144	135	169	25	31
Projected Population Growth(1)	0.05	200	83	250	104	25	10
Existing Champion Petfloods(2)	0.05	660	275	323	135	23	10
Projected Champion Petfoods Growth(2)	0.08	660	440	323	216	23	15
Other Growth (Placeholder) (1)	0.07	200	117	250	146	25	15
Total	**0.40**	-----	**1,060**	-----	**770**	-----	**80**

[1]Assume typical wastewater characteristics (200 mg/L BOD_5, 250 mg/L TSS and 25 mg/L NH_3-N).
[2]Assume highest wastewater characteristics (660 mg/L BOD_5, 323 mg/L TSS and 23 mg/L NH_3-N).

Table 7.02-1 City of Auburn Projected Wastewater Flows and Loadings[1]

7.03 THE PROPOSED DESIGN CAPACITY OF THE AUBURN CITY WWTP

The Auburn City WWTP is proposed to be expanded to handle the projected flows and loadings. The proposed average daily flow is 0.40 mgd. . The peaking factor of 4 was used to project the peak hourly flows based on the Ten States Standards for Wastewater. The proposed influent loadings are based on the previous design loadings at the existing WWTP. The proposed design capacity for the Auburn WWTP expansion is summarized in Table 7.03-1.

Parameter	Flow (mgd)	Loading (lbs/d)
DESIGN FLOWS		
Design Average Daily Flow	0.4	-----
Design Peak Hourly Flow	1.6	-----
Ultimate Average Daily Flow	0.6	-----
Ultimate Average Peak Hourly Flow	2.4	-----
DESIGN LOADINGS		
Design $CBOD_5$	-----	1,060
Design TSS	-----	770
Design NH_3-N	-----	80

Table 7.03-1 Proposed Design Capacity of the Auburn WWTP

7.04 THE WLA OF THE PROPOSED WWTP EXPANSION

A WLA request for the Auburn WWTP expansion was sent to KDOW on August 4, 2014. The subsequent WLA letter was received on August 13, 2014 and updated on September 6, 2017. A copy of these letters are included in Appendix B. The proposed discharge permit water quality limits are shown in Table 7.04-1. In addition, the total Nitrogen and Phosphorus will need to be monitored and they might become enforcement limits in the future.

Parameter	Loading (lb/day)	Quality or Concentration (mg/L)			
	Monthly Average	Monthly Average	Weekly Average	Daily Minimum	Daily Maximum
Design Flow (0.40 mgd)	-----	Report	Report	-----	-----
ANTICIPATED RM 12.2 BLACK LICK CREEK DISCHARGE EFFLUENT LIMITS[1]					
$CBOD_5$	67	20	30	-----	-----
TSS	100	30	45	-----	-----
NH_3-N					
Summer	13	4	-----	-----	-----
Winter	33	10	-----	-----	-----
Dissolved Oxygen	-----	-----	-----	2.0	-----
pH	-----	-----	-----	6.0	9.0
E. coli (Geometric Mean)	-----	130 colonies per 100 mL	240 colonies per 100 mL	-----	-----

[1]Based on Wasteload Allocation Letter (see Appendix B).

Table 7.04-1 Anticipated KPDES Effluent Limitations–Auburn WWTP

SECTION 8
EVALUATION OF ALTERNATIVES

8.01 INTRODUCTION

This section presents wastewater treatment and collection alternatives available for the projected flows and loadings within the Auburn Planning Area. Various alternatives are identified and those deemed the most appropriate are evaluated for cost-effectiveness including a present worth evaluation of capital and O&M costs. Additionally, nonmonetary factors are considered for each alternative to determine which alternative is the most suitable.

8.02 NO ACTION ALTERNATIVE

The “No Action” alternative does not require additional sewers, pumping stations, and construction of treatment plant capacity, nor does it provide for anticipated growth in the Auburn Planning Area. The alternative would include maintaining the present wastewater treatment, collection, and conveyance systems without the needed improvements. The advantage of this alternative is no construction expenditure and no environmental impact for the direct effects of construction of the new facilities. However, this alternative fails to address upgrade needs to the 28-year old WWTP, population growth in the Auburn Planning Area, or the anticipated expansion of the Champion Petfoods industry. This no action alternative will prevent Auburn from growth, and therefore, this “No Action” alternative is not a viable alternative and will not be considered further.

8.03 OPTIMIZATION OF EXISTING FACILITIES

Optimization of the existing Auburn WWTP was considered. The WWTP has occasionally received flows above the hydraulic capacity and handled them successfully. The WWTP currently employs an extended aeration activated sludge process. However, based on the configuration of the existing aeration and clarification processes, it is not a good candidate for conversion to a higher rate activated sludge process, especially with only one final clarifier. The facility has inadequate hydraulic capacity to effectively treat the higher peak flows that are planned and therefore requires expansion for both hydraulic and organic needs.

8.04 POSSIBLE REGIONALIZATION

Regionalization of wastewater management will help to minimize the number of wastewater discharges into state waters. This is accomplished through prevention of new discharges when possible, connection to existing facilities, or the connection of one or more existing facilities into a new or existing regional treatment facility.

The Auburn WWTP is the only regional treatment facility in the planning area; therefore consolidating wastewater treatment with another facility is not feasible. On-site septic treatment systems throughout the planning area will be removed from service during the planning period with the wastewater ultimately conveyed to the Auburn WWTP.

Auburn has previously considered regionalization with the City of Russellville, however, a mutually beneficial solution was not identified. Auburn desires to maintain its utility independence rather than pursue regional solutions with either Bowling Green or Russellville.

8.05 SCREENING OF WASTEWATER TREATMENT ALTERNATIVES

The last major expansion at the Auburn WWTP was completed in 1989. The expansion included a new mixed liquor splitter box, a new aeration basin, a new secondary clarifier, and a new chlorine contact tank.

The Auburn WWTP is proposed to be expanded within the next two years. The proposed expanded average daily flow capacity is 0.4 mgd and the peak hourly flow capacity is 1.6 mgd, as developed in Section 7.

An early review of expanding the Auburn WWTP at the existing site was performed. The existing site is in the flood plain and has many abandoned tanks from construction that dates back to the 1950s. Construction of new open-top treatment tanks at the existing site is extremely limited by the 200-foot setback requirement from 401 KAR 5:005. Consideration was also given to purchasing additional land to the east of the existing WWTP. Much of the site to the east lies in the floodplain and the site is known to have artesian springs, which would make managing groundwater during construction difficult and expensive. Given these constraints, expansion at the existing site was ruled out. Construction at a green field site will generally be less expensive since no constraints will be placed on the contractor to work around existing facilities or processes.

Four alternatives have been developed for the Auburn WWTP to handle the projected flows and loadings. The proposed alternatives for the Auburn WWTP expansion are as follows:

- No action alternative–Previously ruled out.
- Alternative A–Expand the Auburn WWTP to 0.4 mgd with a sequencing batch reactor process and peracetic acid disinfection.
- Alternative B–Expand the Auburn WWTP to 0.4 mgd with an extended aeration oxidation ditch process, final clarification, and peracetic acid disinfection.
- Alternative C–Expand the Auburn WWTP to 0.4 mgd with the Aeromod Sequox package treatment process, tertiary filtration, and peracetic acid disinfection.

8.06 COMMON EXPANSION REQUIREMENTS AT CITY OF AUBURN WWTP

Several process components for the Auburn WWTP expansion are required to be made, regardless of which alternative is selected. Those common expansion requirements include the following:

1. Construct a new influent pump station at the existing Auburn WWTP site with adequate pumping capacity to deliver wastewater to the new Auburn WWTP. The pump station will be located above the 100-year flood elevation.

2. Construct dual force mains from influent pump station to the new proposed WWTP. One force main is 4 inches and the other is 6 inches. The existing 4-inch force main from Champion Petfoods that runs by the proposed Auburn WWTP will also be extended to enter the new Headworks Facility independently.

3. Modify and use existing aeration and clarifier tankage as a new equalization basin for peak flows.

4. Provide a new preliminary treatment facility to handle peak flow up to 2.4 mgd at the new WWTP site.

5. Provide a new influent flow measurement and sampling station at the new WWTP site.

6. Provide a new secondary treatment system at the new WWTP site. Three options will be considered.

7. Provide a new sludge dewatering facility to handle sludge generation at the new WWTP site.

8. Provide a new emergency generator at the existing WWTP site.

9. Provide an emergency generator, WWTP roads, and improvements for access at the new WWTP site.

Each of these common project components will be discussed further in the following paragraphs.

A. New Influent Pump Station and Force Main Expansion

All flow to the existing WWTP, except the flow from Champion Petfoods will be pumped by the new influent station to the proposed new Auburn WWTP. The new WWTP is proposed to be located about 1,600 feet from the existing treatment plant. The new pump station will be provided with one 3 horsepower (hp) submersible sewage pump rated at 200 gallons per minute (gpm) at 25 feet total dynamic head (TDH) and two 10 hp submersible sewage pumps, each rated at 900 gpm at 45 feet TDH. The influent pump station will be designed to deliver up to 1.6 mgd wastewater flow to the proposed treatment plant with two pumps in operation (one small and one large). The small pump will handle flows during a dry day and a larger pump will be employed during wet weather or when a small pump cannot keep up with influent flows.

B. Dual Force Mains from Influent Pump Station to the New Proposed WWTP

The flow from the small influent pump will be transported to the new WWTP via the 4-inch force main while the flow from the large influent pump will be carried by the new 6-inch force main. The wastewater flow from Champion Petfoods will be diverted to discharge directly into the new WWTP. The 4-inch force main already exists between the new and old sites and is used to convey wastewater from Champion Petfoods, and will be repurposed.

C. Equalization Basin Structure

Existing aeration and clarifier tankage will be used as an equalization basin to reduce the total peak hourly flow to 1.6 mgd. Flows in excess of 1.6 mgd will be sent to the equalization basin for temporary storage and stored flows will be returned to the influent pump station once the influent flow drops below 1.6 mgd. The basin can also be used to manage flows during maintenance activities at the proposed WWTP. The total volume available for equalization is 600,000 gallons.

D. New Preliminary Treatment Facilities

A preliminary treatment facility (Headworks Facility) is proposed at the new Auburn WWTP site to handle the ultimate design peak flow of 2.4 mgd. The new Headworks Facility will house a mechanically cleaned screen and a manually cleaned bypass bar screen. Screenings washing and compacting will also be provided for the new headworks. A magnetic flow meter will be provided at the headworks effluent for influent flow measurement. While the design peak hourly flow capacity at the WWTP is 1.6 mgd, the new headworks is proposed with 2.4 mgd capacity to give operators some extra capacity to handle higher peak flow, which may occur in the future. This extra capacity will add a very small cost to the new headworks structure.

E. Plant Influent Flow Measurement and Sampling

Installing a new influent pump station implies the requisite supplementation of a new influent flow measurement device as well as devices for influent and effluent sampling. While this new WWTP will be capable of handling larger flow rates, it is still necessary to know the total flow coming into the system. A magnetic flowmeter is recommended. It is also critical to sample the influent after it has passed through the bar screen in order to know how it should be treated in the proceeding stages. Conversely, the effluent should be sampled once it has passed through the facility to ensure the mandatory regulations have been met.

F. New secondary treatment system

Auburn's WWTP will require a new secondary treatment system, so three alternatives have been developed as options to satisfy this need. Each of the proposed alternatives will consider a different means of providing secondary treatment:

1. Alternative A evaluates the implementation of a Sequencing Batch Reactor activated sludge system.

2. Alternative B includes using a pair of Oxidation Ditches with biological nutrient removal tankage.

3. Alternative C considers the employment of a Package Treatment System involving aeration basins, clarifiers, and downstream filters.

Both monetary and the nonmonetary comparisons are made in Sections 8.08 and 8.09.

G. Solids Dewatering Facilities Expansion

The existing sludge drying beds at the Auburn WWTP are at their design capacity and are dependent on periods of dry weather; meaning they do not function properly during extended times of the year. A mechanical sludge dewatering system will eliminate this inability to dewater sludge during wet weather. The mechanical dewatering system, such as a belt filter press or rotary screw press, will be installed at the new WWTP. The new sludge dewatering system will include sludge feed pumps, a polymer feed system, a wash water system, dewatering equipment, and a solids conveyor. Sludge cake will be stored in a dumpster until landfill disposal. The existing drying beds will be eliminated.

H. New Emergency Generator at Existing WWTP

A new emergency generator is required at the existing WWTP site. It is necessary to have a generator in case of inclement weather conditions or any other unusual circumstances that might cause a power outage to the influent pump station.

I. New Access Roads, Emergency Generator and Improvements for the New WWTP Site

As previously mentioned, a new entrance to the new WWTP site will be required. Employees and trucks must be able to access this new WWTP, so it is necessary to provide new access roads leading to the site. Also, it is equally important for this site to have an emergency generator for mechanical equipment whose operations would be compromised during a power outage.

8.07 CITY OF AUBURN WWTP EXPANSION ALTERNATIVES

Three alternatives will be considered for expansion of the Auburn WWTP to treat a projected average daily flow of 0.4 mgd and a projected peak hourly flow of 1.6 mgd. The treatment process alternatives are selected for the effluent limits provided by the WLA.

A. Alternative A–Expand the City of Auburn WWTP to 0.4 mgd with Sequencing Batch Reactor Process

Alternative A includes the installation of three new Sequencing Batch Reactors (SBRs). These batch reactors would be located at the new facility, about 1,600 feet from the existing site. They would be capable of treating an average daily flow of 0.4 mgd and the flow entering and leaving a basin would be controlled by its own respective motor-operated valve. Each SBR would follow a five-step process that would allow wastewater to enter the basin and clear water to leave it. A single basin would hold 300,000 gallons and run through five cycles per day. The SBRs will allow for some of the uptake of phosphorous and denitrification of nitrate. The water leaving these basins would enter two 18,000 gallon Peracetic acid contact tanks where disinfection would take place. Figure 8.07-1 represents the flow schematic for Alternative A, while Figure 8.07-2 shows the site location plan for Alternative A. The design criteria for Alternative A is listed in Table 8.07-1.

TABLE 8.07-1 ALTERNATIVE A–Biological Treatment with Sequencing Batch Reactor Process Design Criteria

Design Flows		
Average Daily Flow	0.4 mgd	
Peak Hourly Flow	1.6 mgd	
Design Loadings		
BOD_5	318 mg/L	1,060 lbs/day
TSS	231 mg/L	770 lbs/day
NH_3-N	24 mg/L	80 lbs/day
Influent Pump Station		
Type of Pumps	Submersible	
Number of Pumps	3	
Design Capacity (Pump #1)	200 gpm @ 25 FT	
Design Capacity (Pumps #2 and #3)	1,120 gpm @ 45 FT	
Pump HP (Pump #1)	3 hp	
Pump HP (Pumps #2 and #3)	10 hp	
Speed Control	VFDs	
Influent Force Mains	one 4 inch	
	one 6 inch	
Influent Screening		
Number of Channels	2	
Number of Mechanically Cleaned Screen	1	
Design Capacity	2.4 mgd	
Number of Manually Cleaned Screen	1	
Design Capacity	2.4 mgd	
Influent Flow Measurement		
Number of Meters	1	
Type of Meter	Magnetic Flow Meter	
Size	6 inch	
Capacity	2.6 mgd	
SBR Basins		
Number of Influent Valves	3	
Size of each valve	12 inch	
Number of Reactor Basins	3	
Size of Basin	300,000 gallons/basin	
Number of Cycles	5 per day/basin	
Cycle Duration	4.8 hours/cycle	
Number of Mixers	1 at 7.5 hp/each basin	
Number of Blowers	5 at 30 hp/each	

Air Supply	630 scfm/basin
Air Discharge Pressure	10.7 psi
Number of Diffuser Assemblies	3 per each basin
Actual Oxygen Supply	2,940 lbs/day
Number of Decanters	1 per each basin
Number of Transfer Pumps	1 per each basin

Effluent Flow Measurement

Number of Meters	1
Type of Meter	Parshall Flume
Size	9 inch
Capacity	5.73 mgd

Peracetic Acid Disinfection

Number of Contact Basins	2
Size	18,000 gallons/basin
Contact Time	15 minutes @ 2,400 gpm decant rate
Effluent Flow Rates	2,400 gpm or 3.46 mgd
Number of Feed Pumps	2
PAA Concentration	12% to 15%
Dosage Range	0.5 mg/L to 10 mg/L

Sludge Transfer Pumps and Force Main

Number	2 (1+1 standby)
Type	Centrifugal
Size	100 gpm/each
Control	Constant Speed
Sludge Force Main	4 inch

Biosolids Holding

Number of Tanks	2
Volume	30,000 gallons/tank
Type of Aeration	Coarse Bubble Diffusion

Biosolids Holding Air Supply

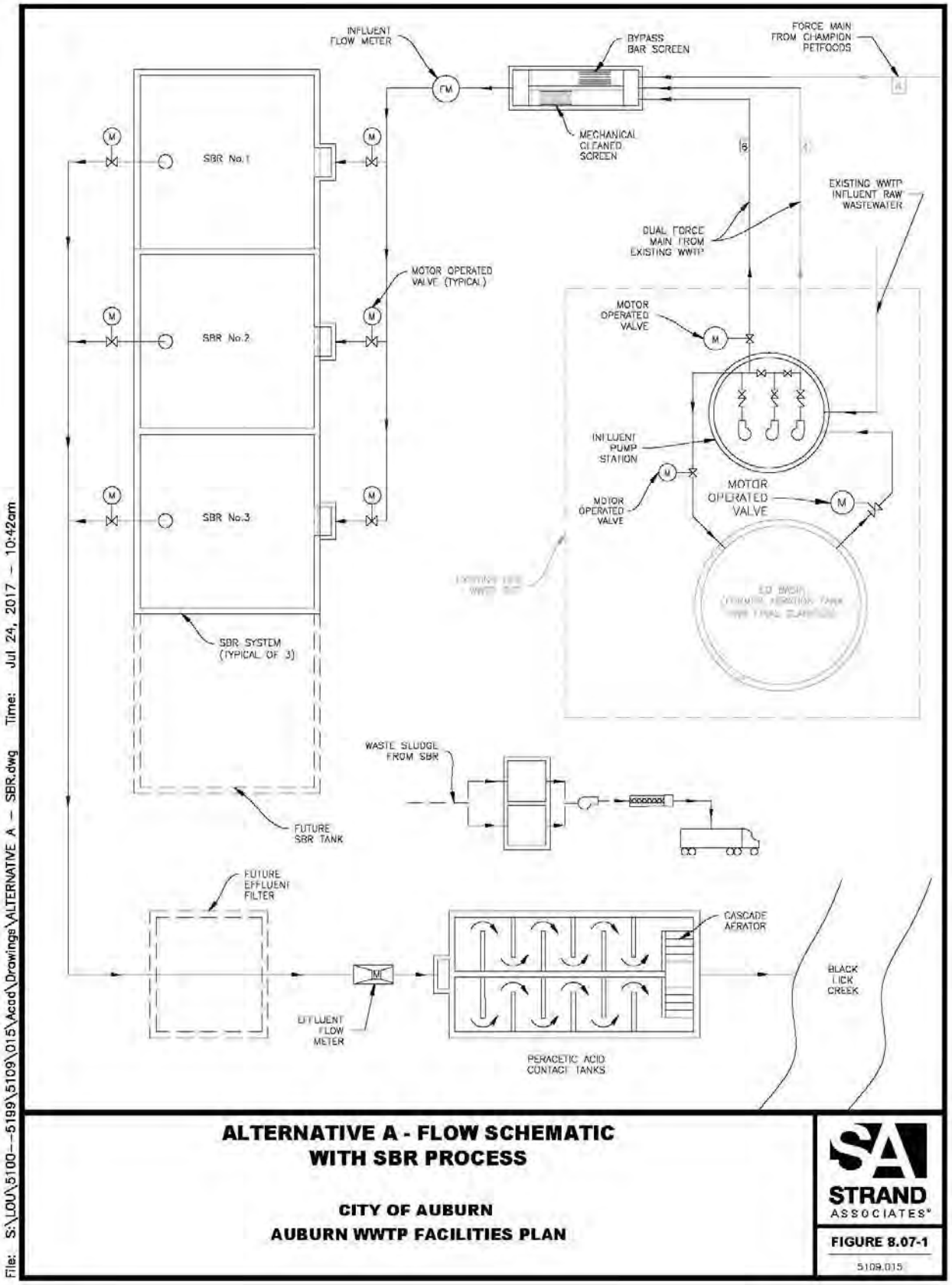
Number of Blowers	2
Type	Positive Displacement
Blower Capacity (each)	480 scfm
Design Mixing	30 scfm/1000 ft^3
Drive Type	Constant Speed

Sludge Dewatering

Type	Belt Filter Press or Screw Press
Number	1
Solids Capacity	400 lbs/hr
Liquid Capacity	80 gpm

Sludge Feed Pumps

Number	2 (1+1 standby)
Type	Centrifugal
Size	100 gpm/each
Control	Variable Speed Drive



ALTERNATIVE A - FLOW SCHEMATIC WITH SBR PROCESS

CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN

STRAND ASSOCIATES®

FIGURE 8.07-1
5109.015

STRUCTURE LOCATIONS:

1. HEADWORKS INFLUENT
2. INFLUENT FLOW METER
3. SBR PROCESS
4. BLOWER AND ELECTRICAL BUILDING
5. FUTURE SBR TANK
6. FUTURE FILTRATION SYSTEM
7. EFFLUENT FLOW METER
8. PAA CONTACT TANKS
9. AERATED SLUDGE HOLDING TANKS
10. SLUDGE DEWATERING FACILITIES
11. ADMINISTRATION BUILDING

NEW WWTP SITE PLAN – ALTERNATIVE A SBR PROCESS
NO SCALE

ALTERNATIVE A - SBR PROCESS
NEW WWTP SITE PLAN

CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN
AUBURN, KENTUCKY

STRAND ASSOCIATES®

FIGURE 8.07-**2**
5109.015

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B. Alternative B–Expand the City of Auburn WWTP to 0.4 mgd with Oxidation Ditches and Final Clarifiers Treatment Processes

Alternative B includes constructing two Biological Nutrient Removal (BNR) oxidation ditches and two final clarifiers to treat an average daily flow of 0.4 mgd. Similar to the SBR setup described in Alternative A, these treatment units would also be constructed at the new site. Together, the two oxidation ditches would be capable of housing 0.528 million gallons. During their hydraulic detention time of about 32 hours, these ditches would function to remove biodegradable organics from the wastewater. A nutrient removal process is included to allow some uptake of phosphorus and denitrification of nitrate. Upon leaving the oxidation ditches, the effluent would enter two final clarifiers, which would work to separate microorganisms from the activated sludge through a process called settling. The effluent would proceed to flow through a pair of Peracetic acid contact tanks, with each 8,500 gallon tank being used for disinfection. Figure 8.07-3 represents the flow schematic for Alternative B, while Figure 8.07-4 shows the site location plan for this alternative. The design criteria for Alternative B is listed in Table 8.07-2.

TABLE 8.07-2 ALTERNATIVE B–Oxidation Ditches and Final Clarifiers Treatment Processes Design Criteria

Design Flows		
Average Daily Flow	0.4 mgd	
Peak Hourly Flow	1.6 mgd	
Design Loadings		
BOD_5	318 mg/L	1,060 lbs/day
TSS	231 mg/L	770 lbs/day
NH_3-N	24 mg/L	80 lbs/day
Influent Pump Station		
Type of Pumps	Submersible	
Number of Pumps	3	
Design Capacity (Pump #1)	200 gpm @ 25 FT	
Design Capacity (Pumps #2 and #3)	1,120 gpm @ 45 FT	
Pump HP (Pump #1)	3 hp	
Pump HP (Pumps #2 and #3)	10 hp	
Speed Control	VFDs	
Influent Force Mains	one 4 inch	
	one 6 inch	
Influent Screening		
Number of Channels	2	
Number of Mechanically Cleaned Screen	1	
Design Capacity	2.4 mgd	
Number of Manually Cleaned Screen	1	
Design Capacity	2.4 mgd	

Influent Flow Measurement

Number of Meters	1
Type of Meter	Magnetic Flow Meter
Size	6 inch
Capacity	2.6 mgd

Extended Aeration Process

Number of Oxidation Ditches	2
Oxidation Ditches Type	Carrousel System with BNR
Anoxic Volume	0.045 mil gal/ditch
Effective Aeration Volume	0.219 mil gal/ditch
Total Oxidation Ditches Volume	0.528 mil gal
Number of Aerators	1 at 25 hp/ditch
Number of Mixers	2 at 0.7 hp/ditch
BOD Loading	15 lbs/d/1,000 ft^3
Hydraulic Detention Time	31.7 hours @ ADF

Clarifiers

Number of Units	2
Clarifier Diameter	36 feet
Total Surface Area	2,036 ft^2
Surface Loading Rate	196 gpd/ft^2 @ ADF
	786 gpd/ft^2 @ PHF
Solids Loading Rate (3,500 mg/L MLSS)	
@ 0.4 mgd + 0.4 mgd RAS	11.5 lbs/d/ft^2
@ 1.6 mgd + 0.6 mgd RAS	31.5 lbs/d/ft^2

RAS Pumps

Type of Pump	Submersible
Number of Pumps	3 (2 + 1 standby)
Design Capacity	208 gpm each
Firm Capacity	417 gpm (with 2 pumps in operation)

Effluent Flow Measurement

Number of Meters	1
Type of Meter	Parshall Flume
Size	6 inch
Capacity	2.53 mgd

Peracetic Acid Disinfection

Number of Contact Basins	2
Size	8,500 gallons/basin
Contact Time	15 minutes @ 1,130 gpm effluent rate
Effluent Flow Rate	1,130 gpm or 1.63 mgd

Number of Feed Pumps	2
PAA Concentration	12% to 15%
Dosage Range	0.5 mg/L to 10 mg/L

Sludge Transfer Pumps

Number	2 (1+1 standby)
Type	Centrifugal
Size	100 gpm/each
Control	Constant Speed
Sludge Force Main	4 inch

Biosolids Holding

Number of Tanks	2
Volume	30,000 gallons/tank
Type of Aeration	Coarse Bubble Diffusion

Biosolids Holding Air Supply

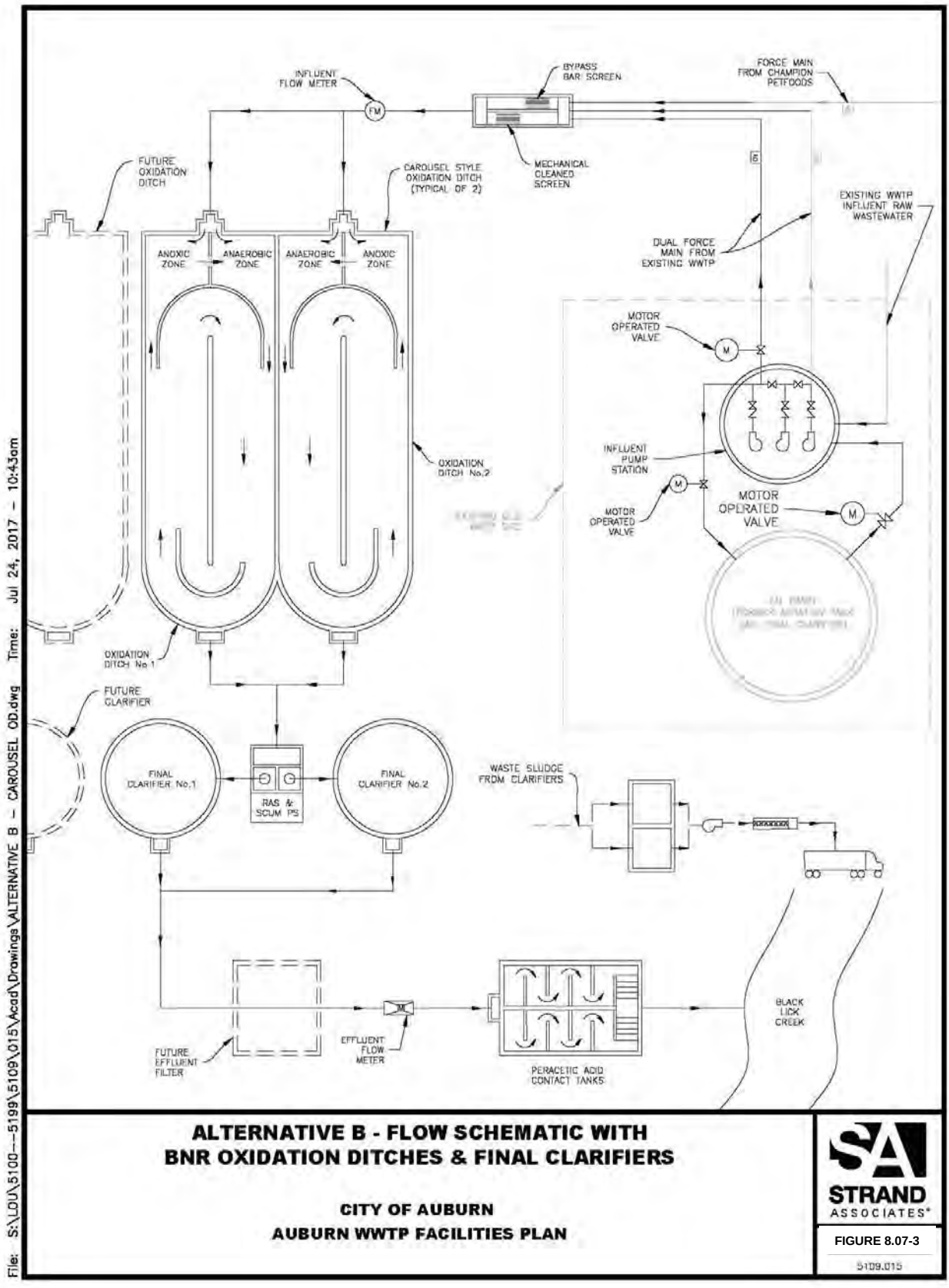
Number of Blowers	2
Type	Positive Displacement
Blower Capacity (each)	480 scfm
Design Mixing	30 scfm/1000 ft^3
Drive Type	Constant Speed

Sludge Dewatering

Type	Belt Filter Press or Screw Press
Number	1
Solids Capacity	400 lbs/hr
Liquid Capacity	80 gpm

Sludge Feed Pumps

Number	2
Type	Centrifugal
Size	100 gpm/each
Control	Variable Speed Drive


INFLUENT FLOW METER
FM
BYPASS BAR SCREEN
FORCE MAIN FROM CHAMPION PETFOODS
MECHANICAL CLEANED SCREEN
FUTURE OXIDATION DITCH
CAROUSEL STYLE OXIDATION DITCH (TYPICAL OF 2)
EXISTING WWTP INFLUENT RAW WASTEWATER
DUAL FORCE MAIN FROM EXISTING WWTP
ANOXIC ZONE
ANAEROBIC ZONE
ANAEROBIC ZONE
ANOXIC ZONE
MOTOR OPERATED VALVE
M
INFLUENT PUMP STATION
OXIDATION DITCH No.2
OXIDATION DITCH No.1
FUTURE CLARIFIER
FINAL CLARIFIER No.1
RAS & SCUM PS
FINAL CLARIFIER No.2
WASTE SLUDGE FROM CLARIFIERS
FUTURE EFFLUENT FILTER
EFFLUENT FLOW METER
PERACETIC ACID CONTACT TANKS
BLACK LICK CREEK
File: S:\LOU\5100—5199\5109\015\Acad\Drawings\ALTERNATIVE B – CAROUSEL OD.dwg Time: Jul 24, 2017 – 10:43am
ALTERNATIVE B - FLOW SCHEMATIC WITH BNR OXIDATION DITCHES & FINAL CLARIFIERS
CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN
STRAND ASSOCIATES®
FIGURE 8.07-3
5109.015

STRUCTURE LOCATIONS:

1. HEADWORKS INFLUENT
2. INFLUENT FLOW METER
3. OXIDATION DITCH STRUCTURE
4. FUTURE OXIDATION DITCH
5. FINAL CLARIFIER
6. FUTURE FINAL CLARIFIER
7. FUTURE FILTRATION SYSTEM
8. EFFLUENT FLOW METER
9. PAA CONTACT TANKS
10. AERATED SLUDGE HOLDING TANKS
11. SLUDGE DEWATERING FACILITIES
12. ADMINISTRATION AND ELECTRICAL BUILDING

NEW WWTP SITE PLAN – ALTERNATIVE B OXIDATION DITCH PROCESS
NO SCALE

ALTERNATIVE B - OXIDATION DITCH AND FINAL CLARIFIER PROCESS
NEW WWTP SITE PLAN

CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN
AUBURN, KENTUCKY

STRAND ASSOCIATES®

FIGURE 8.07-4
5109.015

C. Alternative C–Expand the City of Auburn WWTP to 0.4 mgd with a Package Treatment Center

Alternative C includes constructing an Aeromod package treatment center to treat an average daily flow of 0.4 mgd. The entering wastewater would go through two stages of aeration before entering a clarifier. The total aeration volume would be 544,000 gallons and the hydraulic detention time would be 32 hours. There would be two sludge thickener tanks included where mixed liquor could be wasted and concentrated. After stage two aeration, the wastewater would flow through two rectangular clarifiers then through two filters, each of which would have the capacity to process up to 0.80 mgd. Next, the water would enter a pair of 8,500 gallon Peracetic acid contact tanks in which disinfection would take place. The WWTP will include a degree of biological nutrient removal, however some additional treatment may be required. Figure 8.07-5 represents the flow schematic for Alternative C, while Figure 8.07-6 shows the site location plan for this alternative. The design criteria for Alternative C is listed in Table 8.07-3.

TABLE 8.07-3 ALTERNATIVE C–Biological Aeromod Sequox Package Treatment Process Design Criteria

Design Flows		
Average Daily Flow	0.4 mgd	
Peak Hourly Flow	1.6 mgd	
Design Loadings		
BOD_5	318 mg/L	1,060 lbs/day
TSS	231 mg/L	770 lbs/day
NH_3-N	24 mg/L	80 lbs/day
Influent Pump Station		
Type of Pumps	Submersible	
Number of Pumps	3	
Design Capacity (Pump #1)	200 gpm @ 25 FT	
Design Capacity (Pumps #2 and #3)	1,120 gpm @ 45 FT	
Pump HP (Pump #1)	3 hp	
Pump HP (Pumps #2 and #3)	10 hp	
Speed Control	VFDs	
Influent Force Mains	one 4 inch	
	one 6 inch	
Influent Screening		
Number of Channels	2	
Number of Mechanically Cleaned Screen	1	
Design Capacity	2.4 mgd	
Number of Manually Cleaned Screen	1	
Design Capacity	2.4 mgd	

Influent Flow Measurement

Number of Meters	1
Type of Meter	Magnetic Flow Meter
Size	6 inch
Capacity	2.6 mgd

Fermentation Tank Process

Number of Tanks	1
Effective Volume	0.025 mil gal
Retention Time	90 min @ ADF

Anaerobic Selector Process

Number of Tanks	1
Effective Volume	0.040 mil gal
Retention Time	72 min @ ADF + 100% RAS

Aeration Process

Number of Aeration Basins	2 Stage 1 and 2 Stage 2
Total Stage 1 Aeration Volume	268,000 gallons
Total Stage 2 Aeration Volume	276,000 gallons
Total Aeration Volume	544,000 gallons
BOD Loadings	14.6 lbs/d/1000 ft^3
Hydraulic Detention Time	32 hrs @ ADF

Clarifiers

Number of Units	2
Clarifier Dimension	40-ft x 20-ft x 14-ft SWD
Total Surface Area	1,600 ft^2
Surface Loading Rate	250 gpd/ft^2 @ ADF
	1,000 gpd/ft^2 @ PHF
Solids Loading Rate (3,300 mg/L MLSS)	
@ 0.4 mgd + 0.4 mgd RAS	13.8 lbs/d/ft^2
@ 1.6 mgd + 0.4 mgd RAS	34.4 lbs/d/ft^2

RAS Pumps

Type of Pump	Air Lift
Number of Pumps	2
Design Capacity	140 gpm each
Firm Capacity	280 gpm (with 2 pumps in operation)

Effluent Filtration

Number of Filters	2
Type of Filters	Cloth Disc
Capacity	0.80 mgd/each

Total Effective Filter Area	234 ft^2
Surface Filtration Rate	1.2 gpm/ft^2 @ ADF
	4.8 gpm/ft^2 @ PHF

Effluent Flow Measurement

Number of Meters	1
Type of Meter	Parshall Flume
Size	6 inch
Capacity	2.5 mgd

Peracetic Acid Disinfection

Number of Contact Basins	2
Size	8,500 gallons/basin
Contact Time	15 minutes @ 1,130 gpm effluent rate
Effluent Flow Rates	1,130 gpm or 1.63 mgd
Number of Feed Pumps	2
PAA Concentration	12% to 15%
Dosage Range	0.5 mg/L to 10 mg/L

Mixed Liquor Digester Tanks

Number of Blowers	2
Type	Positive Displacement
Blower Capacity (each)	480 scfm
Design Mixing	30 scfm/1000 ft^3
Drive Type	Constant Speed

Biosolids Holding

Number of Tanks	2
Volume	30,000 gallons/tank
Type of Aeration	Coarse Bubble Diffusion

Biosolids Holding Air Supply

Number of Blowers	2
Type	Positive Displacement
Blower Capacity (each)	480 scfm
Design Mixing	30 scfm/1000 ft^3
Drive Type	Constant Speed

Sludge Transfer Pumps

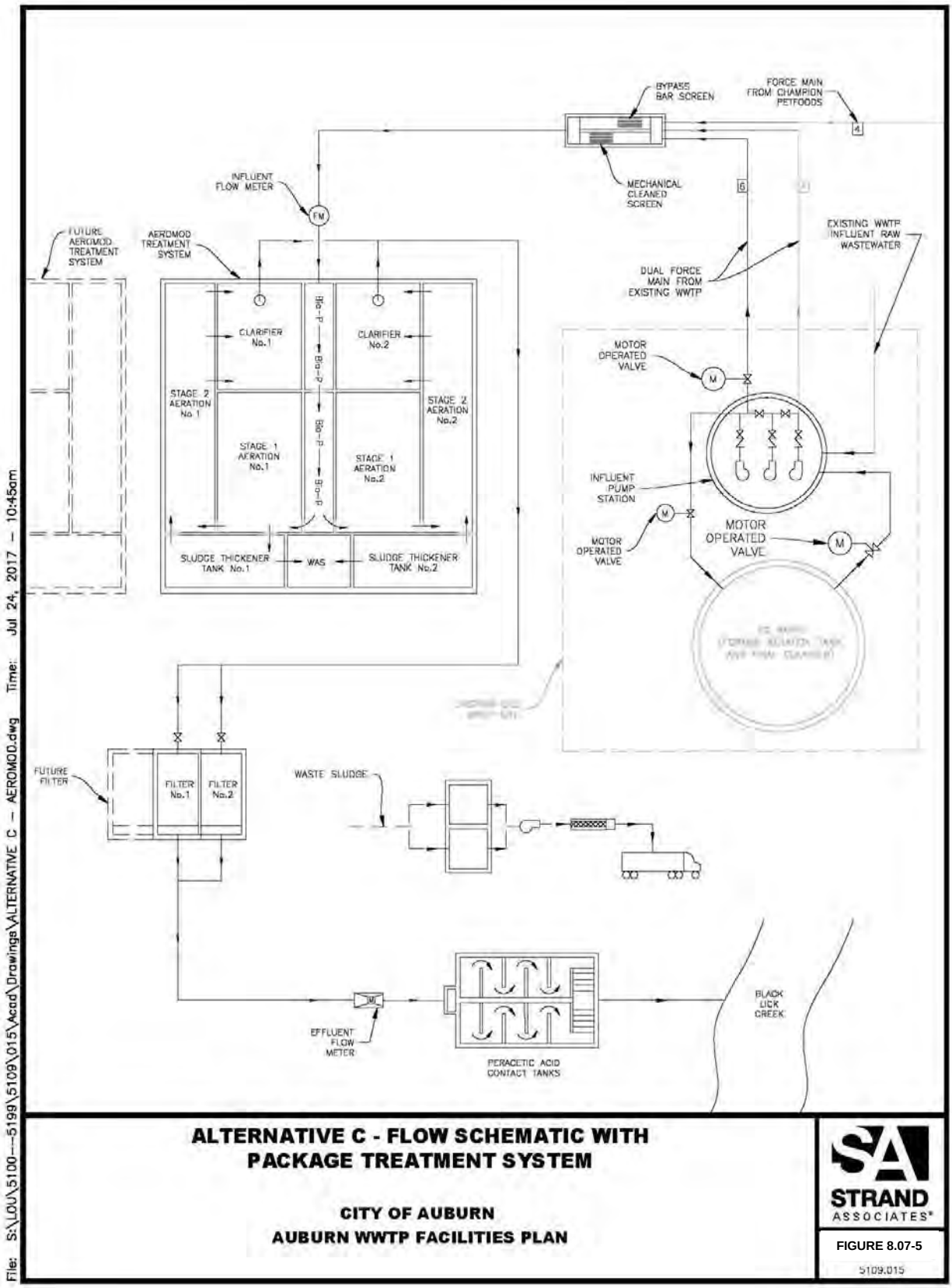
Number	2 (1+1 standby)
Type	Centrifugal
Size	100 gpm/each
Control	Constant Speed
Sludge Force Main	4 inch

Sludge Dewatering

Type	Belt Filter Press or Screw Press
Number	1
Solids Capacity	400 lbs/hr
Liquid Capacity	80 gpm

Sludge Feed Pumps

Number	2
Type	Centrifugal
Size	100 gpm/each
Control	Variable Speed Drive



ALTERNATIVE C - FLOW SCHEMATIC WITH PACKAGE TREATMENT SYSTEM

CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN

STRAND ASSOCIATES®

FIGURE 8.07-5

5109.015

STRUCTURE LOCATIONS:

1. HEADWORKS INFLUENT
2. INFLUENT FLOW METER
3. AEROMOD PACKAGE WWTP
4. BLOWER AND ELECTRICAL BUILDING
5. FUTURE AEROMOD PACKAGE WWTP
6. EFFLUENT FILTRATION SYSTEM
7. FUTURE FILTRATION SYSTEM
8. EFFLUENT FLOW METER
9. PAA CONTACT TANKS
10. AERATED SLUDGE HOLDING TANKS
11. SLUDGE DEWATERING FACILITIES
12. ADMINISTRATION BUILDING

NEW WWTP SITE PLAN – ALTERNATIVE C AEROMOD PACKAGE PROCESS
NO SCALE

ALTERNATIVE C - AEROMOD PACKAGE PROCESS
NEW WWTP SITE PLAN

CITY OF AUBURN
AUBURN WWTP FACILITIES PLAN
AUBURN, KENTUCKY

STRAND ASSOCIATES®

FIGURE 8.07-6
5109.015

File: S:\LOU\5100--5199\5109\015\Acad\Drawings\New Site Plan – Alternative C.dwg Time: Jul 24, 2017 – 10:50am

8.08 PROJECT COSTS

A. City of Auburn WWTP Expansion Probable Construction Cost

The overall wastewater treatment Alternatives A, B, and C were evaluated with respect to the costs associated with each alternative. Monetary evaluations were conducted for the three alternatives to determine the most cost-effective alternative based on the present worth of the projected construction cost and annual operation and maintenance (O&M) expense. The total project cost includes budgets of 7 percent for general conditions, such as bonds and insurance and 40 percent for contingencies and technical services. Table 8.08-1 presents the opinion of probable construction cost for the three evaluated alternatives. The detailed opinion of probable construction cost for each alternative is included in Appendix C.

City of Auburn WWTP Proposed Expansion	Opinion of Probable Construction Cost	Total Project Cost[1,2]
Alternative A–Expand the WWTP with Sequencing Batch Reactor Treatment Process.	$5,041,000	$7,057,000
Alternative B–Expand the WWTP with Carrousel Oxidation Ditches and Final Clarifiers Treatment Process.	$5,173,000	$7,242,000
Alternative C–Expand the WWTP with Aeromod Sequox Package Treatment Process.	$5,756,000	$8,058,000

[1]Includes 7 percent Bonds and Insurance plus 40 percent Construction Contingency and Technical Services.
[2]Second Quarter 2017 dollars.

Table 8.08-1 Opinion of Probable Construction Cost for the Proposed Expansion of the Auburn WWTP[2]

B. City of Auburn WWTP Expansion O&M Cost

O&M costs were considered as they differ among the three proposed alternatives. Since the horsepower and equipment maintenance cost differ with each alternative, these two factors were considered independently. Electrical costs were assumed to be $0.08 per kilowatt hour (kWh), while the equipment maintenance costs were budgeted at 3 percent of the installed equipment cost.

Sludge handling costs are considered to be the same among the proposed alternatives and were assumed to have a cost of $1,500 per month.

Labor costs were assumed to be $40 per hour (including benefits). It was assumed that 24 hours per week or 1,200 hours of labor each year would be needed for maintaining the pump station and new proposed treatment facilities in each evaluated alternative. The new labor cost was assumed to be the same for all three alternatives. Maintenance costs are considered separately.

The chemical cost includes the cost of chemicals used to disinfect the effluent wastewater and the cost of the polymer used in sludge handling. It was assumed that the chemical cost would be the same for each of the evaluated alternatives. The cost of Peracetic acid was assumed to be $3,500 per month or about $42,000 per year. The cost of the sludge handling polymer was assumed to be $1,000 per month or about $12,000 per year. Table 8.08-2 presents the opinion of probable annual O&M cost for the proposed treatment alternatives.

Treatment Alternatives	**Alternative A** Biological Treatment with Sequencing Batch Reactor Process	**Alternative B** Oxidation Ditches and Final Clarifiers Treatment Process	**Alternative C** Biological Package Treatment Process
Electrical Cost per Year[1]	$39,700	$34,000	$40,800
Equipment Maintenance Cost[2]	$67,300	$61,000	$84,100
Sludge Handling Cost[3]	$30,000	$30,000	$30,000
Labor Cost[4]	$48,000	$48,000	$48,000
Chemical Cost[5]	$42,000	$42,000	$42,000
Total Annual O&M Cost	**$227,000**	**$215,000**	**$245,000**

[1]Based on $0.09 per Kwh.
[2]3 percent of Equipment Cost.
[3]$1,500 per month of Sludge Handling + $1,000 per month for Sludge Handling Polymer.
[4]Based on $40/hr and 1,200 hours per year.
[5]$2,500 per month of Chemical Cost.

Table 8.08-2 Opinion of Annual O&M Cost for Proposed Alternatives

C. Present Worth Cost-Effective Analysis

Proposed treatment Alternatives A, B, and C were evaluated with respect to the 20-year life cycle costs associated with each alternative. Life cycle costs were calculated for the three alternatives in order to determine which of the three options would have the lowest overall cost of ownership. This was done by considering the total construction cost and the annual operation and maintenance cost. Table 8.08-3 illustrates life cycle cost analysis (total present worth) for each of the three proposed alternatives to expand Auburn WWTP. The analysis assumes an effective structural life of 40 years and an effective equipment and instrumentation life of 20 years. In order to calculate the present worth, the planning period was assumed to be 20 years and the discount rate was assumed to be 5 percent. Overall, Alternatives A and B cost the least. Alternative C, with AeroMod Sequox package treatment process, has a higher capital investment and a higher O&M cost when compared to Alternatives A and B. The life cycle cost for Alternative A is only 1 percent higher than that of Alternative B and is also within the range of planning cost precision. Therefore, both Alternatives A and B are considered to have the same costs regarding total present worth.

City of Auburn WWTP Expansion	Alternative A	Alternative B	Alternative C
Structure, Building, Piping	$3,361,000	$3,045,000	$4,200,000
Equipment and Electrical Instrumentation	$3,697,000	$4,199,000	$3,858,000
Subtotal Construction Cost	*$7,058,000*	*$7,244,000*	*$8,058,000*
Salvage Values			
Salvage Value in 20 years	($1,849,000)	($2,100,000)	($1,929,000)
Present Worth of Salvage Value[1]	($697,000)	($791,000)	($727,000)
O&M Costs			
Annual O&M Cost	$227,000	$215,000	$245,000
Present Worth of O&M	$2,829,000	$2,679,000	$3,053,000
Total Present Worth[1]	**$9,190,000**	**$9,132,000**	**$10,384,000**

[1]With 5 percent discount rate and 20-year evaluation period.

Table 8.08-3 Total Present Worth for the City of Auburn WWTP Expansion

8.09 NONMONETARY EVALUATION

The cost-effective analysis previously discussed in this section considers only cost implications of each alternative. In addition to monetary costs, other factors should be considered in evaluating alternatives. These factors are often called nonmonetary factors and they can influence the selection of an alternative. The nonmonetary factors considered are ability to implement, environmental impact, engineering evaluation, ease of operation, public support, and regionalization.

The three alternatives are compared with respect to these factors in the following discussion. Table 8.09-1 presents an overview of this nonmonetary evaluation.

Nonmonetary Factor	**Alternative A** Biological Treatment with Sequencing Batch Reactor Process	**Alternative B** Oxidation Ditches and Final Clarifiers Treatment Process	**Alternative C** Biological Package Treatment Process
Ability to Implement	+1	+1	+1
Environmental Impact	0	0	0
Engineering Evaluation	0	+1	0
Ease of Operation	0	+1	0
Public Support	0	0	0
Regionalization	0	0	0
Total Nonmonetary Score	**+1**	**+3**	**+1**

Note: "+1" indicates alternative is favorable with respect to a given evaluation factor, "0" indicates a neutral ranking, and "-1" indicates alternative is unfavorable with respect to a given evaluation factor.

Table 8.09-1 Evaluation of Nonmonetary Factors

A. Ability to Implement

Each alternative is equally favorable when it comes to the ability to implement since each of the three alternatives would be located the same distance from the existing facility. Furthermore, each alternative requires construction and the installation of new features. For these reasons, there are no significant discrepancies in this area.

B. Environmental Impact

All three alternatives are expected to have minimal impact on the environment since they will be constructed within a third of a mile of the current WWTP. The three options would require nearly identical footprints of new construction. Thus, all three alternatives were judged neutral regarding environmental impact.

C. Engineering Evaluation

The same design criteria were used for developing and evaluating the treatment processes for all three alternatives. All three alternatives were judged reliable and there are no significant differences in engineering issues between them. However, Alternative B should produce the most reliable operation, so it received a more favorable rating than Alternative A and Alternative C.

D. Ease of Operation

The level of difficulty in operation of Alternative A and Alternative C would be similar and therefore, were judged neutral. Alternative B is the most flexible alternative to operate. The operator will be able to remove an oxidation ditch or clarifier from service during the low flow period and return them to service without much effort. Therefore, Alternative B was judged most favorable in terms of ease of operation. Alternative B also contains the least amount of equipment when compared to Alternatives A and C.

E. Public Support

A public meeting will be arranged with interested citizens to hear their input and recommendations. No significant difference in public support between the three alternatives is anticipated. The public hearing is required as a part of the Facilities Plan.

F. Regionalization

There is no significant difference between the three alternatives in terms of the future expansion or the ability to provide for future regionalization.

8.10 RECOMMENDED ALTERNATIVE

Based on monetary evaluations, nonmonetary evaluations, and input from Auburn, Alternative B has been chosen as the recommended plan for modifying the Auburn WWTP. This plan involves expanding the Auburn WWTP to 0.4 mgd with a new headworks structure, Carrousel oxidation ditches, and final clarification, Peracetic acid disinfection and a new sludge dewatering system. The alternative also includes several improvements at the existing treatment facility such as an influent pump station and converting the existing aeration basin to the equalization tank. This alternative is among the alternatives with the lowest capital investment cost, lowest present worth cost, and best nonmonetary features. Table 8.10-1 illustrates the opinion of probable cost for the recommended alternative.

8.11 COLLECTION AND CONVEYANCE IMPROVEMENTS

Auburn Sanitary Sewage Collection System will continue to have annual work performed by the city to identify and reduce sources of I/I. Auburn has been able to devote resources each year toward a rehabilitation or reconstruction project. This activity will assume to continue through the recommended plan.

Auburn has identified the need to replace specific pump stations during the 20-year life of the plan. Auburn will upgrade or replace the Stewart Drive and Graham Avenue pump stations in about Year 2 of the 20-year recommended plan. A capital cost budget for the set pump station upgrades is $550,000.

Auburn has also identified the need to construct a new gravity sewer in the vicinity of McCormick Street. The new sewer will allow four small pump stations to be eliminated and one new pump station constructed. A capital cost budget for the gravity sewer and new pump station is $450,000.

Table 8.10-1 Recommended WWTP Alternative Capital Cost

Component	Capital Cost Opinion[1]
New Influent Pump Station at Existing WWTP Site	$ 295,300
EQ Basin Modification and Equalization Return Piping at Existing WWTP Site	137,400
Preliminary Treatment Facilities at New WWTP Site	260,400
Inluent Flow Measurement at New WWTP Site	26,800
Oxidation Ditches	1,485,000
Final Clarifiers	553,000
RAS and Scum Pump Station	130,000
Peracetic Acid Disinfection Structure	99,000
Effluent Flow Measurement at New WWTP Site	40,000
Biosolids Dewatering Facilities	671,500
Adminsitration Building at New WWTP Site	325,000
WWTP Site Improvements, Electrical Service and Generator	812,000
Subtotal Construction Cost Opinion	$4,835,400
General Conditions (7%)	$ 338,000
Projected Construction Cost	$5,173,000
Contingencies and Technical Services (40%)	$2,069,000
Total Project Cost	$7,242,000

[1]All costs in May 2017 dollars

SECTION 9
CROSS-CUTTER CORRESPONDENCE AND MITIGATION

This section will review comments and concerns offered by cross-cutter agencies in their review of proposed projects. All referenced correspondence are included in Appendix D.

9.01 UNITED STATES FISH AND WILDLIFE SERVICE (USFWS) REVIEW

A letter was sent to the USFWS on June 29, 2017, requesting a review of the significant concerns for local fish and wildlife resources or habitat with the proposed project. A response was received on July 11, 2017.

According to an official species list provided by the Kentucky Ecological Services Field Office, there are no critical habitats in the project area. Endangered species and threatened species within the project area include the various types of mammals and clams listed in Table 9.01-1.

Endangered Species	Threatened Species
Gray Bat (*Myotis grisescens)*	Northern Long-eared bat (*Myotis septentrionalis)*
Indiana Bat (*Myotis sodalis)*	Rabbitsfoot (*Quadrula cylindrica cylindrical)*
Fanshell (*Cyprogenia stegaria)*	
Fluted Kidneyshell (*Ptychobranchus subtentum)*	
Littlewing Pearlymussel (*Pegias fabula)*	
Ring Pink (mussel) (*Obovaria retusa)*	
Slabside Pearlymussel *(Pleuronaia dolabelloides)*	

Table 9.01-1 Endangered Species and Threatened Species within the Project Area

9.02 KENTUCKY DEPARTMENT OF FISH AND WILDLIFE RESOURCE (KDFWR) REVIEW

A letter was sent to the KDFWR on June 29, 2017, requesting a review of the significant concerns for local fish and wildlife resources or habitat with the proposed project. A response was received on July 14, 2017. The KDFWR does not anticipate any problems within the project area other than possible erosion. To combat this issue, erosion control measures should be installed before construction begins and will also need to be regularly inspected and repaired.

9.03 KENTUCKY HERITAGE COUNCIL (KHC) REVIEW

A letter was sent to the KHC on June 29, 2017, requesting a review of the significant cultural or historical concerns with the proposed project. Auburn has performed Phase 1 and Phase 2 investigations on the proposed WWTP site and has received concurrence from the KHC to construct on this site. An official response was received on July 14, 2017. According to its letter, KHC does not foresee any properties or sites being impacted by the project.

9.04 UNITED STATES ARMY CORPS OF ENGINEERS (USACE) REVIEW

A letter was sent to the USACE on June 29, 2017, requesting a review of the significant concerns for wetlands and other jurisdictional interests with the proposed project. A response was received on July 10, 2017. Because of the possibility of discharging dredged material into "Waters of the U.S.," the response recommended that a permit request be filled out and sent in to the USACE prior to construction. A permit request will be filled out and sent prior to construction.

9.05 NATURAL RESOURCE CONSERVATION SERVICE (NRCS) REVIEW

A letter was sent to the NRCS on June 29, 2017, requesting a review of the significant concerns over agricultural resources as a result of the proposed project. In the July 26, 2017 response letter from USDA–NRCS, the agency has no concerns with the proposed projects from a prime farmland basis.

9.06 KENTUCKY CLEARINGHOUSE REVIEW

In addition to the agencies listed above, the KDOW will prepare a State Planning and Environmental Assessment Report (SPEAR) that is distributed to the following agencies:

Kentucky Department of Public Health
Kentucky Division for Air Quality
Kentucky Division of Forestry
Kentucky Division of Waste Management
Kentucky Division of Water
Kentucky State Clearinghouse
Kentucky Geological Survey

Comments received from these agencies will be considered in approval of the Facilities Plan.

SECTION 10
EVALUATION OF RECOMMENDED REGIONAL FACILITY PLAN

10.01 RECOMMENDED PLAN

Auburn's WWTP will be expanded in Phase 1 (0 to 2 years) to an average daily treatment capacity of 0.4 mgd and a peak hourly flow capacity of 1.6 mgd by implementing a new headworks, an extended aeration oxidation ditch process with final clarification, and peracetic acid disinfection (Alternative B). Alternative B was recommended because it has the lowest capital cost, lowest present worth cost, and best nonmonetary evaluation among the three alternatives considered. The construction cost opinion for the WWTP expansion is $5,200,000. Once the construction contingencies, technical services, and bonds and insurance are added, the opinion of probable cost is $7,200,000. Alternative B also had the best nonmonetary features when considering engineering evaluation, and ease of operation.

The recommended plan also includes upgrades to the Stewart Drive pump station, the Graham Avenue pump station, and a new gravity sewer to consolidate several small lift stations into a new pump station near the new WWTP site. These collection system projects will be completed in Phase 2 (3 to 10 years).

10.02 ENVIRONMENTAL IMPACTS

Expansion of the current Auburn WWTP will have minimal impact on the environment since the construction activities will occur within the existing WWTP site and on a new site just to the north. Proactive measures for the Auburn WWTP expansion will be taken during the construction to minimize noise, dust, truck traffic, and stormwater runoff. Additional requirements for the project resulting from cross-cutter agencies and the clearinghouse will be implemented.

As for construction on the new site, there will still be very little environmental impact. The loss in farmland will be marginal and the amount of tree clearing needed will also be very small since the buildable acreage is not heavily treed. There will be a creek crossing at Black Lick Creek, which will likely be accomplished using an open-cut crossing. If any endangered species are present, the construction techniques will be modified. Design and construction will be coordinated with the appropriate regulatory agencies to assure compliance with applicable requirements.

10.03 INSTITUTIONAL STRUCTURE

Auburn has the authority to prepare and implement this Facilities Plan since it addresses the wastewater treatment needs within the Auburn planning area.

10.04 FUNDING PLAN

The projected total project budget is as follows:

Phase 1 Construction		
Proposed Projects		
1	Wastewater Treatment Plant Expansion	$4,900,000
	Bonds and Insurance (7%)	300,000
	Subtotal–Construction	**$5,200,000**
Non-Construction		
	Contingency and Technical Services (40% of construction)	$2,000,000
	TOTAL	**$7,200,000**

Phase 2 Construction		
Proposed Projects		
1	Pump Station Reconstruction	$ 550,000
2	Gravity Sewer Construction	$ 450,000
	Subtotal–Construction	**$1,000,000**
Non-Construction		
	Contingency and Technical Services (40% of future construction)	$ 400,000
	TOTAL	**$1,400,000**

Table 10.04-1 Total Preliminary Project Budget

The Phase 1 project will be funded by a combination of grants and loans from federal and state agencies. Because the proposed lending source, USDA Rural Development, will not fund contingencies at the level provided for in the planning cost opinions, the amount of the initial funding request will be adjusted downward to meet USDA Rural Development's guidelines. The tentative sources and amounts are as follows:

Economic Development Administration Grant		$1,500,000
Community Development Block Grant		$1,500,000
USDA Rural Development Grant		$1,100,000
USDA Rural Development Loan		$2,500,000
	TOTAL	$6,600,000

Additional funding, if required, will be obtained from USDA Rural Development or from other sources.

Funding for Phase 2 projects will be determined at a later date.

10.05 USER CHARGE

The project will result in new debt and increased operating and maintenance costs for the expanded plant and collection system. The following proforma income statement shows an estimate of these anticipated costs.

Table 10.05-1 Proforma Income Statement

	FYE 2017* Unaudited	Changes Because of Project	After Project
Operating Revenues			
Champion Pet Foods	$ 124,765	$ 93,600	$ 218,365
Other Customers	273,279	84,400	359,679
Fees	1,380	-	1,380
Miscellaneous	8,286	-	8,286
Total Sewer Revenues	**$ 407,710**	**$ 180,000**	**$ 587,710**
Operating Expenses			
Salaries and Benefits	$ 110,795	$ 10,000	$ 120,795
Chemicals and Supplies	17,177	8,000	25,177
Office Expense	5,891	-	5,891
Repairs and Maintenance	41,316	(10,000)	31,316
Insurance	28,344	7,500	35,844
Utilities	39,087	3,000	42,087
Contract Services	83,405	(5,000)	78,405
Miscellaneous	5,501	-	5,501
Total Operating Expenses	**$ 331,517**	**$ 13,500**	**$ 345,017**
Nonoperating Revenues and Expenses			
RD Interest	$ 19,300	$ 65,600	$ 84,900
RD Principal	9,800	36,100	45,900
Debt Service Reserve	3,000	12,000	15,000
Short-Lived Asset Reserve	6,000	38,000	44,000
Total Non-Operating Revenue and Expenses	$ 38,100	$ 151,700	$ 189,800
Net for Coverage and Depreciation	$ 38,093	$ 14,800	$ 52,893
Depreciation	$ 50,706	$ 165,000	$ 215,706
Net Income	**$ (12,613)**	**$(150,200)**	**$(162,813)**

*FYE 2017=Fiscal Year End 2017

This indicates that the operating revenue will need to go up by about 45 percent to make the project financially viable. A rate increase will be required. The above rate increase for Champion Petfoods and for other users was arrived at by apportioning the costs of each asset within the WWTP to categories of Flow, BOD, TSS, and NH3-N. Then apportioned costs were attributed to the required capacity of Champion Petfoods and other users to arrive at a projected 75 percent rate increase for Champion Petfoods and a 35 percent rate increase for other users. This information has been communicated to the Auburn Mayor and Council.

Table 10.05-2 shows the existing user rates for Auburn Water and Sewer customers. The impact to a typical customer using 4,000 gallons per month is highlighted in Table 10.05-2.

Usage	Current Rates Cost per 1,000 gallons	Estimated Future Rates Cost per 1,000 gallons
City Customers		
First 1,200 gallons	$10.93	$14.43
Next 28,800 gallons	9.61	12.69
Next 70,000 gallons	8.18	10.80
Next 100,000 gallons	6.84	9.03
Champion Petfoods		
Base Monthly charge	$7,700.00	$13,475.00
Usage	3.80	6.65
Average Monthly Sewer Bill		
City Customer, using 4,000 gal/mo	$ 37.84	$ 49.95
Champion Petfoods	10,397.00	18,195.00

Table 10.05-2 Auburn Sewer Rates

10.06 IMPLEMENTATION SCHEDULE

This recommended plan identifies the capital projects required to expand the Auburn WWTP to comply with the KPDES Permit. Auburn will begin implementation of the WWTP project immediately. Figure 10.06-1 shows the schedule for implementing the recommended WWTP project.

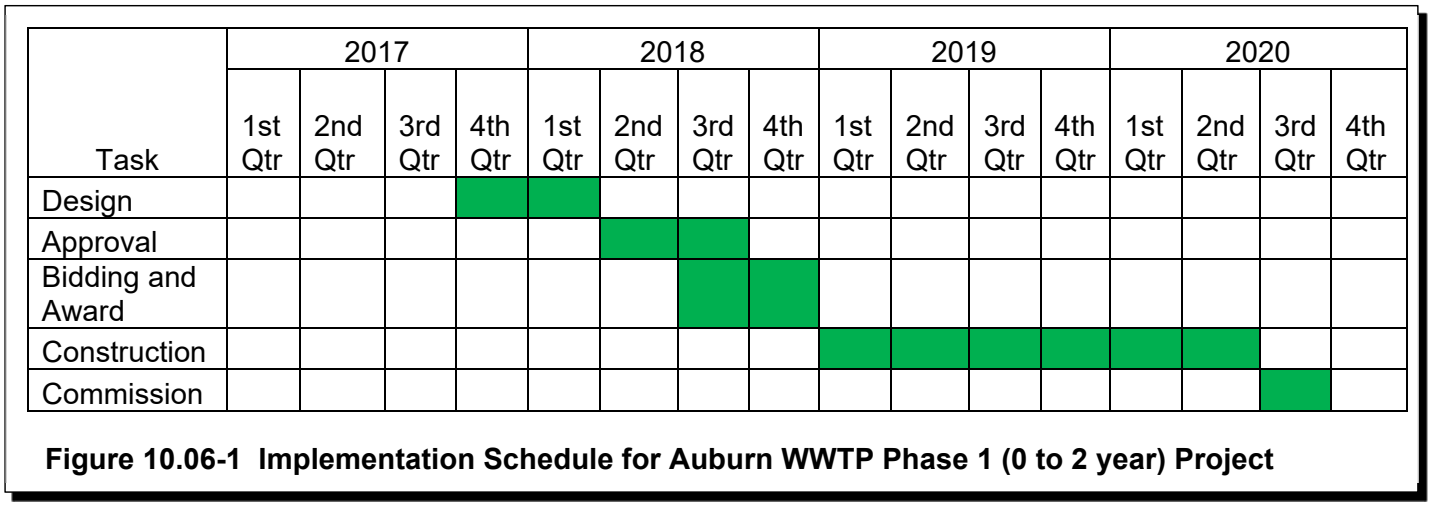


Figure 10.06-1 Implementation Schedule for Auburn WWTP Phase 1 (0 to 2 year) Project

The Phase 2 collection system projects will be pursued in the 3- to 10-year time frame.

SECTION 11
DOCUMENTATION OF PUBLIC PARTICIPATION

11.01 PUBLIC HEARING

The approval process for this Facilities Plan involves conducting a Public Hearing on the Facilities Plan. Citizen comments on the draft plan are accepted during a 30-day comment period. Auburn's public comment period ran from September 8, 2017 to October 9, 2017.

A copy of the draft Facilities Plan was made available on the Kentucky Division of Water Web site and was also available at the Auburn City Hall from September 8, 2017 to October 9, 2017. No written comments were received by the City or KDOW.

Auburn held a public hearing on October 9, 2017 at 5 P.M. The hearing was advertised in the News Democrat & Leader, on the Kentucky Division of Water Web site, on the City's Web site, on the City's Facebook page, and on the back of the water bills. The hearing included a presentation on the Facilities Plan including its impact to users. Questions/comments from the public were invited. Documentation on the hearing advertisement, presentation, and a summary of discussion topics are included in Appendix E. The two central themes of public comment were the impact of Champion Petfoods waste on the WWTP future needs and a general concern over the increase in residential rates to pay for the needed projects.

The City of Auburn provided additional opportunities for public involvement.

- A presentation was made at the August 14, 2017 City Council meeting. The City Council was apprised of the plan, needs, recommendations, costs, and potential rate increases. Public comments were not accepted at this meeting, but the public that attended the meeting were made aware of project needs and of the upcoming public informational meeting in September.

- The City advertised a public informational meeting on the back of water bills to be held on September 11, 2017 at 5 PM. A copy of the sign-in sheet and presentation made at the meeting is included in Appendix E. The public was apprised of the plan, needs, recommendations, costs, and potential rate increases. Public comments at the meeting focused on infiltration/inflow control, the impact of Champion Petfoods on the WWTP needs, and on the need for a rate increase.

The following public participation documents are included in Appendix E.

1. Notification for the September 11, 2017 informational meeting.
2. Attendance sheet from the September 11, 2017 informational meeting.
3. Copy of presentation given at the September 11, 2017 informational meeting.
4. Copy of handout from September 11, 2017 informational meeting.
5. Summary of public questions at the September 11, 2017 informational meeting.
6. Notification for the October 9, 2017 public hearing.
7. Attendance sheets from the October 9, 2017 public hearing.
8. Copy of presentation given at the October 9, 2017 public hearing.
9. Summary of public questions/comments at the October 9, 2017 public hearing.
10. Notification from the KDOW website advertising the public comment period.

SECTION 12
REGIONAL FACILITIES PLAN CHECKLIST

12.01 CHECKLIST

KDOW requires a checklist be filled out to aid in readily locating required information within the report. The completed checklist follows.

		PAGE#
SECTION 1		
REGIONAL FACILITY PLAN SUMMARY–This section shall provide a brief summary of the information provided in the facility plan, including the following:		
1.	Purpose of the plan and major problems evaluated in the plan.	1-1
2.		
3.	Estimated cost of implementing the proposed plan (including user fees) and the proposed funding method to be used.	1-2, 10-4
4.	Planning agency commitments necessary to implement the plan.	1-2
5.	Schedule of implementation for projects.	1-2
SECTION 2		
STATEMENT OF PURPOSE AND NEED–This section shall contain a brief description of the purpose and need for a submitting the facility plan.		2-1
SECTION 3		
PHYSICAL CHARACTERISTICS OF THE PLANNING AREA–This section shall delineate the planning area boundaries and describe key topographic, geographic, and pertinent natural or manmade features of the area. Digital or electronic submission of the planning area boundary shapefile in a standard GIS format shall also be included. This section shall also include the following maps:		
1.	One (1) up to date map, suitable for photocopying, indicate the planning area boundary, service area boundary, watershed boundaries, county lines, populated places, cities and/or towns and project areas or proposed planning period phases.	Figure 3.02-1
2.	One (1) up to date map, suitable for photocopying, include locations of wastewater treatment facilities (including package treatment plants), discharge location(s), collection lines (gravity, force main, interceptors), pump stations, public drinking water intake points and groundwater supply areas [Source Water Area Protection Plans (SWAPP) and/or Wellhead Protection Areas (WHPA)].	Figure 3.03-1
3.	One (1) seven and one-half (7 ½) minute USGS topographic map including the location of wetlands, delineation of the 100-year floodplain, surface water(s), and topography.	Figures 3.04-1, 3.05-1
4.	If available, a local planning and zoning land use map.	Figure 3.06-1
SECTION 4		
SOCIOECONOMIC CHARACTERISTICS OF THE PLANNING AREA–The following characteristics of the planning area shall be discussed:		
1.	Historical, current, and projected population in the planning area including wastewater contributions from industrial and commercial sources.	4-1
2.	Current and projected population in the existing service area and unsewered parts of the planning area.	4-1,2
3.	Economic or social benefit to the affected community.	4-2

SECTION 5		
EXISTING ENVIRONMENT IN THE PLANNING AREA–Describe existing physical, biological, cultural, and other resource features within the planning area with an emphasis on those that may be impacted by the proposed plan or projects, including the following:		
1.	Physical features such as surface and groundwater quality, water sources and supply, wetlands, lakes, streams, air pollution, floodplains, soils, geology, and topography.	5-1, 5-2, 5-4, 5-5
2.	Biological: Identify plant and animal communities in the planning area with an emphasis upon endangered and threatened species likely to be impacted.	5-3
3.	Cultural: Describe archaeological and historical resources that may be affected by the proposed project.	5-4
4.	Other Resource Features such as national and state parks, recreational areas, USDA Designated Important Farmland, and any other applicable environmentally sensitive areas.	NA
SECTION 6		
EXISTING WASTEWATER SYSTEM–This section shall be prepared by a Professional Engineer licensed in Kentucky. A description of the existing facilities within the planning area shall include the following:		
1.	On-site systems in the planning area	6-1
2.	Physical condition of the existing wastewater treatment plant(s) including the type, age, design capacity, process units, peak and average wastewater flows, current discharge permit limits, schematic layout of treatment plant. Include a narrative description of the capacity of the treatment plant to meet reliability and redundancy requirements as outlined in regulation 401 KAR 5:005, Section 13.	6-1 through 6-5
3.	Existing collection and conveyance system and its condition.	6-7, 6-8
4.	Existing biosolids disposal method.	6-5
5.	Existing operation, maintenance, and compliance issues.	6-5,6-6
	SECTION 7	
FORECASTS OF FLOWS AND WASTE LOADS IN THE PLANNING AREA–This section shall be prepared by a professional engineer licensed in Kentucky and shall include:		
1.	Current and projected commercial, industrial and residential growth for the proposed planning period	7-1,2
2.	A copy of the waste load allocation (WLA) issued by the KDOW for new or expanded treatment plant projects	7-3 and Appendix B
SECTION 8		
EVALUATION OF ALTERNATIVES–This section shall be prepared by a professional engineer licensed in Kentucky and include an assessment of alternatives to determine the appropriate facilities that will meet the wastewater needs of the planning area and provide benefits that are cost-effective and environmentally sound. The section shall include:		
1.	No action alternative	8-1
2.	Optimization of existing facilities	8-1
3.	Regionalization	8-1
4.	Other alternatives	8-2 through 8-18
5.	Detailed cost analysis along with 20-year present worth analysis for each alternative	8-19 through 8-22
6.	Recommended alternative	8-23

	SECTION 9	
CROSS-CUTTER CORRESPONDENCE AND MITIGATION–Each facility plan shall include cross-cutter correspondences to and from each agency related to the following four environmental and cultural concerns:		
1.	Threatened and Endangered Species: The U.S. Fish and Wildlife Service--Kentucky Ecological Services Field Station and the Kentucky Department of Fish and Wildlife Resources	9-1
2.	Historical Resources: The Kentucky Heritage Council State Historic Preservation Office	9-1
3.	Aquatic Resources: The US. Army Corps of Engineers (Louisville, Nashville, or Huntington Districts).	9-2
4.	Agricultural Resources: The local office of the Natural Resources Conservation Service (NRCS) or USDA Service Center	9-2
SECTION 10		
EVALUATION OF RECOMMENDED REGIONAL FACILITY PLAN–This section of the facility plan shall summarize the critical components of the recommended plan.		
1.	Environmental impacts	10-1
2.	Institutional structure	10-1
3.	Funding plan	10-1 through 10-4
4.	Current and projected residential user charge rate based on 4,000 gallon usage per month	10-4
5.	Implementation schedule	10-4,5
	SECTION 11	
DOCUMENTATION OF PUBLIC PARTICIPATION–The section shall include a copy of the newspaper advertisement/proof of publication, attendance sheet, and public comments.		11-1 and Appendix E

SECTION 13
FACILITIES PLAN APPROVAL

13.01 FACILITIES PLAN APPROVAL

The Kentucky Division of Water approved the Wastewater Facilities Plan on May 11, 2018. Documentation of the approval of this Facility Plan is included in Appendix F.