Steven L. Beshear
Governor

Leonard K. Peters
Secretary

Energy and Environment Cabinet
Department for Environmental Protection
Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, Kentucky 40601
Phone: (502) 564-3410
www.water.ky.gov

March 23, 2010

Honorable Wendell High, Mayor
City of Augusta
219 Main St
PO Box 85
Augusta, Kentucky 41002

Re: Regional Facilities Plan for
City of Augusta, City of Brooksville and
Northern Bracken County
Bracken County, Kentucky
AI ID: 387; PLN20060001

Dear Mayor High:

The facilities plan and environmental document titled *Wastewater Collection and Treatment System, 201Facility Plan Update* dated October 2005 has been reviewed by this Division and found to conform with the requirements contained in administrative regulation 401 KAR 5:006.

Approval of the facilities plan is hereby given based on the attached State Planning and Environmental Assessment Report (SPEAR) issued by this Department on February 3, 2010, which has undergone review by the Kentucky State Clearinghouse (State Application Identifier #KY20100205-0159). This approval is subject to any conditions and mitigative measures in Section F of the SPEAR and in the State Clearinghouse review comments.

The Department for Environmental Protection offers free regulatory assistance through its Division of Compliance Assistance. If you have questions related to compliance with any environmental requirements, please contact the division by calling 1-800-926-8111.

If you have any questions, please contact me at (502) 564-3410, extension 4805.

Sincerely,

Anshu Singh

Anshu Singh, Ph.D., Supervisor
Wastewater Planning Section
Water Infrastructure Branch

AS
Attachments

cc: Honorable Gary Riggs, Judge Executive, Bracken County
Honorable John Corlis, Mayor, City of Brooksville
Donald Bezold, Consulting Engineer, Burgess and Niple (via e-mail)

STEVEN L. BESHEAR
GOVERNOR

DEPARTMENT FOR LOCAL GOVERNMENT
OFFICE OF THE GOVERNOR
1024 CAPITAL CENTER DRIVE, SUITE 340
FRANKFORT, KENTUCKY 40601-8204
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TONY WILDER
COMMISSIONER

March 12, 2010

Ms. Anshu Singh
Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

RE: City of Augusta, City of Brooksville & Northern Bracken County;s Facility Plan-
New Regional Wastewater Treatment Plant in Augusta
SAI# KY20100205-0159

Dear Ms. Singh:

The Kentucky State Clearinghouse, which has been officially designated as the Commonwealth's Single Point of Contact (SPOC) pursuant to Presidential Executive Order 12372, has completed its evaluation of your proposal. The clearinghouse review of this proposal indicates there are no identifiable conflicts with any state or local plan, goal, or objective. Therefore, the State Clearinghouse recommends this project be approved for assistance by the cognizant federal agency.

Although the primary function of the State Single Point of Contact is to coordinate the state and local evaluation of your proposal, the Kentucky State Clearinghouse also utilizes this process to apprise the applicant of statutory and regulatory requirements or other types of information which could prove to be useful in the event the project is approved for assistance. Information of this nature, if any, concerning this particular proposal will be attached to this correspondence.

You should now continue with the application process prescribed by the appropriate funding agency. This process may include a detailed review by state agencies that have authority over specific types of projects.

This letter signifies only that the project has been processed through the State Single Point of Contact. It is neither a commitment of funds from this agency or any other state of federal agency.

The results of this review are valid for one year from the date of this letter. Continuation or renewal applications must be submitted to the State Clearinghouse annually. An application not submitted to the funding agency, or not approved within one year after completion of this review, must be re-submitted to receive a valid intergovernmental review.

If you have any questions regarding this letter, please feel free to contact my office at 502-573-2382.

Sincerely,

Lee Nalley

Lee Nalley
Kentucky State Clearinghouse

Attachments

The Natural Resources has made the following advisory comment pertaining to State Application Identifier Number KY201002050159
No comments

The Heritage Council has made the following advisory comment pertaining to State Application Identifier Number KY201002050159

The applicant must ensure compliance with the Advisory Council on Historic Preservation's Rules and Regulations for the Protection of Historic and Cultural Properties (36CRF, Part 800) pursuant to the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, and Executive Order 11593.

The project area must be surveyed by a professional archaeologist to determine if sites eligible for listing in the National Register of Historic Places will be affected by the undertaking. The State Historic Preservation Officer must review and approve the survey report. Where a given project area or portions thereof have been disturbed by prior construction, the applicant may file documentation of that disturbance with the State Historic Preservation Officer and request an opinion concerning the need of an archaeological survey (note: farming does not constitute disturbance). If you have any questions, please contact Philip Mink at 502-564-7005, extension 140.

The Transportation has made the following advisory comment pertaining to State Application Identifier Number KY201002050159

Bezold (D6), Mike: no comments

The Housing, Building, Construction has made the following advisory comment pertaining to State Application Identifier Number KY201002050159
no comment

The Labor Cabinet has made the following advisory comment pertaining to State Application Identifier Number KY201002050159

PW RATES MAY APPLY-CONTACT KY LABOR CABINET AT 502 564 3534

The Fish & Wildlife has made the following advisory comment pertaining to State Application Identifier Number KY201002050159

We request that you coordinate the proposed project with the U. S. Fish & Wildlife Service Kentucky Field Office at 502-695-0468 to address potential impacts to the Federally Listed Peregrine Falcon. The Peregrine Falcon is a federally protected bird that occurs within the project area and could be impacted by the proposed project. The U. S. Fish & Wildlife Service will be able to help in the development of a plan to minimize impacts to the blackside dace during construction of the proposed project.

To minimize impacts to the aquatic environment the Kentucky Dept. of Fish & Wildlife Resources recommends that erosion control measures be developed and implemented prior to construction to reduce siltation into waterways located within the project area. Such erosion control measures may include, but are not limited to silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed.

Steven L. Beshear
Governor

Leonard K. Peters
Secretary

Energy and Environment Cabinet
Department for Environmental Protection
Division of Water
300 Fair Oaks Lane
Frankfort, Kentucky 40601
Phone: (502) 564-2150
www.dep.ky.gov

R. Bruce Scott
Commissioner

FEB - 3 2010

STATE PLANNING AND ENVIRONMENTAL ASSESSMENT REPORT (SPEAR)

Regional Facilities Plan
City of Augusta, City of Brooksville & Northern Bracken County, Bracken County, Kentucky
AI 387; PLN20060001

The city of City of Augusta, City of Brooksville & Northern Bracken County has submitted for approval by the Energy and Environment Cabinet (EEC) a regional facility plan ***Wastewater Collection and Treatment System 201 Facility Plan Update*** dated October, 2005. In accordance with KRS Chapter 224 and 401 KAR 5:006, the Department for Environmental Protection (DEP) has prepared a State Planning and Environmental Assessment Report (SPEAR) that summarizes the regional facility plan.

The DEP is required to conduct reviews of the potential environmental impacts of projects applying for funding by the Clean Water State Revolving Fund in accordance with the procedures contained in the State Revolving Fund Operating Agreement between the Environmental Protection Agency Region IV and the Commonwealth of Kentucky. The DEP has included this required review in the attached SPEAR. The DEP has determined that the projects in the SPEAR will not have a significant effect on the environment when all mitigative measures in Section F of the SPEAR are implemented.

The SPEAR contains information supporting this determination in the following sections: A) Project Summary; B) Existing Environment; C) Existing Wastewater Facilities; D) Need for Project; E) Alternatives Analysis; F) Environmental Consequences, Mitigative Measures; G) Public Participation and User Rates; and H) Sources Consulted.

Interested persons are encouraged to submit comments on this SPEAR within 40 days of the above date. The EEC will take no action on this project until after the State Clearinghouse review and public comment period has ended, and will evaluate all comments before a decision is made to proceed with approval of the Regional Facilities Plan or awarding of SRF funds for this project. Send comments to Ms. Anshu Singh, Supervisor, Wastewater Planning Section, Water Infrastructure Branch, Division of Water, 200 Fair Oaks 4th Floor, Frankfort, Kentucky 40601, or by e-mail to anshu.singh@ky.gov, or call her at (502) 564-3410, extension 4805.

Sincerely,

R. Bruce Scott, Commissioner
Department for Environmental Protection

RBS/AS

STATE PLANNING AND ENVIRONMENTAL ASSESSMENT REPORT (SPEAR)
City of Augusta, City of Brooksville & Northern Bracken County
Bracken County, Kentucky
AI #387; PLN20060001

FEB - 3 2010

A. Project Summary and Funding Status

Project Summary: The cities of Augusta and Brooksville in Bracken County are proposing to build a new 690,000 gallons per day (gpd) regional wastewater treatment plant (WWTP) on the Ohio River near Augusta. According to the 2005 facility plan, which was submitted jointly by the two cities and Bracken County Fiscal Court, the new WWTP is needed to meet the current and future wastewater needs of the two cities and northern Bracken County.

The Planning area is shown in Figure 1 and the 20 years planning period is divided into the following three phases:

Phase I (0-2 years): This phase includes construction of 0.69 mgd regional WWTP in the city of Augusta, 465 gpm pump station at Brooksville's WWTP, 500 gpm pump station south of Chatham next to KY-19, 8" force main from Brooksville along KY-19 to KY-9 intersection, 10" forcemain from KY-9 to the new WWTP, 765 gpm pump station with 8" forcemain to the new WWTP to replace Augusta pump station, and 15" gravity outfall sewer to the Ohio River from the new WWTP. In addition, both cities plan to fund small projects to reduce infiltration and inflow in their respective collection systems. The total estimated cost of Phase I projects is $9,513,900.

Phase II (3-10 years): This phase involves extending sewer service to the industrial park and decommissioning the aging package plant that currently serves the park. Sewer service is also proposed along Route-19

Phase III (11-20 years): This phase involves extending sewer service westward along Route-1159 and other new populated areas.

The engineering firm that prepared the facilities plan is Burgess and Niple. The project is located in the Buffalo Trace Area Development District and within the area covered by the Florence Regional Office of the Division of Water (DOW).

Funding Status: The city of Augusta, City of Brooksville and Northern Bracken County intend to fund this project through a combination of loans and grants. These include Kentucky Infrastructure Authority (KIA) grants, State Revolving Fund loan, Community Development Block Grant, USDA Rural Development Loans and Federal Appropriation Grants

B. Existing Environment

Topography: Bracken County is located in the northern part of the Outer Bluegrass Region. The topography of the planning area is generally hilly with narrow ridges and steep slopes to thin

bed plains. A portion of the northeast and central portion of the planning area is comprised of slightly wider ridge tops with steep slopes to thin stream bed plains. There is 450 feet difference in land elevation between the southern and northern portions of the planning area. The geographic divide in the southern portion of the planning area near Brooksville represent the highest elevation at 950 feet. The lowest point in the planning area is at 505 feet amsl at the city of Augusta near the Ohio River.

Geology: In Bracken County, water is obtained from consolidated sedimentary rocks of Ordovician age and unconsolidated sediments of Quaternary age. The oldest rocks found on the surface in Bracken County are those of the Lexington Limestone, deposited in shallow seas 490 million years ago during the Middle Ordovician Period. In the Late Ordovician, the seas became relatively shallow, as indicated by the amounts of mud (shale) in the sediments. Over the last million years, unconsolidated Quaternary sediments have been deposited along the larger streams and rivers.

Soils: A majority of the soils in the planning area are composed of three main series, including Wheeling-Nolin-Otwell, Lowell-Nicholson and Eden. The Wheeling-Nolin-Otwell soils are deep, very level, well drained and have loamy subsoils. This soil type is located adjacent to the Ohio River on the north side of the planning area. Lowell-Nicholson soils are deep to very deep, gently sloping to moderately steep, well to moderately drained with clayey or loamy subsoils located on ridge tops and upper side slopes. The Eden soils are moderately deep, sloping to very steep, well to moderately drained with clayey subsoils found on ridge tops and side slopes. The Eden soil is the most prevalent soil type in the planning area. All the soil series have a somewhat limited to very limited suitability rating for sewage lagoons and septic tank absorption fields.

Surface Waters: The planning area is located primarily within the Licking River Basin Management Unit and multiple watersheds which include the Ohio River (near Augusta), Bracken Creek, Locust Creek (near Brooksville) and the North Fork of the Licking River (near Mt. Olivet). The planning area is drained by portions of Turtle Creek, Little Turtle Creek, Bracken Creek, Little Bracken Creek, the Ohio River, Locust Creek, Goose Creek, and Willow Branch. All of the surface water drainage that occurs within the planning area flows towards the Ohio River except for Willow Branch that drains into the North Fork of the Licking River.

Some of the surface water segments within the planning area have been assessed. According to the 2008 Ohio River 305(b) Report, river miles 541-593 fully support designated uses (warm water aquatic life, public water supply, and contact recreation); however dioxin and PCBs TMDLs are needed to restore the fish consumption use support. Segments of Bracken Creek and Locust Creek have been assessed per the 2008 Integrated Report to Congress on the Water Quality in Kentucky. The impaired segments are listed in Table 2, along with a notation regarding their TMDLs status.

Table 2. Assessed Segments not Supporting Designated Use(s), with TMDL status (source: 2008 Kentucky Integrated Report)			
Waterbody & Segment	Impaired Use Assessment	Causes	Sources
Bracken Creek 2.8 to 11.0	Partial Support Warmwater Aquatic Habitat; TMDL required	Nutrient/Eutrophication, Biological Indicators,	Animal Feed Operations (NPS), Crop Production (Crop Land or Dry Land), Grazing in Riparian or Shoreline Zones
Locust Creek 4.1 to 12.2	Nonsupport Primary Contact Recreation; TMDL required	Fecal Coliform	Unknown

Augusta Regional Water Treatment Plant and Bracken County Water District provides the water to the planning area.

Groundwater: About 2,450 residents (30 percent) of Bracken County rely on private domestic water supplies. The Ohio River alluvium is the best source of groundwater in the county. Many properly constructed wells will produce several hundred gallons per minute from the alluvium. Most wells will produce enough for a domestic supply at depths of less than 100 feet. Water is hard or very hard, but otherwise of good quality. In the lower third of the Licking River Valley, and the valleys of the lower sections of large creeks discharging into the Ohio River, most drilled wells will produce enough for a domestic supply at depths of less than 100 feet. Some wells located in the valleys of major creeks will produce enough water for a domestic supply except during dry weather. In the upland areas (80 percent of the county), most drilled wells will not produce enough for a dependable domestic supply; some wells along drainage lines may produce enough water, except during dry weather. Groundwater in these areas is hard or very hard, and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet. According to the Groundwater Section of the Kentucky Division of Water, Bracken County has areas of low to moderate sensitivity to groundwater pollution. There are several permitted groundwater wells within the planning area that could receive added protection by eliminating improperly operating septic systems.

C. Existing Wastewater Facilities

Augusta Wastewater Treatment Plant: The city of Augusta owns and operates a 0.33 mgd wastewater treatment plant that discharges to the Ohio River at mile point 554.3 pursuant to the Kentucky Pollutant Discharge Elimination (KPDES) Permit No. KY0021261. The plant consists of one round package type plant, constructed above grade for the purpose of flood protection from the Ohio River. The package plant includes a raw wastewater screen and comminuter, a contact stabilization activated sludge aeration tank, final clarifier, aerobic digester and chlorine disinfection system. Two sand type sludge drying beds are also provided on-site. The annual average flow rate received at the plant from September 2008 to August 2009 was 0.241 mgd

with an annual average peak flow of 0.608 mgd. The package treatment plant is near the end of its useful life and should be replaced to remain in compliance with its discharge permit limits.

The monthly average effluent limits that must be met by the existing WWTP are as follows:

Parameter	Limits
BOD_5	30 mg/l
Total Suspended Solids	30 mg/l
Ammonia-Nitrogen	20 mg/l
Dissolved Oxygen	Not less than 2 mg/l
Total Phosphorus	Report
Total Nitrogen	Report
Total Residual Chlorine	0.011 mg/l
E. coli	130 colonies/100 ml

Augusta Collection System: The city of Augusta sanitary sewer collection system was mostly constructed in the 1930's. In 1980, the city built its WWTP and expanded its collection system. The older portion of the collection system is composed of 8" and 10" clay tile pipe with brick manholes. The new sections consist of precast concrete manholes with clay or PVC pipe with gasket joints. The system has five small pump stations ranging in pumping capacities 40 to 500 gallons per minute (gpm). A Sewer System Evaluation Survey (SSES) was completed as part of the facility plan update. The SSES results showed Augusta's collection system has excessive infiltration and inflow. The city will allocate $92,800 to correct the currently known deficiencies and include another $24,000 per year to cover the cost of additional investigation and corrections.

Brooksville Treatment Plant: The city of Brooksville owns and operates 125,000 gpd wastewater treatment plant that discharges to the unnamed tributary of Locust Creek at latitude 38°41'03"N and longitude 84°03'36"W pursuant to the Kentucky Pollutant Discharge Elimination (KPDES) Permit No. KY0025232. The wastewater treatment plant is located on the north side of Brooksville in a relatively deep valley. Wastewater flows from the city, which is located on ridge tops, flows to the plant site via two gravity sewers. A wetwell/drywell canned pump station lifts the wastewater up into the WWTP. The plant consists of one round package type plant constructed above grade. The plant includes a raw wastewater screen and communiter, contact stabilization activated sludge aeration tanks, final clarifier, aerobic digester and chlorine disinfection system. The annual average flow rate received at the plant from September 2008 to August 2009 was 94,000 gpd with an annual average peak flow of 136,000 gpd. The plant fails to meet the reliability and redundancy requirements of regulation 401 KAR 5:005 since it only has one process train. Also the sizing of the aeration tanks, final clarifier and the chlorine contact tank is insufficient. The chlorine contact tank does not have enough capacity to allow the minimum detention time of 15 minutes and the plant is unable to meet the *E. coli* permit limits.

The monthly average effluent limits that must be met by the existing WWTP are as follows:

Parameter	Limits
BOD_5	10 mg/l
TSS	30 mg/l
Ammonia-Nitrogen	4 mg/l (summer)/6 mg/l (winter)
Dissolved Oxygen	Not less than 7 mg/l
Total Phosphorus	Report
Total Nitrogen	Report
Total Residual Chlorine	0.011 mg/l
E. coli	130 colonies/100 ml

Brooksville Collection System: The City of Brooksville sanitary sewer collection system was constructed in 1970. Some minor additions and extensions have been completed since 1970. The sewer system is composed of 8" and 10" clay sewer pipe with gasket joints, precast concrete manholes and additions of PVC pipe. The system has 7 pump stations ranging from 30 to 350 gpm. A SSES was completed for the city of Brooksville as a part of the facility plan update. The study results revealed the collection system contains excessive I&I. The City has plans to spend $53,100 to correct the current deficiencies and allocate $19,000 per year for the next few years to cover the cost of additional investigations and corrections.

Package Treatment Plants and On-Site Systems: Several extended aeration package treatment plants ranging from 500 to 8,000 gallons per day capacity are located within the planning area. These include Augusta Health Care Center (8000 gpd; KPDES Permit No. KY0042170) in Augusta; Bowman (500 gpd; KYG400142), Carl (500 gpd; KPDES Permit No. KYG400275), Clark (500 gpd; KPDES Permit No. KYG400438; inactive), Hartman (500 gpd; KPDES Permit No. KYG400495), Stewarts Farm Supply (500 gpd; KPDES Permit No. KY R000841), Wilson (500 gpd; KPDES Permit No. KYG400433) and KTC Garage (500 gpd; KPDES Permit No. KYG500090) in Brooksville; and Hall (500 gpd; KPDES Permit No. KYG400966), Johnson (500 gpd; KPDES Permit No. KYG400331) and Perkins (500 gpd; KPDES Permit No. KYG400360) in Foster. There is a 5,000 gpd Industrial Park package treatment plant in Bracken County (KPDES Permit No. KY0103187), but it does not receive any wastewater flow. Developments in Bracken County outside the service areas of the cities of Augusta and Brooksville rely on septic tanks to meet their wastewater needs. According to Bracken County Health Department most of the existing on-site systems are working properly and when a non-complaint system is found repair work orders are filed and the corrections are completed by the system owner.

D. Need for Proposed Project

Population in the planning area is projected to increase from 2247 in year 2000 to 3841 in 2025 and the wastewater flows are projected to increase from the current 530,000 gpd average flow to 690,000 gpd average flow in 2025. In addition age has taken its toll on the existing wastewater treatment facilities in the City of Augusta and City of Brooksville and it would be costly to

replace what is needed and still maintain the level of treatment necessary to comply with the discharge permit limits. Moreover the City of Brooksville's WWTP fails to meet the reliability and redundancy requirements of regulation 401 KAR 5:006 and is out of compliance with its KPDES permit limits. Decommissioning the aged WWTPs and replacing them with a new regional WWTP to meet the current and future wastewater needs of both cities and northern Bracken County could also improve the water quality of the local streams.

E. Alternatives Analysis

Wastewater Treatment Alternatives:

Alternative No 1- No Action Alternative: This alternative will involve the continued use of the existing wastewater treatment plants in Augusta and Brooksville, the various package plants and rural on-site systems. This alternative is not feasible because these plants are aged and in bad condition and will deteriorate further with continued use. In a few years they will not be able to meet the effluent limits. This alternative is rejected because it is not environmentally responsible and does not meet the wastewater treatment needs of the planning area.

Alternative No. 2 – Augusta and Brooksville Treatment Plant Replacement: This alternative proposes replacing the existing Augusta and the Brooksville wastewater treatment plants with new plants without changing the existing permitted capacity of both plants. This will involve construction of Augusta WWTP on a new site since the existing site does not have sufficient space to construct a new plant and the current plant is on a lot that is about 12 feet below the 100-year flood elevation and is suffering from bank erosion. However, the new Brooksville WWTP will be constructed on the existing WWTP site while the existing plant is in operation. It will also include replacement of the influent pump station. The estimated project cost is $8,220,000 (Augusta WWTP-$4,890,000 and Brooksville WWTP-$3,330,000) with a 20-year present worth of $13,007,420. This alternative was rejected because it provides minimal ability to serve the areas that were previously unserved, and will provide very little improvement to the surrounding environment. Without an expansion the existing WWTPs will not be able to meet the 20 year wastewater needs of the planning area.

Alternative No. 3 – Regional Wastewater Treatment in Augusta: This alternative will involve construction of a new 0.69 mgd WWTP in Augusta and decommission of the City of Brooksville WWTP and connecting to the City of Augusta's WWTP. The proposed single stage activated sludge plant with biological nitrogen removal will include gravity grit removal, mechanical screen with standby bar rack, two aeration tanks each with an anoxic and an aerobic zone, two 55' final clarifiers, three 340 gpm RAS/WAS pumps, ultraviolet light disinfection, cascade aerator, 195,000 gallon aerobic digester/sludge holding tank and a control building. The plant will discharge to the Ohio River at milepoint 553.9 and the proposed monthly average discharge limits will be as follows:

Parameter	Limits
BOD_5	30 mg/l
Total Suspended Solids	30 mg/l
Ammonia-Nitrogen	20 mg/l
Dissolved Oxygen	2 mg/l
Total Residual Chlorine	0.019 mg/l
Total Phosphorus	Report
Total Nitrogen	Report
E. coli	130 colonies/100 ml
Reliability Classification	Grade 3

The total estimated project cost is $9,368,000 with a 20-year present worth cost of $12,730,715. **This is the selected alternative because it will help both cities and the County meet their current and future wastewater needs and improve the environment.**

F. Environmental Consequences, Mitigative Measures

Impacts on Historic Properties and Archeological Sites:
In a letter dated September 22, 2009, the Kentucky Heritage Council stated that the location of the new wastewater treatment plant will need to be surveyed by a professional archaeologist. There are numerous sites in the vicinity including two that contain human burials that will require Native American consultation if they are to be disturbed. A report documenting the results of this investigation must be submitted to State historic Preservation Officer (SHPO) for review, comment and approval. The pump stations and lines within existing state right-of-ways do not need to be surveyed but any lines or pump stations outside of the right-of-way will need to be surveyed by a professional archaeologist and the report must be submitted to SHPO for review, comment and approval. Where a given project area or portions thereof have been disturbed by prior construction, documentation of that disturbance must be filed with SHPO and an opinion concerning the need of an archaeological survey must be requested.

Impacts on Threatened and Endangered Species:
In a letter dated October 7, 2009, the Kentucky Department of Fish & Wildlife Resources stated that as per the Kentucky Fish and Wildlife Information System (KFWIS) state/federal threatened and endangered species are known to occur within close proximity of the proposed project area. However, the KDFWR does not expect impacts to listed species due to the location and nature of the project.

In a letter dated September 28, 2009, the United States Fish and Wildlife Services (USFWS) stated that due to potential changes in the status of federally listed threatened and endangered species, and possible additions to the Federal endangered species list, the Service can only provide comments on Phase I at this time. The USFWS stated that according to the information provided to them and as per their database two federally listed species have the potential to occur within the project vicinity. These include Indiana bat (*Myotis sodalis*) and Running Buffalo Clover (*Trifolium stoloniferum*).

To avoid potential impact to the Indiana bats population, the USFWS recommended following options:

1) Conduct a survey of the project area for suitable winter habitat (caves, rockshelters, abandoned underground mines) and agree to remove trees in the project area only between October 15 and March 31 in order to avoid impacting summer roosting bats
2) If tree clearing is required during the period of April 1 to October 14 then either a biological survey of the project area should be conducted to determine the presence or absence of the species within the project area, with coordination with USFWS on the survey plan and results; or the applicant should enter into a Conservation Memorandum of Understanding (MOA) with the Service. By entering into a Conservation MOA with the Service, Cooperators can gain flexibility in project timing with regard to the removal of suitable Indiana bat habitat.

To avoid potential impact to running buffalo clover, USFWS recommended survey of the project area to determine the presence or absence of buffalo clover within the project area by a qualified biologist and submission of the report to USFWS for review and approval. However, survey will not be necessary if sufficient site-specific information is available that shows that there is no potentially suitable habitat within the project area or its vicinity; or the species is not present within the project area or its vicinity due to site-specific factors.

Impacts on Wetland and Streams:

In a letter dated October 7, 2009, the Kentucky Department of Fish & Wildlife Resources (KDFWR) recommended that erosion control measures be developed and utilized during any construction to minimize siltation into nearby waterways. Such erosion control measures may include, but are not limited to silt fences, stalked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed. In prior letter dated November 28, 2006, KDFWR, listed the following five recommendations for portions of the projects that cross intermittent and perennial streams;

1) Development/excavation during a low flow period to minimize disturbance;
2) When crossing a stream, the pipe should be laid perpendicular to the stream bank to minimize the direct impacts to the streambed;
3) Proper placement of erosion control structures below highly disturbed area to minimize entry of silt to the stream;
4) Return all disturbed instream habitat to its original condition upon completion of construction in the area, and;
5) Preservation of tree canopy overhanging the stream.

In a letter dated September 28, 2009, the USFWS (FWS# 2007-B-0331) recommended that project plans should be developed to avoid impacting wetland areas and/or streams, and they reserve the right to review any required federal or state permits at the time of public notice issuance. The US Army Corps of Engineers (USACE) should be contacted to assist in determining if wetlands or other jurisdictional waters are present or if a permit is required. The USACE in a letter (LRL-2009-1028-pjl) dated November 20, 2009, stated that authorization under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and/or Section 404 of the Clean water Act (33 USC 1344) may be required. Additional detailed information on the

project's design, scope and construction methods and purpose should be provided in order to determine if a permit is required prior to construction.

Impacts on Floodplains:
A floodplain construction permit is required from the DOW's Surface Water Permits Branch, Floodplain Management Section, if there are any disturbances in the 100-year floodplain.

Impacts on Forests:
There are currently no state forests or champion trees located in the area, however special care should be taken around any existing trees that will remain after the construction is complete. Heavy equipment should be kept away from the base of the tree to prevent wounding of the trunk or surface roots. Construction traffic should be routed away from the dripline of the tree to lessen the severity of soil compaction. Compacted soil reduces the amount of water available to the tree, and this lack of water can cause added stress. Stressed trees are vulnerable to insect and disease infestation. After construction is completed, consider replanting back suitable tree species.

Impacts on Air:
Kentucky Division for Air Quality Regulation 401 KAR 63:010 Fugitive Emissions states that no person shall cause, suffer, or allow any material to be handled, processed, transported, or stored without taking reasonable precaution to prevent particulate matter from becoming airborne. Additional requirements include the covering of open bodied trucks, operating outside the work area transporting materials likely to become airborne, and that no one shall allow earth or other material being transported by truck or earth moving equipment to be deposited onto a paved street or roadway. Please note the Fugitive Emissions Fact Sheet located at http://www.air.ky.gov/homepage_repository/e-Clearinghouse.htm

Kentucky Division for Air Quality Regulation 401 KAR 63:005 states that open burning is prohibited. Open Burning is defined as the burning of any matter in such a manner that the products of combustion resulting from the burning are emitted directly into the outdoor atmosphere without passing through a stack or chimney. However, open burning may be utilized for the expressed purposes listed on the Open Burning Fact Sheet located at http://www.air.ky.gov/homepage_repository/e-Clearinghouse.htm

Miscellaneous Impacts:
The environmental impact of constructing the proposed facilities includes those temporary impacts of noise, dust, and traffic disruption in the construction area. The proposed project will improve the surface water and groundwater quality over the next 20 years. This action will also provide a planned development for economic growth in the planning area.

G. Public Participation and User Rates

A public hearing was held on September 22, 2005, at the Watson Community Building/Brooksville City Building. The public hearing was advertised in The Bracken County News on September 8, September 15 and September 22, 2005. No adverse public comments

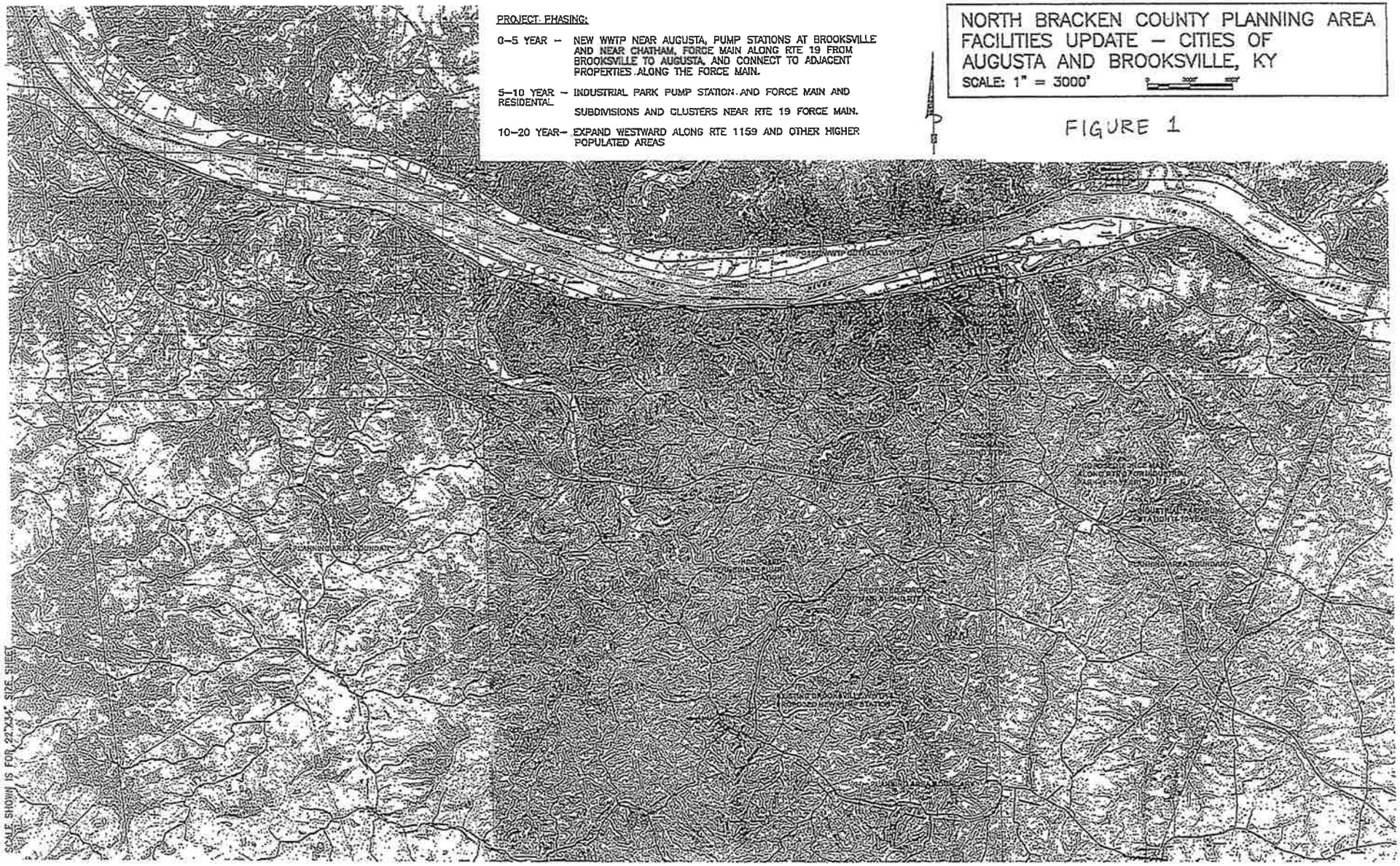
PROJECT PHASING:
0–5 YEAR – NEW WWTP NEAR AUGUSTA, PUMP STATIONS AT BROOKSVILLE AND NEAR CHATHAM, FORCE MAIN ALONG RTE 19 FROM BROOKSVILLE TO AUGUSTA, AND CONNECT TO ADJACENT PROPERTIES ALONG THE FORCE MAIN.
5–10 YEAR – INDUSTRIAL PARK PUMP STATION AND FORCE MAIN AND RESIDENTAL SUBDIVISIONS AND CLUSTERS NEAR RTE 19 FORCE MAIN.
10–20 YEAR– EXPAND WESTWARD ALONG RTE 1159 AND OTHER HIGHER POPULATED AREAS
NORTH BRACKEN COUNTY PLANNING AREA FACILITIES UPDATE – CITIES OF AUGUSTA AND BROOKSVILLE, KY
SCALE: 1" = 3000'
SCALE SHOWN IS FOR 22"X34" SIZE SHEET

FIGURE 1

were received. The Division of Water is not aware of any unresolved public objections that may have been voiced before or after the public meeting in relation to the proposed project. The current monthly sewer rate based on 4,000 gallons of usage is $18.28 for Augusta and $24.89 for Brooksville. The monthly rates are expected to be in the range of $24 to $56 depending on the amount of grants the city can secure. 7

H. Sources Consulted or to be Consulted

Kentucky Department for Public Health
Kentucky Department of Fish & Wildlife Resources
Kentucky Division for Air Quality
Kentucky Division of Forestry
Kentucky Division of Waste Management
Kentucky Division of Water
Kentucky Heritage Council
Kentucky State Clearinghouse
Natural Resources Conservation Service Web Soil Survey
U.S. Fish & Wildlife Service
Kentucky Geological Survey website
City of Augusta and Brooksville
Burgess & Niple
Judge-Executive, Bracken County
Buffalo Trace Area Development District

Wastewater Collection and Treatment System
201 Facility Plan Update

City of Augusta & City of Brooksville and Northern Bracken County

Bracken County, Kentucky

October 2005

BURGESS & NIPLE

Rec 10-11-2005

WASTEWATER COLLECTION AND TREATMENT SYSTEM

201 FACILITY PLAN UPDATE

Bracken Co Health Dept - most onsite systems unknown
failing ones get repaired
no large areas of failing systems that need
community or cluster system

303(d) - Snag Creek impaired for pathogens
- Locust creek impaired, unknown source
- Goose Creek impaired, unknown source

Can failing septics be cause / contributor to impairments

October 2005

Alt 1 - 2 new/replacement WWTPs
Augusta - new site, same capacity
Brooksville - same site, same capacity
sewers - no new except infill & growth
no KY9 Ind Pk, no KY 1159, KY 19

Alt 2 - 1 new WWTP @ Augusta - new site, inc. capacity
sewers - new customers along Fim
KY9 Ind Pk, KY19
need regional sewer district

Alt 3 - 1 new WWTP @ Wellsburg - new site, inc capacity
sewers - new customers along Fim, KY 1159
no Ind Pk

BRACKEN COUNTY, KENTUCKY
FACILITIES PLAN UPDATE

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CHAPTER 1 – EXECUTIVE SUMMARY

A 201 Wastewater Facilities Plan Update was requested by the Kentucky Division of Water for the Cities of Augusta and Brooksville IN Bracken County, KY. The Cities decided to work together along with Bracken County to look into a regional wastewater facility to collect and treat the wastewater in the area. Augusta and Brooksville are the only communities in Bracken County to have wastewater collection and treatment facilities. Both systems are in poor condition due to their age, noncompliance with today's standards and type of treatment plant. Augusta's plant is 25 years old and Brooksville's plant is 35 years old. Both plants are steel structures constructed above grade.

The planning area being considered is the northern portion of Bracken County which drains to the Ohio River. Interviews with Bracken County Health Department gave no indication of significant problem areas within the planning area due to onsite treatment systems; therefore, the main concentration of this report is Augusta, Brooksville and the area along the route of the force main to be constructed between the two communities.

Two regional solutions were reviewed along with local facilities at each community. The location of the regional treatment facility alternatives were selected along the Ohio River, one at Augusta and one near Wellsburg, west of Augusta. Wastewater effluent discharge into the Ohio River require less treatment since the effluent discharge will be to a larger stream. It was determined that a treatment plant in Augusta with pump station in Brooksville and a force main from Brooksville to Augusta along the State Route 19 was the most cost effective solution.

After the selection of the regional treatment plant location, three alternative treatment plant process were investigated. The recommended alternative is a single stage activated sludge plant with biological nitrogen removal. This plant includes grit removal, mechanical bar screen, (2) aeration tanks, (2) final clarifiers, return and waste sludge pumps, ultraviolet light disinfection, cascade aerator, sludge digester/ holding tank and control building. Sludge removal is by contract hauling to a larger plant with dewatering facilities. The estimated project cost for this treatment system is $7,800,000 with an annual O&M&R cost of $244,200 per year.

Various ratios of loan to grant amounts are presented to finance the recommended improvements. The resulting average monthly cost per typical residential user of 6000 gallons per month would range from $74.28 without grant participation to $32.16 with 80% grant participation.

It is recommended that the plan be approved and submitted to Kentucky Division of Water for review. During the time the plan is being reviewed by Division of Water, the Augusta and Brooksville should begin the process of exploring funding options and applying for grants to reduce the cost to the users.

As part of the facilities planning, a Sanitary Sewer Evaluation Survey (SSES) was completed. The collection system was found to receive 6 times the normal dry weather flow during rain events due to excessive inflow and infiltration (I&I). As part of the SSES, several deficiencies were discovered which require corrections. Most of the corrections were on private property and should be corrected by the property owners. Only 20 to 25% of the increase in flow could be accounted for by the found problems; therefore, additional investigation is required.

It is recommended the following collection system improvements be completed:

- Send out notices to property owners with known storm connections to sanitary sewer with a requirement for correction;
- Repair storm connections on City owned property;
- Develop a plan for finding additional storm connections;
- Increase user fee to pay for correction work and additional investigation work including internal TV inspection of sewer.

CHAPTER 2 – INTRODUCTION

2.1 Purpose

The planning area encompasses northern Bracken County, but the main focus of this report is the provision of reliable wastewater treatment and environmentally safe disposal of wastewater generated in the towns of Augusta and Brooksville. While doing this, if economically feasible, capacity should be provided to collect rural residential development wastewater and any new commercial, industrial, and residential wastewater for new development along KY 9, a recently constructed highway linking Ashland, Kentucky to the Northern Kentucky/Cincinnati Metropolitan Area.

The wastewater treatment plants in Augusta and Brooksville, although performing well, are in poor condition. This is due to their age (Augusta's plant is 25 years old and Brooksville's plant is 35 years old). Being of all metallic construction, they have reached the end of their useful lives. Also, these plants do not meet current design standards and regulations. For instance, single unit processes are provided and current standards require duplicate unit processes.

The basic purpose of this report is to determine how best to replace these two wastewater treatment plants. Should both treatment plants be replaced with new ones, or should one plant be constructed to treat the wastewater from the two towns at one location? Could other areas of the planning area be included in the design capacity of the new plant? Where should be plant be located?

After the number and location of the plant(s) is determined, the possible types of treatment plants to be constructed will be evaluated and the best one recommended. This will include consideration for cost effectiveness, environmental and other benefits.

Although the Bracken County Comprehensive Plan reports that the Kentucky State Data Center expects Bracken County to increase in population by only 1.6% to the year 2020, the current reality is that Bracken County's total estimated population growth from 1990 to 1999 was 9.2%. This is occurring because the County is close to the Cincinnati/Northern Kentucky Metropolitan Area and the new KY 9 makes the County more accessible for residential, commercial, and industrial development. Therefore, one purpose of this report is to propose wastewater collection and treatment facilities that could accept flow from such new development, treat it and dispose of it in an environmentally responsible manner.

The major part of the planning area is rural and quite hilly. Roads generally follow ridge tops and narrow valleys. There is dispersed residential housing along the roads. The greater concentration of housing is just northwest of Brooksville and along KY 19 from Brooksville to Augusta. The density is low and subsequent wastewater disposal problems, therefore, not serious. Where possible, capacity for these existing homes plus future new ones will be anticipated for a regional solution.

This report will determine whether it is beneficial to regionalize wastewater treatment for Brooksville and Augusta. It also will estimate the financial needs to accomplish this.

2.2. Background

Bracken County was founded in 1796. Augusta, located on the south bank of the Ohio River, was the original county seat. In 1839, the county seat was moved to Brooksville, which has continued as the county seat until today. The County is very much rural in character, as evidenced by its year 2000 population of 8,279 and a population density of 40.7 people per square mile.

The City of Brooksville had a population of 589 in the year 2000, which is less than its historic high of 980 in the year 1980. The City of Augusta has a population of 1,204 in the year 2000, which is less than its recent historic high of 1,455 in 1980. While this city population decrease is happening, the population of the county is rising modestly (7,738 in 1980 to 8,279 in 2000). Therefore, the existing wastewater systems of the two communities have a smaller customer base now as compared to when the treatment plants were constructed. Also, the number of rural on-lot systems has increased, and since soils are not very permeable, overall wastewater pollution of surface water should have increased. It is desirable to address both of these problems by enlarging the total service area.

At this time, Brooksville's wastewater treatment plant disposes effluent to a small tributary of Locust Creek and Augusta disposes treated wastewater to the Ohio River. Disposal of treated wastewater to the Ohio River is less damaging, environmentally, because of the large continual flow of this river.

2.3 Scope

This report recommends a strategy to best collect wastewater in the planning area and how to best treat it and dispose of it. The scope is basically as follows:

1. Description of existing treatment plants and conditions.

2. Tabulation of influent flows and loads of the Brooksville and Augusta Wastewater Treatment Plants.

3. Project future population to be served by the sewer systems.

4. Develop regional alternatives to transport and treat wastewater and recommend the best solution.

5. For the best regional solution, develop and compare wastewater treatment alternatives and recommend the best solution.

6. Description of the recommended project.

7. Estimate of financial needs of the recommended project.

8. Develop an implementation scheme.

CHAPTER 3 – PLANNING AREA

3.1 Description

The planning area is located in northern Bracken County and is shown in Exhibit 3-1. The northern boundary is the Ohio River. The southern boundary is generally the ridgeline and geographic divide of the natural surface drainage to the Ohio River, which generally runs along State Route 10 through the center of the County. The planning area is mostly rural and is hilly with generally narrow valleys and ridge lines. The largest stream in the area is Locust Creek, which generally runs east to west and discharges into the Ohio River 5 miles west of Augusta.

Two cities are in the planning area. Augusta is located on the south shore of the Ohio River. The town is an older picturesque Ohio River town with a year 2000 census population is 1,204. Brooksville, the county seat, is located on a ridge top in the south central part of the planning area. The year 2000 census population is 589. These two cities provide the only central sanitary sewer systems in the planning area.

The area is well served by a road network. The major highway in the planning area is KY 9. It is a high speed highway connecting northern Kentucky and Ashland, Kentucky and Interstate 64 in eastern Kentucky. KY 19 has recently been improved and it connects Augusta and Brooksville. KY 8, along with the CSX railroad, parallel the Ohio River. There are no bridges over the Ohio River in the planning area. A car ferry service to and from Ohio is located in Augusta.

It is a goal of the County to attract economic development with higher paying jobs. The best location for this is along KY 9, as it is the best transportation route through the county. As a matter of fact, to attract such development, an industrial park has been laid out on the north side of KY 9 in the eastern part of the planning area.

The planning area mostly consists of beautiful ridges and valleys. The sides of the hills are wooded, the valley plains and ridge tops are generally pasture or crop land. This appealing environment is most worthwhile to preserve.

3.2 Local Entities

The local entities include the following:

- Bracken County, including the Bracken County Planning Commission.
- City of Augusta, which also operates a municipal sanitary sewer district.
- City of Brooksville, which also operates a municipal sanitary sewer district.
- Buffalo Trace Area Development District, which aids communities in Bracken County and other nearby counties in obtaining funds for local community projects.

Location Map

NORTH BRACKEN COUNTY PLANNING AREA
FACILITIES PLAN UPDATE
CITIES OF AUGUSTA & BROOKSVILLE

Legend

BURGESS & NIPLE

EXHIBIT 3-1

NORTH BRACKEN COUNTY PLANNING AREA
FACILITIES PLAN UPDATE
CITIES OF AUGUSTA & BROOKSVILLE

3.3 Planning Area Characteristics

The natural features of the planning area were gathered from information obtained from the Bracken County Comprehensive Plan which was developed in 2003. The "Natural Features and Historic Sites" portion of the plan are attached in Appendix A. A summary of characteristics is provided below.

A few designated wetlands were found to be located in the planning area along the Ohio River. These wetlands are associated with ponding areas as a result of high water during flooding of the river. Other minor wetland areas may be present along tributary streams that are undesignated since the back waters of the river may extend up the stream beds and flood plains causing wetland areas. These wetland areas would be susceptible to river flooding therefore no construction is anticipated for these areas.

The 100 year flood plan areas within the planning area are generally along the Ohio River and lower elevation tributary streams to the river. The north portion of Augusta (north of the railroad tracks) is within the 100 year flood plain. The flood plain map is shown in appendix A as part of the Comprehensive Plan.

The topography of the planning area is generally hilly with narrow ridges and steep slopes to thin stream bed plains. A portion of the northeast and central portions of the planning area is comprised of slightly wider ridge tops with steep slopes to thin stream bed plains. There is a 450 feet elevation difference between the south portions of the planning area to the north portions. Ground elevations at the geographic divide in the southern portion of the planning area near Brooksville reach elevations around 950 and elevations to the north near the Ohio River in Augusta are 505.

Groundwater in the planning area is most prevalent along the Ohio River flood plain area. The water wells supplying the county water system are in this aquifer near Augusta. Generally to the south in the planning area, soil is covering limestone bedrock preventing a collection of ground water. The planning area generally slopes to the north and surface waters drain steeply to the Ohio River. Streams with steep slopes collect surface water and transport it to the Ohio River.

Soils in the planning area are generally three types, Wheeling-Nolin-Otwell, Lowell-Nicholson and Eden. The Wheeling-Nolin-Otwell soils are deep, very level, well drained and have loamy subsoils. This soil type is located adjacent to the Ohio River on the north side of the planning area. Lowell-Nicholson soils are deep to very deep, gently sloping to moderately steep, well to moderately drained with clayey or

loamy subsoils located on ridge tops and upper side slopes. The Lowell-Nicholson soils are located on ridge tops and upper side slopes. The Eden soils are moderately deep, sloping to very steep, well to moderately drained with clayey subsoils found on ridge tops and side slopes. The Eden soil is the most prevalent soil type in the planning area. Depending on the thickness of the soil and underlying subsoils on-site sewage disposal systems can and are being used to treat sanitary waste from individual homes which are outside the reach of the Augusta and Brooksville collection systems. If percolation tests show soils will be adequate for discharge of wastewater from septic tanks then leaching chambers are being used in Bracken County. If percolation tests show soils will be inadequate for discharge due to inability to percolate to subsoils either a residential package extended aeration treatment plants are used or additional soil is imported with good percolation rates and leaching chambers are used. These are the common methods used in Bracken County for small individual treatment systems.

CHAPTER 4 – EXISTING REGIONAL FACILITIES

4.1 Overview

The purpose of this chapter is to inventory the planning area's wastewater collection, treatment, and disposal facilities. The performance and condition of these facilities will be discussed along with the ability to continue to use the facilities in the future.

4.2 City of Augusta

4.2.1 Wastewater Treatment Plant

4.2.1.1 Description

The wastewater treatment plant is located on the west side of Augusta on a one acre lot. The wastewater is pumped to the plant by means of a wetwell/drywell canned pump station located at the intersection of Ferry Street and Augusta-Berlin Pike. The treatment plant is designed for an average wastewater flow of 330,000 gpd. Treated effluent is discharged to the Ohio River via a ten inch diameter outfall line.

The plant basically consists of one round package type plant, constructed above grade for the purpose of flood protection from the Ohio River. The package plant includes a raw wastewater screen and comminuter, an originally designed contact stabilization activated sludge aeration tank, final clarifier, effluent chlorination and dechlorination, effluent flow measurement, and aerobic digester. Two sand type sludge drying beds are also provided on the site. Basic design criteria is shown in Table 4-1.

One basic reason the plant does not meet current Kentucky regulatory requirements is that only one process train is provided and two are now required.

TABLE 4-1

City of Augusta
Existing Wastewater Treatment Plant
Basic Design Criteria

Item	Design Value
Flow	
Average	330,000 gpd
Peak Hourly (same as Influent Pump Station Capacity)	720,000 gpd
Influent Pump Station	
Type	Wetwell/Can Drywell
Number of Pumps	2
Type	Horizontal Centrifugal
Capacity, each	500 gpm
, firm	500 gpm
Or	720,000 gpd
Aeration Tank	
Inner Diameter	33' 3-1/2"
Outer Diameter	77' 0"
Quadrant	242° 30"
Sidewater Depth	15 feet
Volume	38,250 cubic feet
	286,000 gallons
Nominal Detention Time	
Average Design Flow	20.8 hours
Final Clarifier	
Number	1
Diameter	33' 3"
Sidewater Depth	12' 4"
Area	868 square feet
Surface Overflow Rate	
Flow	380 gpd/sq. ft.
Peak Hourly Flow	829 gpd/sq. ft.
Chlorine Contact Tank	
Inner Diameter	33' 3-1/2"
Outer Diameter	77' 0"
Quadrant	9°
Sidewater Depth	12.75 feet
Volume	1,207 cubic feet
	9,020 gallons
Nominal Detention Time	
Average Flow	39 minutes
Peak Hourly Flow	18 minutes
Aerobic Digester	

Inner Radius	33' 3-1/2"
Outer Radius	77' 0"
Quadrant	108° 30"
Sidewater Depth	15 feet
Volume	17,115 cubic feet
	128,000 gallons
Sludge Drying Beds	
Type	Sand
Number	2
Dimensions, each	
Length	100 feet
Width	30 feet
Area	
Each	3,000 square feet
Total	6,000 square feet

4.2.1.2 Physical Condition

Overall, the physical condition of the influent pump station and treatment plant is poor due to age and use.

Influent Pump Station. The condition of this pump station is poor, due to age and corrosion. The type of drywell provided, having only a narrow manhole type access, is a safety concern. Since the station is shut, and even provided sealing against flooding, moisture builds up and increased corrosion occurs. The station capacity is also not sufficient to pump peak hourly flow rates. Since the station is in poor condition and is a safety concern, it should be replaced. A new submersible type pump station would both greatly reduce the rate of corrosion and the safety concern.

The package treatment plant, being 25 years old, and constructed of steel, is in poor condition. One of its walls has even suffered a structural failure. This plant should be replaced with a new system. The blowers are located in an elevated building attached to the package plant. The blowers need replaced due to age. The building is functional in keeping equipment out of the weather and minimizing noise to the neighborhood from the blowers. However, the building is not of much monetary value and does not need to be retained.

4.2.1.3 Hydraulic and Organic Design Capacity

Table 4-2 shows the hydraulic and organic capacity of Augusta's wastewater treatment plant. The average flow was determined from the KPDES permit. The peak hourly flow matches the firm capacity of the influent pump station. The pollutant concentrations shown are for typical strength domestic wastewater. The masses are computed from the average flow and concentration.

TABLE 4 – 2

CITY OF AUGUSTA
Wastewater Treatment Plant
Hydraulic and Organic Design Capacity

Parameter	Design Value
Flow	
Average	330,000 gpd
Peak Hourly	720,000 gpd
Biochemical Oxygen Demand (BOD_5)	
Concentration	200 mg/l
Mass	550 lbs./day
Total Suspended Solids (TSS)	
Concentration	220 mg/l
Mass	605 lbs./day
Ammonia N	
Concentration	25 mg/l
Mass	68.8 lbs./day

4.2.1.4 Existing Flows and Loads

Influent flow and pollutant load data was tabulated for the period of January 2003 to October 2004. This information is shown in Table 4-3. In considering the two parameters of concentration and mass, the mass parameter is of primary concern. The data generally indicates the plant operates significantly less than its design capacity. Overall, it's running at about 50% or less of its design capacity. The maximum month flow is slightly over the 90% value of average design flow. This value was caused by Ohio River flooding and is considered non-typical.

TABLE 4-3

CITY OF AUGUSTA
Influent Flows and Pollutant Loads
(January 2003 to October 2004

Parameter	Data	Design Value	Percent of Design
Flow		0.330 mgd	
Annual Average	0.148 mgd		44.8%
Maximum Monthly Value	0.310 mgd		93.9%
Peak Daily	0.897 mgd	0.720 mgd	125%
BOD_5 Concentration		200 mg/l	
Annual Average	134 mg/l		
Maximum Month	254 mg/l		
BOD_5 Mass		550 lbs./day	
Annual Average	163 lbs./day		29.6%
Maximum Month	327 lbs./day		59.5%
TSS Concentration		220 mg/l	
Annual Average	132 mg/l		
Maximum Month	283 mg/l		
TSS Mass		605 lbs./day	
Annual Average	162 lbs./day		26.8%
Maximum Month	382 lbs./day		63.1%
Ammonia Concentration		25 mg/l	
Annual Average	17.2 mg/l		
Maximum Month	25.5 mg/l		
Ammonia Mass		68.8 lbs./day	
Annual Average	20.4 lbs./day		29.7%
Maximum Month	37.2 lbs./day		54.1%

4.2.1.5 Kentucky Discharge Elimination System Permit Limits

The Commonwealth of Kentucky issues Kentucky Pollutant Discharge Elimination System (KPDES) permits. Each permit limits the amount of pollutants that a wastewater treatment plant may discharge to a particular stream. The amount of pollutants that can be discharged to a waterway depends on the waterway's designated use and its low stream flow condition.

The Augusta, Kentucky WWTP discharges to the Ohio River. Since this river is so large as compared to Augusta's wastewater flow, secondary level permit limitations are provided in the permit (Permit No. KY0021261). These are shown in Table 4-4.

TABLE 4-4

CITY OF AUGUSTA WWTP
EXISTING NPDES PERMIT LIMITS

PARAMETER	MONTHLY LIMITS		WEEKLY LIMITS		DAILY LIMITS
	Concentration	Mass	Concentration	Mass	
Total Suspended Solids	30 mg/l	82.6 lbs./day	45 mg/l	124 lbs./day	
BOD_5	30 mg/l	82.6 lbs./day	45 mg/l	124 lbs./day	
Ammonia N	20 mg/l	55.0 lbs./day	30 mg/l	82.5 lbs./day	
Chlorine	0.019 mg/l		0.019 mg/l		0.019 mg/l
Dissolved Oxygen	-	-	-	-	$\geq$2.0 mg/l
Fecal Coliform	200/100 ml	-	400/100 ml	-	-
pH					
Minimum					6.0
Maximum					9.0

4.2.1.6 Wastewater Treatment Plant Performance

4.2.1.6.1 Process Flow

The plant data was tabulated and the results are summarized in Table 4-5. Generally the plant performed significantly better than required by its KPDES permit. The major exception occurred in November 2003, when the final clarifier could not contain the mixed liquor sent to it. The values of TSS and BOD_5 were so high, it caused the average data for the period to show non compliance, although this was a single event. The second column shows the data with the November 2003 data included. The third column shows the data with the November 2003 data excluded. Overall, this column shows fine performance.

The plant had one other compliance difficulty, and that was with chlorine. Chlorine is added to kill fecal coliform and other bacteria in the plant effluent. It is then removed from the effluent with sulfur dioxide, as chlorine is also toxic to aquatic life. Evidently, enough sulfur dioxide was not always applied to remove the chlorine. An increase in feed rate should correct this occasional marginal violation.

TABLE 4-5

CITY OF AUGUSTA
WASTEWATER TREATMENT PLANT
PERFORMANCE SUMMARY
(January 2003 through October 2004)

Parameter	Permit Requirement	Average of All Monthly Data	Average of Monthly Data Without November 2003
TSS			
Monthly Average Concentration (mg/l)	30	105	8.9
Number of Violations		1	0
Monthly Average Mass (lbs./day)	82.6	226	10.8
Number of Violations		1	0
BOD_5			
Monthly Average Concentration (mg/l)	30	34.3	5.1
Number of Violations		1	0
Monthly Average Mass (lbs./day)	82.6	35.0	5.9
Number of Violations		1	0
Ammonia N			
Monthly Average Concentration (mg/l)	20.0	0.92	0.82
Number of Violations		0	0
Monthly Average Mass (lbs./day)	55.0	1.2	1.0
Number of Violations		0	0
Dissolved Oxygen	>2.0 mg/l		
(Minimum reported)		7.2	7.2
Number of Violations		0	0
Fecal Coliform (#/100 ml)	200	24	21
Number of Violations		0	0
Chlorine (mg/l) 0.019	0.015	0.014	
Number of Violations		1*	1*

*Counting individual days, there are more violations than just 1.

4.2.1.6.2 Sludge Flow

At current plant loadings, the detention time of sludge in the aerobic digester should be in excess of 100 days. So, the sludge should be well stabilized.

The sludge drying beds are in poor condition and have not been used for some time.

4.2.1.7 Summary of Plant Deficiencies

The major plant deficiencies are two. One, duplicate aeration tanks and final clarifiers are now required by Kentucky's Division of Water and only one each are provided in the current plant. Second, and more importantly, the plant and its influent pump station have reached the end of their useful lives and are in poor condition. They must be replaced, because if not, they will fail and KPDES permit non-compliance will occur.

4.2.2 Augusta Collection System

Continued Progress!

4.2.2.1 Description

The City of Augusta sanitary sewer collection system was mostly constructed in the 1930's and originally discharged to the Ohio River without treatment. In 1980, a collection system extension was constructed on the east side of City and a treatment facility on the west side of the City to collect and treat all sanitary flows. The older portion of the sanitary sewer system is composed of 8" and 10" clay tile pipe with brick manholes. The portions of the sewer constructed in 1980 to the present consist of precast concrete manholes with clay or PVC pipe with gasket joints. The system has five small pump stations ranging in pumping capacities of 40 to 500 gallons per minute (gpm). The 500 gpm pump station is the main pump station that collects and pumps all wastewater to the treatment plant. The other pump stations collect low lying areas and pump to the main gravity collection system. The main pump station was constructed with an overflow pipe to the Ohio River. During high river levels, the main pump station is flooded by river water backflowing into the pump station and it is shut down until river level drops below overflow pipe elevation. At which time the pump station is turned on and pumping is resumed to the treatment plant.

An inventory of the collection system is shown in the table below. The collection system is separated into five subsystems as shown in Table 4-6.

TABLE 4-6

CITY OF AUGUSTA

SANITARY SEWER SYSTEM

Subsystem	Length of Pipe	Size of Pipe	# of Manholes	Pump Stations	# of Customers
1	710	10"	3	1	8
	6,080	8"	17	1 (apartments)	94
2	660	10"	4	0	11
	3,980	8"	14	0	111
3	4,190	8"	13	0	100
4	4,520	8"	12	0	110
5	6,990	8"	27	4 + 1 (private)	126
Total	27,130	10"& 8"	97	6	560

4.2.2.2 Inflow and Infiltration

Augusta experiences high flows during storm events with average daily flows up to 6 times the normal dry weather flow of 110,600 gallons per day (gpd). A Sewer System Evaluation Survey (SSES) was completed as part of the Facilities Plan Update and is included in the Appendix B. The water usage per capita in gpd in Augusta is 92 gpd based on the water billing records for a one year period. The average daily flow per capita based on treatment plant flow records is 123 gpd. The peak day flow per capita based on treatment plant flow data for the peak day in a twelve month period is 745 gpd. Kentucky Division of Water considers a collection system to have excessive inflow and infiltration (I&I) if the average day flow value is above 120 gpd per capita and the peak day flow value is above 275 gpd per capita. Augusta's peak day flow per capita flow is 2.7 times the 275 gpd standard, therefore I&I would be considered excessive.

During the month of April 2004 a flow monitoring program was completed as shown in the SSES Report. Three rain events occurred during the period for a total of 4.3 (1.75, .92 & 1.6) inches of rainfall. During this month it was estimated that 1.2 (.589, .165 & .449) million gallons on I&I entered the collection system.

As part of the SSES, an investigation of I&I sources were performed by smoke and dye testing of the sewer system. This investigation found sources of I&I which included building downspouts, area drains, storm sewer cross connections and open sewer laterals. It is estimated that 146,000 gallons of I&I per 1.75" rain event (first rain in the flow monitoring month) was contributed by the found deficiencies. This volume is approximately 20 to 25% of the measured I&I. A table of the items found is shown in the SSES Report.

4.2.2.3 Inflow and Infiltration Correction Project

The deficiencies found as part of the SSES should be corrected along with a continued search for additional I&I sources within the system. The majority of I&I sources found were on private property and therefore would be the responsibility of the property owner requiring no public money. Notifications should be sent to effected property owners with a time schedule on when the correction should be completed. Several items were located on public property such as storm sewer cross connections and abandoned open laterals on property the city has acquired through the FEMA property purchase program. These deficiencies will require correction by the City. Additional investigation will also be required on some of the properties that are suspect of being I&I contributors but without proof from the SSES investigation work. The SSES ranks the corrections as to volume of I&I removed per item with larger flow volumes given greater importance for removal. A repair cost is shown for all corrections that are the City's responsibility.

It is recommended the City establish a yearly budget that will allow for additional I&I sources to be discovered and corrected. The suspect problem areas found should be investigated first followed by additional investigation of each subsystem based on the subsystem ranking shown in the SSES Report.

The estimated cost to correct the identified City responsible deficiencies found is approximately $52,800. Additionally the City should include in the sewer system budget another $24,000 per year to cover the cost of additional investigation work to find and connect other sources of I&I. This cost was based on the cleaning and television inspection of 6,000 feet of sewer per year at $2.00 per foot and complete four spot repairs on the sewer system at $3,000 per repair. Once additional deficiencies are found, the City can prioritize the repairs based on the money available. Twenty manholes were found to be buried or miss labeled on the sewer system drawings. These manholes should be uncovered and raised to grade so they can be accessed. The cost of these repairs will vary depending on the work needed but in most cases should be approximately $2000 per manhole for a total of $40,000.

4.2.2.4 Projected Success of I&I Correction Project

The removal of I&I for the deficiencies found in the SSES Report should be successful since most of the sources found were direct connections to the sanitary sewer system. There were some suspect connections, which are thought to contribute I&I; but their correction may be less successful in removing I&I since the rain water may not actually go to the sanitary sewer. These sources should be further investigated prior to correction work being attempted. The drainage area for storm sewer cross connections were estimated since exact location of the cross connections is not known and the volume of water which would flow from the storm to the sanitary cannot be calculated accurately. It is anticipated that 75% of the I&I found in the study could be removed. The removal of this I&I would reduce the wet weather peaking factor from 6.0 to approximately 4.3 times the daily dry weather flow. The ideal wet weather peaking factor should be a maximum of 2.3 times the daily dry weather flow, therefore, additional I&I detection work is needed.

4.3 City of Brooksville

4.3.1 Wastewater Treatment Plant

4.3.1.1 Description

The wastewater treatment plant is located on the north side of Brooksville in a relatively deep valley. Wastewater flow from Brooksville, which is located on ridge tops, flows to the plant site via two gravity sewers. A wetwell/drywell canned pump station lifts the wastewater up into the wastewater treatment plant. The treatment plant is designed for an average wastewater flow of 200,000 gpd. The plant effluent discharges to a small tributary which flows north to Locust Creek.

The plant basically consists of one round package type plant, basically constructed above grade. The package plant includes a raw wastewater screen and comminuter, originally designed contact stabilization activated sludge aeration tanks, final clarifier, effluent chlorination and dechlorination, effluent flow measurement, effluent channel type post-aeration and aerobic digestion. Basic design criteria is shown in Table 4-7.

One basic reason the plant does not meet current Kentucky regulatory requirements is that only one process train is provided and two are now required.

The sizing of the aeration tanks, the final clarifier, and the chlorine contact tank is insufficient. The plant should be operated as extended aeration because of the ammonia limitation in the permit, and a 10 hour detention time is not sufficient. The peak overflow rate of the final clarifier is 40% higher than regulations permit. The chlorine contact tank does not have enough volume to allow the minimum detention time of 15 minutes.

TABLE 4-7

City of Brooksville
Existing Wastewater Treatment Plant
Basic Design Criteria

Item	Design Value
Flow	
Average	200,000 gpd
Peak Hourly (same as Influent Pump Station Capacity)	504,000 gpd
Influent Pump Station	
Type	Wetwell/Can Drywell
Number of Pumps	2
Type	Horizontal Centrifugal
Capacity, each	350 gpm
, firm	350 gpm
Or	504,000 gpd
Aeration Tank	
Inner Diameter	21' 5-1/2"
Outer Diameter	44' 3"
Quadrant	227°
Sidewater Depth	15 feet
Volume	11,126 cubic feet
	83,220 gallons
Nominal Detention Time	
Average Design Flow	10.0 hours
Final Clarifier	
Number	1
Diameter	21' 5"
Sidewater Depth	12' +/-
Area	360 square feet
Surface Overflow Rate	
Flow	556 gpd/sq. ft.
Peak Hourly Flow	1,400 gpd/sq. ft.
Chlorine Contact Tank	
Inner Diameter	21' 5-1/2"
Outer Diameter	44' 3"
Quadrant	12°
Sidewater Depth	14' 7"
Volume	571.8 cubic feet
	4,270 gallons
Nominal Detention Time	
Average Flow	30.7 minutes
Peak Hourly Flow	12.2 minutes

Aerobic Digester	
Inner Radius	21' 5-1/2"
Outer Radius	44' 3"
Quadrant	121°
Sidewater Depth	14' 11"
Volume	5,898 cubic feet
	44,110 gallons

4.3.1.2 Physical Condition

Overall, the physical condition of the influent pump station and treatment plant is poor due to age (36 years old) and use. The facilities are mostly constructed of steel, and such facilities generally have a useful life of 20 to 30 years. The facilities should be replaced with new.

4.3.1.3 Hydraulic and Organic Design Capacity

The treatment plant is not designed to treat the permitted wastewater flow rate to the permitted values. As an extended aeration plant, the original plant design value is presented as 125,000 gpd, on the title sheet of the 1969 plans. This is a reasonable value, as it provides 16 hours of nominal detention time in the aeration tank, which is sufficient to meet the permit limits. The peak hourly flow rate must be reduced so the final clarifier surface overflow rate will not exceed 1,000 gpd/square foot. Therefore, the design peak hourly flow rate is adjusted to 360,000 gpd.

Table 4-8 shows the hydraulic and organic capacity of Brooksville' wastewater treatment plant. The pollutant concentration shown are for typical strength domestic wastewater. The masses are computed from the average flow and concentration.

TABLE 4 – 8

CITY OF BROOKSVILLE
Wastewater Treatment Plant
Hydraulic and Organic Design Capacity

Parameter	Design Value
Flow	
Average	125,000 gpd
Peak Hourly	360,000 gpd
Biochemical Oxygen Demand (BOD_5)	
Concentration	200 mg/l
Mass	208 lbs./day
Total Suspended Solids (TSS)	
Concentration	220 mg/l
Mass	229 lbs./day
Ammonia N	
Concentration	25 mg/l
Mass	26.1 lbs./day

4.3.1.4 Existing Flows and Loads

Influent flow and pollutant load data was tabulated for the period of January 2003 to October 2004. This information is shown in Table 4-9. In considering the two parameters of concentration and mass, the mass parameter is of primary concern. The data indicates that on an annual basis, the plant operates at about 60 to 70% of its capacity. For the maximum month of the period, it operated at over 90% of its capacity.

TABLE 4-9

CITY OF BROOKSVILLE
Influent Flows and Pollutant Loads
(January 2003 to October 2004

Parameter	Data	Design Value	Percent of Design
Flow (mgd)			
Annual Average	0.068	0.125	54.4%
Maximum Monthly	0.105		84.0%
Peak Daily	0.341	0.360	94.7%
BOD_5 Concentration (mg/l)		200	
Annual Average	294		147%
Maximum Month	468		234%
BOD_5 Mass (lbs./day)		208	
Annual Average	165		79.3%
Maximum Month	260		125%
TSS Concentration (mg/l)		220	
Annual Average	234		106%
Maximum Month	537		244%
TSS Mass (lbs./day)		229	
Annual Average	127		55.5%
Maximum Month	219		95.6%
Ammonia Concentration (mg/l)		25	
Annual Average	22.6		90.4%
Maximum Month	48.8		195%
Ammonia Mass (lbs./day)		26.1	
Annual Average	12.5		47.9%
Maximum Month	24.0		92.0%

*Calculated from $CBOD_5$ value by dividing by a factor of 0.85.

4.3.1.5 Kentucky Discharge Elimination System Permit Limits

The Commonwealth of Kentucky issues Kentucky Pollutant Discharge Elimination System (KPDES) permits. Each permit limits the amount of pollutants that a wastewater treatment plant may discharge to a particular stream. The amount of pollutants that can be discharged to a waterway depends on the waterway's designated use and its low stream flow conditions.

The Brooksville, Kentucky WWTP discharges to the headwaters of a small tributary to Locust Creek. During a low flow period, the creek essentially starts at the wastewater treatment plant's discharge. Therefore, relatively strict effluent limits are provided in the permit (Permit No. KY0025232). These are shown in Table 4-10.

TABLE 4-10

CITY OF BROOKSVILLE WWTP
EXISTING NPDES PERMIT LIMITS

PARAMETER	MONTHLY LIMITS		WEEKLY LIMITS		DAILY LIMITS
	Concentration	Mass	Concentration	Mass	
Total Suspended Solids	30 mg/l	50 lbs./day	45 mg/l	75 lbs./day	
BOD_5	10 mg/l	16.7 lbs./day	15 mg/l	25.0 lbs./day	
Ammonia N					
Summer	4 mg/l	6.67 lbs./day	6 mg/l	10.0 lbs./day	
Winter	10 mg/l	16.7 lbs./day	15 mg/l	25.0 lbs./day	
Residual Chlorine	0.010 mg/l	-	0.019 mg/l	-	≥7.0 mg/l
Dissolved Oxygen	-	-	-	-	
Fecal Coliform	200/100 ml	-	400/100 ml	-	-
pH					
Minimum					6.0
Maximum					9.0

4.3.1.6 Wastewater Treatment Plant Performance

4.3.1.6.1 Process Flow

The plant data was tabulated and the results are summarized in Table 4-11. The plant's performance was very good. The performance usually was significantly better than what the permit required. One violation did occur. The October 2004 effluent ammonia concentration was 4.5 mg/l, exceeding the permit limit of 4.0 mg/l. The plant had higher flows and pollutant loadings than normal that month, and this probably contributed to this violation.

TABLE 4-11

CITY OF BROOKSVILLE
WASTEWATER TREATMENT PLANT
PERFORMANCE SUMMARY
(January 2003 through October 2004)

Parameter	Permit Requirement	Average of All Monthly Data
TSS		
Monthly Average Concentration (mg/l)	30	8.8
Number of Violations	0	0
Monthly Average Mass (lbs./day)	50	5.8
Number of Violations	0	0
$CBOD_5$		
Monthly Average Concentration (mg/l)	10	5.0
Number of Violations	0	0
Monthly Average Mass (lbs./day)	16.7	2.9
Number of Violations	0	0
Ammonia N		
Monthly Average Concentration (mg/l)	4.0 (Summer) 10.0 (Winter)	1.61
Number of Violations		1
Monthly Average Mass (lbs./day)	6.7 (Summer) 16.7 (Winter)	1.0
Number of Violations		0
Dissolved Oxygen (Minimum reported)	>7.0 mg/l	8.9
Fecal Coliform (#/100 ml)	200	22
Chlorine (mg/l)	0.010	0.010

4.3.1.6.2 Sludge Flow

At current plant loadings, the estimated 42 days detention time in the aerobic digester, is about 35 to 50 days. The sludge should be properly stabilized. Sludge disposal is by contract hauling to a larger wastewater treatment plant. The design and operation is proper for this disposal method.

4.3.1.7 Summary of Plant Deficiencies.

The major plant deficiencies are two. One, duplicate aeration tanks and final clarifiers are now required by Kentucky's Division of Water and only one each are provided in the current plant. Second, and more importantly, the plant and its influent pump station have reached the end of their useful lives and are in poor condition. They must be replaced, because if not, they will fail and KPDES permit non-compliance will occur.

4.3.2 Brooksville Collection System

4.3.2.1 Description

The City of Brooksville sanitary collection system was constructed in 1970. Only minor additions and extensions have been completed since that time. The sewer system is composed of 8" and 10" clay sewer pipe with gasket joints, precast concrete manholes and with later additions of PVC pipe. The system has 7 pump stations with pumping capacity ranging from 30 to 350 gpm. The 350 gpm pump station is the main pump station at the treatment plant. The other pump stations collect sanitary flows from the surrounding valleys and pump it to the gravity collection system that drains to the treatment plant located on the northeast side of the City. The majority of the pump stations have overflows constructed in them. The overflows are normally not active during rain events unless there are mechanical problems with the pumps preventing them from running.

There have been several additions to the sewer collection system since its original construction. An extension to the new high school, grade school and middle school on the northwest side of the City was completed at the time of the school constructions. Another extension was for an area to the east of the City that included a mobile home park, several homes and an apartment complex with a small pump station. Another extension on the north side of the City added a new apartment complex and on the south side of the City added Galloway Drive homes via collection sewer and pump station.

Recent work on the collection systems has been the upgrade of pump stations in Brooksville, a sewer and pump station replacement with roadway improvements on the west side of the City along KY 1159 and a sewer replacement adjacent to relocated KY 19 on the east side of the City.

An inventory of the collection system is shown in the Table 4-12. The collection system is separated into five subsystems.

TABLE 4-12
CITY OF BROOKSVILLE
SANITARY SEWER SYSTEM

Subsystem	Length of Pipe	Size of Pipe	# of Manholes	Pump stations	# of Buildings
1	7024	8"	35	2	101
2	2128	8"	13	2 + 2(schools)	37
3	3470	8"	15	0	69
4	3573	10" & 8"	20	1	92
5	3866	8"	17	1 (apartment)	47
Total	20061	10"& 8"	100	8	346

4.3.2.2 Inflow and Infiltration

Brooksville has experienced high flows as a result of storm events with average daily flows up to 5.8 times the daily dry weather flow of 66,000 gpd. A Sewer System Evaluation Survey (SSES) was completed as part of the Facilities Plan Update and is included in the appendix. The water usage per capita in gallons per day (gpd) in Brooksville is 112 gpd based on the water billing records for a one year period. The average daily flow per capita based on treatment plant flow records is 115 gpd. The peak day flow per capita based on treatment plant flow data for the peak day in a twelve month period is 579 gpd. Kentucky Division of Water considers a collection system to have excessive inflow and infiltration (I&I) if the average day flow value is above 120 gpd and the peak day flow value is above 275 gpd per capita. Brooksville's peak day flow per capita flow is 2.1 times the 275 gpd standard, therefore I&I would be considered excessive.

During the month of April 2004 a flow monitoring program was completed as shown in the SSES Report. Three rain events occurred during the period for a total of 4.7 (2.00, .95 & 1.75) inches of rainfall. During this month the treatment flow monitor was not working properly so actual flow volumes at the

treatment plant could not be compared to the flow meter data from the collection system. During the last rain period 5/02/04 a total I&I volume of 383,400 gallons was calculated to enter into the collection system.

As part of the SSES, an investigation of I&I sources were performed by smoke and dye testing of the sewer system. This investigation found sources of I&I which included building downspouts, area drains, and open sewer laterals. It is estimated that 100,000 gallons of I&I per a 2.0" rain event was contributed by the found deficiencies. A table of the items found is shown in the SSES Report.

4.3.2.3 Inflow and Infiltration Correction Project

The deficiencies found as part of the SSES should be corrected along with a continued search for additional I&I sources within the system. The majority of I&I sources found were on private property and therefore would be the responsibility of the property owner requiring no public money. Notifications should be sent to effected property owners with a time schedule on when the correction should be completed. Additional investigation will be required on some of the properties that are suspect to being I&I contributors but no proof was found as part of the SSES investigation work. The SSES ranks the corrections as to volume of I&I removed per item with larger flow volumes given greater importance for removal. A repair cost is shown for all corrections that are the City's responsibility.

It is recommended the City establish a yearly budget that will allow for additional I&I sources to be discovered. The suspect problem areas found should be investigated first followed by additional investigation of cach subsystem based on the subsystem ranking shown in the SSES Report. The sewers along the creek should be televised first to detect defects which may be letting creek water into the sewer.

The estimated cost to correct the City responsible deficiencies found is $8,100. Additionally the City should include in the sewer system budget another $19,000 per year to cover the cost of additional investigation work to find and correct other sources of I&I. This cost was based on the cleaning and television inspection of 5,000 feet of sewer per year at $2.00 per foot and complete three spot repairs on the sewer system at $3000 per repair. Once additional deficiencies are found, the City can prioritize the repair based on the money available to correct the problem. Approximately ten manholes were found to be buried. These manholes should be uncovered and raised to grade so they can have proper access. The cost of these repairs will vary depending on the work needed but in most cases should be approximately $2000 per manhole for a total of $20,000. The manhole covers on most on the manholes were found to be

loose from the manhole. This could cause leaks in areas where water ponds or runs adjacent to the manhole. A program should be installed to start sealing the manhole frames to the cover. An estimated cost of $500 per manhole should be used for this work. Assuming 50 percent of the manholes frames need to be sealed a cost of $25,000 is estimated to complete this work.

4.3.2.4 Projected Success of I&I Correction Project

The removal of I&I for the deficiencies found in the SSES Report should be successful since most of the sources found were direct connections to the sanitary sewer system. There were some suspect connections, which were estimated to contribute I&I which may be less successful in removing I&I since the sources may not actually go to the sanitary sewer. These sources should be further investigated prior to correction work being attempted. It is anticipated that 60 to 70% of the I&I found in the study could be removed. This assumes that suspect deficiencies are not connected to the sanitary sewer. If a greater percentage of the suspect items are connected, the anticipated removal would be greater. The removal of this I&I would reduce the wet weather peaking factor from 5.8 to approximately 4.7 times the daily dry weather flow. The ideal wet weather peaking factor should be 2.3 times the daily dry weather flow; therefore, additional I&I detection work is needed.

4.4 Package Treatment Plants in Area

4.4.1 General

Several package plants are located within the planning area. The majority of the plants are small on individual residences. This type of plant is an alternative to septic tank-leaching chamber in areas where soil percolation rates are too low. The small individual home package treatment plant is usually an extended aeration plant with a sand filter and chlorination with final effluent discharge to a nearby stream. One such plant serves Augusta Health Care Center, a residential care facility, nine serve individual homes or businesses and one plant serves the Bracken County Industrial Park.

Each of the treatment plants have their own NPDES permit and required effluent sampling twice per year and reported to Division of Water Office in Florence, KY. Table 4-13 shows the address and location and size of each of the facilities. The majority of the plants have been constructed over the last ten years.

TABLE 4-13

North Bracken County

Package Treatment Plants

Name	Address	Treatment Capacity (gpd)
Augusta Health Care Center	Asbury Road, Augusta	8000
Bowman	Hilton Lane, Brooksville	500
Carl	Bladeston Drive, Brooksville	500
Clark	Justice Dr, Brooksville	500
Hall	Wellsburg-Walcott Rd, Foster	500
Hartman	Farmview Rd, Brooksville	500
Johnson	RR2 KY Hwy 1109, Foster	500
Perkins	RR 2, Foster	500
Stewarts Farm Supply	RR 3, Brooksville	500
Wilson	Salem Ridge Rd., Brooksville	500
KTC Garage	State Route 10, Brooksville	500

4.4.2 Bracken County Industrial Park Package Plant

The Industrial park package plant has been permitted since 1999 but does not have any wastewater flow entering the plant. The industrial park is located along KY Route 9 approximately 2 miles east of KY Route 19 intersection. There have been no sites developed at the industrial park to date. The treatment plant was manufactured by Pro-Water Systems and is an extended aeration system permitted to treat 5,000 gallons per day (gpd). The plant is two parallel tanks constructed of steel plates. The plant consists of the following treatment units.

- Influent bar screen;
- Flow control chamber with flow divisions;
- Equalization Chamber integral to WWTP 1 containing 5000 gallon capacity, flow control pumps (2@ 28 gpm submersible grinder type), pump level controls and blower system for mixing;
- Aeration chamber one per tank – 24 hour detention with air diffusers longitudinal along one side to prevent short circuiting.

- Final clarifier – 2 units - 835 gallons useable volume, surface overflow rate 140 gpd/sq. ft. with air lift pumps in each clarifier;
- Tertiary filters – 2 units – 4 sq. ft. each for a total of 8 sq. ft. with air scour and automatic/manual backwash operation, filtration rate .87 gpm/sq. ft., clearwell size 600 gallons;
- Chlorine contact chamber – volume 260 gallons, hypo-chlorination solution feed metering pumps (2-50 gpd feed rate) and 30 gallon chlorine solution crock;
- Dechlorination unit – volume 239 gallons with tablet sodium sulfite feeder and aeration piping for post aeration;
- Flow meter – record and totalize flow passing over 22.5 deg v-notch weir with strip chart recorder.

No treatment data is available since there is no flow to the plant. Augusta maintenance staff routinely visits the plant and cycles equipment to maintain proper working order.

4.5 On-Site Systems

Developments outside the reach of the Augusta and Brooksville collection systems primarily use on-site treatment systems. An interview with the Bracken County Health Department found that existing on-site systems for the most part are working properly. When noncompliant systems are found, repair work orders are filed and the corrections are completed by the system owner. There are no areas where a large number of systems are noncompliant which would warrant a community collection and treatment system to correct problems.

The most common on-site treatment systems being used are septic tanks with leaching chambers. The leaching chamber length varies depending on the soil evaluation and the volume of wastewater to be discharged. A minimum lot size of 1 acre is required for an on-site treatment system. If the soil evaluation finds a high concentration of clay which will not allow sufficient percolation, leaching chambers are sometimes raised and fill materials are imported to the site that is more permeable than the on-site soils and will percolate to underlying subsoils. If importing soil becomes too expensive, a small package treatment plant is usually used as discussed in Section 4.4.1.

CHAPTER 5 – POPULATION AND FLOW PROJECTIONS

5.1 Existing Conditions

5.1.1 Population

Table 5-1 exhibits the historic population from US Census data from 1970 to 2000. Included are the whole county, Augusta and Brooksville. Table 5-2 exhibits house count data and estimated population for the KY 19 route from Brooksville to Augusta, KY 1159 from Brooksville to Wellsburg and KY 8 from Augusta to Wellsburg. The average number of persons per household in Bracken County, according to the Comprehensive Plan, is 2.55, and this is used to develop a population estimate. This information will be used for regional alternatives.

Table 5-1 shows the county population growing and the population of the two cities decreasing. The trend occurs because individuals moving to Bracken County evidently prefer rural living as compared to living in town. Other reasons may also explain this situation. Augusta is subject to Ohio River flooding, with a particularly severe event occurring in 1996. Individuals often leave such an area and some homes in the lower areas have been removed. This naturally results in the lowering of population. Flooding is not a problem in Brooksville. The loss of population is probably a result of more individuals selecting newer housing in rural areas rather than the older housing located in Brooksville.

TABLE 5-1

Bracken County

Historic Population

Entity	Year			
_____	1970	1980	1990	2000
Bracken County				
Population	7,227	7,738	7,766	8,279
Decade % Change		+7.1%	+0.4%	+6.6%
Augusta				
Population	1,434	1,455	1,336	1,204
Decade % Change		+1.5%	-8.2%	-9.9%
Brooksville				
Population	609	980	670	589
Decade % Change		+60.9%	-31.6%	-12.2%

TABLE 5-2

Rural Home Count and
Population Estimate
(Year 2005)

Area	Residential Home Count	Population Estimate*
KY 19 from Brooksville to Augusta	83	212
KY 1159 from Brooksville to Wellsburg	95	242
KY 8 from Augusta to Wellsburg	2	5

*Based on 2.55 persons per household

5.1.2 Customers

There are two central sanitary sewer systems in the planning area, that for the cities of Augusta and Brooksville. Augusta has a total of 559 customers, of which 509 are residential and 50 are commercial/governmental/industrial/institutional. Brooksville has a total of 322 customers, of which 250 are residential and 72 are commercial/governmental/industrial/institutional.

5.2 Future Conditions

5.2.1 Land Use

The "Bracken County Comprehensive Plan" presents proposed land use. The proposed land use plan for the whole county on page 121 does not show large growth. It does show two locations on the KY 9 corridor for development locations. These are at the KY 9 – KY 1159 and the KY 9 - KY 19 intersections. The existing industrial park site on the north side of KY 9 east of KY 19 is also shown. Although not desired by the Comprehensive Plan, dispersed residential growth will probably continue in the rural areas.

The Comprehensive Plan shows the existing and future land use of Augusta. There is little growth projected for the land area of the City. Some 'mixed use' growth is shown. Low density residential land use is shown to be decreasing. Strictly commercial land use is shown to be constant. A small amount of growth for industrial land use is shown.

The Comprehensive Plan also shows the existing and future land use of Brooksville. A modest amount of commercial, low and high density residential growth is shown.

5.2.2 Population

2015 = 8,321

The Comprehensive Plan shows Bracken County's population increasing from 8,487 in year 2005 to 8,630 in 2020. This is only a 1.7% growth in 15 years and this is much lower than projected for the state of Kentucky (7.1%) and northern Kentucky (10.3%). This low growth rate was projected by the Kentucky State Data Center, University of Louisville and Kentucky Cabinet for Economic Development, Kentucky State Data Center, Kentucky Population Research, "University of Louisville, "How Many Kentuckians," 1999 Edition. The Comprehensive Plan does not really agree with this projection, as it

states on Page 17, "the actual growth rate for the county could be greater than this projection due to regional impacts and other factors unknown at this time.....The projected regional growth rate around Bracken County and other factors such as new road construction and housing development could spur growth rates for the year 2020." We believe growth rates will be higher because of the new KY 9 and Bracken County's proximity to the Northern Kentucky area. Therefore, this report projects the growth rate of Bracken County to mirror the Northern Kentucky area, or approximately 3% growth every 5 years. Table 5-3 shows the estimated population of Bracken County from year 2005 through 2025 assuming this growth rate. The year 2007 population projection is also shown for the purpose of complying with Kentucky's Division of Water Facilities Plan regulations.

Table 5-4 shows an estimate of population growth of selected areas of interest in the planning area. These areas are provided to estimate the needs of the three regional wastewater collection and treatment alternatives.

Augusta, according to the proposed land use plan in the Comprehensive Plan, will not add any net land for residential development. It is actually shown decreasing. Therefore, the population for Augusta is projected to remain constant.

According to the proposed land use plan found in the Comprehensive Plan for Brooksville, some growth in land used for residential development is expected. Therefore, the population for Brooksville is projected to grow at the overall county expected rate of 3% in 5-year increments.

KY 19, from Brooksville to Augusta, currently has 83 homes, including a 30 home subdivision near Augusta. This area is projected to have 180 homes by year 2025, but this is only projected for the case of laying a sanitary sewer force main along this road. It is anticipated that new rural residential development would occur more quickly along this road if sanitary sewer service were available.

There is an industrial park now located on the north side of KY 9 east of the KY 9 and KY 19 intersection. It is reported that the owners of this park want to develop about 160 acres of land next to the park for residential development. If this land were provided a central sanitary sewer system, it would support about 2 homes per acre, or about 320 homes. This growth is not expected immediately as some time would be needed before such sanitary sewer service would be available. It is anticipated that this development could start after the year 2010.

One regional alternative would construct a new regional wastewater treatment plant near Wellsburg. A force main would be laid along KY 1159 from Brooksville to Wellsburg and another would be laid along KY 8 from Augusta to Wellsburg. There are currently 95 homes along these routes. The number of homes along these two routes, if a sanitary sewer force main were constructed, is projected to a total of 200 in the year 2025.

TABLE 5-3

Bracken County Population Projection

Year 2005 to 2025

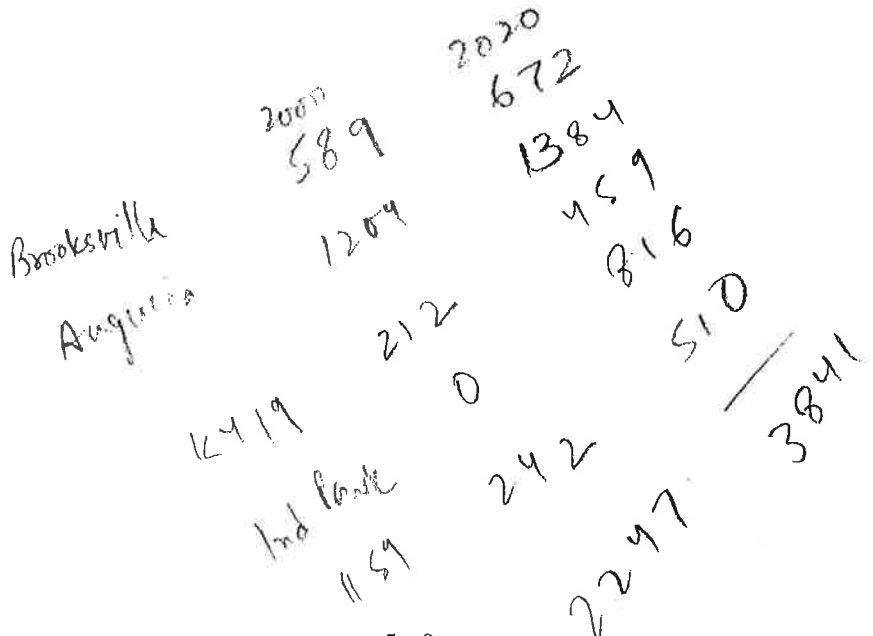
Year	Estimated Population
2005	8,487
2007	8,589
2010	8,742
2015	9,004
2020	9,274
2025	9,552

TABLE 5-4

Facilities Planning Selected Areas Population Projections

Years 2005 to 2025

Entity of Area	2005	2007	2010	2015	2020	2025
Augusta	1,204	1,204	1,204	1,204	1,204	1,204
Brooksville	589	596	607	625	644	663
KY 19, Brooksville to Augusta						
Number of Homes	83	93	107	132	156	180
Population	212	237	273	337	398	459
Industrial Park Area on KY 9						
Number of Homes	0	0	0	100	200	320
Population	0	0	0	255	510	816
KY 1159 Brooksville to Wellsburg & KY 8 Augusta to Wellsburg						
Number of Homes	95	106	121	148	174	200
Population	242	270	309	377	444	510



5.2.3 Wastewater Flow Projection

Wastewater flow projections are developed for three regionalization alternatives. The first regionalization alternative is separate treatment plants in Augusta and Brooksville, which is what is occurring now. The current KPDES permitted flow is larger than the existing flow plus growth. Therefore, the permitted flow will govern. For Augusta, the existing average flow is 148,000 gpd and the maximum month flow is 249,000 gpd. The maximum month flow is the appropriate value to consider as the permit must be complied with every month. The KPDES permitted value is 330,000 gpd. Therefore, the plant would be designed for the 330,000 gpd value. This would be sufficient for the additional mixed land use and industrial land use shown in the Comprehensive Plan.

For Brooksville, the existing average flow is 68,000 gpd and the current maximum monthly flow is 103,000 gpd. Once again, the maximum monthly flow is the appropriate flow to consider. Table 5-4 shows Brooksville's population increasing by 74 to the year 2025. Assuming a wastewater flow of 100 gallons per day per person, the additional flow computes to 7,400 gpd. The maximum monthly flow would increase to about 110,000 gpd. The existing KPDES permitted flow is 200,000 gpd, and being larger, governs.

The second regionalization alternative is regional treatment in Augusta, with flows from Augusta, Brooksville, KY 19 from Brooksville to Augusta and the industrial park area. This calculation is shown in Table 5-5. The design flow for this alternative is 690,000 gpd.

The third regionalization alternative is regional treatment near Wellsburg. It includes flow from Augusta, Brooksville, KY 1159 from Brooksville to Wellsburg and KY 8 from Augusta to Wellsburg. This is shown in Table5-8. The design flow for this alternative is 595,000 gpd.

TABLE 5-5

Year 2025 Wastewater Flow Projection for
an Augusta Regional Wastewater Treatment Plant

Entity	Estimated Wastewater Flow (gpd)
Augusta	330,000
Brooksville	200,000
Existing and New Homes along KY 19 and near the Industrial Park on KY 9 (500 homes x 300 gpd/home)	150,000
Industrial Park	10,000
Total Estimated Wastewater Flow	690,000

TABLE 5-6

Year 2025 Wastewater Flow Projection for
A Wellsburg Regional Wastewater Treatment Plant

Entity	Estimated Wastewater Flow (gpd)
Augusta	330,000
Brooksville	200,000
Existing and New Homes Along KY 1159 and KY 8 (200 homes x 300 gpd/home)	60,000
Commercial Development at Intersection of KY 9 and KY 1159	5,000
Total Estimated Wastewater Flow	595,000

CHAPTER 6 – METHOD OF ALTERNATIVES AND COMPARISONS

6.1 General

An economic analysis is useful in selecting the best alternative. It determines a measure of total money spent to implement any particular alternative. Of course, it is not the only criteria that is used to recommend a particular alternative. Other factors, such as impact to water quality, implementation schedule, land consumption, primary and secondary environmental impacts, energy consumption, reliability, etc. are also considered.

The cost of the alternatives is based on "present worth". The alternative with the smallest present worth value is the least costly alternative to implement. Present worth may be thought of as the sum, which, if invested now at a given rate, would provide exactly the funds required to make all necessary expenditures during the life of the project. The period of time considered in the analysis is 20 years. The analysis is dependent on the selection of an interest rate. For this analysis, an interest rate of 5% is used.

6.2 Construction Cost

Construction costs are the capital cost to purchase and install the facilities and equipment. The costs are based on 2005 dollar values. A breakdown of the estimated construction cost is presented.

6.3 Operation and Maintenance Cost

The costs are based upon the following unit rate estimates.

A. Labor costs are based on the number of estimated operating hours at a rate of $25 per hour, plus benefits, overhead, and other costs.

B. Power costs are based on an electric rate of 8 cents per kWh.

C. Fuel cost for vehicles is based upon $2.00 per gallon.

6.4 Equipment Replacement Costs

Where major equipment life is 20 years or less, a yearly replacement cost is estimated for the purpose of replacing major equipment once it's useful life is complete. The annual cost assigned is the cost of the particular piece of equipment divided by its estimated life.

6.5 Salvage Value

The economic analysis is based on a 20-year period. Salvage value is based on straight-line depreciation. A service life of 20 years is estimated for structural steel, 40 years of permanent buildings and concrete structures, and 50 years of piping.

6.6 Economic Analysis

The economic analysis consists of determining the total project and total present worth for each alternative. Total project costs include the following:

1. Construction Costs: Generally, construction cost includes a contractor's overhead and profit margin of 20 percent.

2. A project contingency of 10% for both design and construction of contingency is generally used.

3. Associated Project Cost: A cost factor of 25 percent is used to estimate costs to include design engineering, engineering construction services, legal and administrative services, and interest during construction.

6.7 Present Worth Analysis Method

The total present worth of an alternative is determined by summing the initial total project costs, present worth of the operation, maintenance and equipment replacement costs, then subtracting the present worth salvage value. The project period evaluated is 20 years and the interest rate utilized is 5.00 percent.

The present worth of the salvage value, which is tabulated for the Year 20 initially, is calculated by multiplying its value by 0.3769.

The present worth of the annual operation, maintenance and equipment replacement costs is calculated by multiplying its value by 12.462.

CHAPTER 7 – REGIONAL WASTEWATER COLLECTION AND TREATMENT ANALYSIS

7.1 General

The Cities of Augusta and Brooksville currently own and operate their own wastewater treatment plants. Homes and businesses in the rural part of the facilities planning area own and operate on-site systems, and a few package wastewater treatment plants. The industrial park on KY-9 owns and operates a small package wastewater treatment plant. The treatment plants in Augusta and Brooksville need to be replaced because of their age and condition. Instead of merely replacing these individual plants with new ones, it may be better to build one regional wastewater treatment plant. This chapter develops and compares separate treatment at the two cities versus two regionalization alternatives.

A common type of wastewater treatment plant plan was developed for all alternatives. The biological process chosen is the single stage activated sludge system with biological nitrogen removal. The common components include:

- Manual grit removal
- Mechanical screening
- Two activated sludge aeration tanks with an anoxic zone followed by a larger aerobic zone
- Two final clarifiers, each one sized to successfully process the peak flow rate
- Ultraviolet light disinfection
- Cascade effluent aeration
- Aerobic digester/sludge storage tank
- Contract removal and disposal of liquid digested sludge

The regionalization alternatives will be compared cost effectively, but on a unit flow basis. The three alternatives do not serve the same number of potential customers and are sized for three different flow rates. Therefore, to equitably compare the alternatives, the present worth value will be divided by the average design flow to produce the unit flow present worth value. The alternative with the lowest unit flow present worth value is considered to be the most cost effective.

7.2 No Action

This alternative would include the continued use of the existing wastewater treatment plants in Augusta and Brooksville, the various package plants including for the industrial park and rural on-site systems. The continued use of the existing treatment plants in Augusta and Brooksville is not feasible as these plants are not in good condition now and will further deteriorate with continued use. Because of their condition, they will not be able to continue to meet their effluent limits in a few years without increased maintenance and equipment replacement costs.

It is not necessary to connect the industrial park package wastewater treatment plant to a regional system at this time. The 5,000 gpd plant, already permitted, is not near capacity. However, it would be beneficial to have an option to connect to a regional system. This will make it more likely that industries would decide to locate at this industrial park, and would help Bracken County economically, which it needs.

There are failures of on-site treatment and disposal systems in the planning area. However, the homes are mostly next to ridge-top roads and not generally densely developed. The problems experienced appear to be localized. Although not a good situation, connecting these to a regional system is not considered necessary, but would be considered beneficial for public health and environmental quality.

In summary, the no-action alternative for the treatment plants in Augusta and Brooksville is not feasible. Improvements for rural on-site systems would be beneficial, but not necessary. Abandoning the package wastewater treatment plant at the industrial park and connecting the flow to the regional system would also be beneficial, but also not necessary at this time.

7.3 Alternative No. 1 – Separate Treatment

7.3.1 Augusta Wastewater Treatment Plant

The existing treatment plant is located on the north side of Berlin Pike on the south bank of the Ohio River, just west of Augusta. The elevation of this lot is about 12 feet below the 100-year flood elevation, although the plant is built so as to be protected from the 100-year flood. The lot is too small to both construct a new plant and keep the existing plant operational. Therefore, a new site is needed.

The site selected for the analysis is located just south of the railroad track and west of Ferry Street. It is located just behind the cemetery northeast of the water plant. Although the lot elevation is about the same as the existing lot, it is better protected from flood waters as it is behind the railroad embankment. The current lot is suffering from bank erosion and new site would not have this problem.

The existing wastewater treatment plant has a permitted capacity of 330,000 gpd. It does not use all of this permitted capacity and retains some capacity for growth. It is recommended that a new plant be constructed to conform to the existing permitted capacity. The design peak hourly flow rate is 695 gpm along with the previously described components, a new influent pump station, 8 inch diameter force main and 10 inch diameter outfall sewer would be constructed. The treatment plant is designed to comply with and consistently perform better than the existing KPDES permit limits. The estimate of costs for this new wastewater treatment plant is included in Table 7-1.

7.3.2 Brooksville Wastewater Treatment Plant

The existing wastewater treatment plant is located on the north side of Brooksville next to a small tributary to Locust Creek. This stream essentially starts at the wastewater treatment plant. There is room on this site to build a new wastewater treatment plant while keeping the existing plant in operation.

The existing wastewater treatment plant has a permitted capacity of 200,000 gpd. It does not use all of this permitted capacity and retains some capacity for growth. It is recommended that a new plant be constructed to conform to the existing permitted capacity. The treatment plant will comply with current permit limitations. The design peak hourly flow rate is 465 gpm. Along with the previously described components, a new influent pump station would be constructed. The estimate of costs for this new wastewater treatment plant is included in Table 7-1.

7.3.3 Ky 9 Area

This alternative does not provide capability to serve the industrial park on Route 9.

7.3.4 On-Site System Area

This alternative provides minimal ability to serve areas with on-lot systems. The only area that could be served is the area north of Brooksville along S.R. 1159, perhaps within a mile or two of town. This area

does have a concentration of residential development along the ridge top and there would be capacity at the treatment plant to serve it. The other homes north on KY-1159 and on KY-19 from Brooksville to Augusta would not be provided the opportunity for service with this alternative.

7.3.5 Cost Summary

2005!

Table 7-1 exhibits the estimate of costs. For Augusta, the estimated project cost is $2,890,000. The annual O&M&R cost for Augusta would increase from $128,000 per year to $165,200 per year. For Brooksville, the estimated project cost is $2,330,000. The annual O&M&R cost for Brooksville would increase from $120,000 per year to $156,300 per year. The O&M&R cost presented are for design flow.

TABLE 7-1

ALTERNATIVE NO. 1
SEPARATE TREATMENT
ESTIMATE OF COSTS

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Augusta Wastewater Treatment Plant (300,000 gpd)		
Site Work and Control Building	$530,000	$180,000
Influent Pump Station	260,000	80,000
Screening and Grit Removal	145,000	18,000
Activated Sludge Aeration Tank	420,000	130,000
Final Clarifiers/RAS Pump Station	360,000	88,000
Ultraviolet Light Disinfection/Effluent Aeration	125,000	13,000
Aerobic Digester and Sludge Storage Tank	190,000	54,000
Subtotal	$2,030,000	$563,000
Mobilization (3%)	60,000	
Contingencies (10%)	200,000	55,000
Total Estimated Construction Cost	$2,290,000	$618,000
Pump Station Property	5,000	5,000
WWTP Property	25,000	25,000
Project Related Costs (25%)	570,000	
Augusta Estimated Project Cost	$2,890,000	$648,000

Brooksville Wastewater Treatment Plant		
Site Work and Control Building	$355,000	$92,000
Influent Pump Station	110,000	18,000
Screening and Grit Removal	145,000	18,000
Activated Sludge Aeration Tank	395,000	132,000
Final Clarifiers/RAS Pump Station	340,000	74,000
Ultraviolet Light Disinfection/Effluent Aeration	115,000	13,000
Aerobic Digester and Sludge Storage Tank	190,000	51,000
Subtotal	$1,650,000	$398,000
Mobilization (3%)	50,000	
Contingencies (10%)	165,000	40,000
Total Estimated Construction Cost	$1,865,000	$438,000
Project Related Costs (25%)	465,000	
Brooksville Estimated Project Cost	$2,330,000	$438,000
Total Estimated Augusta and Brooksville Project Cost	$5,220,000	
Total Estimated Salvage Value		$1,086,000
Total Estimated Augusta and Brooksville Cost per Gallon per Day Capacity ($5,220,000/(530,000 gpd))	= $9.85/GPD	

Annual Operating, Maintenance and Equipment Replacement Costs

Augusta	
Existing Annual Expense Without Bond Retirement	$128,000 /yr.
Additional Labor	4,900
Additional Power	3,000
Additional Materials and Supplies	2,700
Equipment Replacement Fund	9,800
Sludge Disposal (4¢/gallon)	16,800
Augusta Estimated Annual O&M&R	$165,200 /yr.

Brooksville	
Existing Annual Expense Without Bond Retirement	$120,000 /yr.
Additional Labor	4,900
Additional Power	2,600
Additional Materials & Supplies	2,500
Equipment Replacement Fund	9,500
Sludge Disposal (4¢/gallon)	16,800
Brooksville Estimated Annual O&M&R	$156,300 /yr.
Total for Both Communities	$321,500 /yr.

7.4 Alternative No. 2 – Regional Treatment at an Augusta Wastewater Treatment Plant

7.4.1 Augusta Wastewater Treatment Plant

The treatment plant would be located as in Alternative No. 1. The plant would be sized to treat a wastewater flow of 690,000 gpd, which includes 330,000 gpd for Augusta, 200,000 gpd for Brooksville and 160,000 gpd for rural areas, including the industrial park. The outfall sewer to the Ohio River would be 15 inches in diameter.

7.4.2 Brooksville-Augusta Force Main

Exhibit 7-1 shows this alternative schematically. A new pump station would be constructed at the Brooksville WWTP site to start the transport of wastewater to Augusta. An 8 inch diameter force main would be laid north next to KY-19. Just south of Chatham, an intermediate pump station would be constructed to further push the wastewater up the hill. At KY-9, the force main would be enlarged to 10 inches in diameter so flow from the industrial park could be added to it. The force main would follow Little Turtle Creek Road to the new regional Augusta WWTP as this is a more direct and, therefore, less costly route.

Homes along KY-19 could be served by the new force main. However, since the force main is pressurized flow, the method of connecting to the force main must be considered on a case by case basis. To get flow from individual or small groups of homes into the force main, a pump for these homes would have to overcome the pressure present in the force main at that particular location.

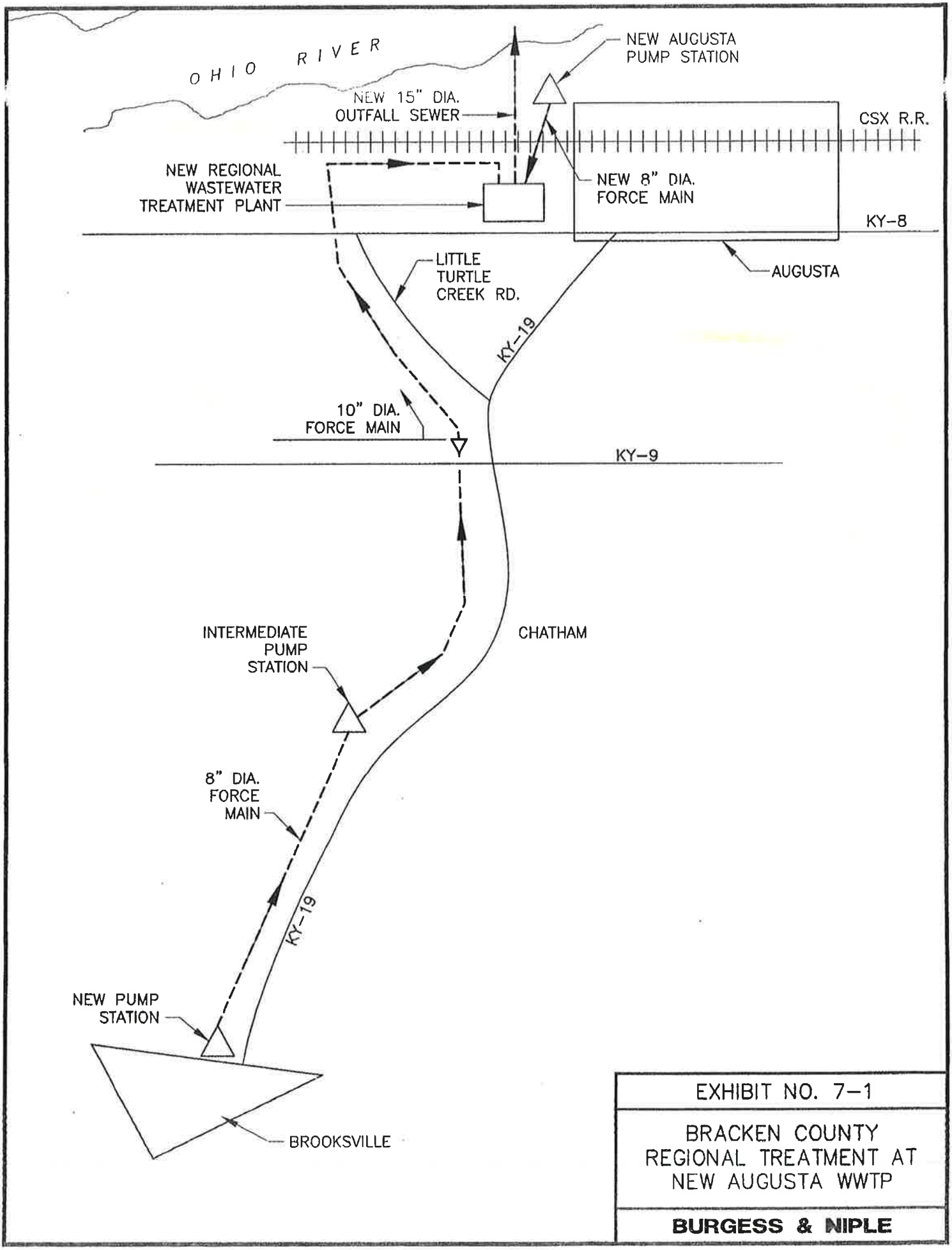


EXHIBIT NO. 7-1

BRACKEN COUNTY REGIONAL TREATMENT AT NEW AUGUSTA WWTP

BURGESS & NIPLE

7.4.3 KY-9 Area

This alternative does not include any pump station and force main to serve the industrial park. It is not justified at this time due to current low flows at the park. Also, it should be otherwise funded, since the purpose of such a pump station and force main would be job creation. If a residential development were proposed, it would be expected that the developer would contribute to, or even construct this pump station and force main.

7.4.4 Cost Summary

Table 7-2 exhibits the estimate of costs. The estimated total project cost is $7,800,000. The estimated design flow annual O&M&R cost is $303,100 per year, as compared to the current sum of $248,000 for both communities. Since new customers could be added to the system, this cost could be spread further so as to lessen the impact to existing customers. Of course, to implement this system, a regional type sewer district would have to be established.

TABLE 7-2

ALTERNATIVE NO. 2
REGIONAL TREATMENT AT AN AUGUSTA
WASTEWATER TREATMENT PLANT
ESTIMATE OF COSTS

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Brooksville to Augusta Pump Stations and Force Main		
Force Main	$2,090,000	$1,110,000
Brooksville Pump Station	225,000	19,000
Intermediate Pump Station	180,000	19,000
Subtotal	$2,495,000	$1,148,000
Mobilization (3%)	75,000	
Contingencies (10%)	250,000	115,000
Total Estimated Construction Cost	$2,820,000	$1,263,000

Pump Station Property	5,000	5,000
Temporary Easements	60,000	
Permanent Easements	120,000	
Project Related Costs (25%)	705,000	
Estimated Project Cost	$3,710,000	$1,268,000
Augusta Regional Wastewater Treatment Plant (650,000 GPD)		
Site Work and Control Building	$800,000	$300,000
Influent Pump Station	260,000	80,000
Screening and Grit Removal	155,000	19,000
Activated Sludge Aeration Tank	700,000	225,000
Final Clarifiers/RAS Pump Station	480,000	130,000
Ultraviolet Light Disinfection/Effluent Aeration	175,000	17,000
Aerobic Digester and Sludge Storage Tank	305,000	92,000
Subtotal	$2,875,000	$863,000
Mobilization (3%)	85,000	
Contingencies (10%)	290,000	85,000
Total Estimated Construction Cost	$3,250,000	$948,000
Pump Station Property	5,000	5,000
WWTP Property	25,000	25,000
Project Related Costs (25%)	810,000	
Estimated Project Cost	$4,090,000	$978,000
Total Estimated Project Cost	$7,800,000	
Total Estimated Salvage Value		$2,246,000
Total Estimated Project Cost per Gallon per Day Capacity ($7,800,000/(690,000 gpd))	= $11.30/GPD	

Annual Operating, Maintenance and Equipment Replacement Costs

Existing Augusta System Cost	$128,000 /yr.
Reduce Brooksville Cost to Collection System Only	30,000 /yr.
Pump Stations – Force Main Costs	
Labor	9,400
Power	28,000
Materials and Supplies	4,500
Equipment Replacement Fund	7,000

Augusta Regional WWTP Cost	
Additional Labor	8,600
Additional Power	24,000
Additional Materials & Supplies	4,600
Equipment Replacement Fund	14,000
Sludge Disposal (4¢/gallon)	45,000
Total Estimated Annual O&M&R	$303,100 /yr.

7.5 Alternative No. 3 – Regional Treatment at a Wellsburg Wastewater Treatment Plant

The concept of this alternative is to allow for the construction of a force main north of Brooksville along KY-1159 to Wellsburg, to allow for the collection of wastewater from residences along that road.

7.5.1 Wellsburg Wastewater Treatment Plant

The treatment plant would be located east of Wellsburg. The plant site in this location, still below the 100-year flood elevation, is at a slightly higher elevation than the site west of Augusta. The plant would be sized to treat a wastewater flow of 595,000 gpd, which includes 330,000 gpd for Augusta, 200,000 gpd for Brooksville and 65,000 gpd for rural areas. The industrial park, being too distant from the proposed force main, is not included.

7.5.2 Force Mains

Exhibit 7-2 shows this alternative schematically. Four pump stations would be needed to transport wastewater from Brooksville to Wellsburg. One, at the old wastewater treatment plant, one up the hill and in the City limits to overcome the change in elevation, one at KY-9 and KY-1159 intersection to push the wastewater over the hill south of Wellsburg and one at Wellsburg to transport the wastewater to the plant. A section of gravity sewer is included at KY-9 and KY-1159, so a small amount of commercial growth could be supported.

Homes along KY-1159 could be served by the new force main, but on a case by case basis as described for Alternative No. 2. There are more homes along KY-1159 near Brooksville. There is good potential to serve these with this alternative as these homes are close to town and are clustered closer together here as compared to other parts of the planning area.

One pump station in Augusta would be adequate to transport the wastewater from Augusta to Wellsburg. There are few homes along this route. Construction would be difficult as Ky 8 is cut into a steep hillside on the south bank of the Ohio River.

7.5.3 KY-9 Area

This alternative does not provide the opportunity of service to the industrial park. It does provide service at the KY-9 and KY-1159 intersection. This could support a small amount of commercial growth.

7.5.4 Cost Summary

Table 7-3 exhibits the estimate of costs. The estimated total project cost is $9,630,000. The estimated annual O&M&R cost is $279,600 per year, as compared to the current sum of $248,000 for both communities. Since new customers could be added to the system, this cost could be spread further so as to lessen the impact to existing customers. Of course, to implement this system, a regional type sewer district would have to be established.

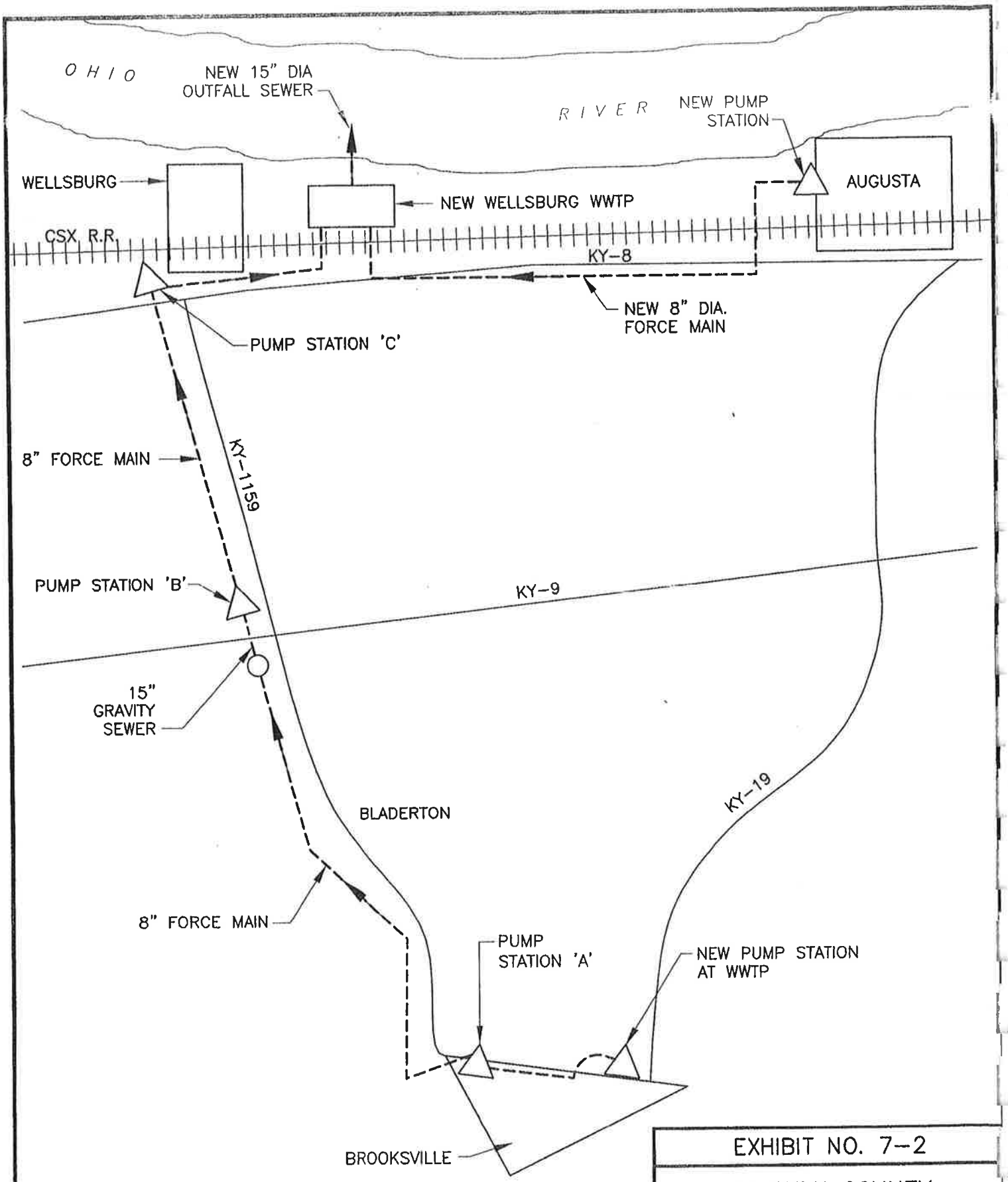


EXHIBIT NO. 7-2

BRACKEN COUNTY
REGIONAL TREATMENT AT
NEW WELLSBURG WWTP

BURGESS & NIPLE

TABLE 7-3

ALTERNATIVE NO. 3
REGIONAL TREATMENT AT WELLSBURG
WASTEWATER TREATMENT PLANT
ESTIMATE OF COSTS

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Pump Stations and Force Mains		
Brooksville Force Main	$2,040,000	$1,115,000
Pump Stations (4)	675,000	75,000
Augusta Force Main	1,350,000	750,000
Pump Station (1)	300,000	80,000
Subtotal	$4,365,000	$2,020,000
Mobilization (3%)	130,000	
Contingencies (10%)	435,000	202,000
Total Estimated Construction Cost	$4,930,000	$2,222,000
Temporary Easements	70,000	
Permanent Easements	240,000	
Pump Station Properties	25,000	25,000
Project Related Costs	1,230,000	
Total Estimated Project Cost	$6,495,000	$2,247,000
Wellsburg Regional Wastewater Treatment Plant (595,000 gpd)		
Site Work and Control Building	$590,000	$185,000
Screening and Grit Removal	145,000	18,000
Activated Sludge Aeration Tank	595,000	195,000
Final Clarifiers/RAS Pump Station	445,000	115,000
Ultraviolet Light Disinfection/Effluent Aeration	155,000	15,000
Aerobic Digester and Sludge Storage Tank	270,000	78,000
Subtotal	$2,200,000	$606,000
Mobilization (3%)	65,000	
Contingencies (10%)	220,000	59,000
Total Estimated Construction Cost	$2,485,000	$665,000

WWTP Property	$25,000	$25,000
Temporary Easements	2,500	
Permanent Easements	2,500	
Project Related Costs (25%)	620,000	
Total Estimated Project Cost	$3,135,000	$690,000
Total Estimated Project Cost	$9,630,000	
Total Estimated Salvage Value		$2,937,000
Total Estimated Project Cost per Gallon per Day Capacity ($9,630,000/(595,000 gpd))	= $16.18/GPD	

Annual Operating, Maintenance and Equipment Replacement Costs

Reduce Augusta Cost to Collection System Only	$40,000 /yr.
Reduce Brooksville Cost to Collection System Only	30,000 /yr.
Pump Stations – Force Main Costs	
Labor	18,600
Power	51,300
Materials and Supplies	7,500
Equipment Replacement Fund	12,400
Wellsburg Regional WWTP Cost	
Labor	28,400
Power	26,000
Materials & Supplies	9,500
Equipment Replacement Fund	17,900
Sludge Disposal (4¢/gallon)	38,000
Total Estimated Annual O&M&R	$279,600 /yr.

7.6 Economic Analysis

Table 7-4 shows the cost effective analysis of the three alternatives. Alternative No. 2, Regional Treatment at Augusta, is cost effective. Alternative No. 1, Separate Treatment (at Augusta and Brooksville) is 6.6% more expensive. It could be recommended if it were decided to be superior in a non-monetary way as compared to Alternative No. 2. Alternative No. 3, Regional Treatment at Wellsburg, is 29% more expensive. This is significant, and this alternative will not be further considered.

TABLE 7-4

ECONOMIC ANALYSIS AND COMPARISON
OF REGIONAL WASTEWATER COLLECTION AND TREATMENT ALTERNATIVES

Cost Item	Factor	Alternative No. 1 Separate Treatment	Alternative No. 2 Regional Treatment at Augusta	Alternative No. 3 Regional Treatment at Wellsburg
A. Total Project Cost	A	$5,220,000	$7,800,000	$9,630,000
B. Operation, Maintenance and Replacement Costs (Present Worth)	12.462	4,006,533	3,777,232	3,484,375
C. Salvage Value (Present Worth)	0.3769	(409,313)	(846,517)	(1,106,955)
D. TOTAL PRESENT WORTH	A + B – C	$8,817,220	$10,730,715	$12,007,420
E. Design Capacity (gpd)		530,000	690,000	595,000
F. Unit Flow Present Worth ($ per GPD)	(D ÷ E)	$16.64	$15.55	$20.18
G. Relative Percent Cost of Least Cost Alternative		+7.0%	Least Cost	+30%

7.7 Non-Monetary Effectiveness Criteria Comparison

7.7.1 Implementation

Alternative No. 1, Separate Treatment, is more easily implemented because no new legal entity needs to be established. Alternative No. 2 would require the formation of a sanitary sewer district of one form or another. However, because the treatment plants are currently in compliance, there is time to do this. Also, a required sewer district will be much more capable of solving the rural wastewater treatment and disposal problems than separate treatment.

7.7.2 Environmental Impact

Alternative No. 2, Regional Treatment at Augusta, is clearly the better environmental solution. It will remove treated wastewater from the small tributary to Locust Creek and Locust Creek. These streams have very low, low flow, and little to no pollutant assimilative capacity. This would be a most positive environmental impact. This alternative also provides the ability to correct on-lot sewage disposal problems by connecting homes along KY-19 to the regional system. The package plant discharge to a small tributary to Bracken Creek could also be eliminated in the future.

The construction of the new force main along KY-19 and Little Turtle Creek Road does have a modest environmental impact due to construction activities. However, this impact should be minimal as the line will follow existing roadways, and, therefore, impact previously disturbed land. Mitigative measures for erosion control will also take place.

7.7.3 Engineering Evaluation

Alternative No. 2, Regional Plant at Augusta, is superior. It removes the duplication of effort in treating wastewater at one plant instead of two. The complexity of the one plant is no different than each of the two plants. Also, this one plant located in Augusta, and discharging to the very large Ohio River, best protects surface water quality, which is the purpose of the project.

7.7.4 Public Support

The level of public support will be made known with the public hearing process.

7.7.5 Regionalization

Alternative No. 2, Regional Plant in Augusta, is a regional alternative whereas Alternative No. 1, Separate Treatment, is not. Therefore, Alternative No. 2 is preferable with respect to this criteria. Additionally, the Kentucky Natural Resources and Environmental Protection Agency, Division of Water, is strongly urging regionalization wherever it is feasible.

7.8 Recommendation

Alternative No. 2, Regional Plant at Augusta, is cost effective. The brief discussion of nonmonetary effectiveness criteria shows that Alternative No. 2 is superior with respect to these. Therefore, Alternative No. 2, Regional Plant at Augusta, is recommended.

Only one type of treatment plant was considered in this regionalization analysis, yet there are a number of treatment plant types that can be considered. These will be developed, compared and the best one recommended in Chapter 8.

CHAPTER 8 – WASTEWATER TREATMENT PLANT ALTERNATIVES

8.1 General

Chapter 7 established the best regional wastewater collection, transport and treatment alternative. The best solution is to build a new regional wastewater treatment plant near Augusta. It would serve Augusta, Brooksville, homes along Ky 19 from Brooksville to Augusta and also Ky 9 in the eastern part of the study area. This chapter will determine the best type of wastewater treatment plant to construct.

8.2 Selection of Feasible Alternatives to Consider

There are three generic types of treatment plants that could be considered for the new plant. These include lagoon based treatment plants, fixed film type biological treatment plants and activated sludge type treatment plants.

Lagoon type treatment plants can either be the aerated type or the non-aerated type. The aerated type would have to be large enough for a wastewater detention time of 30 days, whereas an unaerated type could have to be as large as needed for a wastewater detention time of 180 days. An aerated lagoon could be constructed at a sidewater depth of about 12 feet and would require about 10 to 15 acres to construct. Although the land exists west of Augusta, it would be very expensive to build as the land has an elevation about 15 feet below the 100-year flood elevation. For an unaerated lagoon, about 80 to 90 acres of land would be required. This amount of flat land does not exist in this location. All land located south of the valley bottomland is too hilly. Therefore, because of these considerations, a lagoon type wastewater treatment plant is not feasible for the Augusta Regional Wastewater Treatment plant.

Fixed film type biological treatment systems include trickling filters and rotating biological contactors (RBCs). These types of plants do not use much land area. They do have several drawbacks. Trickling filters and RBCs are less capable of treating wastewater to as high a degree of purification as compared to an activated sludge plant. They are not capable of biological nutrient removal to the degree and efficiency that an activated sludge plant is able to do. Also, a conventional type trickling filter plant and RBC plant use shallow tanks, and to protect these types of plants from a 100-year flood would require a lot of fill. This increases construction cost. In addition to this, RBC plants have had a bad track record, and this is a concern. For these reasons, fixed film biological treatment plants will not be further considered.

An activated sludge plant supports an active biomass held in suspension in the wastewater. This process is less temperature sensitive, with respect to treatment, as compared to a trickling filter process. Since the biomass is held in suspension, it is better able to adsorb pollutants and to stabilize them. Also, the process can be easily modified for enhanced nitrogen and phosphorous removal. There are a number of types of activated sludge plants that can be constructed. These include:

- Activated sludge plants preceded by primary treatment
- Metal type package activated sludge plants
- Single stage activated sludge plant
- Single stage activated sludge plants with biological nitrogen removal
- Single stage activated sludge plants with biological nitrogen and phosphorous removal
- Sequencing batch reactors
- Poured in place activated sludge plant equipped with package equipment
- Oxidation ditch type plant

These plants will be considered individually.

The activated sludge plant preceded by primary treatment is a cost effective method for large treatment plants and uses a lower amount of energy to treat the wastewater. However, this kind of plant is inappropriate for this plant because it is overly complex, requires too much manpower to operate and has a larger potential to produce odor. Therefore, it will not be further considered.

The metal type package activated sludge plant is the type of treatment plant the two cities have now. This type of plant is compact, but has a shorter design life as metal deteriorates more quickly than reinforced concrete. Also, being self contained with individual clarifiers dedicated to individual aeration tanks, makes this system less flexible. When either an aeration tank or a clarifier is shut down for maintenance, its corresponding clarifier and aeration tank, respectively, must also be taken out of service. The basic deficiency of this type of plant, however, is its lower expected lifespan, and it therefore will not be further considered.

The single stage activated sludge plant is often called an extended aeration plant and is often designed as a package plant. This type of plant typically uses blowers and submerged diffusers to supply oxygen to the biomass. This plant typically is designed as a plug flow reactor. This type of plant is feasible, but is now outdated by the following type of plant. Relatively speaking, it has higher energy consumption,

lower enhanced biological nutrient removal capability and more operating problems. For these reasons, it will not be further considered.

The single stage activated sludge plant with biological nitrogen removal is an improvement to the single stage activated sludge plant. It incorporates an unaerated anoxic zone prior to the aeration tank. It does have more equipment, but the total installed horsepower is usually less. This type of plant also relies upon diffused aeration in the aeration zone, and also uses a submersible mixer in the anoxic (unaerated) zone and a submersible pump to return mixed liquor from the end of the aeration tank to the anoxic zone. The tanks can be constructed with a deeper water depth, which saves construction cost in the floodplain as less fill, if any, is needed. This process has the advantages of lower energy consumption, removal of about 80% of the nitrogen in the wastewater, and better performance due to the improved condition of the biomass. It will be further considered.

The single stage activated sludge plant with enhanced biological nitrogen and phosphorous removal is even more capable than the previous plant. However, it is significantly more complicated to design, construct and to operate, as five sequential compartments are often used. Each compartment requires a different operational control strategy. Therefore, due to complexity and because it is not needed for permit compliance, it will not be further considered.

A sequencing batch reactor system uses at least two fill and draw reactors. Three should be provided for full standby capability. This system is very capable and can be set up to remove nitrogen and phosphorous biologically. This process requires automatic operation of motorized valves, gates and motors. This has been made possible due to modern electronic technology such as programmable logic controllers (PLCs). The system batch speed must be ramped up and down to match influent diurnal flow variation and storm flow conditions. The system works well when infiltration/inflow rates are not high. This is not the case for Augusta and Brooksville. Also, if the system controller malfunctions, such as may occur from a nearby lightning strike, the plant would have to be manually operated 24/7 until it was repaired. Therefore, for these reasons, it will not be further considered.

A poured in place activated sludge plant with package equipment is advantageous in that a longer lasting concrete structure is used, and a single source of equipment supply is obtained. Process design and enhancement is also obtained from the manufacturer. The system anticipated also has nitrogen removal capability incorporated within it. It also is provided a relatively deep basin, making it an economical structure to construct in the floodplain. It will be further considered.

An oxidation ditch activated sludge plant uses a race track design with surface aerators to both mix and aerate the tank contents. The rotors consist of many blades attached to a horizontal shaft. This system is simple to operate, handles peak loads well and can be operated to obtain some biological nitrogen removal. For a plant of this size, its water depth is less than what other activated sludge alternatives would have. Therefore, the plant will have to be built on fill. Nonetheless, due to its simplicity and effectiveness, it will be further considered.

In summary, the following alternatives will be developed and further considered:

- Single stage activated sludge plant with biological nitrogen removal
- Poured in place activated sludge plant with package equipment
- Oxidation ditches

8.3 Regional Wastewater Treatment Plant Alternatives

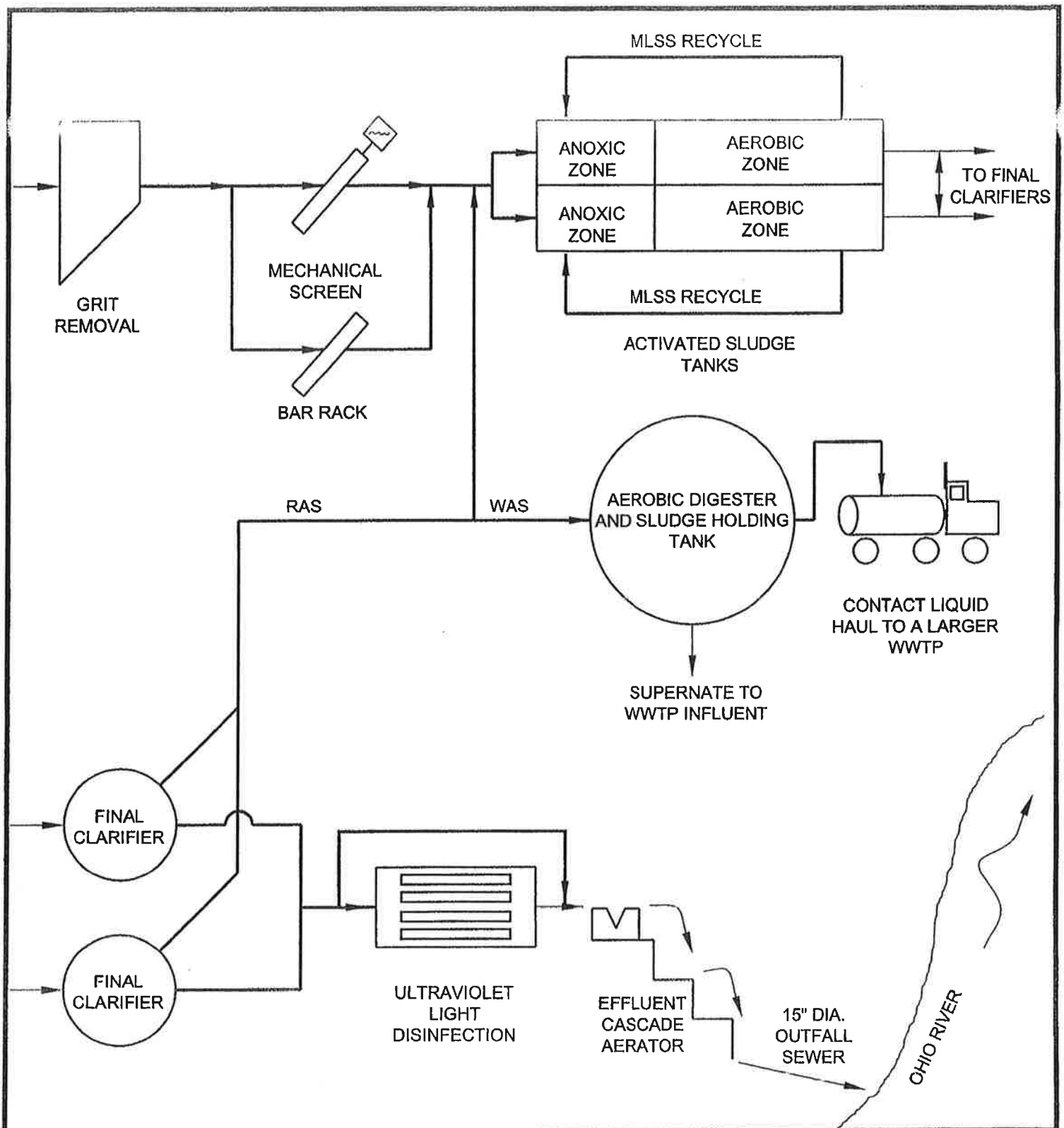
8.3.1 Single Stage Activated Sludge Plant with Biological Nitrogen Removal

Exhibit 8-1 shows the schematic of this alternative. This alternative includes the following features:

- New influent pump station for Augusta
- Gravity grit removal
- Mechanical screen with standby bar rack
- Two aeration tanks, each with an anoxic zone and an aerobic zone.
  Features include:
  - Anoxic zones with a 4-hour nominal detention time
  - Aerobic zones with a 19 hour nominal detention time
  - Two 880 gpm MLSS pumps
  - Two 450 scfm, 25 horsepower blowers
- Two 55 foot diameter final clarifiers
- Three 340 gpm RAS/WAS pumps
- Ultraviolet light disinfection
- Cascade aerator
- 195,000 gallon aerobic digester/sludge holding tank

- Tanker truck loading pad
- Control building on top of the aeration tank structure

Table 8-1 exhibits the construction, project and annual O&M&R costs.



NOTE:
ALL ITEMS SHOWN ARE PROPOSED.

EXHIBIT NO. 8-1

BRACKEN COUNTY
REGIONAL WWTP
FLOW SCHEMATIC
SINGLE STAGE ACTIVATED SLUDGE PLANT
WITH BIOLOGICAL NITROGEN REMOVAL

BURGESS & NIPLE

TABLE 8-1

ALTERNATIVE NO. 1
SINGLE STAGE ACTIVATED SLUDGE PLANT
WITH BIOLOGICAL NITROGEN REMOVAL

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Site Work and Control Building	$800,000	$300,000
Influent Pump Station	260,000	80,000
Screening and Grit Removal	155,000	19,000
Activated Sludge Aeration Tank	700,000	225,000
Final Clarifiers/RAS Pump Station	480,000	130,000
Ultraviolet Light Disinfection/Effluent Aeration	175,000	17,000
Aerobic Digestion/Sludge Storage Tank	305,000	92,000
Subtotal	$2,875,000	$863,000
Mobilization (3%)	85,000	
Contingencies (10%)	290,000	85,000
Total Estimated Construction Cost	$3,250,000	$948,000
Pump Station Property	5,000	5,000
WWTP Property	25,000	25,000
Project Related Costs (25%)	810,000	
Estimated Project Cost	$4,090,000	$978,000

Annual Operating, Maintenance and Equipment Replacement Costs

Additional Labor	$8,600 /yr
Additional Power	24,000
Additional Materials & Supplies	4,600
Equipment Replacement Fund	14,000
Sludge Disposal	45,000
Total Estimated Annual O&M&R	$96,200

8.3.2 Poured in Place Activated Sludge Plant Equipped with Package Equipment

This treatment plant has all of the unit processes in or attached to one structure. The activated sludge, final clarifiers, activated sludge pumping and aerobic digester equipment would come from one manufacturer. The activated sludge system first includes a selector tank, to condition the sludge for better settling. The first stage aeration tank accomplishes most of the organic pollutant removal and nitrification. The second stage aeration tanks' air supply is on and off 50% of the time to accomplish denitrification. The final clarifiers are package units with an outlet orifice design to accomplish modest flow equalization. Materials used in the equipment are selected for long life. This alternative is shown schematically in Exhibit 8-2. This alternative includes the following features:

- New influent pump station for Augusta
- Gravity grit removal
- Mechanical screen with standby bar rack
- One 38,000 gallon aerated selector tank
- Two 138,000 gallon aerated first stage aeration tanks
- Two 134,000 gallon on/off aerated second stage aeration tanks
- Four 720 square feet final clarifier tanks, each with two package type clarifier units with sludge removal and pumping
- Ultraviolet light disinfection
- Cascade aerator
- Two 97,000 gallon aerobic digestor/sludge holding tanks
- Tanker truck loading pad
- Control building built on top of the aeration tank.

Table 8-2 exhibits the construction, project and annual O&M&R costs.

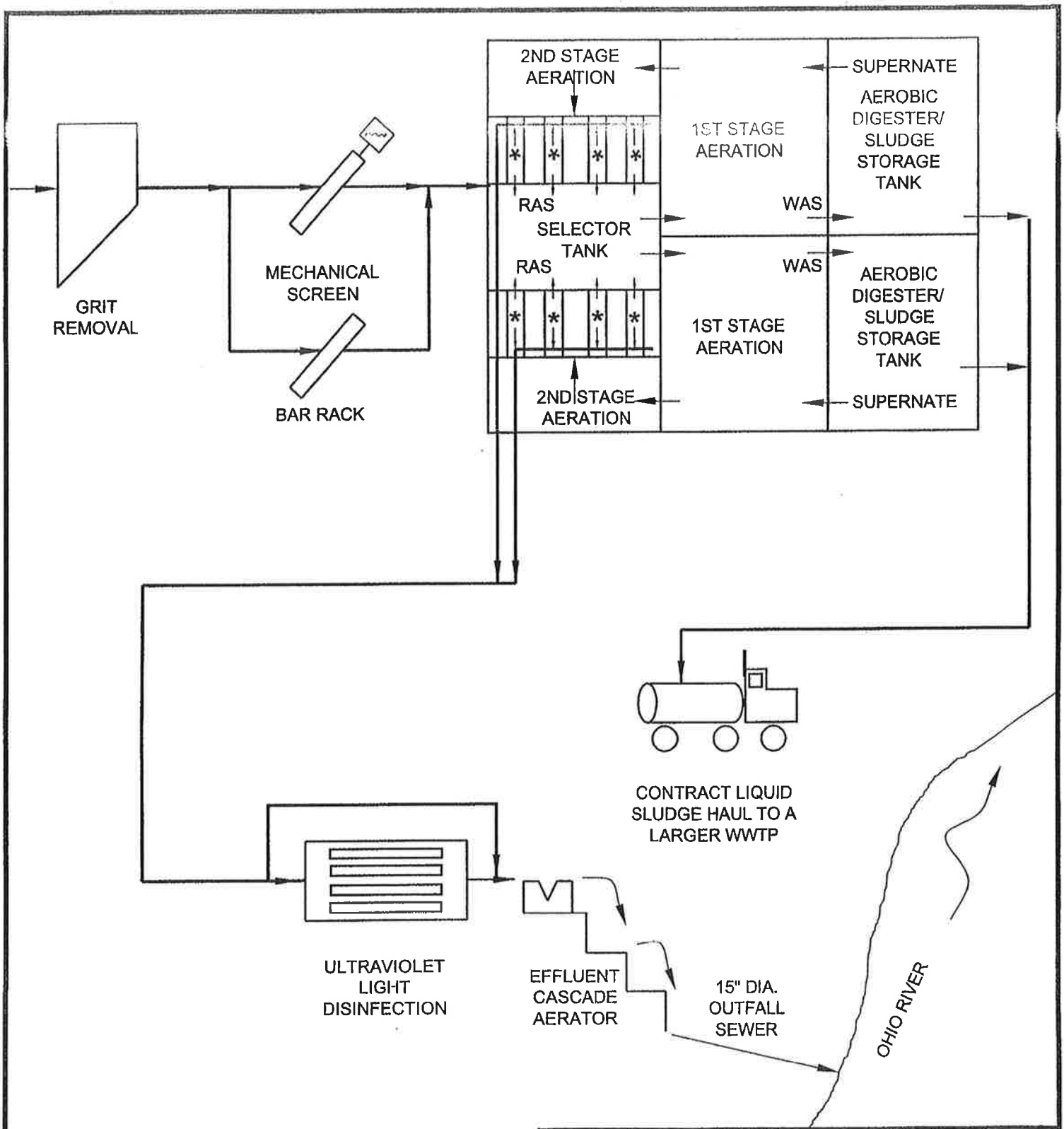


EXHIBIT NO. 8-2

BRACKEN COUNTY
REGIONAL WWTP
FLOW SCHEMATIC
POURED IN PLACE ACTIVATED SLUDGE
PLANT EQUIPPED WITH PACKAGE
EQUIPMENT

BURGESS & NIPLE

NOTE:
ALL ITEMS SHOWN ARE PROPOSED.

* PACKAGE CLARIFIER UNITS (8)

TABLE 8-2

ALTERNATIVE NO. 2
POURED IN PLACE ACTIVATED SLUDGE PLANT
WITH PACKAGE EQUIPMENT

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Site Work and Control Building	$760,000	$290,000
Influent Pump Station	260,000	80,000
Screening and Grit Removal	155,000	19,000
Unit Clarifier Package Activated Sludge Plant	1,945,000	345,000
Ultraviolet Light Disinfection/Effluent Aeration	175,000	15,000
Subtotal	$3,295,000	$749,000
Mobilization (3%)	100,000	
Contingencies (10%)	330,000	76,000
Total Estimated Construction Cost	$3,725,000	$825,000
Pump Station Property	5,000	5,000
WWTP Property	25,000	25,000
Project Related Costs (25%)	930,000	
Estimated Project Cost	$4,685,000	$855,000

Annual Operating, Maintenance and Equipment Replacement Costs

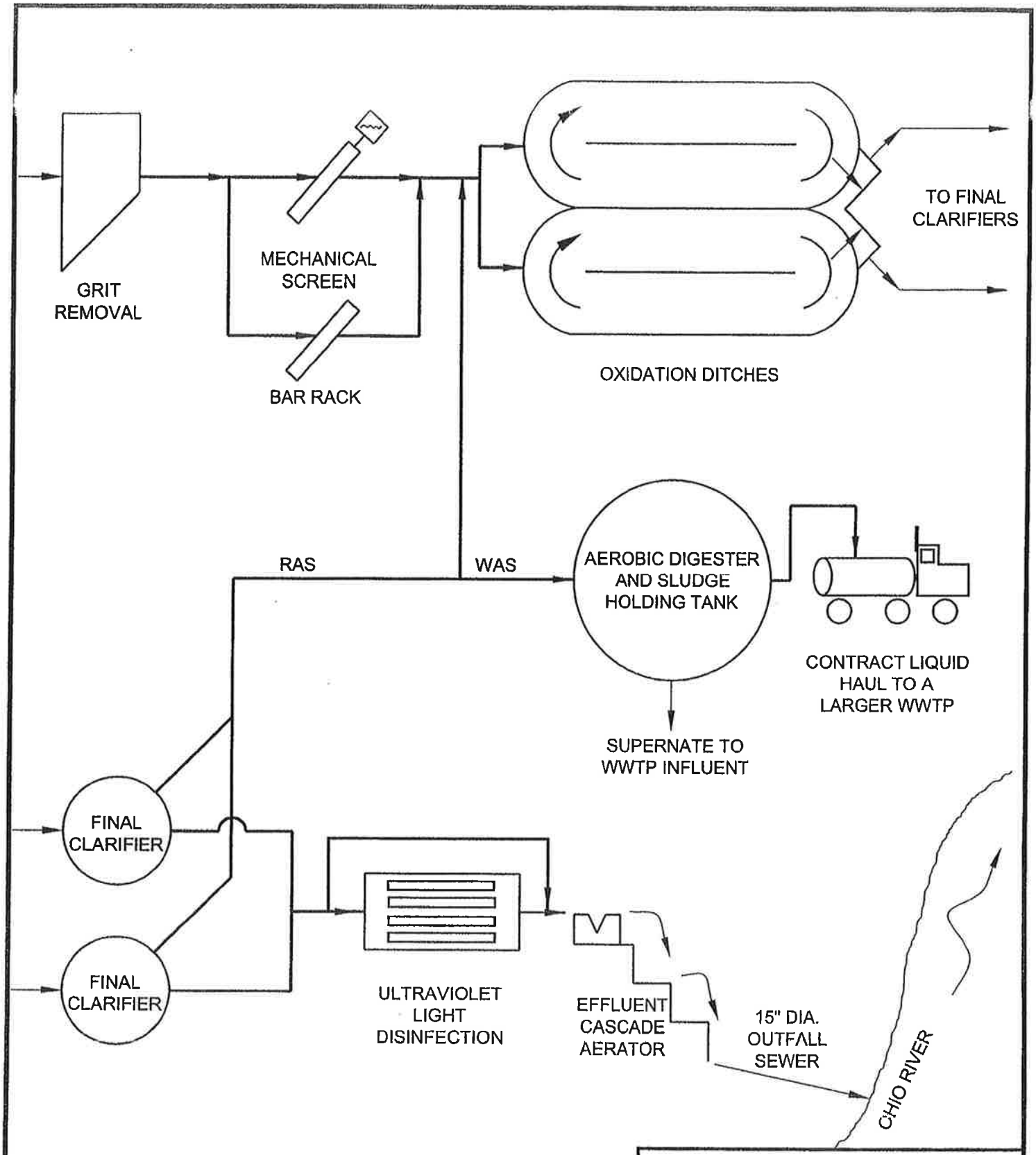
Additional Labor	$7,200 /yr
Additional Power	22,000
Additional Materials & Supplies	3,200
Equipment Replacement Fund	9,000
Sludge Disposal	45,000
Total Estimated Annual O&M&R	$86,400

8.3.3 Oxidation Ditch Activated Sludge Plant

This alternative is similar to Alternative No. 1, except that the biological reactors are oxidation ditches, instead of single stage aeration. Exhibit 8-3 shows the schematic of this alternative. This alternative includes the following features:

- New influent pump station for Augusta
- Gravity Grit Removal
- Mechanical screen with standby bar rack
- Two 325,000 gallon oxidation ditches, with a 9 foot sidewater depth.
- Each ditch would have two 40 horsepower rotor aerators
- Two 55 foot diameter final clarifiers
- Three 340 gpm RAS/WAS pumps
- Ultraviolet light disinfection
- Cascade Aerator
- 195,000 gallon aerobic digester/sludge holding tank
- Tanker truck loading pad
- Control building constructed at grade

Table 8-3 exhibits the construction and annual O&M&R costs.



NOTE:
ALL ITEMS SHOWN ARE PROPOSED.

EXHIBIT NO. 8-3

BRACKEN COUNTY
REGIONAL WWTP
FLOW SCHEMATIC
OXIDATION DITCHES PLANT

BURGESS & NIPLE

TABLE 8-3

ALTERNATIVE NO. 3

OXIDATION DITCH ACTIVATED SLUDGE TREATMENT PLANT

Construction and Project Costs

Item	Estimated Construction Cost	Year 20 Salvage Value
Site Work and Control Building	$835,000	$320,000
Influent Pump Station	260,000	80,000
Screening and Grit Removal	160,000	21,000
Oxidation Ditches	810,000	210,000
Final Clarifiers/RAS Pump Station	480,000	130,000
Ultraviolet Light Disinfection/Effluent Aeration	175,000	17,000
Aerobic Digestion/Sludge Storage Tank	305,000	92,000
Subtotal	$3,025,000	$870,000
Mobilization (3%)	90,000	
Contingencies (10%)	305,000	85,000
Total Estimated Construction Cost	$3,420,000	$955,000
Pump Station Property	5,000	5,000
WWTP Property	40,000	40,000
Project Related Costs (25%)	855,000	
Estimated Project Cost	$4,320,000	$1,000,000

Annual Operating, Maintenance and Equipment Replacement Costs

Additional Labor	$8,000 /yr
Additional Power	38,000
Additional Materials & Supplies	4,300
Equipment Replacement Fund	17,000
Sludge Disposal	45,000
Total Estimated Annual O&M&R	$112,300

8.4 Economic Analysis

Table 8-4 shows the cost effective analysis of the three alternatives. Alternative No. 1, the Single Stage Activated Sludge Plant is cost effective. The other two alternatives, being 10.6% and 8.6 % more costly, could be selected if found superior in a non-monetary way, as compared to Alternative No. 1.

TABLE 8-4

ECONOMIC ANALYSIS AND COMPARISON
OF THE AUGUSTA REGIONAL WASTEWATER TREATMENT PLANT ALTERNATIVES

Cost Item	Factor	Alternative No. 1 Single Stage Activated Sludge Plant with Biological Nitrogen Removal	Alternative No. 2 Poured-in-Place Activated Sludge Plant Equipped with Package Equipment	Alternative No. 3 Oxidation Ditches
A. Total Project Cost	A	$4,090,000	$4,685,000	$4,320,000
B. Operation, Maintenance and Replacement Costs (Present Worth)	12.462	1,198,844	1,076,717	1,399,483
C. Salvage Value (Present Worth)	0.3769	(368,608)	(322,250)	(376,900)
D. TOTAL PRESENT WORTH	A + B – C	$4,920,236	$5,439,467	$5,342,583
G. Relative Percent Cost of Least Cost Alternative		Least Cost	+10.6%	+8.6%

8.5 Non-Monetary Effectiveness Criteria Comparison

8.5.1 Implementation

All alternatives require the purchase of new property and construction of connecting lines and an outfall sewer. Alternative No. 3, Oxidation Ditches, may be slightly less implementable because it requires a little more land than the other two alternatives.

8.5.2 Environmental Impact

All three alternatives provide a good degree of protection to the environment as they all three produce a high quality effluent. Alternatives 1 and 2 offer more nutrient removal capability as compared to Alternative No. 3, and would have a slightly better environmental impact. The impact is considered 'slight' because the new plant's flow is insignificant as compared to the flow in the Ohio River, the receiving stream.

Alternatives 1 and 2 are also superior in that they would use less electrical energy than Alternative No. 3. Production of electrical energy in this area is mostly by coal-fired power plants, and using less energy reduces the environmental impact of operating coal-fired power plants.

8.5.3 Engineering Evaluation

The simplest system to operate would be Alternative No. 3 –Oxidation Ditches. The biological reactor is simpler and takes less operational skill to control. At the same time, though, it is not as capable in nutrient control as the other two alternatives. The equipment for Alternative No. 3 is reliable.

Alternatives Nos. 1 and 2 have more reactor compartments and equipment than Alternative No. 3. Each reactor compartment has a different purpose which the operator must recognize and then ensure that these conditions are present in each compartment. This level of operational skill can be readily obtained with training of personnel during start-up. For example, the small community of Aberdeen, Ohio, located just upstream on the Ohio River, owns and operates Alternative No. 2, Poured-in-Place Activated Sludge Plant with Package Equipment, successfully.

The alternatives are considered equal on an engineering evaluation basis. The more capable systems require more operator skill and the slightly less capable alternative (only on a nutrient removal basis) takes less operator skill. All alternatives are reliable and would provide long-term service.

8.5.4 Public Support

There likely would not be any difference in public support in any of the three alternatives from the viewpoint of their appearance or impact to the area. The public would likely support the alternative (or oppose less) that would have the smallest impact to their monthly sewer bill. Alternative No. 1, the Single Stage Activated Sludge Plant with Biological Nitrogen Removal, being cost effective, would probably have more public support than the other alternatives.

8.6 Recommendation

Alternative No. 1, the Single Stage Activated Sludge Plant with Biological Nitrogen Removal is cost effective. There are no over-riding non-monetary considerations that would place any one of the other two alternatives before this alternative. Therefore, Alternative No. 1, the Single Stage Activated Sludge Plant with Biological Nitrogen Removal is recommended.

CHAPTER 9 – FUTURE CAPITAL IMPROVEMENTS

The Division of Water requires facilities plans to also provide estimated costs for capital improvements for the next 20 years, broken down as to whether they will occur in the 0-2 year time frame, 3-10 time frame, or the 10-20 year time frame. Categories to be considered, include;

- Secondary Wastewater Treatment
- Advanced Wastewater Treatment
- Inflow and Infiltration Correction
- Major Sewer Rehabilitation
- New Collector Sewers
- Interceptor Sewers
- Combined Sewer Overflow Corrections
- Storm Water Pollution Corrections

Of these categories, the combined sewer overflow corrections category does not apply, as there are no combined sewers in the area.

There is only one known project planned in the 20 year period. It is the construction of the new Industrial Park pump station and force main to the KY 9 – KY 19 intersection. The estimated construction and project (capital) cost is shown in Table 9-1. This project is anticipated to occur in the 3-10 year time frame. It would not start until new or imminently planned development would result in the existing 10,000 gpd plant becoming overloaded. The appropriate category for this project would be "Interceptor Sewer."

There are no other projects planned. The location of other new development accessible to the new regional system is possible. The location of such developments is not presently known, so no projects are planned at this time.

TABLE 9-1

INDUSTRIAL PARK PUMP STATION
AND FORCE MAIN TO KY 19 – KY 19 INTERSECTION

Item	Estimated Construction Cost
Pump Station (300 gpm)	$210,000
6 Inch Diameter Force Main and Appurtenances	450,000
Subtotal	$660,000
Mobilization (3%)	20,000
Contingencies (10%)	65,000
Total Estimated Construction Cost	$745,000
Temporary Easements	20,000
Permanent Easements	40,000
Pump Station Property	5,000
Project Related Costs (25%)	185,000
Total Estimated Project Cost	$995,000

CHAPTER 10 – RECOMMENDED PLAN

10.1 Recommended Plan

Exhibit 10-1 shows the recommended regional solution for wastewater collection, transport and treatment for the planning area. The treatment plant for Brooksville should be abandoned and the wastewater pumped to Augusta to a new regional wastewater treatment plant. In Augusta, the existing influent pump station should be replaced with a new one and the existing wastewater treatment plant abandoned. A future project recommended is the pump station and force main from the industrial park to the regional system. This should be constructed when sufficient development occurs so that the industrial park's package plant would be of insufficient capacity to treat the wastewater generated. Features of the initial recommended project to implement include the following;

- A new 465 gpm pump station located on the current Brooksville Wastewater Treatment property.
- A new 500 gpm pump station located next to Ky 19, just south of Chatham.
- A new 8 inch diameter force main from Brooksville along Ky 19 to the Ky 19 - Ky 9 intersection.
- A new 10 inch diameter force main laid north from Ky 9 alongside Ky 19 and Little Turtle Creek Road and then to the new regional wastewater treatment plant.
- A new 765 gpm pump station to replace Augusta's main pump station and a new 8 inch diameter force main to the new regional wastewater treatment plant.
- A new 690,000 gpd regional wastewater treatment plant.
- A new 15 inch diameter gravity outfall sewer to the Ohio River from the new regional wastewater treatment plant.

The new regional wastewater treatment plant uses technology that will not only provide a high quality effluent, but also one that has had most nitrogen removed. The effluent produced from this treatment plant should consistently produce an effluent with a water quality of $CBOD_5 \leq 5$ mg/l, TSS ≤ 10 mg/l, Ammonia N ≤ 1 mg/l and total nitrogen ≤ 5 mg/l. Exhibit 10-2 shows a schematic of the proposed plant. Plant features include;

- Gravity Grit Removal
- Mechanical Screen with standby bar rack

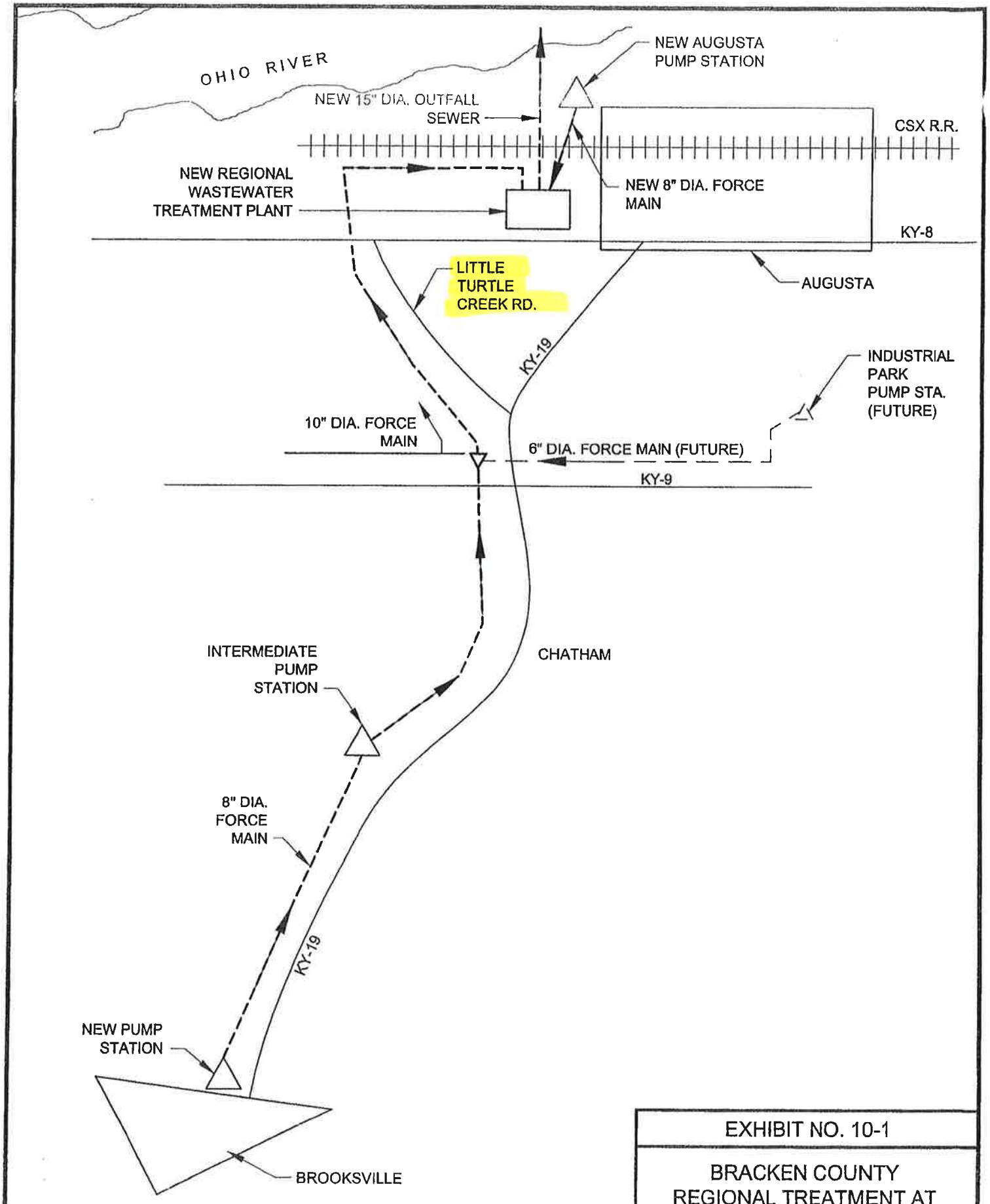
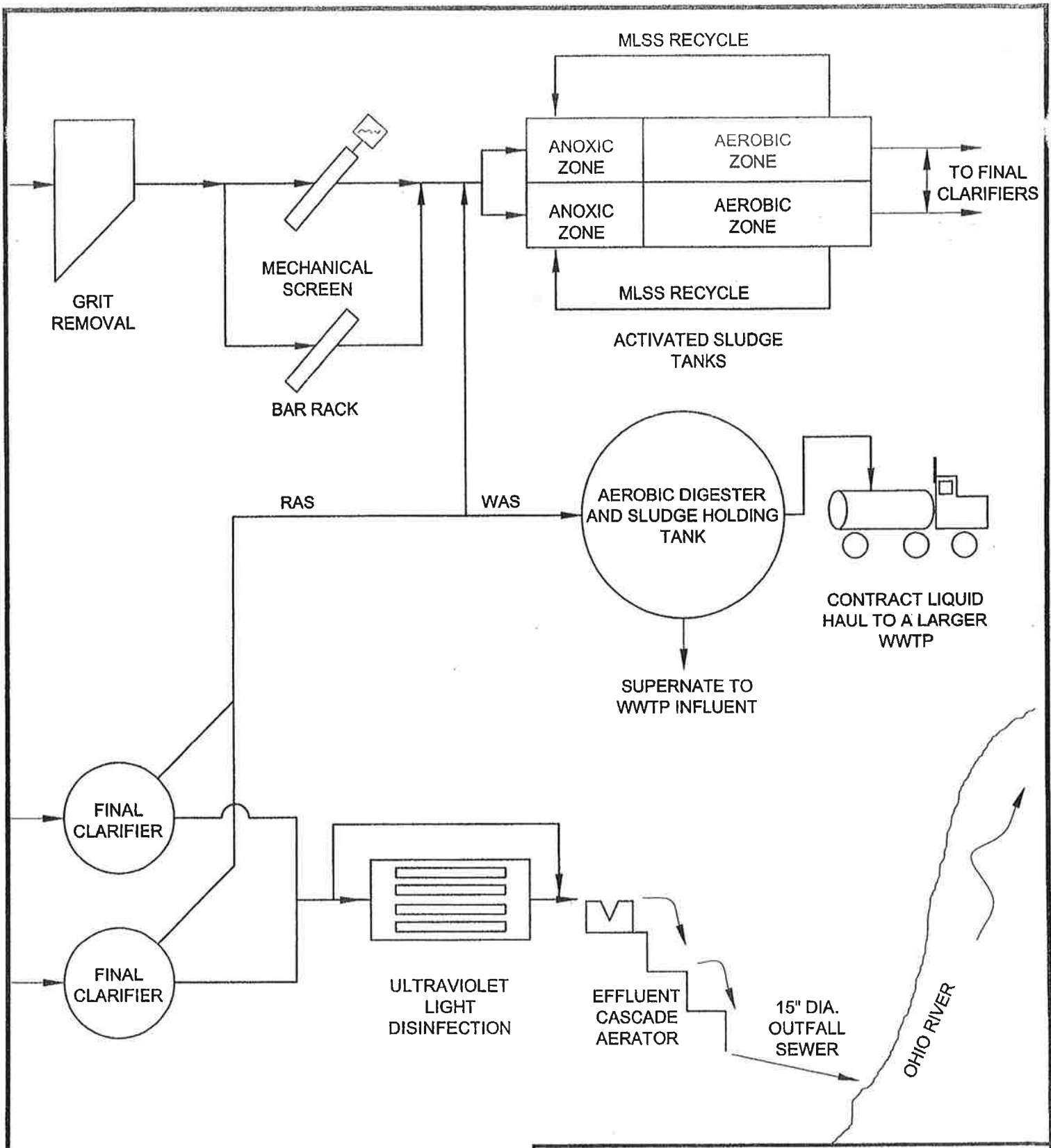


EXHIBIT NO. 10-1

BRACKEN COUNTY
REGIONAL TREATMENT AT
NEW AUGUSTA WWTP

BURGESS & NIPLE



NOTE:
ALL ITEMS SHOWN ARE PROPOSED.

EXHIBIT NO. 10-2

BRACKEN COUNTY REGIONAL WWTP
FLOW SCHEMATIC
SINGLE STAGE ACTIVATED SLUDGE PLANT
WITH BIOLOGICAL NITROGEN REMOVAL

BURGESS & NIPLE

- Two aeration tanks, each with an anoxic zone and an aerobic zone. Features include;
  - Anoxic zones having a nominal detention time of 4 hours
  - Aerobic zones having a nominal detention time of 19 hours
  - Two 880 gpm MLSS pumps
  - Two 450 scfm, 25 horsepower blowers
- Two 55 foot diameter final clarifiers
- Three 340 gpm RAS/WAS pumps
- Ultraviolet light disinfection
- Cascade aerator
- 195,000 gallon aerobic digester/sludge holding tank
- Tanker truck loading pad
- Control building built on top of the aeration tank structure

The construction cost for the new facilities are shown in previous report sections. The cost of pump stations and force mains from Brooksville to Augusta is $3,710,000 with an additional operation and maintenance cost of $48,900/yr. as shown in Table 7-2. The cost of the treatment plant, pump station and outfall sewer in Augusta is $4,090,000 with an additional operation and maintenance cost of $96,200/yr. as shown in Table 8-1.

10.2 Operation and Maintenance Requirements

Operation and Maintenance requirements will change. The operations of the Brooksville wastewater treatment will cease. Instead, the two pump stations to transport the wastewater to the regional treatment plant will have to be maintained. An operator would visit the pump stations once to three times weekly, depending on conditions, to record pump operating times, inspect the pump stations and perform housekeeping duties.

The proposed regional treatment plant in Augusta has more unit processes and pieces of equipment as compared to the current treatment plant. However, part time operation will still be sufficient at the plant. The plant should normally require about 4 hours of labor per day, 5 days per week. Work for that period of time would include record keeping, sampling, lab analysis for process control, equipment adjustments, inspection, housekeeping, sludge wasting, aerobic digester tank decanting and coordination with outside contractors. Additional time will have to be spent for periodic preventive maintenance activities and yard maintenance.

The cost effectiveness analysis in chapters 7 and 8 assumed design flows were occurring, which won't be the case during the first year of operation. Therefore, in computing revenue required to initially operate the system with fewer customers than full flow, the initial year O&M&R cost should be used. Table 10-1 is provided to show the expected initial year annual O&M&R cost.

TABLE 10-1

NORTHERN BRACKEN COUNTY SEWER SYSTEM PROJECT
INITIAL YEAR ANNUAL O&M&R COST

Item	Design Flow Annual Cost	Factor for Initial Year	Initial Year Annual Cost
Existing Augusta Cost	-	-	$128,000 /yr.
Reduce Brooksville Cost for Collection System Only	-	-	30,000
Pump Stations – Force Main Costs			
Labor	$9,400	0.80	7,500
Power	28,000	0.40	11,200
Materials and Supplies	4,500	0.80	3,600
Equipment Replacement Fund	7,000	1.00	7,000
Regional WWTP Cost (Additional)			
Labor	8,600	0.80	6,900
Power	24,000	0.50	12,000
Materials and Supplies	4,600	0.80	3,700
Equipment Replacement Fund	14,000	1.00	14,000
Sludge Disposal	45,000	0.45	20,300
Estimated Initial Year Annual O&M&R Cost			$244,200 /yr.

The initial annual O&M&R cost to operate the system is estimated to be $244,200 per year. The current annual O&M&R cost to run Augusta and Brooksville systems now is about $248,000 ($128,000 and $120,000, respectively). Therefore, there is no impact to current customers with respect to funding the initial O&M&R.

10.3 Financial Requirements

The revenue now generated in the Augusta sanitary sewer system is approximately $155,000 per year and in the Brooksville sanitary sewer system is approximately $116,000, for a total of about $271,000 per year. In calculating financial requirements to fund the system, existing bond retirement is not considered as both cities should have their bonds retired in the year 2008, and this project's payments can start, therefore, in the year 2009.

Several tables are provided to show the impact of financing methods including loans and grants from various sources. Table 10-2 shows a simple loan type financing using Kentucky's State Revolving Fund. Bracken County qualifies for the standard rate loan, which is 3%. The annual payment also includes a 0.2% payment on the unpaid balance of the loan. The revenue required is estimated to be 2.89 times the current revenue. Clearly grant funds are needed to make this project feasible.

TABLE 10-2

FINANCIAL REQUIREMENTS WITH 3% LOAN FROM THE STATE REVOLVING FUND

Item	Cost
Total Project Cost	$7,800,000
Estimated Annual Debt Retirement at 3% for 20 years (0.06722 x $7,800,000)	524,316 /yr.
Annual Payment on Principle, First Year (0.002 x $7,800,000)	15,600 /yr.
Initial Year O&M&R	244,200 /yr.
Total Annual Revenue Required	$784,116 /yr.
Current Revenue	271,000 /yr.
Revenue Increase Required	513,116 /yr.
Percent Increase in Revenue Required	189%
Multiplier Factor as Compared to Existing Revenue	2.89

Table 10-3 shows the monthly user cost breakdown of the capital and yearly treatment plant operation, maintenance and replacement costs based on various grant to loan ratios. A comparison to the existing sewer use fee is also shown. The average monthly household in Augusta and Brooksville uses approximately 6000 gallons per month. The average user fee as shown in Table 10-3 would range from $72.88 with a 100% loan to $32.74 with an 80% grant and 20% loan. A new sewer rate study should be completed following establishment of funding to determine new rates based on water usage records and residential versus commercial user information. Table 10-3 scenarios are based on existing customers presently using the Augusta and Brooksville sewer systems.

TABLE 10-3

NORTHERN BRACKEN COUNTY SEWER SYSTEM PROJECT

MONTHLY COST PER FUNDING OPTIONS

	100% Loan	50/50 Grant/Loan	75/25 Grant/Loan	80/20 Grant/Loan		
Loan Amount	7,800,000	3,900,000	1,950,000	1,560,000		
Debt Service	524,283	262,141	131,071	104,857		
.2% loan service fee	15,600	7,800	3,900	3,120		
Debt Service Income required	539,883	269,941	134,971	107,977		
Estimated OM & R	244,200	244,200	244,200	244,200		
Total Revenue Required	784,083	514,141	379,171	352,177		
					Existing Augusta	Existing Brooksville
Unit Cost/1,000 Gals	$12.15	$7.97	$5.87	$5.46	$12.07	$15.79
Min Bill < 2000 gal	$24.29	$20.00	$18.00	$16.00	$14.14	$15.79
Bill for 4,000 Gals	$48.59	$31.86	$23.50	$21.82	$18.28	$24.89
Bill for 5,000 Gals	$60.73	$39.83	$29.37	$27.28	$20.35	$29.44
Bill for 6000 Gals	$72.88	$47.79	$35.24	$32.74	$22.42	$33.99
Bill for 7,000 Gals	$85.03	$55.76	$41.12	$38.19	$24.49	$38.54
Bill for 8,000 Gals	$97.18	$63.72	$46.99	$43.65	$26.56	$43.09

Loan - percentage rate 3 % term = 20 yrs (Based on State Revolving Loan financing)

Flow Estimate – Number of users =	881	Households		
Avg. water usage =	200.5	Gal/day/household	6,015	Gal/mo
	365	Days		
	64,549,520	Gal/year		

?

The possible funding sources to aid in the financing of the project are listed below. The list shows the various funding limits and interest rates currently being offered by the various organizations. If a regional treatment solution is approved, a joint application for funding would need to be completed by Augusta and Brooksville.

- Kentucky Infrastructure Authority – KIA – Various funding levels for grants through special State Legislature appropriation funds similar to Tobacco Funds. Loans are administered through Kentucky Division of Water State Revolving Loan Fund. Loan rates are currently at 3% for 20 years for the Bracken County area. A .2% annual loan servicing fee on the unpaid balance is charged on all loans. Tobacco Fund appropriation grants are usually limited to a maximum amount of $500,000.
- Community Development Block Grant – CDBG – $1,000,000 maximum grant, requires an income survey to determine eligibility 51% of the homes must be in the low to moderate income levels to qualify for the funding.
- USDA Rural Development – Funding levels are based on the 2000 census. Augusta is eligible for up to 45% grant and Brooksville is eligible for up to 75% grant. Actual loan to grant ratios over the last few years have been 65:35 and 70:30. Loan interest rates are currently at 4.25% for 40 years with the first 2 years being interest only payments. Loans require a debt coverage of 20% of annual cost for loan only financing and 10% of annual cost for loan/grant financing until a reserve of one year's payment is accumulated.
- Federal Budget Appropriation Grants – Grants are administered by Division of Water and are applied for through the local congressman. The grants range from 0 to 55% of the project cost depending on Congressional appropriation.

10.4 Sanitary Collection Systems

Renovation work is required on the sanitary sewer collection system in Augusta and Brooksville to reduce I&I as discussed in Chapter 4, Sections 4.2.2 and 4.3.2 of this report and the SSES report. This repair work as well as future I&I detection and repairs will require a means of financing. Since the search for funding of the regionalization may take several years to complete, it is recommended that the sewer repairs and search for additional I&I sources begin immediately. The funding of this work could be completed by increase in sewer user fee. If each city would concentrate on I&I removal projects over the next several years, many I&I sources could be corrected prior to the construction of the new treatment plant saving pumping cost and treatment capacity. Table 10-3 shows a cost breakdown of the repair work

along with the cost for additional search for undetected I&I sources. Work is assumed to be completed over a four year period. The table provides an estimate of the increase in monthly user fee required to complete the investigation work and repairs.

Table 10-4

AUGUSTA AND BROOKSVILLE, KY
SANITARY SEWER SYSTEM CORRECTIONS

Augusta

Work Description	Cost	Cost per year
I&I corrections	$52,800	$13,200
Manhole lid raising	$40,000	$10,000
Investigation & Future work		$24,000

Total = $47,200 / year

User cost increase - $47,200 / 560 customers / 12 mo. = $7.00 / mo.

Brooksville

Work Description	Cost	Cost per year
I&I corrections	$8,100	$2,025
Manhole lid raising and anchoring	$45,000	$11,250
Investigation & Future work		$19,000

Total = $32,275 / year

User cost increase – $32,275 / 434 customers / 12 mo. = $6.20 / mo.

A benefit of completing the additional sewer investigation work as soon as possible is that if substantial repair work is found to be necessary during the investigation, this repair work could be included in the overall financing of the regional treatment facility.

10.5 Schedule

The project is needed soon as the treatment plants do need replaced. However, the plants are currently in compliance with their KPDES permit limits, so time should be spent in obtaining low interest loans and grants. Also, time is needed in forming the legal entity to own and operate the expanded sewer system. It would be best for the two cities if the new loan payment could start in the year 2009, so that the existing bonds could be retired before taking on new debt. Table 10-5 shows the recommended schedule for this project.

TABLE 10-5

NORTHERN BRACKEN COUNTY SEWER SYSTEM PROJECT
PROPOSED SCHEDULE

Task	Completion Date
I&I Investigation and Corrections	2005 - 2008
Obtain low interest loan and grant funding	October 1, 2007
Complete Design	October 1, 2008
Obtain Division of Water Approval	December 1, 2008
Receive bids	February 1, 2008
Award contracts and start construction	March 1, 2009
Complete construction	March 1, 2010
Complete start-up	May 1, 2010