U.S. Fish and Wildlife Service

National Wetlands Inventory

Jackson Twp.

Mar 4, 2015

Wetlands

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Northern Area

FIGURE 3–6: WETLANDS–NORTH

U.S. Fish and Wildlife Service

National Wetlands Inventory

Jackson Twp

Mar 4, 2015

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Southern Area

FIGURE 3–7: WETLANDS–SOUTH

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Ohio State Plane South Zone (FIPS zone 3402). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography provided by the Ohio Statewide Imagery Program. This information was created from photography dated 2007.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

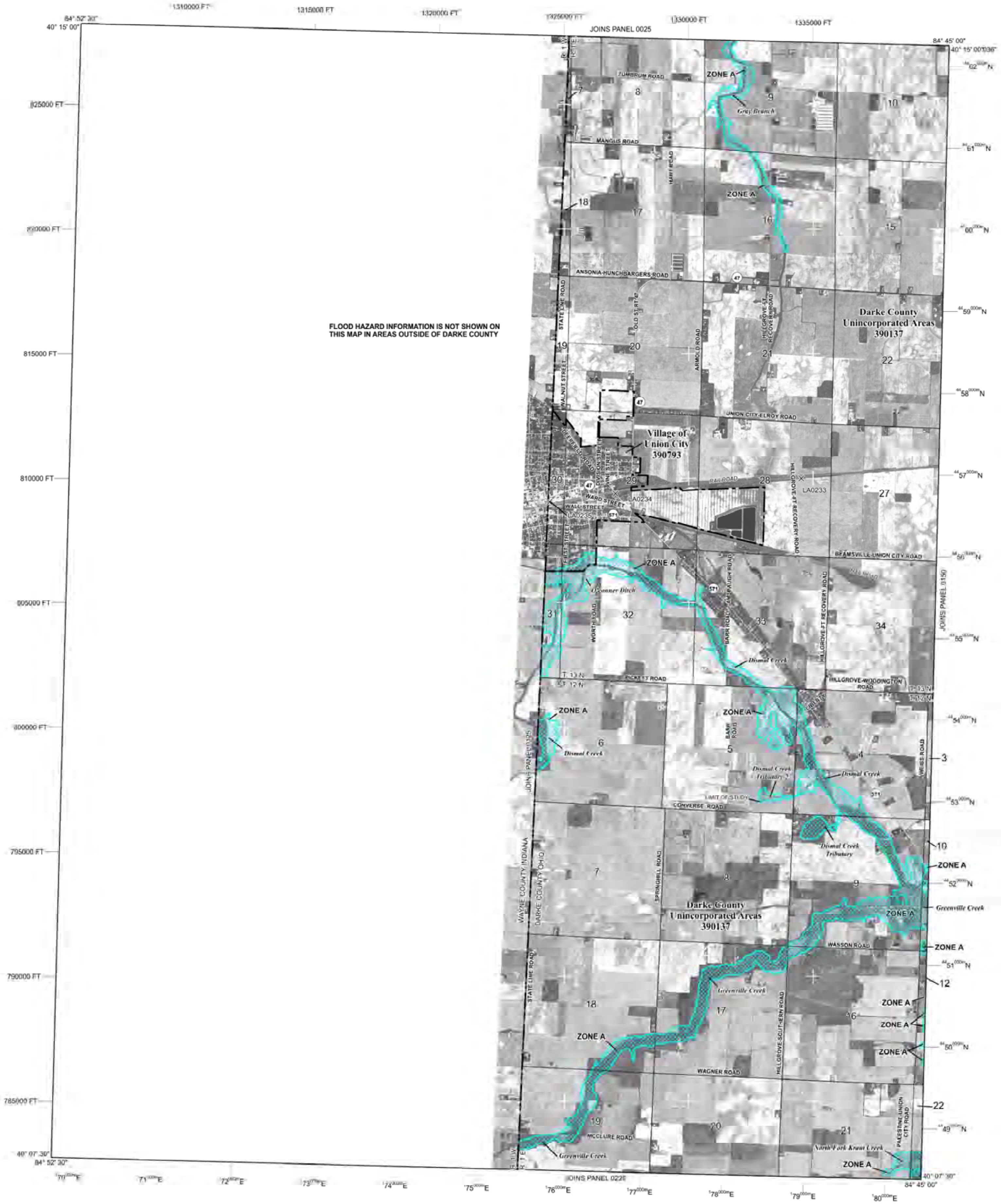
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center** (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line
23 - - - 23 Transect line
Culvert
Bridge
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
5000-foot ticks: Ohio State Plane South Zone (FIPS Zone 3402), Lambert Conformal Conic projection
1000-meter Universal Transverse Mercator grid ticks, zone 16N
Bench mark (see explanation in Notes to Users section of this FIRM panel)
River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 18, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP

PANEL 0125E

FIRM
FLOOD INSURANCE RATE MAP
DARKE COUNTY, OHIO
AND INCORPORATED AREAS

PANEL 125 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DARKE COUNTY	390137	0125	E
UNION CITY, VILLAGE OF	390793	0125	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 39037C0125E

EFFECTIVE DATE JULY 18, 2011

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

GRAPHIC SCALE

0 2500 5000

(IN FEET)
1 inch = 5000 ft.

IBI

IBI GROUP
635 Brooksedge Boulevard
Westerville OH 43081 USA
tel 614 818 4900 fax 614 818 4901
ibigroup.com

REVISION:

SUBMISSION:

JACKSON TOWNSHIP
MVRPC UNSEWERED COMMUNITIES

SHEET TITLE:

100 YEAR FLOOD MAP

FIGURE 3-8

IBI GROUP
635 Brooksedge Boulevard
Westerville OH 43081 USA
tel 614 818 4900 fax 614 818 4901
ibigroup.com

JACKSON TOWNSHIP

MVRPC UNSEWERED COMMUNITIES

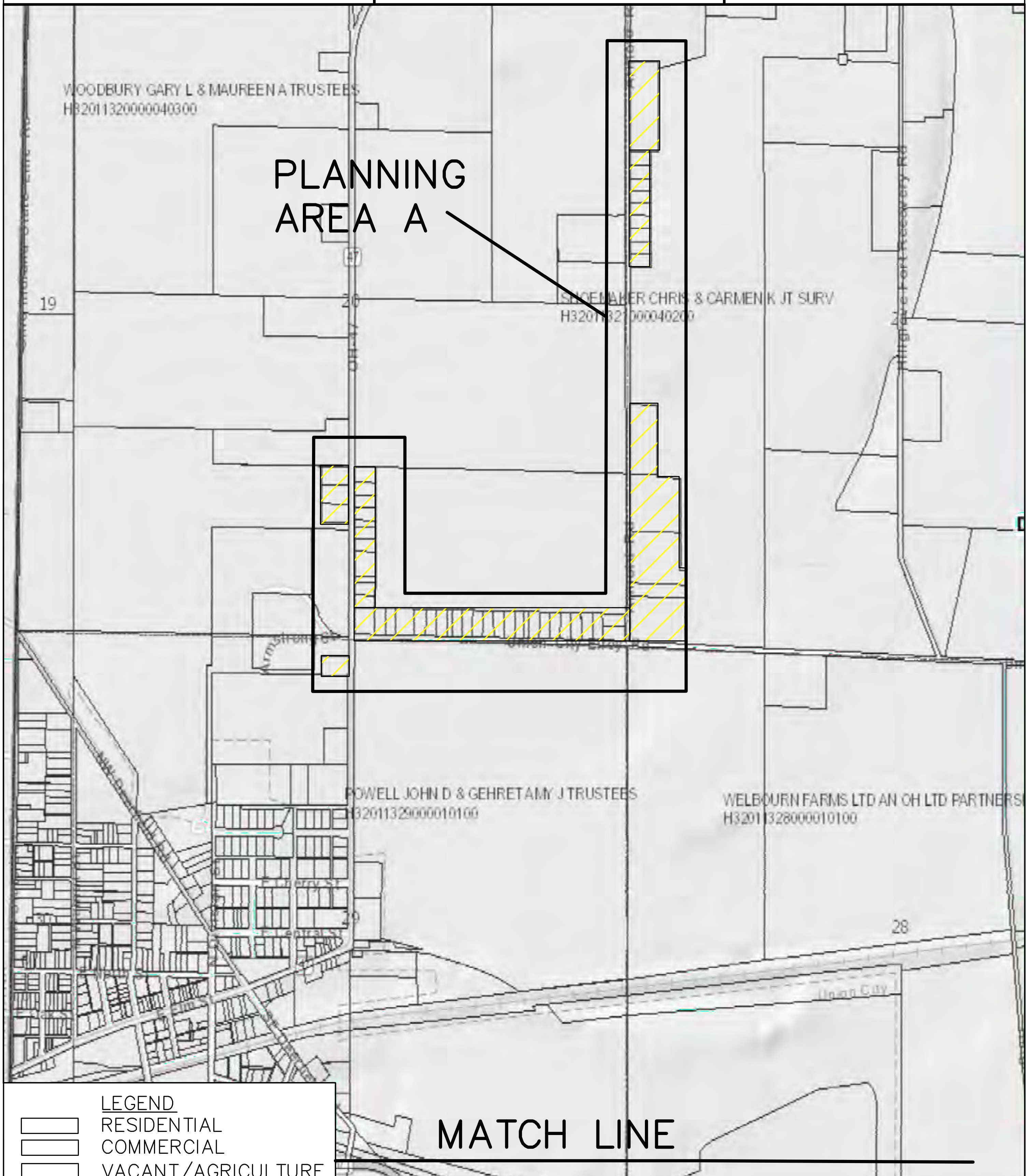
FIGURE 3-9: LAND USE-NORTH

GRAPHIC SCALE

0 650 1300

(IN FEET)

1 inch = 1300 ft.



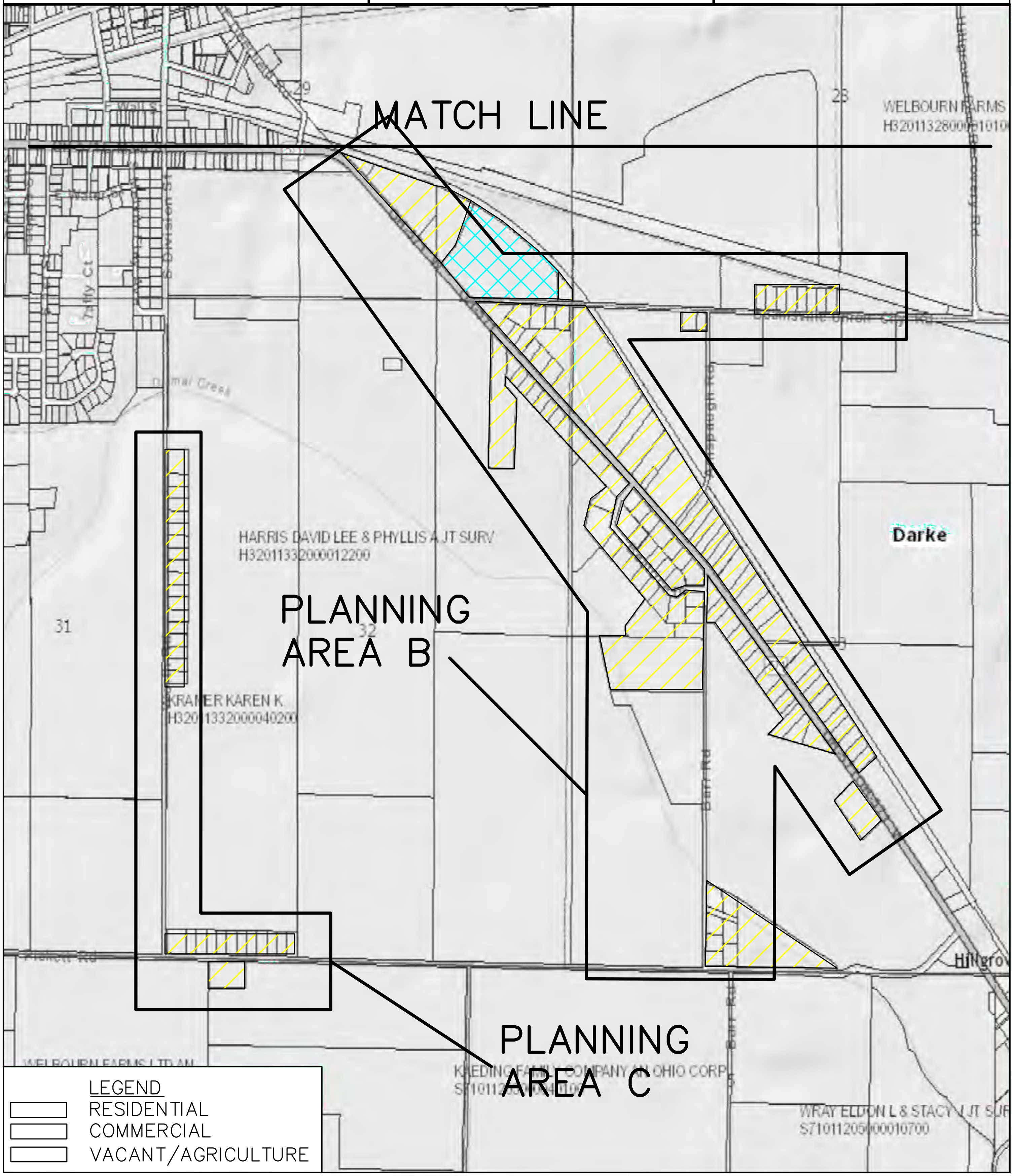
IBI GROUP
635 Brooksedge Boulevard
Westerville OH 43081 USA
tel 614 818 4900 fax 614 818 4901
ibigroup.com

JACKSON TOWNSHIP

MVRPC UNSEWERED COMMUNITIES

FIGURE 3-10: LAND USE-SOUTH

GRAPHIC SCALE
0 650 1300
(IN FEET)
1 inch = 1300 ft.



LEGEND
RESIDENTIAL
COMMERCIAL
VACANT/AGRICULTURE

Chapter 4 - Future Conditions

A 25-year planning period will be used and all forecasts on population, land use, economics, flows, and loads will be trended from the most recent available data to the year 2040.

Development

Demographic and economic projections are vital to the planning of wastewater facilities in that they permit proper sizing of both collection and treatment systems. Over estimating these projections can result in oversized facilities which are not utilizing their maximum capacities. Under estimating these projections can result in an undersized facility, which would need expensive upgrades to reach the desired degree of treatment. As a result, a need for accurate projections cannot be overstressed.

There is a potential for population and industrial growth just outside of the planning areas. These possibilities need to be taken into consideration when designing a new wastewater system. The proposed system needs to be able to with stand the additional amount of collection needed.

Population Trends

The development of an area is directly related to changing population over time. In general, population growth trends create the basis for changing demand for various housing and commercial development. Population growth also has implications for demands on community facilities and infrastructure.

Determining population trends for smaller areas is more unreliable and erratic than for larger urban areas because small area growth is influenced by local political factors and social economic changes. Historically, the provision of adequate water and sewage facilities remains a major influence on future growth. The following table shows the population of Darke County. These trends show a general increase in population in the area of about 0.3% per year.

Table 4-1: Population Trends

Year	Darke County Population	% Change
1960	45,612	-
1970	49,141	7.7%
1980	55,096	12.1%
1990	53,619	-2.7%
2000	53,309	-0.6%
2010	52,959	-0.7%

To generate future population projections through the year 2050, it is assumed that the population of the planning area will continue to increase steadily. To generate a population for the Jackson Township planning areas, the number of homes in the planning area is multiplied by the U.S. Census average of 2.8 persons per home. From there, we have assumed the study area will grow at a geometric gradient of approximately 5 percent for every 10 years or 1/2 percent annually.

In order to obtain a design flow for each of the areas a theoretical sanitary flow based on EPA's typical 100 gallons per capita per day. In addition, an allowance for future industrial development should be made. 10% will be used for the service areas.

The following tables show the projected population and a design flow for each of the planning areas.

Table 4-2: Planning Area A Projected Population and Design Flow

Year	Planning Area A Population	% Change	Sewage Flow (gpcd)	Total Theoretical Sanitary Flow (gpd)
2010	146	-	100	14,600
2020	153	5.0%	100	15,300
2030	161	5.0%	100	16,100
2040	169	5.0%	100	16,900
2050	177	5.0%	100	17,700

Year	Base Residential Sanitary Flow (gpd)	Commercial and Industrial Allowance (gpd)	Total Design Flow (gpd)
Present - 2040	16,900	2,000	18,900

We recommend that the proposed wastewater treatment facility be designed for a minimum of 20,000 GPD. Design peak flows for treatment will be based on 4.0 times the average daily flows. Therefore the peak flows will be 0.080MGD (80,000 GPD).

Table 4-3: Planning Area B Projected Population and Design Flow

Year	Planning Area B Population	% Change	Sewage Flow (gpcd)	Total Theoretical Sanitary Flow (gpd)
2010	325	-	100	32,500
2020	341	5.0%	100	34,100
2030	358	5.0%	100	35,800
2040	376	5.0%	100	37,600
2050	395	5.0%	100	39,500

Year	Base Residential Sanitary Flow (gpd)	Hillgrove Residential Sanitary Flow (gpd)	Summation of Flows (gpd)	Commercial and Industrial Allowance (gpd)	Total Design Flow (gpd)
Present - 2040	37,600	12,000	49,600	5,000	54,600

The Hillgrove community contains 37 homes located approximately half a mile southwest of planning area B. This community has the potential to tie into the planning area B collection system. The community is taken into consideration for future growth because of the close approximation to the planning area.

We recommend that the proposed wastewater treatment facility be designed for a minimum of 60,000 GPD. Design peak flows for treatment will be based on 4.0 times the average daily flows. Therefore the peak flows will be 0.240 MGD (240,000GPD).

Table 4-4: Planning Area C Projected Population and Design Flow

Year	Planning Area C Population	% Change	Sewage Flow (gpcd)	Total Theoretical Sanitary Flow (gpd)
2010	78	-	100	7,800
2020	82	5.0%	100	8,200
2030	86	5.0%	100	8,600
2040	90	5.0%	100	9,000
2050	95	5.0%	100	9,500

Year	Base Residential Sanitary Flow (gpd)	Commercial and Industrial Allowance (gpd)	Total Design Flow (gpd)
Present - 2040	9,000	1,000	10,000

We recommend that the proposed wastewater treatment facility be designed for a minimum of 12,000 GPD. Design peak flows for treatment will be based on 4.0 times the average daily flows. Therefore the peak flows will be 0.048 MGD (48,000 GPD).

Table 4-5: Combined Planning Areas Projected Design Flow

Area A Total Design Flow (gpd)	Area B Total Design Flow (gpd)	Area C Total Design Flow (gpd)	Total Design Flow (gpd)
18,900	54,600	10,000	83,500

We recommend that the proposed wastewater treatment facility be designed for a minimum of 90,000 GPD. Design peak flows fro treatment will be based on a 4.0 times the average daily flows. Therefore the peak flows will be 0.36 MGD (360,000 GPD).

Chapter 5 - Wastewater System Alternatives

The primary goal of all wastewater management systems is to remove waste products from water and to safely return the water back into the environment. Wastewater management involves:

- Collection and transport of wastewater from the source to a treatment process
- Removal of all or most of the waste products that are suspended and/or dissolved in the water
- Returning the water back to the environment
- Management of these processes to ensure that a wastewater system is fully functional

The primary public health concern in wastewater management is to substantially reduce the risk of transferring pathogens into the environment and minimize negative impacts on public health. The following sections describe different alternatives for each of these collection and treatment processes.

Collection System Alternatives

The first stage for managing wastewater is collection. Several alternatives were reviewed to provide a centralized collection system. These options are: gravity sewer system, Septic Tank Effluent Pump (STEP) sewer system, grinder pump sewer system, and a vacuum sewer system. The cost estimates for each of these alternatives comes from the base layout of the Area.

Gravity Sewer System

Gravity sewers are ideal for populated urban areas that create large volumes of flow. In conventional gravity collection systems the wastewater flows by gravity and except where pumping stations are required, the system is devoid of moving parts. Pump stations are added to the gravity system to overcome elevation problems within areas of rolling terrain or to avoid extremely deep installation requirements when transporting sewage over long distances. The system eliminates private septic tanks and leeching systems and replaces them with a sewer pipe that connects the building to the main sewer line. Gravity sewer systems require little maintenance in comparison to pressure systems such as the STEP or leaching type systems. The O,M&R costs for this type of system are generally associated with the pump stations within the system O,M&R demands generally increase with age, but in well constructed systems, costs associated with this can be minimal. Due to larger pipe diameters, blockages within the system are rare and are generally easily removed when they do occur. With the simplicity of design and many years of application, conventional gravity sewer systems are a reliable and economical means of conveying wastewater from multiple sources to a central treatment facility. The following is a list of advantages and disadvantages for a conventional gravity sewer system.

Advantages

- Design standards and procedures well established
- Reliable operation
- Handle grit and solids
- At minimum velocity lower production of hydrogen sulfide
- Higher excess capacity for future growth

Disadvantages

- Slope requirements can require deeper excavation
- Pumping and lift stations may be required to overcome slope and elevation requirements
- Deeper manholes that require confined space entry
- Higher inflow and infiltration
- High bedrock could increase construction cost

Conventional gravity sewers are generally 8 to 15 inches in diameter and constructed of polyvinyl chloride (PVC) pipe with construction depths ranging from 7 to 20 feet. All sewers are designed and constructed to develop velocities not less than 2.0 feet per second when flowing full. Also, manholes are installed at the end of each line, at all changes in grade and/or alignment, at all intersections, and at distances not greater than 400 feet (for sewer up to 15 inches in diameter).

Residential and non-residential flows along with allowable clean water infiltration quantities must be considered in the design of a gravity wastewater collection system. Infiltration is identified as clean ground water that seeps into a sanitary collection system through pipe joints and other minor openings and mixes with sanitary flows creating larger volumes of wastewater to transport and treat. The allowable infiltration rate limit of 100 gpd per inch diameter per mile is based on current sanitary sewer construction technology. However, this amount would be expected to increase over the years mainly due to sewer extensions and the age of the collection system. Conventional gravity sewers shall also be designed on a peak flow basis with a peak factor of 4 times the average daily flow for municipalities as required by the EPA.

The minimum size of new conventional sanitary sewers is generally eight inches unless otherwise approved by the reviewing authority. Whenever possible, sanitary sewers shall be sufficiently deep to prevent freezing and to receive gravity flow from basements. Alternatives to the conventional gravity sewer system involve using grinder pump stations or septic systems. These are used to provide service to areas where the cost or the means of constructing a gravity system becomes dangerous or prohibitive.

Generation of the gravity collection system assumes that service laterals would be constructed from the main sewer line (usually located within public right-of-way) to the property lines (assumed 30 feet). From the property line to the house connection, individual property owners are typically required to construct the service line as well as abandon the existing septic tank or other on-lot disposal system. Figure 5-1 shows the standard house connection for a gravity collection system. The layouts of the gravity sewer systems for the Jackson Township planning areas are presented in Figure 5-2.

Detailed construction cost analyses of these systems are presented below in Table 5-1.

Table 5-1: Gravity Sewer Cost Analysis

Planning Area A

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	CLEARING & GRUBBING	1	LS	$5,000	$5,000
2	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
3	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	4,000	SY	$30	$120,000
4	8" GRAVITY SEWER PIPE, COMPLETE W/ BEDDING & BACKFILL	7,400	LF	$80	$592,000
5	6" SANITARY SERVICE PIPE, COMPLETE W/ BEDDING & BACKFILL	1,560	LF	$45	$70,200
6	8X6 WYE FITTING, COMPLETE	52	EA	$150	$7,800
7	3" SANITARTY FORCE MAIN, COMPLETE W/ BEDDDING & BACKFILL	2900	LF	$20	$58,000
8	MANHOLE, COMPLETE	22	EA	$3,200	$70,400
9	PUMP STATION, COMPLETE	2	EA	$180,000	$360,000
10	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
11	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
12	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
13	SEEDING & MULCHING, COMPLETE	5,300	SY	$1	$5,300
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$1,348,700
10% CONTINGENCY					$134,870
20% NON-CONSTRUCTION					$296,714
TOTAL					**$1,780,284**

Planning Area B

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	CLEARING & GRUBBING	1	LS	$5,000	$5,000
2	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
3	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	8,900	SY	$30	$267,000
4	8" GRAVITY SEWER PIPE, COMPLETE W/ BEDDING & BACKFILL	16,100	LF	$80	$1,288,000
5	6" SANITARY SERVICE PIPE, COMPLETE W/ BEDDING & BACKFILL	3,480	LF	$45	$156,600
6	8X6 WYE FITTING, COMPLETE	116	EA	$150	$17,400
7	3" SANITARTY FORCE MAIN, COMPLETE W/ BEDDDING & BACKFILL	7,000	LF	$20	$140,000
8	MANHOLE, COMPLETE	40	EA	$3,200	$128,000
9	PUMP STATION, COMPLETE	3	EA	$180,000	$540,000
10	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
11	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
12	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
13	SEEDING & MULCHING, COMPLETE	11,800	SY	$1	$11,800
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$2,613,800
10% CONTINGENCY					$261,380
20% NON-CONSTRUCTION					$575,036
TOTAL					**$3,450,216**

Planning Area C

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	CLEARING & GRUBBING	1	LS	$5,000	$5,000
2	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
3	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	2,000	SY	$30	$60,000
4	8" GRAVITY SEWER PIPE, COMPLETE W/ BEDDING & BACKFILL	4,600	LF	$80	$368,000
5	6" SANITARY SERVICE PIPE, COMPLETE W/ BEDDING & BACKFILL	840	LF	$45	$37,800
6	8X6 WYE FITTING, COMPLETE	28	EA	$150	$4,200
7	3" SANITARTY FORCE MAIN, COMPLETE W/ BEDDDING & BACKFILL	800	LF	$20	$16,000
8	MANHOLE, COMPLETE	15	EA	$3,200	$48,000
9	PUMP STATION, COMPLETE	1	EA	$180,000	$180,000
10	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
11	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
12	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
13	SEEDING & MULCHING, COMPLETE	2,800	SY	$1	$2,800
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$781,800
10% CONTINGENCY					$78,180
20% NON-CONSTRUCTION					$171,996
TOTAL					**$1,031,976**

STEP Sewer System

A Septic Tank Effluent Pump (STEP) collection system combines the traditional septic tank system with a small pump and force main or a small diameter gravity system. The STEP system collects only the effluent off of septic tanks which can be located at each customer's building or a group of customers can be on one septic tank. The STEP system then uses small effluent pumps and a network of force mains, usually 2 inch to 4 inch pipe, to collect the effluent and send it to a small package treatment plant.

This collection system conducts different stages of treatment at different locations. The solids are collected in a septic tank, where primary treatment takes place, before the sewage is discharged into a central collection system. Wastewater then flows from the pressurized collection system to a small package plant where the effluent is treated and disinfected. The following is a list of advantages and disadvantages for the STEP system.

Advantages

- Connect multiple residents to septic tank
- Infiltration reduced
- Cleanouts and valve assemblies less expensive than manholes.
- Pipe size and depth requirements reduced

Disadvantages

- Mechanical components require greater institutional involvement
- O,M&R costs higher due to number of septic tanks and pumps
- Annual preventative maintenance for septic tanks and pumps
- Life cycle replacement costs are higher
- Power outages can result in limited use for pumps
- Required solids removal as part of septic tank maintenance

Advantages of a STEP system over a conventional gravity system are smaller pipe sizes and shallower pipe depths within the collection network. Smaller pipes have lower material costs and may be less expensive to install.

The STEP network uses all force mains and the depth of the pipes will be shallower than a conventional gravity system, thus further reducing the installation costs. On the other hand, the septic tanks and effluent pumps can drive up the initial cost of installation. The effluent pumps will need regular maintenance and repairs, and the septic tanks will require regular cleaning to remove the solids collected within them. Thus, the O,M&R cost of the system will go up as well.

A STEP system can be an effective means of collecting sewage from a small collection of homes, subdivisions, schools, and industrial parks, but it is not usually the preferred means of treatment for large communities or facilities that generate large flows.

The connection at the house will be similar to Figure 5-3. This Figure shows the typical connection for a STEP system where either the existing or new septic tank is installed on the property with an effluent pump where it is transported to the pressure main through a 1 ½ " pressure service line. Figure 5-5 shows the layout for the STEP collection systems.

Detailed construction cost analyses of these systems are presented below in Table 5-2.

Table 5-2: STEP Sewer Cost Analysis

Planning Area A

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	1,000 GAL SEPTIC TANK W/ PUMP	52	EA	$5,700	$296,400
2	2" DIA. FORCEMAIN	5,900	LF	$20	$118,000
3	3" DIA. FORCEMAIN	2,700	LF	$23	$62,100
4	AIR RELEASE VALVES	3	EA	$2,500	$7,500
5	CLEANOUTS	4	EA	$950	$3,800
6	1.25" DIA. SERVICE LATERAL & CONNECTION	52	EA	$1,000	$52,000
7	SEEDING & MULCHING	4,500	SY	$1	$4,500
8	ASPHALT PAVEMENT REPLACEMENT	3,400	SY	$30	$102,000
9	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
10	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
11	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
12	CLEARING & GRUBBING	1	LS	$ 5,000	$5,000
13	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$711,300
10% CONTINGENCY					$71,130
20%NON-CONSTRUCTION					$156,486
TOTAL					**$938,916**

Planning Area B

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	1,000 GAL SEPTIC TANK W/ PUMP	116	EA	$5,700	$661,200
2	2" DIA. FORCEMAIN	8,900	LF	$20	$178,000
3	3" DIA. FORCEMAIN	7,200	LF	$23	$165,600
4	AIR RELEASE VALVES	5	EA	$2,500	$12,500
5	CLEANOUTS	4	EA	$950	$3,800
6	1.25" DIA. SERVICE LATERAL & CONNECTION	116	EA	$1,000	$116,000
7	SEEDING & MULCHING	8,700	SY	$1	$8,700
8	ASPHALT PAVEMENT REPLACEMENT	6,500	SY	$30	$195,000
9	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
10	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
11	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
12	CLEARING & GRUBBING	1	LS	$5,000	$5,000
13	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$1,405,800
10% CONTINGENCY					$140,580
20%NON-CONSTRUCTION					$309,276
TOTAL					**$1,855,656**

Planning Area C

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	1,000 GAL SEPTIC TANK W/ PUMP	28	EA	$5,700	$159,600
2	2" DIA. FORCEMAIN	5,400	LF	$20	$108,000
3	AIR RELEASE VALVES	2	EA	$2,500	$5,000
4	CLEANOUTS	2	EA	$950	$1,900
5	1.25" DIA. SERVICE LATERAL & CONNECTION	28	EA	$1,000	$28,000
6	SEEDING & MULCHING	2,800	SY	$1	$2,800
7	ASPHALT PAVEMENT REPLACEMENT	2,000	SY	$30	$60,000
8	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
9	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
10	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
11	CLEARING & GRUBBING	1	LS	$5,000	$5,000
12	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
13	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$430,300
10% CONTINGENCY					$43,030
20%NON-CONSTRUCTION					$94,666
TOTAL					**$567,996**

Grinder Pump Sewer System

The Grinder pump system utilizes a prefabricated pump and basin configuration. Wastewater from the house flows into the grinder pump station basin until liquid level controls turn on the pump. The grinder pump simultaneously grinds the waste into a slurry while pumping into the collection mains. Individual services are usually 1 ¼" PVC pipe with collection mains usually 2" to 6" PVC pipe.

The layout for the typical grinder system here is similar to those generated for the STEP system in this report. A low-pressure force main sewer system will follow the existing topography with the addition of isolation valves at intersections of mains, in-line cleanouts, terminal cleanouts, air release valves, and pressure monitoring stations. Main sewer lines would be constructed ranging in size from 4 inches to 6 inches in diameter. The following is a list of advantages and disadvantages for a conventional grinder pump sewer system.

Advantages

- Slope and pipe alignment not as critical as gravity sewers
- Pipe size and depth requirements reduced
- Cleanouts and valve assembles less expensive than manholes

Disadvantages

- Less- flexibility for expansion and O,M&R concerns
- Less range of flow capacity
- Power outages can result in limited use for pumps
- Periodic maintenance

Another operating concern with low pressure systems is power outage. A typical power outage lasts less than two hours. Grinder pump basins are designed with several hours' worth of holding capacity. However, in power outage conditions individuals would need to avoid showers and other heavy water usage activities.

The Grinder Pump conventional sewer connection and collection layout would be very similar to that of the STEP system with the exception that the existing septic tank would be removed and a grinder pump would replace the effluent pump, thus eliminating the primary treatment component associated with a step system. The design for each of these can be seen in Figures 5-4 and 5-5.

Detailed construction cost analyses of these systems are presented below in Table 5-3.

Table 5-3: Grinder Pump Sewer Cost Analysis

Planning Area A

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	SIMPLEX GRINDER PUMP UNITS	52	EA	$6,000	$312,000
2	2" DIA. FORCEMAIN	5,900	LF	$20	$118,000
3	3" DIA. FORCEMAIN	2,700	LF	$23	$62,100
4	AIR RELEASE VALVES	3	EA	$2,500	$7,500
5	CLEANOUTS	4	EA	$950	$3,800
6	1.25" DIA. SERVICE LATERAL & CONNECTION	52	EA	$1,000	$52,000
7	SEEDING AND MULCHING	4,500	SY	$1	$4,500
8	ASPHALT PAVEMENT REPLACEMENT	3,400	SY	$30	$102,000
9	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
10	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
11	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
12	CLEARING & GRUBBING	1	LS	$5,000	$5,000
13	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
14	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$726,900
10% CONTINGENCY					$72,690
20% NON-CONSTRUCTION					$159,918
TOTAL					**$959,508**

Planning Area B

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	SIMPLEX GRINDER PUMP UNITS	116	EA	$6,000	$696,000
2	2" DIA. FORCEMAIN	8,900	LF	$20	$178,000
3	3" DIA. FORCEMAIN	7,200	LF	$23	$165,600
4	AIR RELEASE VALVES	5	EA	$2,500	$12,500
5	CLEANOUTS	4	EA	$950	$3,800
6	1.25" DIA. SERVICE LATERAL & CONNECTION	116	EA	$1,000	$116,000
7	SEEDING AND MULCHING	8,700	SY	$1	$8,700
8	ASPHALT PAVEMENT REPLACEMENT	6,500	SY	$30	$195,000
9	MAINTAINING TRAFFIC	1	LS	$ 10,000	$10,000
10	CONSTRUCTION LAYOUT STAKING	1	LS	$ 10,000	$10,000
11	MOBILIZATION/DEMOBILIZATION	1	LS	$ 20,000	$20,000
12	CLEARING & GRUBBING	1	LS	$ 5,000	$5,000
13	TEMPORARY SOIL EROSION CONTROL	1	LS	$ 5,000	$5,000
14	PERMITTING	1	LS	$ 15,000	$15,000
SUBTOTAL					$1,440,600
10% Contingency					$144,060
20% Non-Conctruction					$316,932
TOTAL					**$1,901,592**

Planning Area C

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	SIMPLEX GRINDER PUMP UNITS	28	EA	$6,000	$168,000
2	2" DIA. FORCEMAIN	5,400	LF	$20	$108,000
5	AIR RELEASE VALVES	2	EA	$2,500	$5,000
6	CLEANOUTS	2	EA	$950	$1,900
7	1.25" DIA. SERVICE LATERAL & CONNECTION	28	EA	$1,000	$28,000
8	SEEDING AND MULCHING	2,800	SY	$1	$2,800
9	ASPHALT PAVEMENT REPLACEMENT	2,000	SY	$30	$60,000
10	MAINTAINING TRAFFIC	1	LS	$10,000	$10,000
11	CONSTRUCTION LAYOUT STAKING	1	LS	$10,000	$10,000
12	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
13	CLEARING & GRUBBING	1	LS	$5,000	$5,000
14	TEMPORARY SOIL EROSION CONTROL	1	LS	$5,000	$5,000
15	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$438,700
10% CONTINGENCY					$43,870
20% NON-CONSTRUCTION					$96,514
TOTAL					**$579,084**

Vacuum Sewer System

Vacuum sewer systems are a mechanized system of wastewater transport where, unlike gravity flow, differential air pressure is used to move the wastewater. It requires a central source of power to run vacuum pumps which maintain a vacuum on the collection system. The system requires a normally closed vacuum/gravity interface valve at each entry point to seal the lines so that vacuum is maintained. These valves, located in a pit, open when a predetermined amount of wastewater accumulates in the collecting sump. The resulting differential pressure between atmosphere and vacuum becomes the driving force that propels the wastewater towards the vacuum station. A vacuum system is similar to a rural water distribution system in that it is a dendriform shape. The following is a list of advantages and disadvantages of a vacuum sewer system.

Advantages

- Installed following the existing topography
- Pipe size and depth requirements reduced

Disadvantages

- Less- flexibility for expansion and O,M&R concerns
- A broken main line can cause substantial operating problems
- Few vacuum sewer systems are in use

The layout for the typical Vacuum Sewer system here, again, is similar to those generated for the Gravity collection system in this report. A Vacuum Sewer system will follow the existing topography with the addition of vacuum valves, auxiliary vents, valve pits/sump pits, vacuum stations, and lift stations. Main sewer lines would be constructed ranging in size from 4 inches to 6 inches in diameter.

The connection at the house will be similar to Figure 5-6. This Figure shows the typical connection for a Vacuum system where the existing septic tank is abandoned and wastewater from the home flows by gravity to a valve pit, which is then transported to the main via 3 inch vacuum service line. A potential layout of the vacuum collection systems can be found in Figure 5-7.

Detailed construction cost analyses of these systems are presented below in Table 5-4.

Table 5-4: Vacuum Sewer System Cost Analysis

Planning Area A

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	6.0' - 2PC HYBRID VALVE PIT	52	EA	$4,700	$244,400
2	AIR TERMINALS	52	EA	$230	$11,960
3	TRAILER MOUNTED VACUUM PUMP	1	EA	$40,000	$40,000
4	PACVAC 165M-10	1	LS	$250,000	$250,000
5	3" SERVICE LATERAL, COMPLETE	10,160	LF	$23	$233,680
6	4" ISOLATION VALVE, COMPLETE	2	EA	$1,200	$2,400
7	VAC STA - SITE WORK	1	LS	$20,000	$20,000
8	VAC STA - BUILDING/FOUNDATION	1	LS	$10,000	$10,000
9	VAC STA - TANK INSTALLATION	1	LS	$20,000	$20,000
10	VAC STA - MECHANICAL/ELECTRICAL (BLDG TO TANK)	1	LS	$15,000	$15,000
11	VAC STA - VALVE VAULT(S)	1	LS	$5,000	$5,000
12	VAC STA - ODOR CONTROL	1	LS	$15,000	$15,000
13	VAC STA - GENERATOR	1	LS	$35,000	$35,000
14	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
15	CLEARING AND GRUBBING	1	LS	$5,000	$5,000
16	TEPMORARY SOIL CONTROL	1	LS	$5,000	$5,000
17	MAINTAINING TRAFFIC	1	LS	$15,000	$15,000
18	CONSTRUCTION LAYOUT STAKING	1	LS	$20,000	$20,000
19	SEEDING AND MULCHING	4,500	SY	$1	$4,500
20	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	3,400	SY	$30	$102,000
21	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$1,088,940
10% CONTINGENCY					$108,894
20% NON-CONSTRUCTION					$239,567
TOTAL					**$1,437,401**

Planning Area B

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	6.0' - 2PC HYBRID VALVE PIT	116	EA	$4,700	$545,200
2	AIR TERMINALS	116	EA	$230	$26,680
3	TRAILER MOUNTED VACUUM PUMP	1	EA	$40,000	$40,000
4	PACVAC 165M-10	1	LS	$350,000	$350,000
5	3" VACUUM MAIN, COMPLETE	16,100	LF	$23	$370,300
6	4" ISOLATION VALVE, COMPLETE	5	EA	$1,200	$6,000
7	VAC STA - SITE WORK	1	LS	$20,000	$20,000
8	VAC STA - BUILDING/FOUNDATION	1	LS	$10,000	$10,000
9	VAC STA - TANK INSTALLATION	1	LS	$20,000	$20,000
10	VAC STA - MECHANICAL/ELECTRICAL (BLDG TO TANK)	1	LS	$15,000	$15,000
11	VAC STA - VALVE VAULT(S)	1	LS	$5,000	$5,000
12	VAC STA - ODOR CONTROL	1	LS	$15,000	$15,000
13	VAC STA - GENERATOR	1	LS	$35,000	$35,000
14	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
15	CLEARING AND GRUBBING	1	LS	$5,000	$5,000
16	TEPMORARY SOIL CONTROL	1	LS	$5,000	$5,000
17	MAINTAINING TRAFFIC	1	LS	$15,000	$15,000
18	CONSTRUCTION LAYOUT STAKING	1	LS	$20,000	$20,000
19	SEEDING AND MULCHING	8,700	SY	$1	$8,700
20	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	6,500	SY	$30	$195,000
22	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$1,741,880
10% CONTINGENCY					$174,188
20% NON-CONSTRUCTION					$383,214
TOTAL					**$2,299,282**

Planning Area C

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	6.0' - 2PC HYBRID VALVE PIT	28	EA	$4,700	$131,600
2	AIR TERMINALS	28	EA	$230	$6,440
3	TRAILER MOUNTED VACUUM PUMP	1	EA	$40,000	$40,000
4	PACVAC 165M-10	1	LS	$250,000	$250,000
5	3" VACUUM MAIN, COMPLETE	6,240	LF	$23	$143,520
6	4" ISOLATION VALVE, COMPLETE	1	EA	$1,200	$1,200
7	VAC STA - SITE WORK	1	LS	$20,000	$20,000
8	VAC STA - BUILDING/FOUNDATION	1	LS	$10,000	$10,000
9	VAC STA - TANK INSTALLATION	1	LS	$20,000	$20,000
10	VAC STA - MECHANICAL/ELECTRICAL (BLDG TO TANK)	1	LS	$15,000	$15,000
11	VAC STA - VALVE VAULT(S)	1	LS	$5,000	$5,000
12	VAC STA - ODOR CONTROL	1	LS	$15,000	$15,000
13	VAC STA - GENERATOR	1	LS	$35,000	$35,000
14	MOBILIZATION/DEMOBILIZATION	1	LS	$20,000	$20,000
15	CLEARING AND GRUBBING	1	LS	$5,000	$5,000
16	TEPMORARY SOIL CONTROL	1	LS	$5,000	$5,000
17	MAINTAINING TRAFFIC	1	LS	$15,000	$15,000
18	CONSTRUCTION LAYOUT STAKING	1	LS	$20,000	$20,000
19	SEEDING AND MULCHING	2,800	SY	$1	$2,800
20	ASPHALT PAVEMENT REMOVAL & REPLACEMENT, COMPLETE	2,000	SY	$30	$60,000
21	PERMITTING	1	LS	$15,000	$15,000
SUBTOTAL					$835,560
10% CONTINGENCY					$83,556
20% NON-CONSTRUCTION					$183,823
TOTAL					**$1,102,939**

Treatment System Alternatives

The treatment of wastewater is the second stage in managing wastewater. Four scenarios were reviewed for the Jackson Township areas. Three scenarios include the construction of new wastewater treatment facilities in Jackson Township. These treatment options include an extended aeration plant, a lagoon system or a packed bed media system. One additional scenario includes transporting wastewater to the Village of Union City's existing treatment facility and contracting with Union City for treatment operations.

All of the scenarios will examine all three planning areas as a whole and each planning area on an individual basis. Force mains will connect planning areas A and C to planning area B when regionalizing all three areas. The locations of the treatment plants and connecting force mains can be found in Figure 5-11.

Given that the proposed wastewater treatment facilities are new, there are currently no specific effluent parameters for Jackson Township. Without having specific effluent limitation parameters, effluent will need to comply with the EPA's Best Available Demonstrated Control Technology for new sources discharging sanitary wastewater which is identified as follows:

Table 5-5: Design Effluent

Parameter	30 Day Limit	Daily or 7 Day Limit	Max/Min Limit
CBOD5	10 mg/l	15 mg/l	n/a
Total Suspended Solids	12 mg/l	18 mg/l	n/a
Ammonia (summer)	1.0 mg/l	1.5 mg/l	n/a
Ammonia (winter)	3.0 mg/l	4.5 mg/l	n/a
Dissolved Oxygen	n/a	n/a	6.0 mg/l (min.)
Total Residual Chlorine	n/a	n/a	0.038 mg/l (max.)
E. Coli	126 / 100 ml	235 / 100 ml	n/a

In addition, a final decision upon the amount of residual treated wastewater constituents requires a formal study of the receiving water, in this case Dismal Creek.

For the purpose of this study, it will be assumed that any new wastewater treatment facility will consist of primary, secondary and tertiary treatment. In the three scenarios evaluated, the extent of each component i.e. primary, secondary and tertiary treatment will be described briefly and used to evaluate the alternatives.

New Wastewater Treatment Plant – Extended Aeration

The first alternative for a new wastewater treatment plant utilizes extended aeration. Extended Aeration is a modified form of the activated sludge treatment process and is ideal for smaller flows. For purpose of this study, it will be assumed that the proposed treatment facility would consist of mechanical screening and grit removal as primary treatment. Secondary treatment would be the extended aeration process and clarification. This would be followed by tertiary filtration, Ultra Violet (UV) disinfection, post aeration and sludge treatment for land application.

Treatment of the wastewater will begin with the removal of large pieces of debris and any materials carried through the collection system using a bar screen followed by a mechanical fine screen. The bar screen will need to be manually cleaned by an operator. Mechanical fine screens typically have an automated self cleaning system. The screenings will be collected and disposed of appropriately.

Following the screening process the wastewater will then proceed to secondary treatment which in this alternative is the extended aeration process. The proposed Biolac

System is an activated sludge biological treatment system that is suitable for many municipal wastewater applications. It is an extended aeration system with internal final clarification. The system utilizes low-loaded activated sludge technology, single basin operation, simple basin construction, and high-efficiency aeration chains with suspended fine –bubble diffusers. These features make the system very effective and cost efficient. The treatment process is presented in the diagram in Figure 5-8.

The system also offers a longer activated sludge age than most treatment systems. This provides excellent BOD removal, complete nitrification, and nutrient removal in warm and cold climates. The process incorporates a wave-oxidation process, which simplifies biological nutrient removal. Air distribution can be adjusted to vary the dissolved oxygen content and promotes alkalinity recovery. It also promotes nitrification, denitrification, and biological phosphorous removal.

Clarification is the next step in the treatment process and this occurs in a chamber that is integral to the extended aeration basin. The clarified wastewater then proceeds to the rapid sand filters where the tertiary filtration occurs. The rapid sand filters will be utilized as a polishing step to improve the quality of the wastewater prior to discharge.

After tertiary filtration, the wastewater is then disinfected as it proceeds through the UV disinfection unit. This is the followed by post aeration to meet the dissolved oxygen requirements. The treated effluent is then discharged to the receiving stream i.e. Dismal Creek.

Sludge that is collected at the bottom of the clarifier flows to a sludge holding tank. From the sludge holding tank, some of the sludge can be pumped and returned to be mixed with the influent. This can be either upstream of the screening process or combined with the influent to the aeration basin. Any remaining sludge in the sludge holding tank can be held for extended periods of time without aeration. Air can be easily introduced into the sludge if required via the diffused air piping in the sludge holding tank. No further digestion is required and the large quantity of biomass can treat fluctuating loads with minimal operational changes. It also minimizes excess sludge and makes the process very stable. Excess sludge can be pumped to sludge drying beds for dewatering and further processing prior to land application.

A building will also be provided for the blowers, electrical equipment, process controls and other appurtenances necessary for the operation of the plant. A sludge building will also be considered for sludge processing equipment as required.

Advantages

- Modular – ready for installation
- Routinely maintains good effluent quality
- Highest capacity to accept increased wastewater flows
- Relatively odorless and noiseless operation
- Less indicative to site selection

Disadvantages

- Increased power consumption
- Increased O,M&R
- More frequent sludge handling

Under this scenario, Jackson Township would construct, own, operate, and maintain wastewater treatment plants which would be designed to handle wastewater flows of 20,000GPD, 60,000 GPD, and 13,000 GPD. The location of the wastewater treatment plants can be found in Figure 5-11.

Listed below in Table 5-6 are construction cost estimates for an extended aeration plant.

Table 5-6: Extended Aeration Treatment System Cost Analysis

Planning Area A

ITEM	DESCRIPTION	QTY.	UNIT	COST/UNIT	TOTAL
1	BARS/SCREEN UNIT	1	LS	$15,000	$15,000
2	BIOLAC SYSTEM	1	LS	$90,000	$90,000
3	SAND FILTER	2	LS	$10,000	$20,000
4	SLUDGE DRYING BED	2	LS	$10,000	$20,000
5	SLUDGE DRYING BED BUILDING	1	LS	$10,000	$10,000
6	UV DISINFECTION UNIT	1	LS	$15,000	$15,000
7	POST AERATION TANK/FLOW METERS	1	LS	$10,000	$10,000
8	OFFICE/BLOWERS BUILDING	1	LS	$70,000	$70,000
9	YARD PIPING	1	LS	$25,000	$25,000
10	SITE WORK	1	LS	$15,000	$15,000
11	ELECTRICAL AND CONTROL	1	LS	$15,000	$15,000
12	6" SANITARY FORCE MAIN, COMPLETE	500	LF	$ 24	$12,000
13	LAND ACQUISITION	2	AC	$1,000	$2,000
SUBTOTAL					$319,000
10% CONTINGENCY					$31,900
20% NON-CONSTRUCTION					$70,180
TOTAL					**$421,080**