Sanitary Sewer Master Plan

TOWN OF ZIONSVILLE

I N D I A N A

ZIONSVILLE
TOWN HALL

Sanitary Sewer Master Plan
June 2011

Prepared by:

COMMONWEALTH™
ENGINEERS, INC.
A wealth of resources to master a common goal.

TOWN OF ZIONSVILLE
SANITARY SEWER MASTER PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF FIGURES

LIST OF FIGURES
(Continued)

EXECUTIVE SUMMARY

Commonwealth Engineers, Inc. has prepared this update to Zionsville's Sanitary Sewer Master Plan to provide a comprehensive analysis of current and future needs of the community's wastewater collection facilities. The Master Plan is an important tool which will help facilitate orderly expansion of the sanitary collection and treatment system to meet future demands. In the early stages of the planning process a Master Plan Work Group was created to provide oversight regarding the issues, needs, and recommendations for future wastewater infrastructure which will be needed to serve the growing community. The Work Group consists of the Utilities and Environment Committee of the Town Council, utility and community planning officials, local residents with representatives from Eagle and Union Townships, and a representative of the Boone County Health Department.

The Master Plan Update also provides guidance for Town Officials and a timeframe for implementation of the proposed improvements. The input of key utility personnel and our knowledge of the operations and history of the Zionsville Wastewater Department were fully utilized to develop the capital improvement recommendations presented herein. This Executive Summary provides a brief synopsis of the overall Plan.

A. Purpose

The Sanitary Sewer Master Plan was prepared to provide the Town of Zionsville with a thorough evaluation of its wastewater collection and treatment system. Existing treatment facilities were evaluated with regard to capacity and the ability to meet projected future flows. A primary intent of the Plan is to enable a cost-effective planning strategy which will allow the Town to meet both long and short term needs of its wastewater utility. Existing interceptor sewer capacities were evaluated in an effort to optimize utilization of the existing sanitary collection and treatment facilities.

Another purpose of the master plan update is to establish a plan for the conveyance of wastewater from areas of future growth in Union Township, which has recently undergone a voluntary consolidation with the Town of Zionsville. Recommendations for sanitary sewer system improvements and new sewer system piping have been included where needed to accommodate future growth and to correct system deficiencies.

As with any long term master plan, the recommendations set forth are based upon future population projections and growth and development expectations for the Town. It is recommended that this master plan be reviewed in five year increments, and amended as appropriate to reflect changes in growth trends and local conditions.

B. Planning Period and Planning Area

A planning period of 25 years was established for this Plan and was determined to be an appropriate time frame for analyzing future population trends and addressing potential sewer system and related equipment needs. The study area for this Master Plan corresponds to the existing Town corporate limits, which, following the recent consolidation, now includes the entirety of Union Township. The consolidation of Zionsville is the result of the implementation of the provisions of Indiana House Bill 1362, also known as the Government Modernization Act of 2006. This bill provided the first framework for local governments to pursue voluntary consolidation.

C. Existing Facilities

The existing wastewater collection system was divided into three sewer basins. The basin boundaries were generated based upon the locations of the main interceptors within the collection system and their point of discharge to the wastewater treatment plant. The basins were further divided into sub-basins based upon local topography, pump station discharge locations, and the hydraulic characteristics of gravity sanitary sewer flow within each basin. The characteristics of each sub-basin were evaluated to determine the respective sources and volume of wastewater contributed to the system. Utilizing Monthly Reports of Operations, average daily wastewater flows and infiltration and inflow amounts were estimated for each of the sub-basins. With no system flow measurement data available, age, pipe material, and the diameters and lengths of collection system piping were the basic criteria used to estimate inflow and infiltration volumes for each sewer sub-basin.

Utilizing the estimated flows, a spreadsheet model was generated to evaluate the collection system. The evaluation focused primarily upon the capacity and loadings for each of the major interceptors located within each basin.

The model was used to calculate sanitary sewer system flows for both existing and future conditions based on land use, population, and the cumulative average daily dry weather flows with an allowance for infiltration and inflow. Based on these concepts, wastewater loadings were estimated for the major interceptors within the Town's existing sanitary sewer collection system. The critical information regarding each interceptor, i.e. size, slope, roughness factor, was based on information obtained from the Town's Geographical Information System database. This information was gathered and entered into the hydraulic model to calculate the current loading on the pipe and the remaining capacity available to accommodate future flow.

D. Capital Improvements Projects

The Master Plan is intended to guide future sanitary sewer service within the greater Zionsville area. A primary goal is to help ensure that adequate sewer infrastructure will be available to both existing and new development. Another goal is to ensure that future improvements will help to implement the Town's Comprehensive Plan and will be phased according to community priorities. Sewer utility improvements should also strive to maintain equitable levels of service, safeguard public health and safety, and serve new development in a timely manner.

Detrimental impacts of utility improvements on surrounding developments and the community as a whole must be minimized. The Master Plan looks to promote efficiency in the provision or improvement of sewer service wherever appropriate and feasible. In addition, costs of improvements should be distributed in an equitable manner. In many cases, the costs associated with the recommended sanitary sewer projects are expected to be borne by local developers as shown in Table ES-2 at the end of this Executive Summary.

Utilizing the Town's Comprehensive Plan and Transportation Plan, along with discussions and input from the Master Plan Work Group, several areas within Eagle and Union Townships were targeted for future development. By incorporating results obtained from the system model, a conveyance plan was developed to help eliminate overloading conditions in current interceptors and to provide sanitary sewer service to areas of future development.

Using zoning guidelines and expected land use densities, population was projected for both Eagle and Union Township for plan year 2035. Population projections, land use, and current zoning regulations were also used to estimate year 2035 wastewater flows throughout the existing and future service areas. Recommended Improvement projects were then developed to accommodate the future wastewater flow projections.

Developable areas within the Eagle Township study area are zoned primarily for single family residential land use. In several cases, the model illustrates that the existing interceptor sewers are currently at or near capacity in the West and East Sewer Basins. New interceptor sewers, lift station enlargements, and in some cases new force main routings have been proposed to relieve overloading conditions in key interceptors. Along with the physical locations of targeted development, the conveyance system layouts were largely determined based upon the topography of the land, including features such as construction constraints, ground elevations, creeks, and natural drainage patterns.

Based upon the locations of future development areas and the timing of development activity, it may be logical to allow certain parcels to be provided with sanitary sewer service by neighboring utilities. This is particularly true for the area in the vicinity of U.S. Highway 421 and 146th Street, which could potentially be served by the Clay Township Regional Waste District (CTRWD).

1. Union Township

Wastewater needs in Union Township must be addressed before significant growth can occur. Residents and businesses will be slow to relocate to an area where the current infrastructure is inadequate. Generally, the Town of Zionsville would like to maintain the agricultural and rural character of Union Township while accommodating a moderate pace of growth which complies with the local zoning guidelines. Several areas within Union Township have therefore been targeted for future development. Understandably, single family residential homes would be the primary focus, with some scattered commercial activity taking place in designated areas to support basic household needs.

Corporate, commercial and industrial activity in Union Township is expected to be limited to the area near the Indianapolis Executive Airport and to a small area contiguous to the landfill site which is maintained by Boone County Resource Recovery. Much of the landfill site has been reclaimed, and at this time only "clean fill" operations are underway at the facility. Managed fill activities which could include organic matter and moderately contaminated soils are no longer accepted. Current landfill operations are not expected to have an adverse impact on the environment or on local development activity.

Utilizing the targeted development areas, a conveyance plan was created to provide a foundation for sewer service within Union Township. In order to provide service to these new developments, a new wastewater treatment plant in Union Township would be required unless the wastewater can be conveyed to a neighboring utility for treatment and disposal.

2. Interim Approach for Wastewater Collection and Treatment in Union Township

The cost for construction of new wastewater treatment facilities is extremely prohibitive, particularly when an adequate customer base is not present to generate the necessary revenue stream to retire the accompanying debt. In addition, it would be unreasonable to expect Eagle Township customers to bear the costs associated with providing sanitary sewer service to Union Township.

An interim plan was therefore developed which would provide for the conveyance of wastewater to a neighboring utility until adequate development has occurred in Union Township. Wastewater collection, transmission, and treatment to address needs in the region were developed using a multifaceted approach which included input from neighboring utilities. These included the City of Westfield, Hamilton Southeastern Utilities, and the Clay Township Regional Waste District. Several alternatives were evaluated with regard to the provision of wastewater collection and treatment services in Union Township. These included:

Collection and Conveyance	Treatment
Town of Zionsville	City of Westfield
Town of Zionsville	Clay Township Regional Waste District
Hamilton Southeastern Utilities	Hamilton Southeastern Utilities
Town of Zionsville	Town of Zionsville

Hamilton Southeastern Utilities (HSE) is a private, investor-owned system regulated by the Indiana Utility Regulatory Commission. HSE provides sanitary sewer service for much of the Town of Fishers and portions of the City of Noblesville, as well as unincorporated areas within Delaware, Fall Creek and Wayne Townships in Hamilton County. It must be noted that the HSE has been granted a provisional Certificate of Territorial Authority to provide sanitary sewer service to the Union Township area. "Provisional" is a key stipulation, since the recent consolidation of Union Township will require an HSE owned system to be subject to the approval of the Town of Zionsville. It should also be noted that nothing is more fundamental to a community's economic growth and development than adequate, reliable and affordable utility services. A private company may find it undesirable to expand into a new area if its cost/benefit analysis fails to project sufficient profits from the investment. This in turn could delay interest in the area among the local development community.

For these reasons, the Work Group recommended an "Interim" approach which would allow the Town of Zionsville to ultimately maintain full control over wastewater collection and treatment alternatives in Union Township. Using this approach, Zionsville would construct only those collection facilities necessary to convey wastewater to a connection point with either the City of Westfield or the Clay Township Regional Waste District (CTRWD). This would allow the Town to postpone the construction of a wastewater treatment plant until residential development has reached a point where future Town owned facilities would be financially self-sustaining. Following completion of the conveyance plan for Union Township, the feasibility of interim conveyance of wastewater to the Westfield and CTRWD alternatives was evaluated. Costs for the two options are very similar, as shown in Options 2 and 3 of the following table.

Town of Zionsville - Union Township Area
Wastewater Collection and Treatment Options

Component	Option			
	1	2	3	4
Collection System:	Zionsville	**Zionsville**	**Zionsville**	Hamilton Southeastern Utilities
Monthly Debt Service	$11,530	$8,780	$7,940	-
Monthly O & M Cost	$600	$800	$800	-
Wastewater Treatment:	Zionsville	**City of Westfield**	**Clay Township RWD**	Hamilton Southeastern Utilities
Monthly Debt Service	$20,670	$7,940	$10,710	-
Monthly O & M Cost	$7,000	$500	$700	-
Outside Treatment Cost / Month	$0	$11,250	$9,000	-
Total Monthly Debt Service	$32,200	$16,720	$18,650	-
Total Monthly O & M Cost	$7,600	$1,300	$1,500	-
Outside Treatment Cost	$0	$11,250	$9,000	-
Total Monthly Disbursement:	$39,800	$29,270	$29,150	-
No. of Customers needed to Meet revenue requirements *(Based upon current rates)*:	894	658	655	-

Clay Township RWD Treatment Cost based upon a volume of 250,000 gpd @ **$1.20 per 1,000 gallons**

City of Westfield Treatment Cost based upon a volume of 250,000 gpd @ **$1.50 per 1,000 gallons**

Option 4 assumes all facilities will be constructed, owned and operated by Hamilton Southeastern Utilities

All costs are based upon 2011 dollars.

Collection System O&M costs include power, routine maintenance, plus an allowance for depreciation.

It should be noted that the outside treatment costs shown in the above table are based upon future conditions where a moderate level of development in Union Township has already occurred. The 250,000 gallon per day figure used is equivalent to roughly 800 homes under dry weather conditions, including an allowance for base groundwater infiltration. The outside treatment costs will be significantly lower during the early years of an interim agreement before significant development activities are underway.

Conveyance to the CTRWD is a logical alternative, given the lower volumetric cost for wastewater treatment, and the fact that the Clay Township Regional Waste District already serves several Zionsville neighborhoods in Eagle Township east of U.S. Highway 421. The Clay Township wastewater treatment facility for this area also lies within the Zionsville corporate boundary, located south of 106th Street and just west of the Boone – Hamilton County Line.

It is believed that an Interim Plan (conveying wastewater to the CTRWD through the development of a wholesale service agreement) provides the best means of expediting sanitary sewer service to Union township. Such an agreement must be renewable, with mutually agreeable terms of service. It should also include a provision which would allow Zionsville to exercise an option to withdraw from the contract upon a favorable vote of the Town Council.

Construction of sanitary sewer infrastructure in Union township should be subject to the following criteria unless other provisions are implemented and approved by the Town Council: 1) The proposed sanitary sewer facilities must have the capacity to meet the sanitary flows projected in this Master Plan, and 2) With the exception of transmission and conveyance to the connection point with the treatment provider, the development community should bear all costs for extending the sanitary sewer collection system to proposed development areas.

E. Consensus Decision of the Master Plan Work Group

Progress meetings with the Master Plan Work Group were conducted on a monthly basis over the period of November 2010 through May 2011. At its final meeting, the group was asked to reach a consensus opinion regarding the wastewater collection and treatment alternatives which had been presented. The Master Plan Work Group voted in favor of an Interim Plan which would allow the Town of Zionsville to maintain oversight, ownership, and control over public wastewater collection and conveyance facilities in Union Township.

The Interim Plan would provide for conveyance of wastewater to the Clay Township Regional Waste District (CTRWD), subject to mutual agreement and the successful execution of a bulk wastewater treatment contract with the CTRWD. Such an agreement must include provisions for amendment or renewal by mutual written consent of both parties. The agreement must also grant the Town a provision to terminate the contract upon favorable vote by the Zionsville Town Council.

F. Project Costs

Sanitary Sewer construction projects present individually unique conditions with respect to location, site constraints, soils, groundwater, and related geotechnical considerations. Construction industry market conditions can also greatly affect project costs.

By reviewing recent data from publicly bid projects of comparable scope, along with consideration of current market trends, cost estimates were generated for all of the recommended collection system improvements. No estimates can be considered final, however, until specific site conditions are known and complete construction plans and specifications have been prepared. The costs presented are generalized estimates which are considered appropriate for master planning purposes.

It must be noted that all costs are based upon 2011 dollars. Going forward, an annual escalation factor of 2.5% is recommended to allow for inflationary pressures. Unit costs presented are base construction costs which include contractor overhead and profit.

Expenses for dewatering have been included, along with a provision for erosion control due to the environmentally sensitive nature of some of the proposed construction areas such as floodways, wetlands, wooded areas, embankments and agricultural land. A fifteen percent construction contingency was added to the estimated costs to cover unknowns and potential variables which can arise during the construction phase. A twenty-five percent allowance was included to cover non-construction costs such as engineering, legal, administrative, and management expenses. The Non-Construction Costs also included an allowance for land acquisition.

Table ES-1 provides an overview of the proposed project costs for both Eagle and Union Townships. Projects which we expect to be "developer funded" are indicated with a (DF) designation following the project name. At this time, all other projects are expected to be locally funded through the Town's wastewater utility. Table ES-2 itemizes the recommended projects by Township and categorizes them by the anticipated funding source, providing total estimated project costs for both developer-funded and locally funded projects.

Table No. ES-1

Town of Zionsville - Summary Table
Recommended Projects and Estimated Costs (2011)

Project Name	Construction Costs	Non-Construction Costs	Estimated Total Project Costs
Eagle Township			
Cobblestone Interceptor Sewer Extension (DF)	$ 1,389,500	$ 387,000	$ 1,776,500
West Eagle Township Interceptor (DF)	$ 1,666,500	$ 467,000	$ 2,133,500
Irishmans's Run Lift Station Enlargement, New Force Main to WWTP	$ 1,452,500	$ 393,000	$ 1,845,500
Eastern Interceptor Relief Sewer	$ 846,500	$ 242,000	$ 1,088,500
Enlargement of Willow Road Lift Station	$ 375,700	$ 104,000	$ 479,700
Re-Routing Raintree, Lost Run Force Mains	$ 148,500	$ 57,000	$ 205,500
Michigan Road Sewer and Lift Station (DF)	$ 1,872,500	$ 548,000	$ 2,420,500
	Subtotal, Eagle Township:		**$ 9,949,700**
Union Township			
Co. Road 100 N. Interceptor (DF)	$ 840,900	$ 242,000	$ 1,083,000
Section 35 Interceptor (DF)	$ 781,200	$ 227,000	$ 1,008,000
North Lift Station	$ 287,700	$ 80,000	$ 368,000
Northfield Interceptor	$ 817,200	$ 236,000	$ 1,053,200
Finley Creek Interceptor (DF)	$ 569,000	$ 166,000	$ 735,000
Airport Lift Station (DF)	$ 276,350	$ 69,000	$ 345,350
Finley Creek Lift Station	$ 712,500	$ 178,000	$ 890,500
Mounts Run North Interceptor (DF)	$ 1,533,900	$ 423,000	$ 1,956,900
Mounts Run South Intercetpor (DF)	$ 2,212,200	$ 609,000	$ 2,821,200
Pleasant View Sewer (DF)	$ 588,200	$ 155,000	$ 743,200
County Rd. 200 S. Lift Station	$ 869,900	$ 233,000	$ 1,102,900
0.25 MGD Phase I Wastewater Treatment Plant (Future)	$ 1,920,000	$ 480,000	$ 2,400,000
	Subtotal, Union Township:		**$ 14,507,250**

Notes: Estimated lift station costs shown above include the costs for the applicable force main and associated items such as granular backfill, dewatering, and grading and seeding. More detailed breakdowns of these costs are provided in Section 8 of the Master Plan.

(DF) Indicates projects which are expected to be Developer Funded

Table ES-2 Town of Zionsville Summary of Developer Funded and Locally Funded Projects and Costs		
Project Name and Anticipated Funding Source	**Estimated Project Costs**	**Total Cost**
Eagle Township		
Developer Funded Projects:		
Cobblestone Interceptor Sewer Extension	$ 1,776,500	
West Eagle Township Interceptor	$ 2,133,500	
Irishmans's Run Lift Station Enlargement, New Force Main to WWTP	$ 1,845,500	
Michigan Road Sewer and Lift Station	$ 2,420,500	
Total Developer Funded Projects, Eagle Township:		**$ 8,176,000**
Locally Funded Projects:		
Eastern Interceptor Relief Sewer	$ 1,088,500	
Enlargement of Willow Road Lift Station	$ 479,700	
Re-Routing Raintree, Lost Run Force Mains	$ 205,500	
Total Locally Funded Projects, Eagle Township:		**$ 1,773,700**
Union Township		
Developer Funded Projects:		
Co. Road 100 N. Interceptor	$ 1,083,000	
Section 35 Interceptor	$ 1,008,000	
Finley Creek Interceptor	$ 735,000	
Airport Lift Station and Force Main	$ 345,350	
Mounts Run North Interceptor	$ 1,956,900	
Mounts Run South Intercetpor	$ 2,821,200	
Pleasant View Sewer	$ 743,200	
Total Developer Funded Projects, Union Township:		**$ 8,692,650**
Locally Funded Projects:		
North Lift Station and Force Main	$ 368,000	
Northfield Interceptor	$ 1,053,200	
Finley Creek Lift Station and Force Main	$ 890,500	
County Rd. 200 S. Lift Station and Force Main	$ 1,102,900	
Total Locally Funded Projects, Union Township:		**$ 3,414,600**
Total Developer Funded:		**$ 16,868,650**
Total Locally Funded:		**$ 5,188,300**

Note: Costs shown on Table ES-1 for a future wastewater treatment plant in Union Township have not been included. Construction of a new treatment facility would not occur until an adequate customer base has been achieved. Sewer use revenues must be adequate to meet the debt service and operating costs associated with construction of a new plant.

SECTION 1
INTRODUCTION

A. Purpose and Scope

The preparation of this Sanitary Sewer Master Plan was conducted during the period of September 2010 to February 2011. The Master Plan is based upon existing GIS information and engineering and planning data available when the study began. The scope of work for the Plan includes the following tasks:

- Confirm the planning area boundaries
- Evaluate historical population trends
- Evaluate loading and capacities of existing major interceptor sewers
- Project future population and associated wastewater flows
- Estimate distribution of infiltration and inflow for existing and future facilities
- Prepare a spreadsheet based hydraulic model of the existing collection system
- Conduct a capacity analysis of the existing sewer system
- Develop a wastewater conveyance plan for existing and future service areas
- Develop a capital improvements plan with recommendations for future improvements

B. Planning Period

Municipal sewer utilities must strive to achieve an orderly plan for the completion of improvements needed to meet future sewer system needs. Improvements should be based upon the evaluation of existing system facilities, reports from engineering and operations staff, and the analyses performed in preparation of the Master Plan. Recommended improvements are commonly identified through five year increments in a capital improvements plan to the end of the planning horizon.

For this study, the planning horizon has been set at 25 years, or a plan year of 2035. It is recognized, however, that the minimum useful life of a conventional gravity sewer system is approximately 50 years. In order to obtain full beneficial use of any sewers recommended in this study, a long term planning year of 2060 was used to size any

gravity sewers proposed to serve future development. The 2060 plan year has also been used to evaluate the capacities of existing major interceptor sewers and their ability to convey the projected wastewater flows for the long term time horizon.

This Master Plan generally identifies the recommended locations for collection system improvements which will be needed to serve future development. It is difficult, however, to predict the timing and sequence of development activity for specific areas over a long term planning period. It must be noted that actual development may create the need for a reevaluation of both size and recommended locations for new facilities.

C. Goals and Policies

Planning is essentially a rational process used to formulate and achieve goals and objectives. Establishing goals and policies is an essential task to be undertaken before a plan is prepared and implemented. Some of the primary goals of this Master Plan are as follows:

- Maintain a wastewater collection system and ensure its adequacy to protect the health and safety of all residents and businesses in Zionsville.
- Provide wastewater collection and transmission that will satisfy existing needs and projected growth.
- Coordinate the location of wastewater facilities with projected growth and development patterns.
- Coordinate facilities with designated land use and recognize the relationship between sewer infrastructure capabilities, natural features, and environmental and physical factors.
- Encourage efficient use of existing and planned sanitary sewer collection facilities.

SECTION 2
PLANNING AREA CHARACTERISTICS

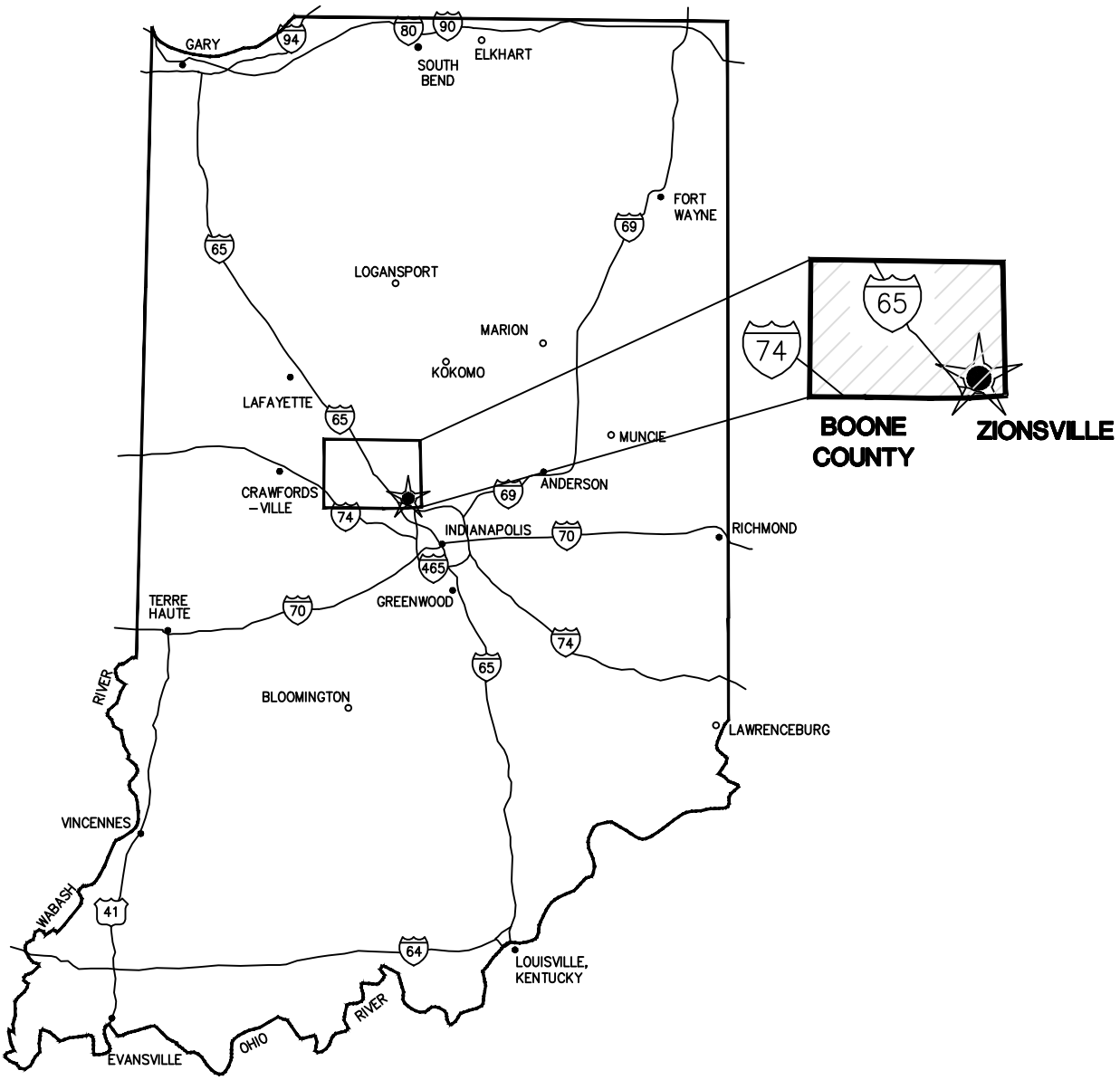
A. Planning Area Location

Zionsville lies in central Indiana in Boone County, approximately 15 miles northwest of downtown Indianapolis. With the recent consolidation and incorporation of Eagle and Union Townships, Zionsville now encompasses a total area of approximately 52 square miles, 98% of which is land. The most predominant geographical feature is Eagle Creek, which flows from north to south through the central portions of both Eagle and Union Townships. Zionsville offers an attractive community setting, with a large area of natural woodlands, a rolling hillside and the desirable amenities associated with a small community environment having close proximity to a large urban population center.

Zionsville is located near a number of major roadways. Interstate 65 offers convenient access to Indianapolis and Lafayette. **Figure No. 2-1** illustrates the general location of the Town of Zionsville. The Town also lies near the northwest corner of the Interstate 465 beltway which circles Indianapolis. State Road 334 is an east-west artery that passes through Zionsville and connects Interstate 65 and U.S. Highway 421, which passes north-south on the east side of the community. Relative to other significant population areas, Zionsville lies approximately 150 miles south-southeast of Chicago, 50 miles southeast of Lafayette, and 42 miles south of Kokomo.

B. Background Information

The Town of Zionsville originated in part due to the need for a stop along the railroad route between Lebanon and Indianapolis. William Zion, for whom the Town is named, partnered with Elijah Cross to build a railway station on Cross's land in Eagle Township. The Town received its charter in 1852. The first resident, John Miller, constructed a home which also served as a boarding house for local travelers and businessmen.



GENERAL LOCATION MAP

NO SCALE

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
HAMILTON COUNTY

SANITARY SEWER UPDATE/EXPANSION

GENERAL LOCATION MAP
FIGURE 2-1

In the Town's early years, local businesses and churches relocated from nearby Eagle Village, and by the 1860 census the population of Zionsville had grown to 364. A historical marker located in Lincoln Park at the junction of State Road 334 and 1st Street is said to mark the spot of an 1861 address made by Abraham Lincoln to the people of Zionsville as he was traveling to his inaugural event in the Nation's Capital.

From 1903 to 1930 the Northwestern Division of the T.H.I. & E. Interurban Railroad operated a passenger rail line that connected Indianapolis and Lafayette. The Interurban held widespread popularity during the first three decades of the twentieth century, and in Zionsville the tracks were located in the middle of Main Street. This passenger line held great appeal for commuters seeking convenient access between the major served cities. The Interurban provided swift transit and provided further expansion and progress to Zionsville's growing business environment.

In recent decades, Zionsville for the most part has led a relatively quiet existence. While many people were relocating from Indianapolis to the northern suburbs of Carmel, Fishers, and Westfield during the 1970's to 1990's, Zionsville has retained its mostly rural identity by taking measures to avoid problems associated with urban sprawl. Through the years, Zionsville has continued to add amenities and cultural facilities such as the P.H. Sullivan Museum and the Munce Art Center. The many local social organizations and Churches help to provide an atmosphere with an emphasis on study and camaraderie. Other attractions of note in the Zionsville area include the Fort Harrison State Park, Wolf Run Golf Club, and the Becky Fehsenfeld Fine Art Gallery.

C. Zionsville Consolidation

As of January 2, 2010, Eagle and Union Townships in Boone County were consolidated and incorporated as part of the Town of Zionsville. The consolidation occurred following the successful passage of a voter referendum on November 4, 2008 to institute a Plan of

Government Reorganization. The enacted Indiana State House Bill 1362, also known as Government Modernization Act or the "Reorganization Statute", allows political subdivisions in Indiana to consolidate their operations with other political subdivisions. The Zionsville consolidation is the first successful reorganization to take place in the State since the enactment of the law.

The purpose of House Bill 1362 is to grant broader powers to government units on the local level, by eliminating restrictions and allowing smaller political entities to operate more efficiently. Another primary goal is to encourage political entities to reduce their reliance on property tax revenue and to enhance local government's ability to provide critical services including public water supply, sanitary sewer service, transportation, and other vital infrastructure.

With the reorganization, the Town now shares the Zionsville Community School district with the townships. In May 2007, the legislative bodies of the Town and each Township jointly authorized a nine-member committee to craft a government plan in accordance with the Reorganization Statue. The entities sought to establish and define a border around Zionsville and the Townships to prevent annexation from outside communities and to gain control over land development activity and zoning regulation formerly provided by the Boone County Plan Commission and Board of Zoning Appeals.

D. General Characteristics of the Planning Area

1. Geography

The physical geography of Zionsville is dominated by Eagle Creek and its numerous tributaries. The watershed has a fairly pronounced gradient, and most developments lie on flat to moderate sloping terraces; low lying areas are occasionally subject to flooding conditions. The floodplain of Eagle Creek in most areas is less than 500 feet in width. Based upon a review of the FEMA Flood Insurance Rate Maps, the widest designated floodplain area, approximately 1,800 feet in width, is located west of Willow Road just upstream of the confluence of Eagle Creek and Little Eagle Creek.

The vast majority of Zionsville including the original Village is located west of Eagle Creek. Most recent development which has occurred east of Eagle Creek is provided with sanitary sewer service by the Clay Township Regional Waste District. Exceptions include the subdivisions along Willow Road north of Templin Road, and the Raintree Place and Lost Run Farm subdivisions.

There are several drainage basins with tributary streams flowing to Eagle Creek. In Union Township, Mounts Run and Finley Creek are two natural drainage-ways flowing into Eagle Creek that have several smaller tributaries of their own. Both Mounts Run and Finely Creek flow south and converge with Eagle Creek just north of County Road 200 South. Farther south In Eagle Township, Little Eagle Creek, Jackson Run, and Irishman Run are three tributaries that flow to Eagle Creek.

2. Existing Land Use

Existing land use is guided by the Town's zoning ordinance, its accompanying zoning map, and to some extent the land use component of the Comprehensive Plan. The Comprehensive Plan established many of the goals and policies that are intended to guide future development. The Town's zoning map is divided into land use designations for all areas of the Town within the two township region. Zoning classification are divided into two categories: Rural Zoning and Urban Zoning.

A detailed zoning ordinance defines the character of the land use, the intent of future growth, and the target densities for future development. While the zoning map may be seen as the most essential component concerning land use, it is basically a graphic representation of the goals and policies expressed by the local ordinance. Town officials, developers, and other interested parties are advised to refer to the goals and policies of the ordinance as well as the diagram when evaluating proposed development and capital improvement projects.

a. Eagle Township

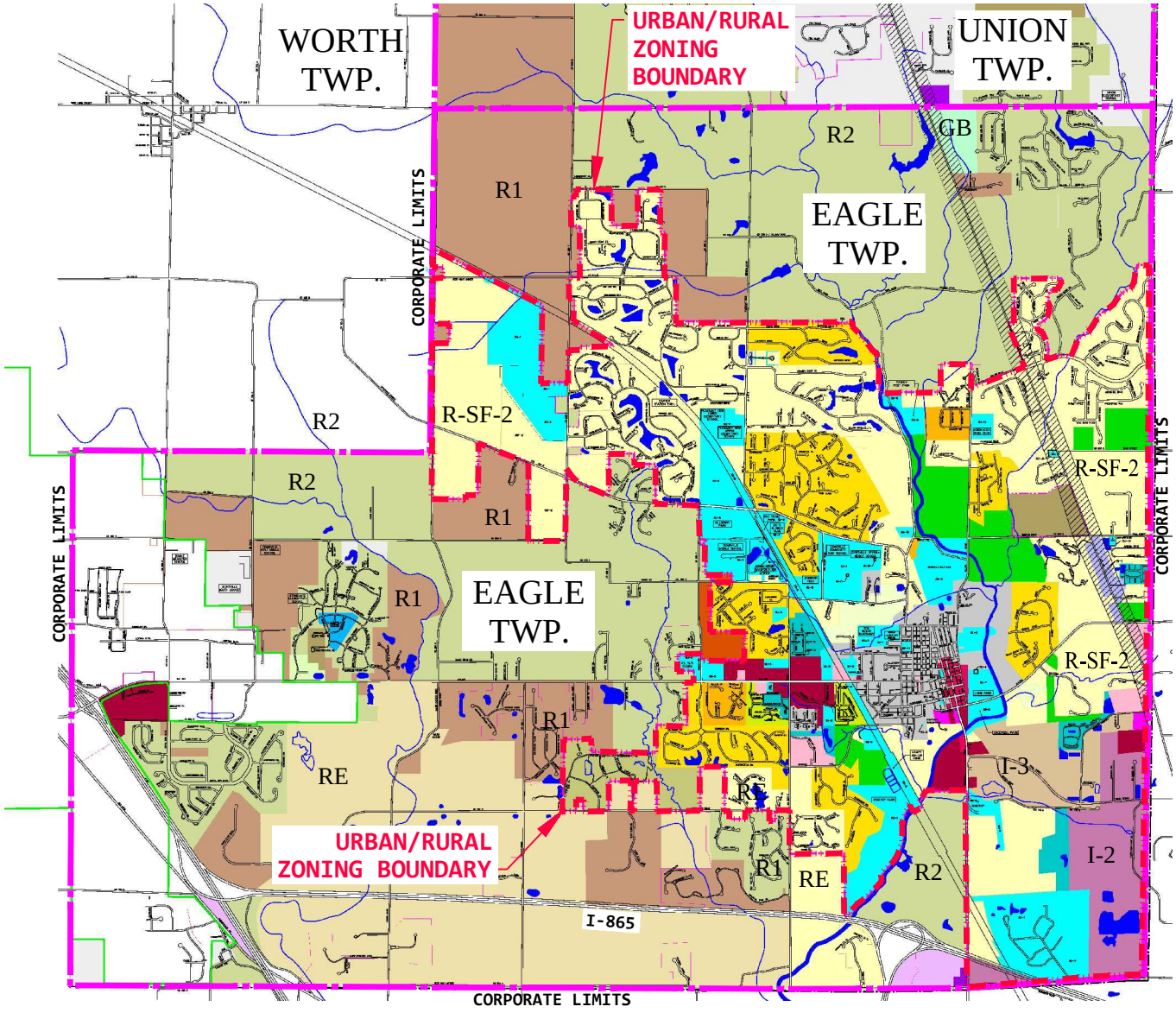
Eagle Township encompasses a total area of approximately 26 square miles in the southeast corner of Boone County. **Figure No. 2-2** shows the layout of Eagle Township. Approximately 2 square miles in the southwest portion of Eagle Township lie within the Whitestown corporate limit. An additional 2 square miles are provided with sanitary sewer service by Whitestown Utilities.

Approximately 3 square miles along the eastern perimeter of Eagle Township are provided with sanitary sewer service by the Clay Township Regional Waste District. This includes all of the single family residential land use east of U.S. Highway 421 and south of 146th Street (approx, 2½ sq. mi.), and the roughly 1½ square miles of commercial and industrial land uses in the very southeast corner of the Township.

The predominant area of commercial land use, with mostly B-2 and B-3 zoning classifications, is situated near the intersection of State Road 334 and Ford Road. Another commercial region is the Village Business District, an area generally bordered by Elm Street to the east, Sycamore Street to the south, 2nd Street to the west, and Poplar Street on the north. In all, roughly ½ square mile in Zionsville is dedicated to business and commercial land use.

Following the consolidation of Eagle and Union Townships, two separate land use classifications were created: Urban Zoning and Rural Zoning. Generally, the Urban Zoning classification includes all land which was located within the Town's corporate boundary as it existed prior to the consolidation. Therefore, all developed land which is served by the existing sanitary sewer system lies within the Urban Zoning classification.

Approximately 17 square miles within Eagle Township are dedicated to low to moderate density residential, single family development. Much of the land is undergoing a transformation from land uses established 40 to



URBAN ZONING

INDICATES B-0 ZONING	INDICATES RE ZONING	OPEN LAND
INDICATES B-1 ZONING	INDICATES I-1 ZONING	INDICATES SPECIAL USE ZONING
INDICATES B-2 ZONING	INDICATES I-2 ZONING	INDICATES VBD ZONING
INDICATES B-3 ZONING	INDICATES I-3 ZONING	INDICATES MICHIGAN ROAD OVERLAY ZONE
INDICATES R-SF-1 ZONING	INDICATES I-ORT ZONING	* SEE ORDINANCE FOR SPECIAL RESTRICTIONS
INDICATES R-SF-2 ZONING	INDICATES R-MF-1 ZONING	URBAN & RURAL BOUNDARY
INDICATES R-SF-3 ZONING	INDICATES R-MF-2 ZONING	COUNTY BOUNDARY
INDICATES R-SF-4 ZONING	INDICATES R-V ZONING	TOWNSHIP BOUNDARY
		WHITESTOWN CORPORATE LIMIT

RURAL ZONING

INDICATES RE ZONING	INDICATES LB ZONING
INDICATES R1 ZONING	INDICATES I1 ZONING
INDICATES R2 ZONING	INDICATES I2 ZONING
INDICATES R3 ZONING	INDICATES AG ZONING
INDICATES R4 ZONING	INDICATES AZ ZONING
INDICATES GB ZONING	INDICATES UB ZONING
	INDICATES PB ZONING

MAP SOURCE:

UNION & EAGLE TWP - ZIONSVILLE ZONING MAP
TOWN OF ZIONSVILLE, INDIANA
JANUARY 2010

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

EAGLE TOWNSHIP – ZONING AND BOUNDARY MAP
FIGURE 2-2

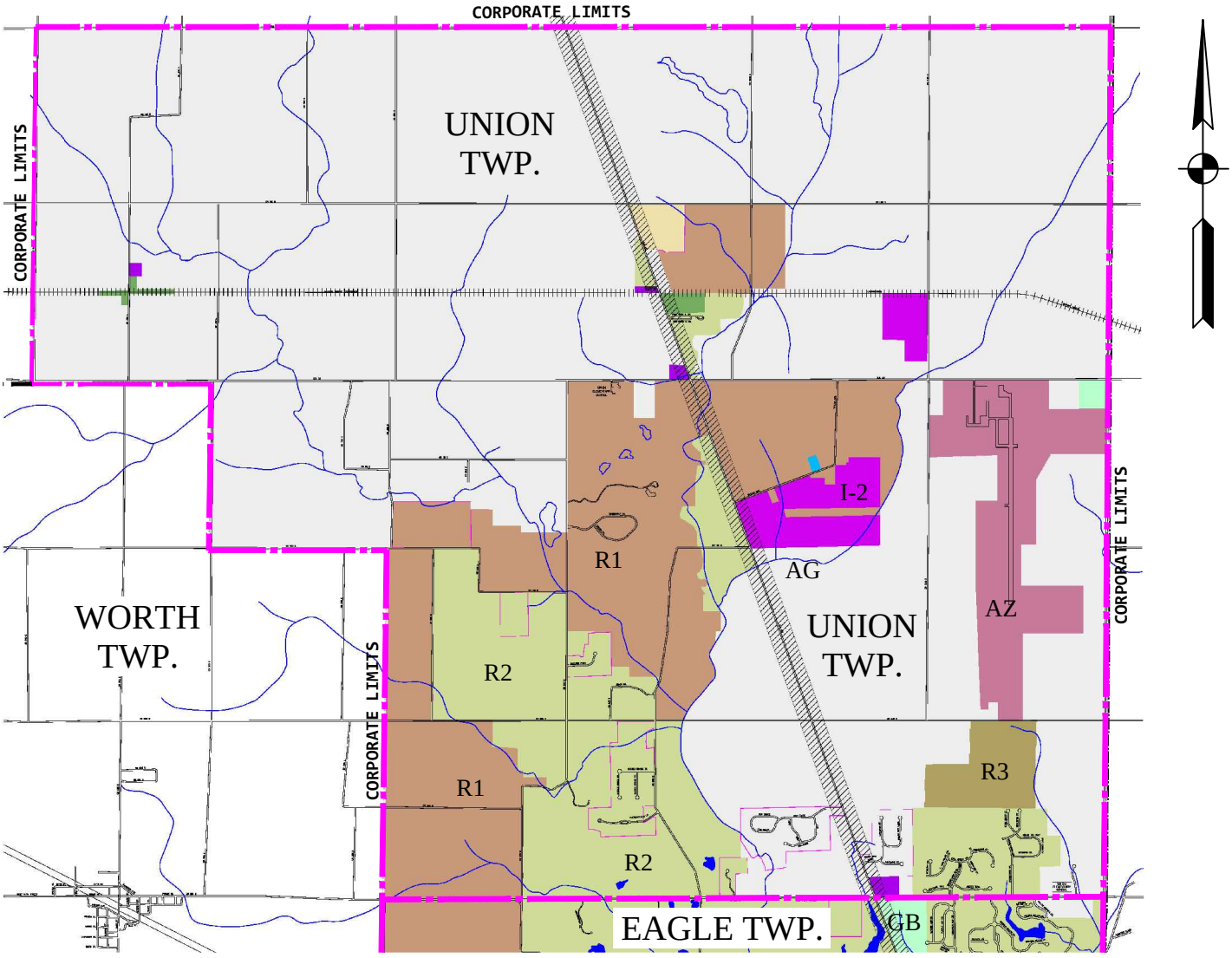
50 years ago into new uses that reflect life today and the changing needs of the Town and its residents. There is also a common desire to preserve the hometown feel and the core residential character of the community. The preservation and protection of residential neighborhoods is one of the most important purposes of the Town's Comprehensive Plan.

Zionsville contains diverse residential development with an orderly transition between varying densities and land uses. Pride in the community is readily apparent, and neighborhoods are attractive and well maintained. The Town also enjoys the benefits of nearby open space and school sites, which are buffered from the impacts of freeway traffic or extensive industrial or commercial development. The diverse range of neighborhoods includes the older homes and smaller lot sizes within the original Village, and newer residential developments, many of which are of low to moderate density with larger lot sizes.

The Town has maintained uniformly high standards for residential property development and maintenance to preserve real estate values and to provide a high quality of life for its residents. The stability of each neighborhood is important to the well-being of the community and the image of the Town as a whole.

b. Union Township

Union Township, located immediately north of Eagle Township, contains a total land area of 25 square miles. **Figure No. 2-3** shows the location and other details of Union Township. At this time, Union Township is a predominantly agricultural area, and approximately 16.5 square miles are included within the Agricultural zoning classification. Most of the current agricultural land use is located within the six mile long by two mile wide strip bordered by State Road 32 on the south and County Road 200N along the Township's north boundary. Although mostly agricultural, moderately dense woodlands do exist along the Eagle Creek watershed and its tributaries.



RURAL ZONING

INDICATES RE ZONING	INDICATES LB ZONING
INDICATES R1 ZONING	INDICATES I1 ZONING
INDICATES R2 ZONING	INDICATES I2 ZONING
INDICATES R3 ZONING	INDICATES AG ZONING
INDICATES R4 ZONING	INDICATES AZ ZONING
INDICATES GB ZONING	INDICATES UB ZONING
	INDICATES PB ZONING
	COUNTY BOUNDARY

MAP SOURCE:

UNION & EAGLE TWP - ZIONSVILLE ZONING MAP
TOWN OF ZIONSVILLE, INDIANA
JANUARY 2010

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP – ZONING AND BOUNDARY MAP
FIGURE 2–3

While agricultural activity in Union Township has declined somewhat from historic levels, the many active farms that remain are highly valued by local residents. Agricultural land in Union Township is used mostly for row crop farming, some livestock and related activities. Farm dwellings and agricultural accessory buildings are common in the area.

Current zoning regulations acknowledge that clusters or strips of residential development have occurred within areas where agriculture is the predominant land use. One of the goals identified by the Town's Comprehensive Plan is the preservation of agricultural land. Boone County recognizes that the presence of agricultural activity contributes significantly to the scenic and rural character valued by local residents.

Roughly 6 square miles, mostly within the central and southwestern portions of the Township, have been zoned for rural residential land use. Approximately 3.5 square miles, or 2,200 acres has been dedicated to Rural R1 zoning to promote the development of low density suburban land uses with large lot sizes. Approximately 2.5 square miles have been categorized as R2, earmarked for single and two family residential developments having a low to moderate density within the range of 0.5 to 1.75 homes per acre.

It should be noted that agricultural areas could serve as potential transfer zones for the future reallocation of zoning and associated development guidelines. This would allow the permitted density to be modified so that an agricultural area could be re-designated in situations where a higher density is desired or acceptable. In the future, some areas which are presently zoned for agricultural land use could be compatible with low density residential (R1) development such as clustered housing with committed open space.

Through land use planning and suitable zoning regulations, Zionsville intends to ensure that existing rural residential, agricultural, park and recreational land uses continue, and reasonable growth can be accommodated with minimal conflict or environmental impact.

The Indianapolis Executive Airport, located in the far east-central portion of Union Township, has grown dramatically over the past 50 years. A master planning study recently completed for the airport authority has predicted that business operations at the airport will double by the year 2027, providing a growing economic impact for Zionsville and the surrounding central Indiana area. An study performed by the Aviation Association of Indiana identified the airport's 2009 economic impact as close to $88 million, 275% greater than the $32 million impact estimated for the year 2003. The airport's convenient location makes it a hub capable of serving regional corporate and commercial air traffic throughout the Boone, Hamilton, Marion and Hendricks County area.

3. Area Economy

The area's economy is well founded and widely based. Clearly, Zionsville's economy also operates within the larger context of Boone County and central Indiana. Indianapolis is a primary industrial, commercial, and transportation hub for the Midwest. Prior to the 1980s, central Indiana's principal industry was manufacturing. At this time, a transition is occurring which will place retailing and the service industry in the economic picture. With proximity to the vast agricultural region of the corn belt and major industrialized cities of the upper Midwest and the East, Indianapolis, Carmel, Fishers, Zionsville and all central Indiana is supported by a diversified economic base.

Table No. 2-1 shows employment figures by industry for Boone County, Indiana. General information regarding occupation and distribution of jobs, along with average annual income data for the Boone County area for year 2008 are also included. Data for the table was generated from the STATS Indiana website. The source for the data was listed as the Bureau of Economic Analysis.

The average earnings per job was obtained by taking the data of total earnings by place of work and dividing by the number of employees by place of work.

Table No. 2-1

Boone County, Employment by Industry

Employment and Earnings by Industry	Number of Jobs in 2008	Percent of All Jobs	Average Earnings Per Job
Farming Related Jobs	**624**	**1.9%**	**$93,429**
Non-Farm Jobs	**32,755**	**98.1%**	**$41,498**
Accommodations, Food Service	1,696	5.1%	$14,928
Administrative	2,840	8.5%	$68,754
Arts, Entertainment, Recreation	878	2.6%	$10,030
Construction	3,243	9.7%	$47,157
Educational Services	431	1.3%	$14,186
Finance, Insurance	1,406	4.2%	$21,577
Health Care, Social Services	2,488	7.5%	$36,197
Information	319	1.0%	$20,639
Management	45	0.1%	$14,489
Manufacturing	2,370	7.1%	$55,962
Professional, Technical Services	2,221	6.7%	$33,624
Real Estate	2,275	6.8%	$7,506
Retail Trade	2,958	8.9%	$22,729
Transportation, Warehousing	2,154	6.5%	$53,245
Other, Private	7,431	22.3%	$35,975
Government	3,481	10.4%	$48,710
Total:	**33,379**	**100%**	**Avg.: $42,469**

Private industry and the services sector employ approximately 27.2% of the local workforce. A significant portion of this employment is located in Indianapolis. The manufacturing sector provides moderate employment, with statistically the highest average annual earnings per non-farm related job. Major manufacturing facilities in the area include the following:

- BPI Packaging
- Ten Point Trim Corp
- Iat Manufacturing, LLC
- Fanimation, Inc.
- Gravel Conveyors Inc.
- Somer Inc.
- Remco Products Corporation
- Midwest Digital Express, Inc.
- LLC 2 Holdings Limited, Llc
- Woodgrain Construction Inc.
- Dental Ceramics Limited Inc.

In central Indiana, there is also a movement toward the information based economy that is driving communities to accommodate technology segments like bio-med, customer service, advanced transportation systems, distance learning, nanotechnologies, e-commerce and information technology initiatives.

We believe the recent governmental consolidation will serve to provide consistent and ongoing stewardship of available resources in the area. Proper planning efforts in the past have led to comprehensive planning and zoning measures, which in turn will help to provide infrastructure that is well planned and coordinated. Together, these actions should result in fiscally sound public financing and responsible incentives to retain, expand and attract businesses to the Zionsville area.

Higher education facilities are also readily available in the area. Purdue University is no more than a one hour drive away. Indiana University - Purdue University at Indianapolis, Marian College and Butler University, also in Indianapolis, provide additional sources of employment and revenue to the local economy as students relocate to the area to further their education.

4. Population – Historical Trends

The analysis of a community's historical population trends with regard to change, migration, and age distribution is a fundamental aspect of utility master planning. Significant changes can affect a community's land use and development patterns, economic base, employment outlook, and demands for housing, education, infrastructure, and other community resources. The planning of sewer system improvements must take into account not only the Town and County population trends and the potential for growth, but where that growth is likely to occur.

This section examines historical population trends for the Town of Zionsville through the year 2009 and places them in context with the county and the overall planning area. Currently, approximately 80% of the Zionsville's population is served by the Town owned wastewater utility. The remainder is served by the Clay Township Regional Waste District or Whitestown Utilities.

Historical population figures for the Town of Zionsville and Boone County for the years 1900 through 2009 are provided in **Table No. 2-2** below. It should be noted that these figures are based upon the population within the corporate limits for the Town of Zionsville prior to the recent consolidation. This data has been obtained from information provided on the Stats Indiana web page (http://www.stats.indiana.edu/). Population projections for future conditions will be discussed in a subsequent section of the report.

Table No. 2-2
Historical Population Figures, 1900 - 2009
Boone County and Town of Zionsville

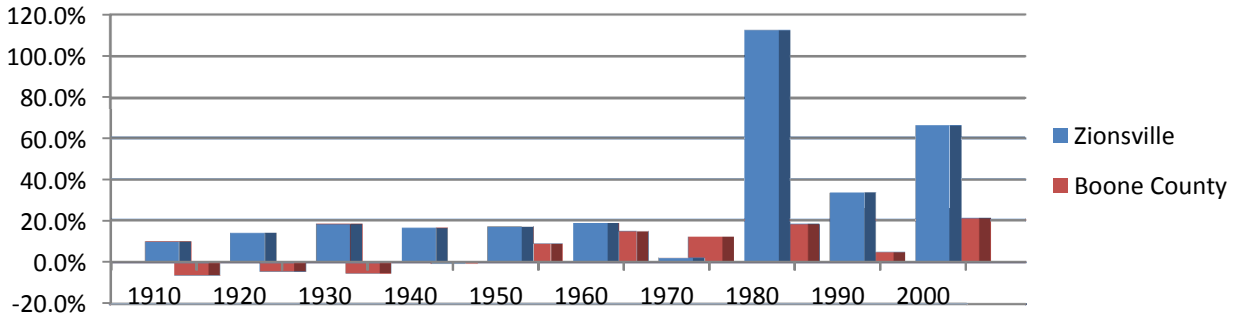
Year	Boone County	% Change	Zionsville	% Change
1900	26,321	-	765	-
1910	24,673	-6.26%	840	9.80%
1920	23,575	-4.45%	957	13.93%
1930	22,290	-5.45%	1,131	18.18%
1940	22,081	-0.94%	1,314	16.18%
1950	23,993	8.66%	1,536	16.89%
1960	27,543	14.80%	1,822	18.62%
1970	30,870	12.08%	1,857	1.92%
1980	36,446	18.06%	3,948	112.60%
1990	38,147	4.67%	5,281	33.76%
2000	46,107	20.87%	8,755	65.78%
2009	56,287	22.08%	14,015	60.08%

The data presented in **Table No. 2-2** clearly indicates the rapid pace of growth which is underway in Boone County. As strong as the county growth has been, it has been overshadowed by the development activity and growth rate which has occurred in Zionsville over the past three decades. Today, population growth has transformed Zionsville from a rural community into one that has become more urbanized. According to the U.S. Census Bureau, an urban area is one where a census block or a group of census blocks have a population density of at least 1,000 people per square mile. Much of Zionsville that lies within the former corporate boundary meets the criteria for classification as an urban area.

Figure No. 2-4 below graphically compares the percentage growth rate for the Town of Zionsville with that of Boone County as a whole. The percentages were compiled from those shown in the previous table.

Figure No. 2-4

Decennial Growth Rates
Boone County vs. Town of Zionsville



STATS Indiana (developed and maintained by the Indiana Business Research Center at Indiana University's Kelley School of Business at www.stats.indiana.edu) provides yearly population estimates for non-census years. This data is shown in **Table No. 2-3** for both the Town of Zionsville and Boone County. As shown, the population estimate for the Town of Zionsville has continued to increase steadily from 2000 to 2009. The overall population for Boone County has also continued to steadily increase during the same time period. The growth rate for the Town from 2000 to 2009 was just under sixty percent (60%). This growth rate significantly surpasses the estimated growth rate for Boone County (22.1%).

Table No. 2-3

Year 2000 to 2009 Stats Indiana Population Estimates
Town of Zionsville and Boone County

Date	Town of Zionsville		Boone County	
	Population	Percent Change	Population	Percent Change
April 1, 2000 (Census Data)	10,332	-	46,107	-
July 1, 2000	10,531	1.9%	46,380	0.5%
July 1, 2001	11,274	7.6%	47,095	1.5%
July 1, 2002	11,525	2.2%	48,171	2.3%
July 1, 2003	11,765	2.1%	49,160	2.1%
July 1, 2004	12,015	2.1%	50,305	2.3%
July 1, 2005	12,414	3.3%	51,427	2.2%
July 1, 2006	12,976	4.5%	52,970	3.0%
July 1, 2007	13,354	2.9%	54,009	2.0%
July 1, 2008	13,647	2.2%	54,964	1.8%
July 1, 2009	14,012	2.7%	56,287	2.4%
Total Change April, 2000 to July, 2009	**5,237**	**59.7%**	**10,180**	**22.1%**

Source: Population Division, U.S. Census Bureau
Note: The April 1, 2000 estimates base reflects changes to the Census 2000 population resulting from legal boundary updates, other geographic program changes, and Count Question Resolution actions.

The planning of sewer system improvements must take into account not only the Town and County population trends and the potential for growth, but where that growth is likely to occur. Historical population records derived from township population data will provide the most useful information for this purpose.

There are twelve townships in Boone County. However, for the purpose of this report, Eagle and Union Townships are the two townships of interest which will be highlighted. Their historical population figures for the period between 1900 and 2000 are shown in **Table No. 2-4**. The table also includes the decennial percent change for each decade.

The current sanitary sewer system serves only areas within Eagle Township. It includes all of those areas which lie within the current "Urban" zoning classification. The future sewer service area shall include large portions of Union Township which have not been designated for agricultural land use. Agricultural areas remote from U.S. 421 in northwest Union Township are expected to remain un-served through the period addressed by this planning study.

Table No. 2-4

Historical Population Figures, 1900 – 2000
Eagle Township and Union Township

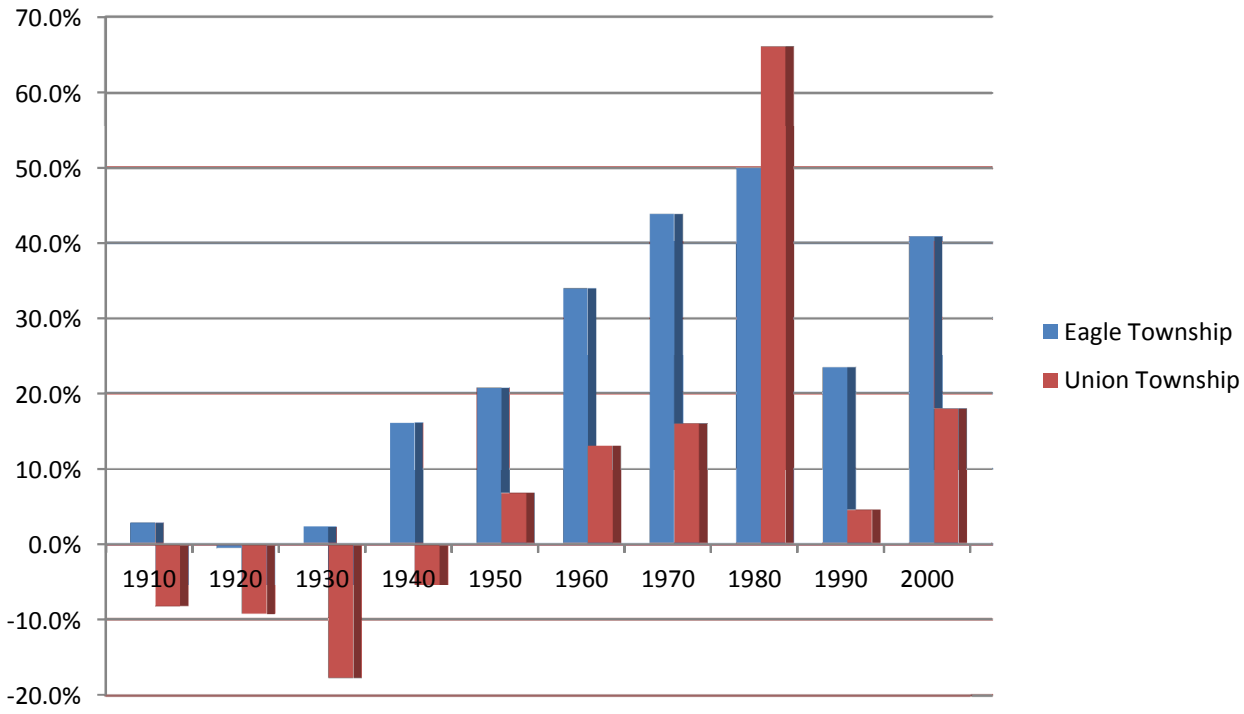
Year	Eagle Township Population	Decennial Percent Change	Union Township Population	Decennial Percent Change
1900	1,883		1,087	
1910	1,936	2.8%	997	-8.3%
1920	1,926	-0.5%	904	-9.3%
1930	1,970	2.3%	744	-17.7%
1940	2,288	16.1%	703	-5.5%
1950	2,762	20.7%	750	6.7%
1960	3,701	34.0%	848	13.1%
1970	5,331	44.0%	984	16.0%
1980	7,995	50.0%	1,634	66.1%
1990	9,864	23.4%	1,707	4.5%
2000	13,910	41.0%	2,014	18.0%

Table No. 2-4 illustrates the significant growth which has occurred in Eagle Township since the 1940's, ranging from 16% to 50% per decade. Union Township did not begin to experience a positive rate of growth until the 1950's and 1960's. The highest period of growth occurred during the 1970's with a rate of approximately 66%. Even though Union Township's growth rates are not as significant as those in Eagle Township, Union Township has begun to exhibit comparable trends, and future infrastructure

improvements are certain to enhance growth going forward. **Figure No. 2-5** provides a comparison of decennial growth rates for Eagle and Union Township and illustrates the comparable trends in the two townships since the 1940's.

Figure No. 2-5

Decennial Growth Rates
Eagle and Union Townships – 1910 to 2000



Growth Over the Past Decade

The pace of growth for Eagle Township slowed during the period of 2000 to 2009. However, the Township still experienced a significant population growth of nearly 31% for the decade. Union Township saw the growth rate increase slightly during the same period. The rate increased from 18% in the 1990's to 19% in the first decade of the 21st century. Based on the historical trends for the Town, Townships, and County, it can be safely assumed that the strong growth trend will continue if the infrastructure is available to support that growth. The final population table, **Table No. 2-5**, shows the population figures for both Eagle and Union Townships for the period of April 1, 2000 to July 1, 2009.

Table No. 2-5

Year 2000 to 2009 Stats Indiana Population Estimates
Eagle Township and Union Township

Date	Eagle Township		Union Township	
	Population	Percent Change	Population	Percent Change
April1, 2000 (Census Data)	13,910	(Base)	2,014	-
July 1, 2000	14,121	-	2,020	0.3%
July 1, 2001	14,870	5.3%	2,025	0.2%
July 1, 2002	15,225	2.4%	2,080	2.7%
July 1, 2003	15,560	2.2%	2,129	2.4%
July 1, 2004	15,918	2.3%	2,186	2.7%
July 1, 2005	16,409	3.1%	2,241	2.5%
July 1, 2006	17,006	3.6%	2,271	1.3%
July 1, 2007	17,428	2.5%	2,307	1.6%
July 1, 2008	17,763	1.9%	2,343	1.6%
July 1, 2009	18,207	2.5%	2,397	2.3%
Total Change April, 2000 to July, 2009	**4,297**	**30.9%**	**383**	**19.0%**

E. Environmental Characteristics and Potential Impacts

1. Introduction

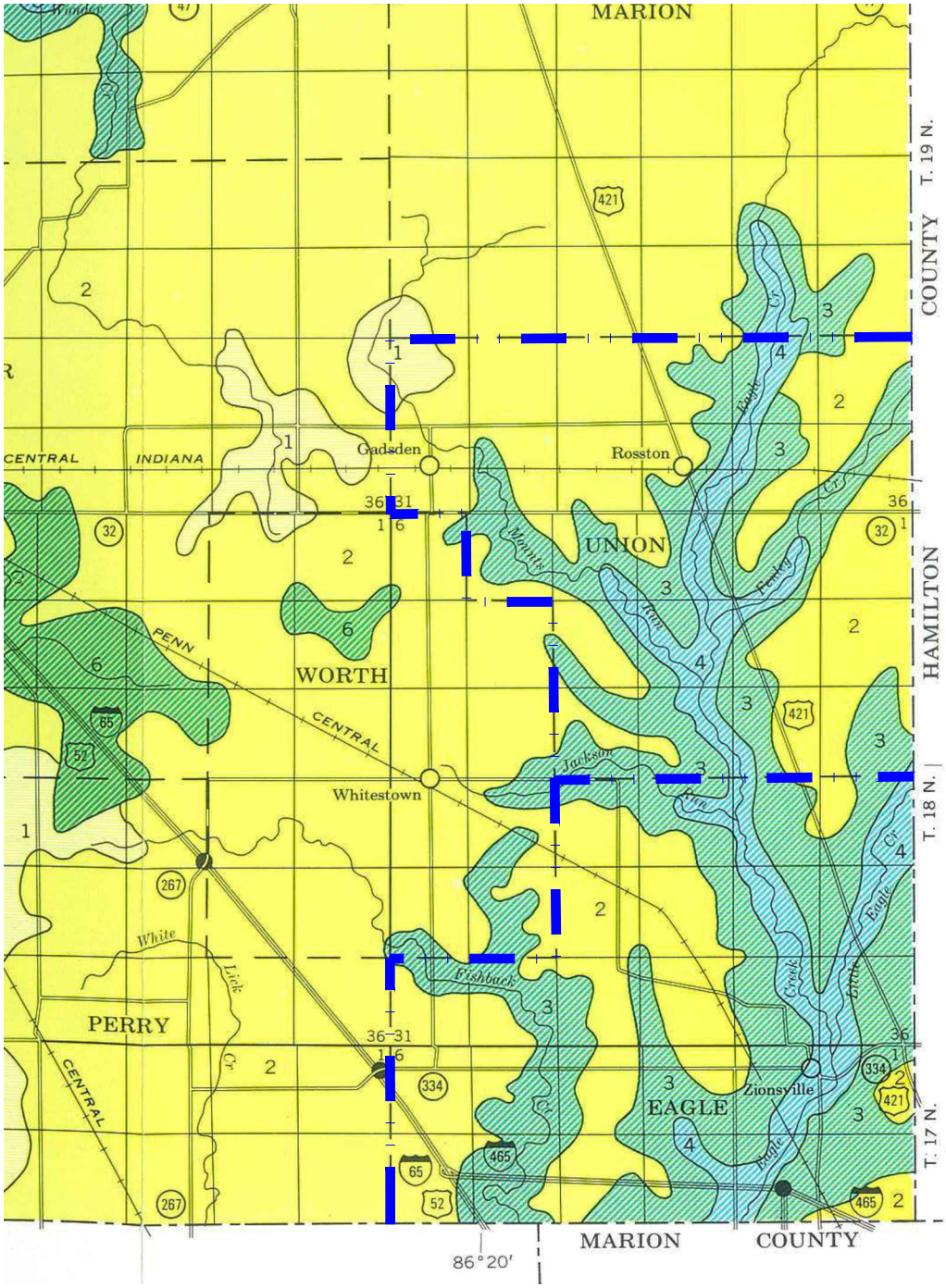
The evaluation of environmental issues and impacts involves site inspection and a consideration of local zoning restrictions, soils types and conditions, floodway issues, and coordination with local and state agencies. Depending upon the potential costs of alternatives and the scope of the planning effort, more detailed field surveys and/or geotechnical investigations will be necessary as part of the design phase of future improvements projects. During the evaluation process, it may also be appropriate to identify the various permits that may be required to implement a proposed alternative.

This section examines the potential environmental impacts of any proposed future improvements or expansion projects and the recommended mitigation measures. The implementation of sanitary sewer system improvements will have a moderate short term impact, but with proper mitigation measures, those impacts can be minimized. Potential impacts and mitigation measures will be included in this discussion.

2. Soils Geology

The types of soils found within the planning area are shown in **Figure No. 2-6**, which was taken from the Soil Survey of Boone County, Indiana, prepared by the USDA Soils Conservation Service. Detailed descriptions of the various soils shown can be found in the soil survey, available from the Soil Conservation Service.

The portion of older Zionsville which lies near the Eagle Creek watershed is generally built on Mahalasville-Whitaker association soil. This soils group is described as “Deep, poorly to somewhat poorly drained, moderately fine to medium textured, nearly level soil formed in glacial outwash material on outwash plains.” Away from the Eagle Creek and its tributaries, the predominant soils type is of the Brookston-Crosby association, with deep, poorly to very poorly drained and moderately fine textured soil formed in glacial till on uplands. There



SOIL ASSOCIATIONS *

1 — Ragsdale–Fincastle association; Deep, very poorly drained and somewhat poorly drain, moderately find textured and medium–textured, nearly level soils formed in silts and silt–covered glacial till on uplands.

2 — Brookston–Crosby association; Deep, very poorly drained and somewhat poorly drained, moderately fine textured and medium–textured, nearly level soils formed in glacial till on uplands.

3 — Miami–Crosby association: Deep, well–drained and somewhat poorly drained, medium–textured and moderately fine textured, nearly level to moderately steep soils formed in glacial till on uplands.

4 — Genesee–Shoals association: Deep, well–drained and somewhat poorly drained, medium–textured, nearly level soils formed in alluvial deposits on bottom lands.

5 — Ockley–Fox association: Deep and moderately deep over sand and gravel, well–drained, medium–textured, nearly level to moderately sloping soils formed in glacial outwash material on outwash plains

6 — Mahalasville–Whitalker association: Deep, poorly drained and somewhat poorly drained, moderately din textured and medium–textured, nearly level soils formed in glacial outwash material on outwash plains

* Texture terms refer to the surface layer of the major soils in the association.

MAP SOURCE:
SOIL SURVEY OF
BOONE COUNTY, INDIANA
PREPARED BY THE USDA
SOILS CONSERVATION SERVICE

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

BOONE COUNTY SOILS MAP
FIGURE 2–6

are three other soils associations for upland areas that occur within the sewer service area. All of these soils are described as “deep” soils, and most are level to moderately sloping.

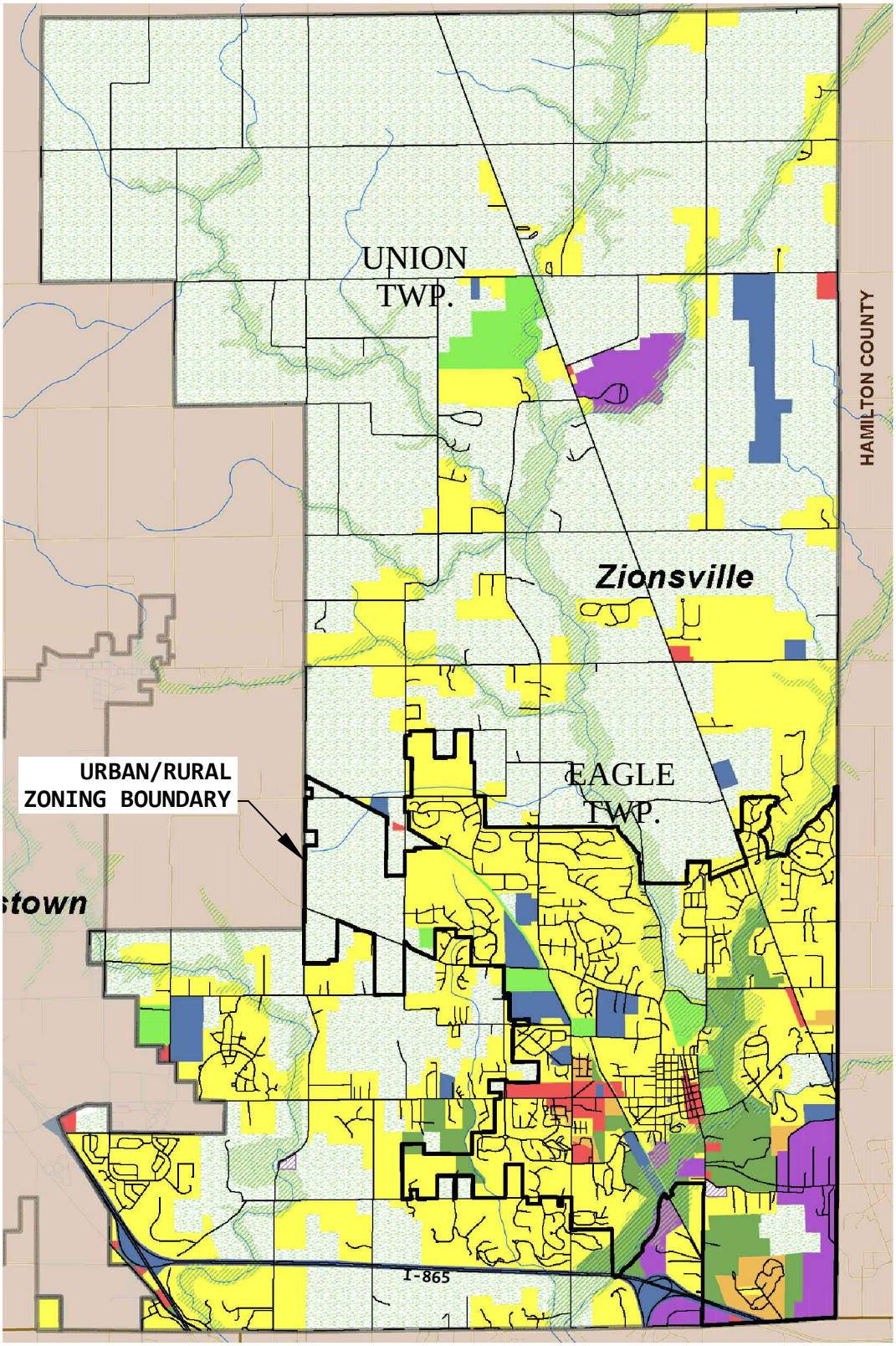
With regard to effects on local soils, short term impacts will relate only to excavation activities for the installation of sewers or structures and will be minimal. These impacts can be easily mitigated through the use of appropriate techniques for erosion control and surface restoration during construction.

3. Prime Agricultural Land

Prime Agricultural Land or Farmland is a designation assigned by the U.S. Department of Agriculture (USDA), and includes land that exhibits the best combination of physical and chemical characteristics for the production of food crops, feed, forage and fiber, and which is also readily available for these uses.

Prime farmland has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from regional precipitation, a favorable temperature and growing season, acceptable acidity and sodium content, and few or no rock outcroppings. They are permeable to water and air. Prime farmlands are not excessively susceptible to erosion or saturation for long periods of time, and they either do not flood frequently or are protected from flooding.

Prime farmland also tends to be well suited to residential and commercial development, and is therefore prone to conversion when in proximity to urban growth areas. The USDA “Prime Farmland” designation serves to promote growth management and resource conservation efforts in urban areas. Zoning restrictions and conservation easements may be mandated to preserve prime farmland resources, maintain local economic diversity, and establish local greenways. A land use map for the planning area is shown in **Figure No. 2-7**. The construction of new sewers is not expected to adversely affect prime farmland.



LEGEND

- Agriculture
- Natural Areas
- Single-Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Cemetery
- Public
- Recreation
- Corporate Limits
- Zionsville Urban Limits
- Floodplain

MAP SOURCE:

Date: 7/30/10
Source: Boone County Aerial Orthophotograhpy, 2008

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

LAND USE MAP
FIGURE 2-7

4. Hydrology

Zionsville lies in the northern portion of what is referred to as the White River Basin in central Indiana. This river basin includes all or large parts of Boone, Clay, Davies, Delaware, Greene, Hamilton, Hendricks, Knox, Madison, Marion, Monroe, Morgan, Owen, Putnam, Randolph, and Tipton Counties. Topographic relief within the basin is approximately 750 feet, with elevations ranging from a high of 1,200 feet above mean sea level to a low of 450 feet above sea level. The higher elevations are found in the Randolph County in the eastern part of the basin. The lower elevations lie in Gibson County in the southernmost part of the basin where the White River converges with the Wabash River.

a. Physiography

The topography of the White River basin is dominated by five physiographic units. The northern half of the basin lies within the Tipton Till Plain, which is generally featureless, marked by a flat to gently rolling plain, occasionally interrupted by low-relief end moraines. It is generally composed of thick glacial deposits that cover the underlying bedrock. The Norman Upland occupies the middle of the basin, which is marked by its narrow, flat-topped divides and deep V-shaped valleys. Under that is the Mitchell Plain, a westward-sloping plain that is mostly composed of limestone subject to karst development and sinkholes. The Crawford Upland, located adjacent to and generally west of Mitchell Plain in the southern central part of the basin is a westward-sloping plateau developed in interbedded sandstones, shales, and limestone. The Wabash Lowland is the southernmost physiographic unit in the basin. It is composed of primarily siltstone and shales that have been eroded by glaciations into subdued landscapes.

The White River is the main surface drainage waterway within the Basin. Mean discharges at gauging stations range from 208 $ft.^3$/second at Muncie in Delaware County to 11,850 $ft.^3$/second at Petersburg in Pike County.

b. Wetlands

As shown in **Figure No. 2-8**, which is taken from the National Wetlands Inventory, the planning area contains scattered locations of designated wetlands.

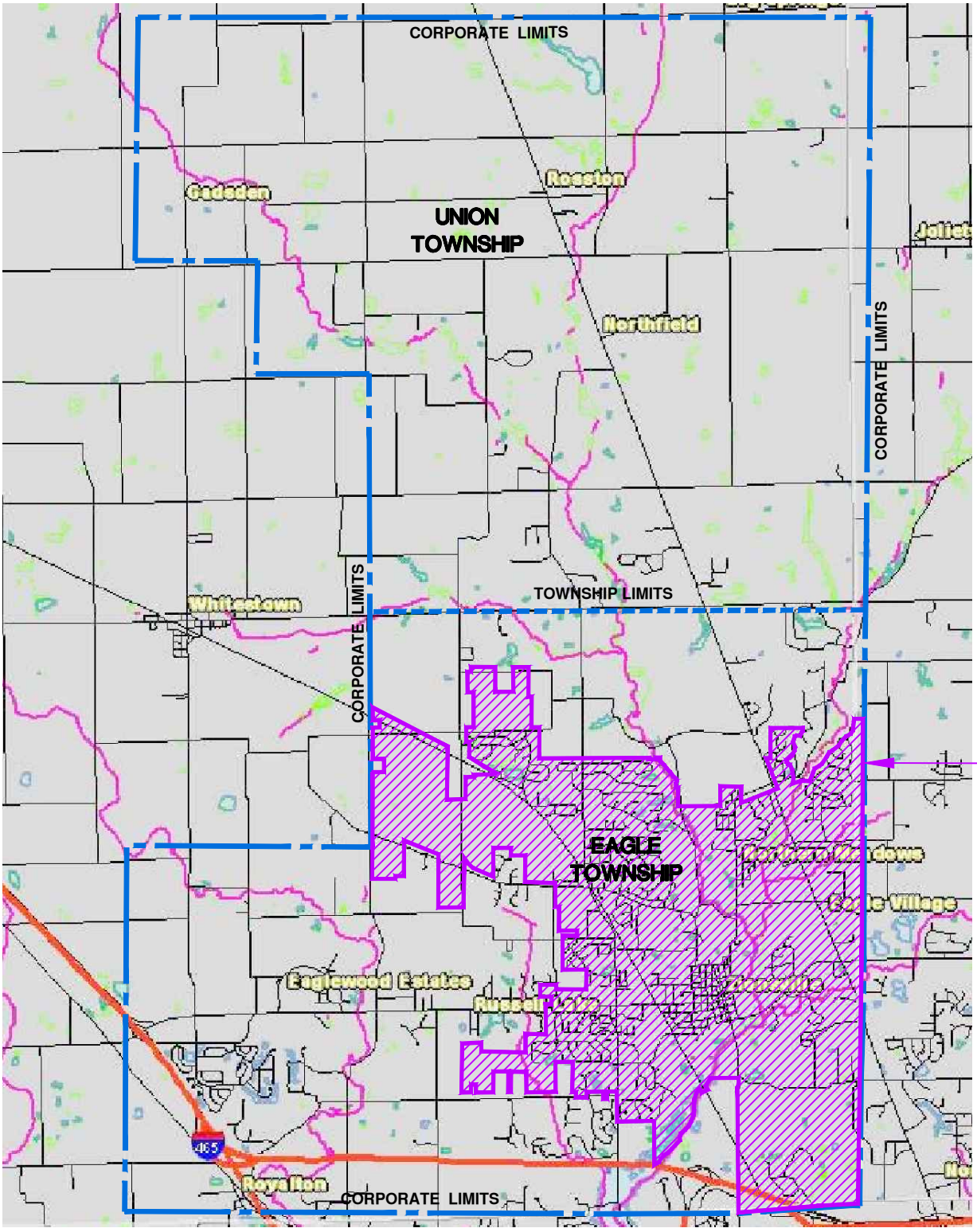
The existence of wetlands in the planning area will have some affect on development since the overall reduction of wetland area is prohibited by federal law. Virtually all of the wetlands in the planning area are classified in the Palustrine system. The most prevalent classes of the Palustrine system within the planning area are Emergent, Unconsolidated Bottom, Forested, and Aquatic Bed.

Where future local sewers (i.e. individual developments) are constructed to serve undeveloped areas, much of the construction will take place within existing or proposed dedicated public rights-of-way. Development has taken place outside of wetland areas for obvious reasons, and the impacts from providing service to unsewered areas should be minimal. The exception will be those areas where larger diameter interceptor sewers are proposed to provide for high volume, regional conveyance of wastewater within the system. Those sewers would most likely be installed along existing streams to take advantage of elevation and natural drainage patterns. Erosion control measures will need to be implemented in such cases to minimize environmental impacts.

c. Floodplains

The FEMA Flood Insurance Rate Maps for the planning area show a typical pattern of 100 and 500 year flood boundaries which exist along the major drainage channels. **Figure No. 2-9** depicts the available floodplain information for the planning area.

No long term adverse impact, such as displacement of flood storage volume, is expected to result due to the installation of sewers within these floodplains. Any disturbance of the floodplain will need to be mitigated in



URBAN/RURAL ZONING BOUNDARY

Legend

Wetland Lines

Wetlands

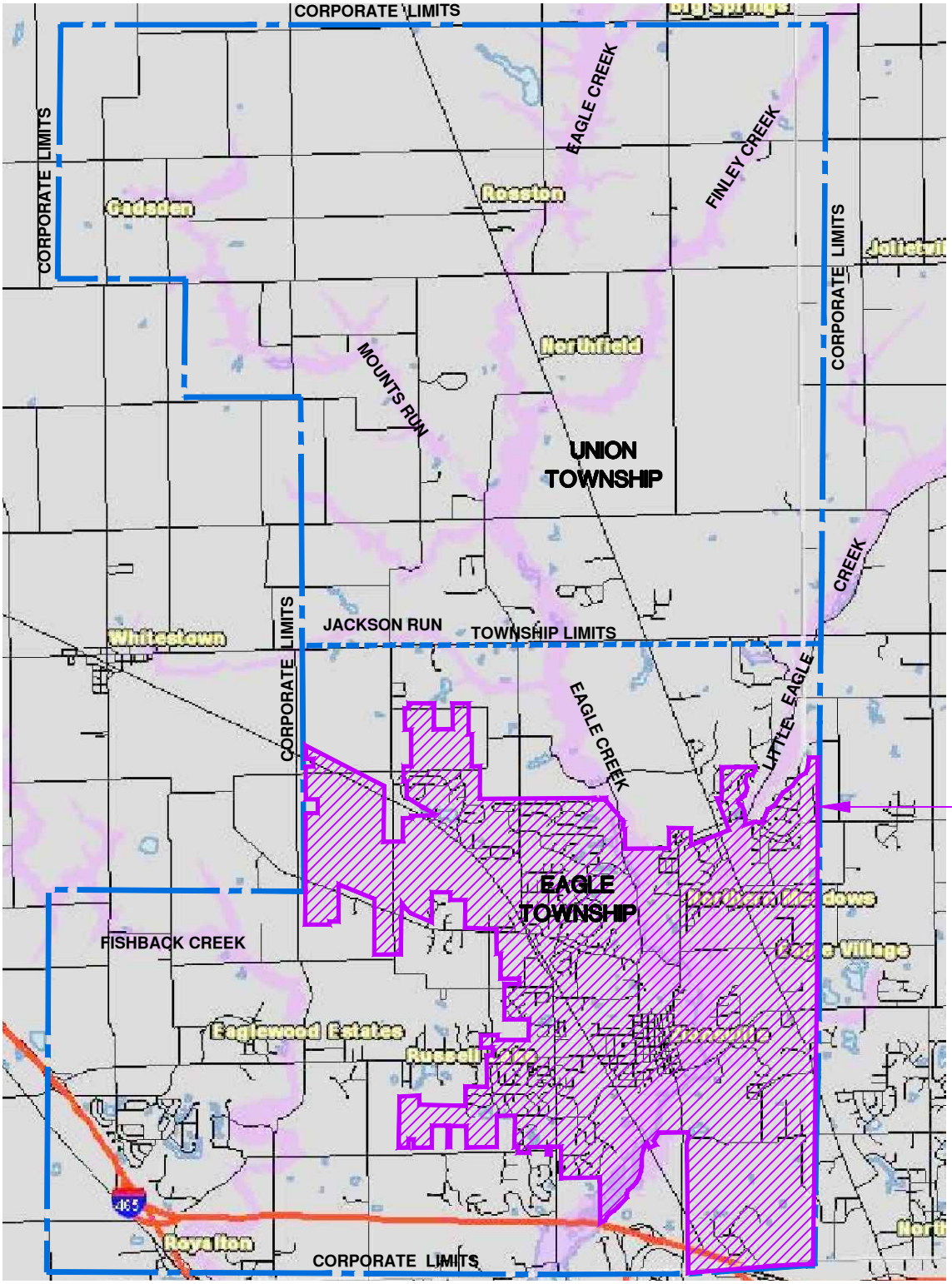
MAP SOURCE:
NATIONAL WETLANDS INVENTORY

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

WETLANDS MAP
FIGURE 2-8



MAP SOURCE:
FEMA FLOOD INSURANCE RATE MAPS

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

FLOODPLAINS MAP
FIGURE 2-9

an appropriate fashion. If feasible, manhole structures will have to be placed so as to avoid causing an obstruction in the floodway. Manhole castings within floodways will need to be watertight, or with the tops placed above the floodplain elevation. In the short term, steps will have to be taken to control erosion and protect equipment and materials during construction.

Where possible, future Interceptor sewer construction as discussed subsequently in this report is intended to take advantage of the local topography and elevations associated with the natural drainage patterns. In some cases, construction may need to cross or encroach upon existing streams and small tributaries that are within the 100-year floodplain. Construction across floodplains has the potential to increase the flood elevation and the potential for erosion and sedimentation concerns. To minimize potential flooding, planning and design activities may need to consider upstream headwater elevations. Piping and related structures will need to be designed in accordance with floodplain impact requirements of the applicable jurisdictional authority.

Floodplain crossings should be made as close to ninety degrees as practical to minimize floodway encroachment. Methods to limit adverse impacts from construction will include minimizing fill and grading requirements, preserving the free natural drainage wherever possible, maintaining vegetation buffers, and controlling runoff. Specific measures that should be implemented during the detailed design phase to mitigate floodplain impacts include:

- Avoidance of longitudinal encroachments
- Minimization of channel alterations
- Adequate measures to minimize erosion and sedimentation

d. Groundwater

The impacts on groundwater quality from the construction of new sanitary sewers can only be positive in the long run. Providing sanitary sewers to areas of new development, or to developed but un-sewered areas, will eliminate on-site septic disposal systems whose wastewater treatment effectiveness can be hampered by poor or marginal soils conditions.

Degradation of groundwater quality can be avoided by proper use and disposal of construction materials and sound construction methods. Short term impacts will need to be controlled during the course of construction activities. Work that involves excavation into saturated soils may create significant impacts on both construction activity and the groundwater environment. In the majority of these cases, measures can be adopted to mitigate the effects of these impacts. Mitigation and the associated monitoring can only be prescribed once the potential impacts have been identified, and this is something which should be done in the early phases of a project.

5. Air Quality

Evaluation of air quality impacts from future projects should be reviewed for conformance with applicable Rules under Title 326 Articles 1, 2, 6, 7 and 8, the Federal 1990 Clean Air Act Amendments, and odor control concerns. This review focuses attention on the following subject area:

a. Construction Activity

To minimize non-conformance with 326 IAC 6-4, "Fugitive Dust Emissions", reasonable and proper construction techniques and clean-up practices should be implemented. Surface wetting practices should be utilized to control dust emissions. 326 IAC 6-4-6(3) provides for an exceptions to the rule where every reasonable precaution has been taken in minimizing fugitive dust emissions.

6. Endangered Plant and Animal Species

The Indiana Department of Natural Resources web site was utilized to obtain a list of rare and endangered species which are known to exist in the Boone County area. Worldwide, there are over 1,500 known species identified as endangered or near extinction and under protection by government law. Many wetland species depend on vegetation and buffer zones for a portion of their life cycle. Designated wetlands must be avoided, as should extensive clearing in their vicinity to minimize adverse affects on natural habitats.

Table No. 2-6 includes a summary of the various rare and endangered plant and animal species within the planning area. None of these specie populations is expected to be disturbed by construction activities associated with sewer construction projects recommended in this study. Exceptions to this general condition could include work such as the construction of an interceptor sewer which is proposed to follow a natural waterway to take advantage of existing elevation and drainage patterns.

Table No. 2-6
Indiana County Endangered, Threatened and Rare Species List
Boone County

Species Name	Common Name	FED	STATE	GRANK	SRANK
Mollusk: Bivalvia (Mussels)					
Fusconaia subrotunda	Longsolid		SE	G3	SX
Lampsilis fasciola	Wavyrayed Lampmussel		SSC	G5	S3
Ptychobranchus fasciolaris	Kidneyshell		SSC	G4G5	S2
Toxolasma lividus	Purple Lilliput		SSC	G3	S2
Villosa lienosa	Little Spectaclecase		SSC	G5	S3
Bird					
Ammodramus henslowii	Henslow's Sparrow		SE	G4	S3B
Bartramia longicauda	Upland Sandpiper		SE	G5	S3B
Buteo lineatus	Red-shouldered Hawk		SSC	G5	S3
Cistothorus palustris	Marsh Wren		SE	G5	S3B
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Dendroica cerulean	Cerulean Warbler		SE	G4	S3B
Helmitheros vermivorus	Worm-eating Warbler		SSC	G5	S3B
Ixobrychus exilis	Least Bittern		SE	G5	S3B
Mniotilta varia	Black-and-white Warbler		SSC	G5	S1S2B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Rallus elegans	King Rail		SE	G4	S1B
Rallus limicola	Virginia Rail		SE	G5	S3B
Tyto alba	Barn Owl		SE	G5	S2
Wilsonia citrine	Hooded Warbler		SSC	G5	S3B
Mammal					
Myotis sodalist	Indiana Bat or Social Myotis	LE	SE	G2	S1
Taxidea taxus	American Badger		SSC	G5	S2
Vascular Plant					
Crataegus grandis	Grand Hawthorn		SE	G3G5Q	S1
Juglans cinerea	Butternut		WL	G4	S3
Plantago cordata	Heart-leaved Plantain		SE	G4	S1
High Quality Natural Community					
Forest - flatwoods central till plain	Central Till Plain Flatwoods		SG	G3	S2

Fed: LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant; WL = watch list

GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank

SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana Natural Heritage Data Center
Division of Nature Preserves
Indiana Department of Natural Resources
This data is not the result of comprehensive county surveys

7. Registered Historical Sites

The following is a listing of historical sites within the planning area (Eagle and Union Townships) which are of historical significance, or which are identified in the National Register of Historic Sites.

Boone County, Eagle Township, Historical Sites:

01	House	520 West Ash Street; Architecture
02	House	420 West Walnut Street; Architecture
03	House	380 West Walnut Street; Architecture
04	House	205 North Main Street; Architecture
05	House	169 North Main Street; Architecture
06	House	180 North Main Street; Architecture
07	Christian Union Church	395 West Walnut Street; Architecture, Religion
08	House	490 West Poplar Street; Architecture
09	House	370 West Poplar Street; Architecture
10	House	110 North Third Street; Architecture
11	Historical Marker	100 North Main Street; Educational
12	Church	North Main Street; Architecture, Religion
13	Commercial Building	40 North Main Street; Architecture, Commerce
14	House	Second and Cedar Streets; Architecture
15	House	290 West Cedar Street; Architecture
16	House	320 West Cedar Street; Architecture
17	House	370 West Cedar Street; Architecture
18	House	480 West Cedar Street; Architecture
19	House	495 West Poplar Street; Architecture
20	House	545 West Poplar Street; Architecture
21	House	520 West Cedar Street; Architecture
22	House	465 West Cedar Street; Architecture

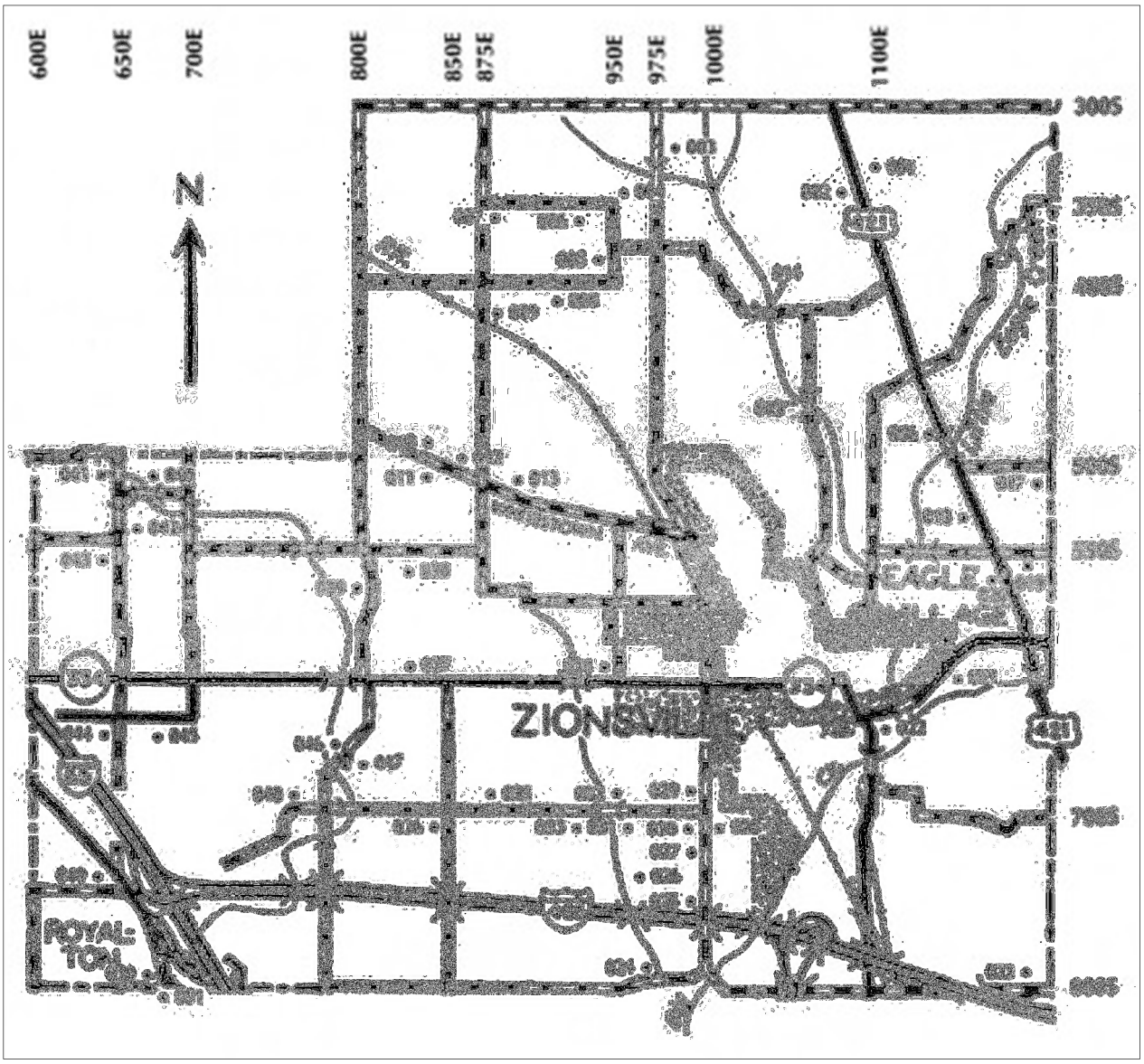
Boone County, Eagle Township, Historical Sites (Continued):

23	House	425 West Cedar Street; Architecture
24	House	365 West Cedar Street; Architecture
25	House	345 West Cedar Street; Architecture
26	House	275 West Cedar Street; Architecture
27	House	20 South Second Street; Architecture
28	Lincoln Park	100 West Oak Street; Politics/Government
29	Zionsville Main Street	Main Street; Transportation
30	Town Hall	100 West Oak Street; Architecture, Community Planning, Politics/Government, Social/Ethnicity
31	House	15 Elm Street; Architecture
32	House	35 South Elm Street; Architecture
33	House	175 South Main Street; Architecture
34	House	110 South Second Street; Architecture
35	House	60 South Second Street; Architecture
36	House	390 West Oak Street; Architecture
37	House	80 South Fifth Street; Architecture
38	Historical Marker	695 Oak Street; Exploration/Settlement
39	House	West Pine Street; Architecture
40	House	670 West Pine Street; Architecture
41	House	620 West Pine Street; Architecture
42	House	580 West Pine Street; Architecture
43	House	510 West Pine Street; Architecture
44	House	340 West Pine Street; Architecture
45	Historical Marker	West Pine Street; Environs/Neighborhoods
46	House	240-240 ½ South Second Street; Architecture
47	House	210 South Second Street; Architecture
48	House	255 West Pine Street; Architecture

Boone County, Eagle Township, Historical Sites (Continued):

49	House	345 West Pine Street; Architecture
50	House	415 West Pine Street; Architecture
51	House	535 West Pine Street; Architecture
52	House	635 West Pine Street; Architecture
53	Log Cabin	762 West Sycamore; Architecture, Vernacular/Construction
54	Log Cabin	760 West Sycamore; Architecture, Vernacular/Construction
55	House	745 West Hawthorne Street; Architecture
56	House	595 West Hawthorne Street; Architecture
57	House	305 West Hawthorne Street; Architecture
58	House	285 West Hawthorne Street; Architecture
59	Hussey Memorial Library	255 West Hawthorne Street; Architecture
60	Historical Marker	255 West Hawthorne Street; Site of Patrick Sullivan Home
61	Historical Marker	330 South Main Street; Exploration/Settlement
62	William Zion House	55 East Hawthorne Street; Architecture, Exploration/Settlement

Figure No. 2-10
Eagle Township - Historical Site Locations
Boone County Interim Report



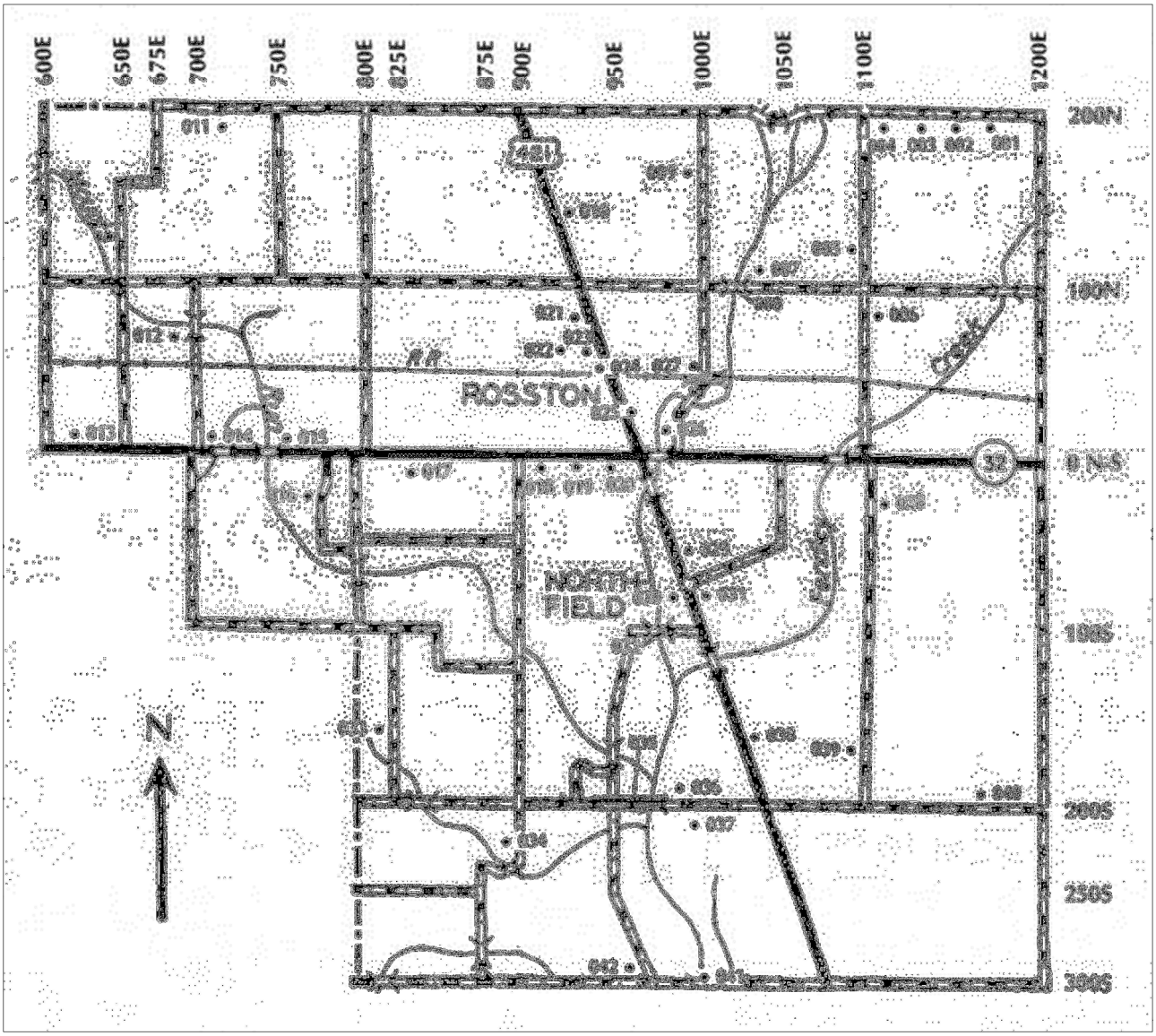
Boone County, Union Township, Historical Sites:

01	Thistlethwait Farm	200 N; Architecture
02	Farm	200 N; Architecture
03	House	200 N; Architecture
04	Big Springs Church	200 N; Architecture, Religion
05	Farm	1100 E; Architecture
06	Farm	1100 E; Architecture
07	House	100 N; Architecture
08	Bridge	100 N; Engineering, Transportation
09	House	1000 N; Architecture
10	Cemetery	U.S. 421; Military
11	Farm	200 N; Architecture, Indian
12	Farm	700 E; Architecture
13	Farm	State Road 32; Architecture
14	House	State Road 32; Architecture
15	House	State Road 32; Architecture
16	Mts. Run Baptist Church	775 E; Architecture, Religion
17	Farm	State Road 32; Architecture
18	Farm	State Road 32; Architecture
19	School	State Road 32; Architecture, Education
20	Arthur St. Clair Farm	State Road 32; Architecture
21	House	U.S. 421; Architecture
22	Dr. Hendricks House	Rosston Ave; Architecture
23	Rosston General Store	U.S. 421; Architecture, Commerce
24	Bank	U.S. 421; Architecture, Commerce

Boone County, Union Township, Historical Sites (Continued):

25	Rosston Union Church	Demolished
26	Wilson Barn	State Road 32; Architecture
27	Sedwick Family Cemetery	1000 E; Environs/Neighborhoods
28	Hobucken School	1100 E; Architecture, Education
29	Farm	U.S. 421; Architecture
30	Northfield Community Church	U.S. 421; Architecture
31	Taylor Farm	U.S. 421; Architecture
32	Bridge	100 S; Engineering, Transportation
33	Farm	825 E; Architecture
34	Cemetery	900 E; Exploration/Settlement
35	Bridge	200 S; Engineering, Transportation
36	House	200 S; Architecture
37	House	200 S; Architecture
38	Barn	U.S. 421; Architecture
39	Stevenson Farm	1100 E; Architecture
40	Noah Gifford House	200 S; Architecture
41	Bridge	300 S; Engineering, Transportation
42	Hufton Memorial Cemetery	950 E & 300S; Environs/Neighborhoods

Figure No. 2-11
Union Township - Historical Site Locations
Boone County Interim Report

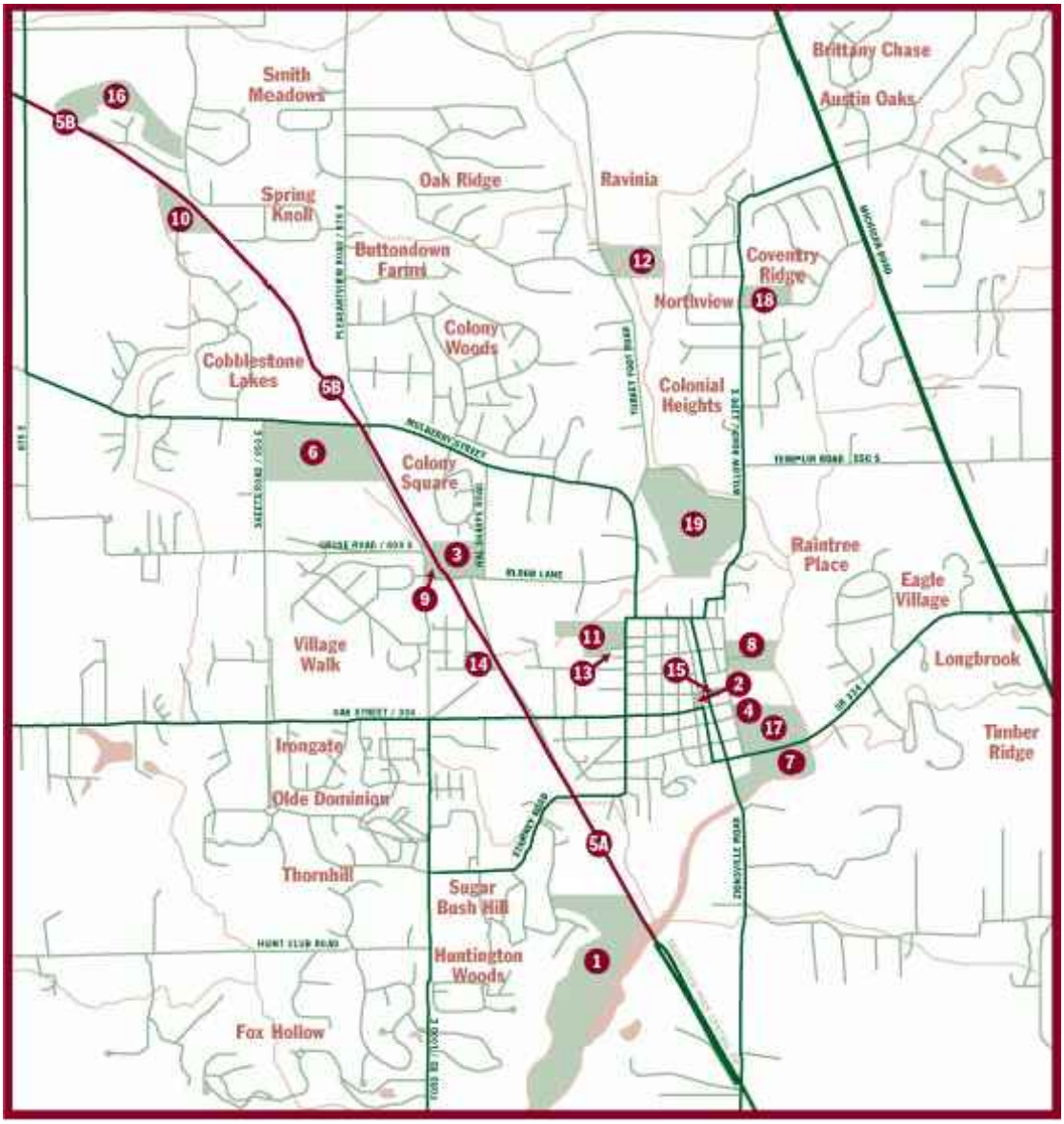


8. Open Space and Parks

To maximize the benefit of municipal park space, cities and towns often seek a meaningful system of complementary land use, with the goal of meeting a diverse range of community interests. The growing population, changing public lifestyles, and the desire for increased leisure activities have and will continue to place increasing demands on existing parks and recreational facilities.

The Town Department of Parks and Recreation maintains several recreational facilities ranging from a golf course to swimming pools, playgrounds, hiking paths, nature center and sanctuary, and wetland area. **Figure No. 2-12** illustrates the general locations of parks located within the Zionsville Area.

The largest facility in the Zionsville Park System is Starkey Nature Park, a 77 acre facility located along Eagle Creek and just a quarter mile from the Village. The park features a serene outdoor environment, three miles of hiking trails, picnicking, and space for many different types of outdoor activities. The park is named after Lucile Starkey, who donated the land to conserve nature and to educate people about the impact of human activity on the environment. Lions Park is an 18 acre greenspace that contains seven lighted athletic fields, a gazebo, all-weather picnic areas and the Lions Club Community Building. The Town also operates the Jennings Field, Creekside Nature Park, Zion Nature Center, The Zionsville Golf Course and Zionsville's Goldman Union Camp Institute.



Public Parks

10) Carter Station
11) Zion Nature Sanctuary
12) Turkey Foot Park
13) Zion Nature Center
14) Town Hall Park
15) Village Corner
16) Wetland Area
17) Lions Park
18) Azionaqua Swim Club
19) Zionsville Golf Course

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

PARK LOCATIONS IN PLANNING AREA
FIGURE 2-12

SECTION 3
EXISTING FACILITIES

This section provides a general overview of Zionsville's existing sanitary sewer collection system and treatment facilities, including a brief history of system development, a discussion of primary collection system basins and sub-basins, and detailed information regarding key system components such as pump stations and interceptor sewers. The major interceptors and trunk sewers are shown on the map included in **Appendix A** of this report. The basic collection system boundaries and the subsystems are also shown. A schematic diagram of the existing sanitary collection system and sewer sub-systems is shown in **Figure No. 3-1**.

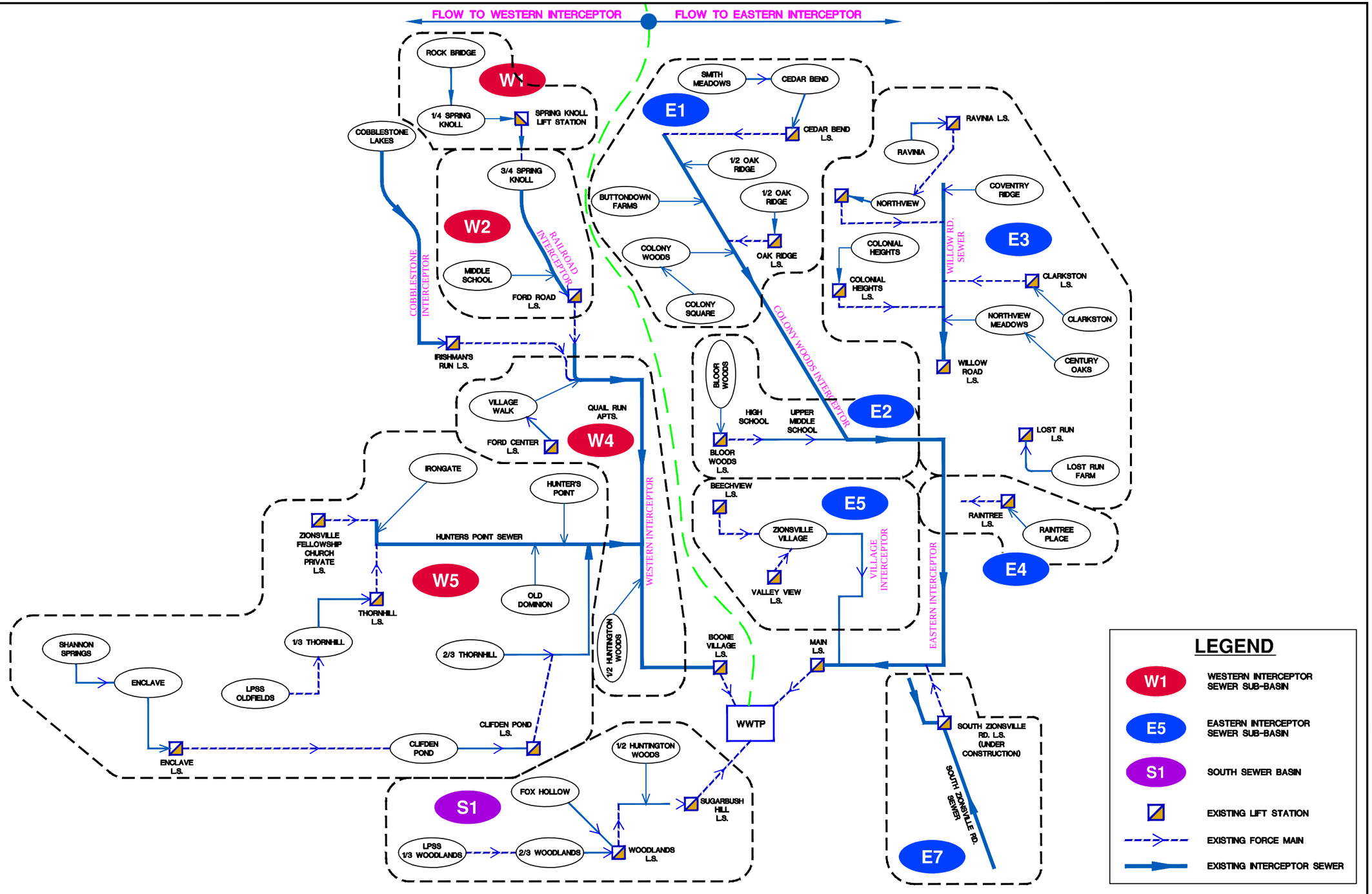
A. Existing Wastewater Treatment Plant

The majority of sewage flows generated within Zionsville's existing sanitary sewer service area are conveyed to and treated by the Town's wastewater treatment plant. The existing plant is an extended aeration, activated sludge facility with a design average daily capacity of 2.0 MGD, and a peak hourly capacity of 7.0 MGD. The existing plant consists of mechanical screening, grit removal, primary clarification, aeration, secondary clarification, chlorine contact, and four tertiary polishing ponds. Sludge processes include anaerobic digestion, sludge thickening, sludge dewatering, belt filter press and a sludge storage facility.

B. Neighboring Utilities

Due to the rapid growth rates experienced within Eagle Township over the past 40 to 50 years, two neighboring utilities have also extended sanitary sewer service to areas which had been previously not been served, or which were difficult for Zionsville to accommodate at the time the developments were conceived. These utilities include the Clay Township Regional Waste District (CTRWD) to the east of Zionsville and the Town of Whitestown to the west.

The Clay Township Regional Waste District was created in 1975 as a non-profit municipal corporation. In 1991 the District expanded into Boone County, and its Board of Directors was enlarged to include an appointee to be designated by the Boone County



COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

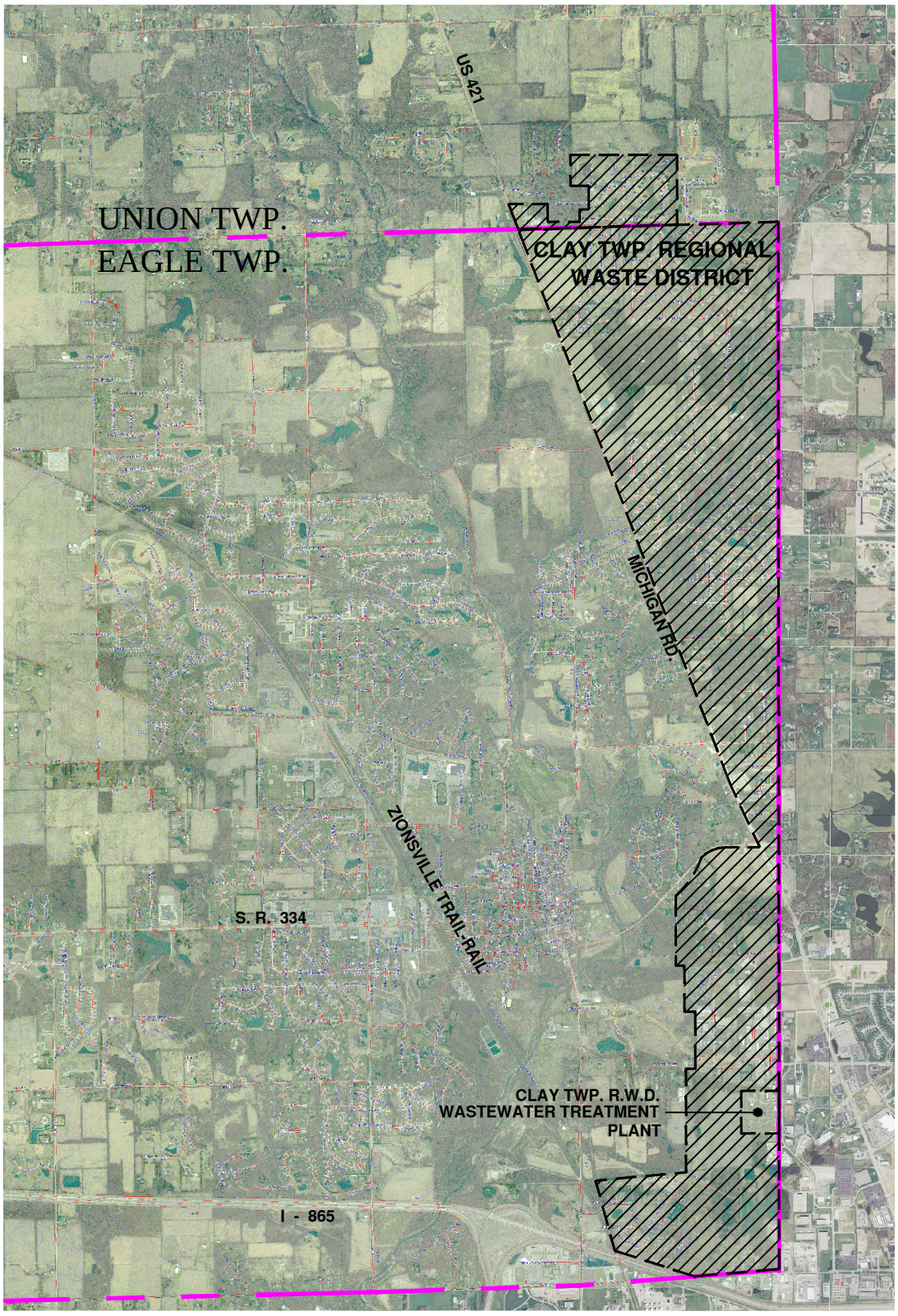
EXISTING SANITARY SEWER COLLECTION SYSTEM SCHEMATIC
FIGURE 3-1

Commissioners. The CTRWD now provides sanitary sewer service to areas along the entire eastern edge of Eagle Township. Developments within the Zionsville corporate limits which are served by the CTRWD include:

Cimmaron Place
The Willows
Bridlewood
Willowbridge
Brittany Chase
Austin Oaks
Zion Lane
Hunter Glen
Andrade Industrial Park

Wastewater from these developments is conveyed to a treatment plant owned and operated by the Clay Township Regional Waste District. That facility is located within the Zionsville corporate boundary, west of Mayflower Park Drive and south of 106th Street. The general location of the CTRWD treatment plant and the portion of the Zionsville service area which is served by Clay Township is shown in **Figure No. 3-2**.

Whitestown is located mostly in Worth Township, Boone County, approximately 5 miles northwest of Zionsville. As shown on **Figure No. 3-3**, the corporate limits of Whitestown extend in a southerly direction to encompass a small portion of southwestern Eagle Township. Whitestown's sanitary sewer service area extends even further east, into the Zionsville corporate limits, to provide sanitary sewer service to the Royal Run and Stonegate developments. Wastewater from those developments is conveyed to the City of Indianapolis for treatment and disposal. An additional 1,700 acre mixed use community called Anson is presently being developed. Anson is located along Interstate 65, generally north and east of the State Road 334 interchange and within Whitestown's Utility service area. This planned community was conceived by the Duke Realty Corporation, and will include a number of residential, office, healthcare and retail developments.

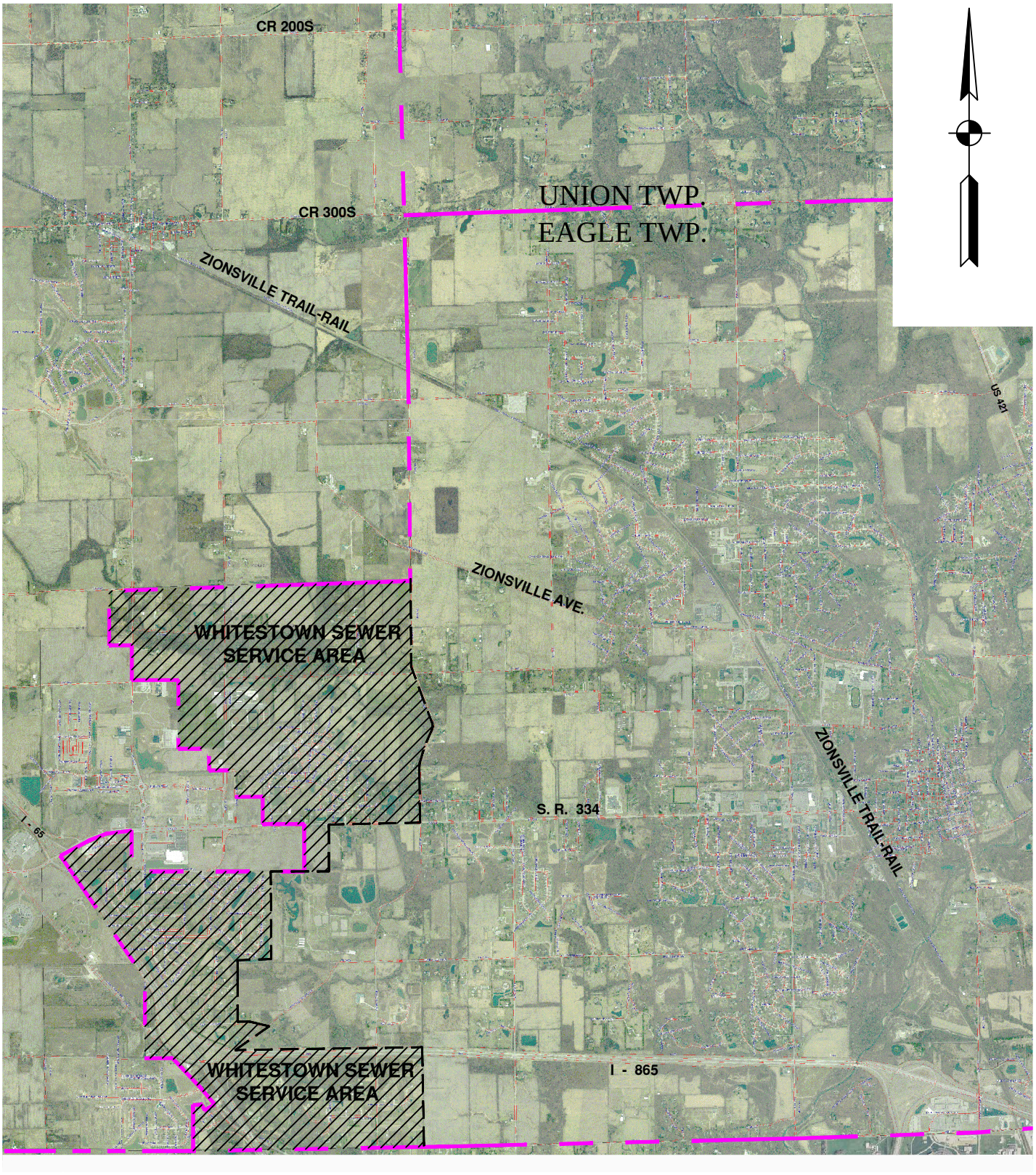


COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

CLAY TOWNSHIP REGIONAL WASTE DISTRICT WWTP LOCATION AND BOUNDARY
FIGURE 3-2



COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

WHITESTOWN CORPORATE LIMITS AND SEWER SERVICE AREA BOUNDARY
FIGURE 3-3

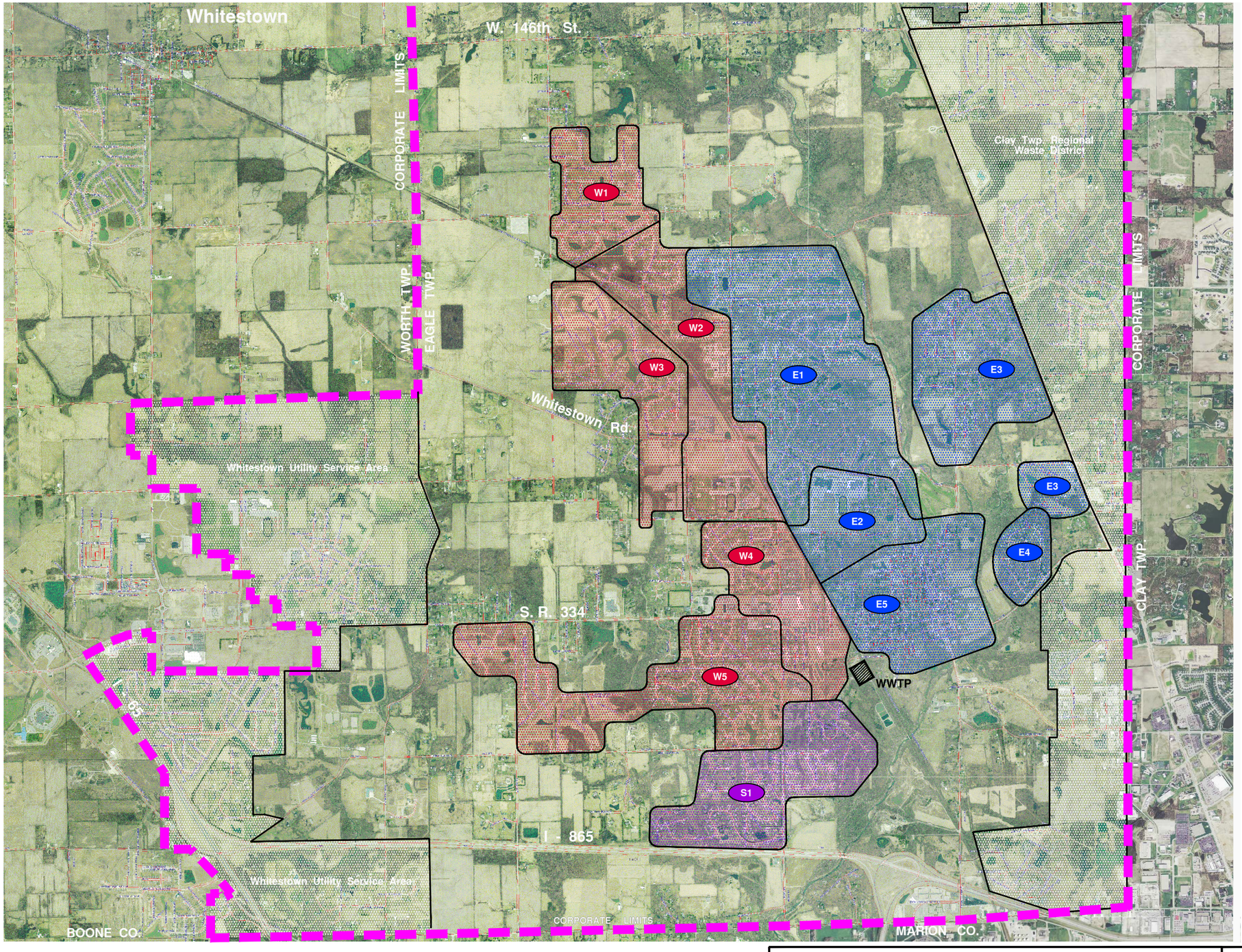
C. Existing Wastewater Collection System

To evaluate current wastewater flows, Zionsville's existing sanitary sewer service area was divided into three primary sewer collection basins: East Sewer Basin, which flows to the Main Lift Station; West Sewer Basin, which flows to the Boone Village Lift Station; and the South Sewer Basin, which flows to the Sugarbush Hill Lift Station. Flows from each of these basins and their respective lift stations are conveyed by individual force mains to the Town's wastewater treatment plant.

For system analysis and reference, the East and West Sewer Basins have been further divided into 5 sub-basins each. The sub-basins were numbered based on hydraulic characteristics, generally from upstream to downstream as they discharge to their respective interceptor. Sub-basins boundaries have been determined based upon the local topography, pump station discharge locations, and the hydraulics of the gravity sanitary sewer flow within each basin. Primary sewer collection basin and sub-basin boundaries are indicated on **Figure No. 3-4** and are described in further detail in the following discussions.

1. West Sewer Basin

Flows within the West Sewer Basin are collected by the Western Interceptor which is located immediately west of Zionsville Village, running north to south between Ford Road and the abandoned Penn-Central Railroad right-of-way. The former railroad grade has been since been converted to a multi-use trail, commonly referred to as the Zionsville Rail-Trail. The Western Interceptor originally consisted of predominantly 12" diameter vitrified clay pipe (VCP). Due to the poor condition of this sewer, a recent rehabilitation program was implemented using pipe bursting techniques and open excavation to replace many sections of this line. Included within the West Sewer Basin are Sewer Sub-Basins W1 through W5. These sub-basins are generally numbered in order hydraulically, from upstream to downstream locations based upon the location of their discharge to the Western Interceptor. General basin characteristics are given below with approximate boundary descriptions and identifications of key housing developments which are served.



Legend

- West Sewer Basin
- East Sewer Basin
- South Sewer Basin
- Existing Wastewater Treatment Plant

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

EXISTING SEWER BASINS AND SUB-BASINS
FIGURE 3-4

a. Sub-Basin W1

Sub-Basin W1 covers approximately 240 acres of single-family residential land and includes approximately 289 homes. The sub-basin is bordered on the west by County Road 875 East and on the north by County Road 350 South. Sub-Basin W1 includes the Rock Bridge subdivision at the northwestern extent of the Town's current sanitary sewer service area. Also included is the northern-most section of the Spring Knoll subdivision. Flows within Sub-Basin W1 are directed to the Spring Knoll Lift Station and are then pumped to the Railroad Interceptor which provides gravity conveyance south to the Ford Road Lift Station.

b. Sub-Basin W2

Wastewater generated within Sub-Basin W2 is collected by the Railroad Interceptor which flows southward to the Ford Road Lift Station. This lift station discharges directly into the north end of the Western Interceptor.

The boundary for Sub-Basin W2 begins at the intersection of County Road 600 South and Ford Road, moving in a generally northerly direction, crossing Mulberry Street and proceeding west to County Road 975 East. The boundary follows 975 E northward to the Rail-Trail, then follows the trail before turning north again between the Smith Meadows and Spring Knoll developments. The sub-basin reaches its northernmost point east of Greenthread Drive between Sedge Court and Shelburne Way. The boundary then runs southwesterly to the Rail-Trail. At the trail, the boundary continues southeast to a point just east of Cobblestone Lakes. The boundary line then turns south, past the Methodist Church, and follows County Road 950 East to Cruise Road where it turns east and returns to the point of beginning.

Sub-Basin W2 serves the southern sections of the Spring Knoll subdivision (approximately 251 homes) and several other wastewater contributors, including: Pleasant View Elementary School, Zionsville

Middle School, Zionsville Methodist Church, the American Legion and St. Francis Episcopal Church.

c. Sub-Basin W3

Sub-Basin W3 is located generally southwest of Sub-Basin W2. The western boundary of the sub-basin is situated along County Road 875 East between Whitestown Road and the southwest corner of Sub-Basin W2. The south boundary is generally Whitestown Road. The Eastern boundary follows a path along the west side of the Methodist Church and the abandoned Penn-Central Railroad right-of-way.

Sub-Basin W3 serves all of the Cobblestone Lakes subdivision which is roughly ¾ developed as of this writing. All wastewater flow within Cobblestone Lakes is collected by the Cobblestone Interceptor, a 12" gravity line with flows southward to the Irishman's Run Lift Station. The Irishman's Run station pumps westward along Cruise Road and discharges to the Western Interceptor just north of Quail Run Apartments. A total of 271 homes are currently served within Sub-Basin W3.

d. Sub-Basin W4

Sub-Basin W4 is located south of Sub-Basin W2. The northern boundary of the sub-basin runs generally along County Road 600 South. The eastern boundary follows the abandoned Penn-Central Railroad right-of way to West Oak Street east of County Road 1000 East. The southern portion of the boundary runs along West Oak Street and the south boundary of Village Walk subdivision. The western boundary follows the west edge of the Village Walk Subdivision to County Road 600 East.

With the exception of the Ford Center Lift Station, Sub-Basin W4 is entirely served by gravity flow to the Western Interceptor. Entities served include the Village Walk subdivision (168 homes), Quail Run Apartments (approximately 150 units), Zionsville Christian Church, Starbucks, and

Flagstar Bank. This sub-basin also provides sanitary sewer service to approximately 20 acres of general commercial land use and office space.

e. Sub-Basin W5

Sub-Basin W5 serves the majority of the southwestern portion of the existing collection system. The southern boundary follows Hunt Club Road between South Ford Road and County Road 850 East. The boundary turns north on County Road 850 East and encompasses the Shannon Springs and Enclave subdivisions. The eastern portion of Sub-Basin W5 lies south of State Road 334 (Oak Street), north of County Road 700 South, and west of Ford Road.

Sub-Basin W5 is the largest basin conveying wastewater to the Western Interceptor. Major flow contributors include Shannon Springs and The Enclave subdivisions, Olde Dominion condominiums, Hunt Club Village, Zionsville Meadows, Thornhill, Irongate, and Clifden Pond subdivisions, and the Oldfields subdivision which is served by a low pressure sewer system (LPSS). Sub-Basin W5 also includes five Town-owned lift stations and one private lift station which serves the Zionsville Fellowship Church on State Road 334.

Wastewater from Shannon springs and the Enclave flow southward by gravity to the Enclave Lift Station which pumps east approximately 1 mile along Hunt Club Road before discharging to a gravity sewer in the Clifden Pond subdivision.

2. East Sewer Basin

The Eastern Interceptor collects flow from Sub-Basins E1 through E5 in the East Sewer Basin, and ultimately conveys that flow to the Town's Main Lift Station located on the south side of the Village near Sycamore and Fourth Street. Sub-Basins E1 through E5 are numbered in order hydraulically from upstream to downstream locations based upon their general discharge to the Eastern Interceptor and upstream collector sewers.

The East Sewer Basin collects wastewater from Zionsville Village and the vast majority of flow generated north of the Village and east of the abandoned Penn-Central Railroad right-of-way. At its north-most end, the Eastern Interceptor receives flow from the Colony Woods Interceptor and the Bloor Woods Lift Station. At the point where the Blair Woods Lift Station discharges into the collection system, the remaining downstream sewer segments are referred to as the Eastern Interceptor. The 15" diameter Village Interceptor discharges into the downstream end of the Eastern Interceptor just east of the Main Lift Station. The Main Lift Station conveys all collected Eastern interceptor flow directly to the Town's wastewater treatment plant.

General basin characteristics are given below with approximate boundary descriptions and identifications of key housing and commercial developments which are served.

a. Sub-Basin E1

Sub-Basin E1 is located on the north side of the current sewer service area. This sub-basin is made up of mostly residential land along with Zionsville Upper Middle School and St. Francis Episcopal Church. The basin is bounded generally on the west by County Road 975 East (Ford Road), Bloor Lane to the south, Turkey Foot Road to the east, and Cedar Bend subdivision to the north. Sub-Basin E1 includes the Smith Meadows and Cedar Bend subdivisions at the Town's northeastern extent of the sanitary sewer service area.

Other subdivisions located in the sub-basin include Oak Ridge, Buttondown Farms, Colony Woods, and Colony Square. Approximately 781 homes are located in the basin.

Sewage flows from Smith Meadows and Cedar Bend are directed to the Cedar Bend Lift Station. This lift station is located at the eastern end of Lakewood Drive. The lift station discharges to the northern most end of the Colony Woods Interceptor, which is a ten 10" diameter gravity sewer at this location. The discharge point is located between Hickory Ridge Drive and Lakewood Drive, approximately 1,400 feet east of County Road 475 East. The northern half of Oak Ridge and all of Buttondown Farms discharge directly into the interceptor. The remainder of Oak Ridge flows to the Oak Ridge Lift Station, located on Oak Ridge Drive west of Turkey Foot Road. The Oak Ridge Lift Station discharges west to the Colony Woods Interceptor, with the discharge point located east of Maxwell Lane. The Colony Woods Interceptor increases to a 12" sewer pipe just north of the Oak Ridge Lift Station discharge point. The Colony Square and Colony Woods developments discharge directly into the interceptor.

b. Sub-Basin E2

Sub-Basin E2 is located directly south of Sub-Basin E1. The sub-basin is comprised mostly of residential homes. The basin boundary starts at the intersection of Bloor Lane and the abandoned Pen-Central Railroad right-of-way. The boundary extends to the southeast to a wooded area located south of Benderfield Drive. From this point, the boundary extends east through a wooded area, across Mulberry Street, to the western boundary of the Zionsville Golf Course. The boundary continues to the northwest along the edge of the golf course to Temple Avenue and turns back to the west to Zionsville Road. The boundary continues on Zionsville Road to the east side of the high school and then turns south following the high school property line to Bloor Lane where the boundary continues westerly to the starting point.

Sub-Basin E2 includes the Benderfield and Bloor Woods subdivisions. The sub-basin contains approximately 102 homes. Sewage from the Benderfield subdivision flows by gravity to the Bloor Woods Lift Station, located at Bloor Lane and Bloor Woods Court. Flow from the lift station also includes the Zionsville High School. Flow from the lift station enters a 12" gravity pipe just east of Bloor Woods Court on Bloor Lane. The gravity pipe flows to the east on Bloor Lane to the south end of the Colony Woods Interceptor east of Mulberry Street. The point where the lift station enters the interceptor is also the location where the 12" Colony Woods Interceptor is upsized to 15" diameter pipe, becoming the upstream end of the Eastern Interceptor.

c. Sub-Basin E3

Sub-Basin E3 is divided into two different areas, each served by lift stations which discharge near the same location at the north end of the Eastern Interceptor. The first area is located to the east of Sub-Basin E1. This area is bounded generally by U.S. 421 (Michigan Road) to the east; Ravinia Subdivision to the north; Redbud Lane, Somerset Lane, and Willow Road (County Road 1100 East) to the west; and a line north of East County Road 550 South between Willow Road and South Michigan Road on the south.

The second area considered to be a portion of Sub-Basin E3 includes roughly 80 acres located immediately southwest of the intersection of U.S. 421 and County Road 550 South (121st Street). This portion ofSub-Basin E3 includes the Lost Run Farm subdivision which is intended to provide large, 3 to 4 acre estate style homesites.

Sub-Basin E3 is comprised primarily of residential subdivisions with a small commercial area located in the southern portion of the basin. The subdivisions located in the sub-basin include Coventry Ridge, Ravinia, Northview, Century Oaks, Clarkston, Colonial Heights, Northern

Meadows, and Lost Run Farm. In total, approximately 353 homes are located within the sub-basin and provided with sanitary sewer service. In addition to residential development, Sub-Basin E3 also serves a small area of medical and health care support facilities, and a day care facility.

The Ravinia subdivision is located at the northern most point of the sub-basin. Wastewater from this subdivision flows to the Ravinia Lift Station, located at Willow Road and South County Road 1100 East. The Ravinia Lift Station discharges to a gravity sewer located in the Northview subdivision on Woodside Drive. Sewage in the Northview subdivision flows to the Northview Lift Station, located at Woodside Drive and Redbud Lane, and is discharged to the Willow Road Sewer. At its upstream northern end, the Willow Road Sewer consists of 8" diameter pipe. Clarkston Lift Station, located approximately 150 feet south of Clarkston Road and approximately 900 feet east of Century Oaks Drive, pumps sewage from the Clarkston and Coventry Ridge subdivisions to the Willow Road Sewer. The discharge point for the lift station is located between Century Oaks Drive and Meadow Lane. At that location, the Willow Road Sewer increases to 12" diameter pipe. Sewage flow from Colonial Heights also flows to a dedicated lift station, located at the western end of Marquette Drive, and is pumped to the Willow Road Sewer. Century Oaks and Northern Meadows enter the Willow Road Sewer through gravity pipelines.

The 12" Willow Road Sewer discharges into the Willow Road Lift Station located on the west side of Willow Road north of Templin Road. The Willow Road Lift Station conveys the sewage via a 6" force main to the north end of the Eastern Interceptor.

According to available sewer maps, the discharge point for the force main from the Willow Road Lift Station is located at Elm Street and Elm Court. The Lost Run Farm subdivision is served by a dedicated lift station which pumps wastewater in a westerly direction to the Willow Road Lift Station.

d. Sub-Basin E4

Sub-Basin E4 is located directly south of Sub-Basin E3 and includes the Raintree Place subdivision, which is served by a dedicated lift station. Raintree Place is located on the north side of State Road 334 and east of Eagle Creek. Sub-Basin E4 is entirely residential, serving approximately 111 homes. Wastewater from the Raintree Place subdivision is directed to the Raintree Lift Station. The lift station discharges into the Eastern Interceptor at a location near the north side of Lions Park. The Eastern Interceptor at this point onward is upsized to 15" diameter pipe.

e. Sub-Basin E5

The final sub-basin to discharge into the Eastern Interceptor is Sub-Basin E5. This basin encompasses the downtown Village of Zionsville along with the Village commercial area and a few smaller contiguous developments. Beginning at the northwest corner of the sub-basin, the boundary starts at the abandoned Penn-Central Railroad right-of-way southwest of Benderfield Drive. The northern boundary continues east along a line north of Ash Street. Sub-Basin E5 is generally bordered by Elm Street to the east, Starkey Road (extended) to the south, and the abandoned Penn-Central Railroad, now the Rail-Trail to the west.

Sub-Basin E5 is composed of a mix of residential and business related land uses. The commercial area within Zionsville Village consists of approximately twenty acres of property used primarily for small businesses, shops, and restaurants. Also included in the sub-basin is Eagle Elementary School, the Hussey-Mayfield Memorial Library, and an apartment complex.

The residential area includes approximately 650 homes located within the Village, along with Compton's mobile home park located at the south-central portion of the sub-basin.

Two sanitary lift stations are included within Sub-Basin E5. Beechwood Lift Station is located at the northwest corner of the basin and serves a number of homes along Beechwood Lane. The second, Valley View Lift Station, is located near the center of the Village. Both stations discharge into the gravity system which serves the Village district. The Village Interceptor begins as 8" diameter pipe commencing at Poplar Street and Ninth Street and flowing east along Poplar Street to Third Street. At this point, the interceptor is upsized to 10" pipe and continues south along Third Street to Pine Street. At Pine Street, the interceptor becomes 12" gravity pipe flowing west along Pine Street before turning south on Fourth Street. The Village Interceptor discharges into the Eastern Interceptor just upstream of the Main Lift Station. The Main Lift Station conveys all wastewater flows generated within the East Sewer Basin to the Town's wastewater treatment plant.

3. South Sewer Basin

Wastewater generated within the South Sewer Basin is not directed to any of the previously discussed major interceptor sewers. The South Sewer Basin is located south and west of the Town's existing wastewater treatment plant and north of Interstate 865. This sewer basin includes the following subdivisions: The Woodlands at Irishman's Run and Fox Hollow, which lie west of Ford Road, and Huntington Woods, and Sugarbush Hill on the east side of Ford Road. The west portion of the Woodlands subdivision is served by a low pressure sewer system (LPSS). Individual grinder pumping stations convey wastewater from the LPSS area to the gravity based system which carries the flow to the Woodlands Lift Station. The Woodlands Lift Station conveys the flow to a gravity sewer which serves Huntington Woods.

Sewage from Huntington Woods and Sugarbush Hill flows to the Sugarbush Hill Lift Station which conveys the flow to the Town's wastewater treatment plant via a 6" force main which passes through Starkey Park.

4. Existing Lift Station Information

Zionsville owns and operates 22 lift stations within the existing sanitary sewer service area. Generally, these lift stations have been given names based upon the subdivisions they serve or in which they are located. The following table, **Table No. 3-1**, has been prepared to identify each sanitary sewer lift station and to associate each station with the major sewer basin it lies within.

There are three primary lift stations: The Main Lift Station which receives all flow from the Eastern Interceptor; The Boone Village Lift Station, which receives all flow from the Western Interceptor; and the Sugarbush Lift Station, which receives wastewater flow generated within the South Sewer Basin. Smaller lift stations are identified as contributors to the primary lift stations. Where the information is available, the number of pumps provided at each lift station is shown, along with the design flow rate, operating head, and force main size.

Table No. 3-1
Lift Station Information

LIFT STATION	Contributing Lift Stations	Basin or Sub-Basin	# of Pumps	Design GPM@TDH	Force Main Size
MAIN L.S.		**Eastern Interceptor**	**3 Sanitary**	**970 gpm @ 117'**	**8" or 12"**
			2 Storm	**1,650 gpm @ 124'**	**12"**
	Cedar Bend Lift Station	E1	2	110gpm @ 68'	4"
	Oakridge Lift Station		2	110gpm @ 68'	4"
	Bloor Woods Lift Station	E2	2	47gpm @ 30'	2"
	Ravinia Lift Station	E3	2	310gpm @ 28'	4"
	Northview Lift Station		2	140 gpm @ 42'	4"
	Clarkston Lift Station		2	150' @ 67'	6"
	Colonial Heights Lift Station		2	24 gpm @ 38'	2"
	Willow Rd Lift Station		2	250gpm @ 52'	6"
	Lost Run Farms		2	124 gpm @ 35'	
	Raintree Lift Station	E4	2	320gpm @ 22'	6"
	Beechwood Lane Lift Station	E5	1	100 gpm @ 23'	4"
	Valley View Lift Station		2		2"
BOONE VILLAGE L.S.		**Western Interceptor**	**3**	**600gpm @ 70'**	8"
	Spring Knoll Lift Station	W1	2		6"
	Ford Road Lift Statiion	W2	3	415gpm @ 32.5'	6"
	Irishman's Run Lift Station	W3	3	360gpm @ 46'	6"
	Ford Center Lift Station	W4			
	Enclave Lift Station	W5	2	234gpm @ 49'	4"
	Thornhilll Lift Station		2	142gpm @ 76'	4"
	Cfliden Pond Lift Station		2	100gpm @ 28'	4"
SUGARBUSH L.S.		**South Sewer Basin**	**2**	**200gpm @ 115'**	**8"**
	Woodlands Lift Station		2		

SECTION 4
EVALUATION OF EXISTING SEWER SYSTEM

A. General

In order to evaluate the Town's existing sanitary collection system and plan for expansion of the system to meet future development, estimates of loadings and capacities needed to be determined for the existing major interceptors and trunk sewers. A hydraulic model was created to evaluate current loadings and carrying capacities of the most critical components of the sanitary sewer system.

The hydraulic evaluation of the collection system was based largely upon information obtained from the Town's Geographical Information System (GIS) database. The GIS data was used to calculate the expected flows based upon existing land use and development density. These unit flows were then applied to existing pipelines and ultimately to future developments. The GIS data provided pipeline size and slope information, from which a hydraulic model was constructed using a Microsoft Excel spreadsheet. This type of spreadsheet model, as opposed to a commercial modeling program, is a simple, easy-to-modify tool that can be used by utility personnel with proper training. It also eliminates the need for special software and licensing agreements.

The model worksheets have been included in **Appendix D** of this report. The model was used to calculate sanitary sewer system flows for both existing and future conditions based on land use, population, and the cumulative average daily dry weather flows with an allowance for Infiltration and Inflow.

B. Wastewater Generation and Flow Rates

The vast majority of pipelines within urban and rural portions of the planning area are residential mains. Sewers in residential areas are generally designed with minimum 8-inch diameter pipe and slopes which will maintain a minimum flow velocity of 2 feet per second. Downstream segments and interceptor sewers will be larger as dictated by the projected peak cumulative flow.

Estimates of average, peak dry weather, and peak wet weather flows were derived from the hydraulic model. Flows are based upon a combination of factors, including land use, drainage basin size, and projected population within each sewer basin and sub-basin. We have used commonly accepted industry standards in the projection of these flows. Average daily wastewater generation in residential areas has been based on a unit estimate of 190 gallons per day per household.

Typical Dry-Weather Wastewater Flows (per Household, per Capita)

Since residential land use in Zionsville is predominantly a mix of single family and multi-family residences, future wastewater flows are based upon EDU's (Equivalent Dwelling Units). One EDU is defined as the average size of a single family household. Based upon information provided by the Town, at the time of this writing there are 3,851 residential wastewater customers and 90 commercial customers. Therefore, nearly 98% of utility connections are residential in nature. Since there are no unusually large-demand commercial or industrial water users, a simple determination of average daily wastewater flow per household can be made by dividing the average daily dry weather flow observed at the Town's wastewater treatment plant by the total number of service connections:

750,000 gpd avg. dry weather flow ÷ 3,941 services = 190 gallons per day per home

Based upon the most recent census figure of approximately 2.80 people per household, the average wastewater production per capita then is:

190 gal. per household ÷ 2.8 people per household = 68 gal. per capita per day

For commercial, industrial, and institutional areas, wastewater generation estimates are based upon a quantity of flow per unit area. Business and commercial developments are likely to include a mix of office space, warehousing, retail, and business support facilities. For commercial applications, we have estimated the developable acreage for the applicable service area, and applied a wastewater generation rate of 1,000 gallons per day per acre (gpd/ac). Wastewater flows from industrial sources will vary widely depending upon the size and nature of the facility and its level of water consumption.

Because of this variation, we have used a design value of 1,500 gpd/ac for the light to moderate industrial development expected to occur within undeveloped portions of the planning area zoned for industrial use.

The dry weather wastewater flow component is generated from routine water consumption by residential, commercial and industrial users, with an allowance for groundwater infiltration rates which occur during dry weather periods and normal groundwater tables. Dry weather flows vary diurnally, with peak flows typically occurring in the morning between 7:00 and 9:00 a.m., and in the evening between 6:00 and 8:00 p.m. Dry weather flow rates will also vary seasonally, with the highest flows occurring during the summer months. Variations will also occur from weekdays to weekends, and on Holidays.

For modeling purposes, flow demands for the existing system were based upon information regarding current land use, population distribution, and the Town's existing GIS data. House counts from field investigations and the most recently available aerial photography were also utilized to develop base wastewater flow rates. The average dry weather flows, peaking factors, and infiltration and inflow rates were adjusted as necessary within the model to achieve values consistent with flow rates observed at the Town's wastewater treatment facility.

C. Flow Components

Flow within a sanitary sewer collection system consists not only of wastewater generated by utility customers during dry weather conditions, but also of flows contributed by the entry of stormwater and groundwater into the system due to the effects of wet weather. Generally speaking, for every gallon of domestic wastewater generated, it is not uncommon for an additional 1½ to 3 gallons of water to enter the collection system from external sources. This simple fact has a significant impact upon the design and sizing of collection system piping, pumping, and treatment facilities. Rainfall Derived Infiltration and Inflow (RDII) is a term used to describe the various ways that groundwater and stormwater are able to enter a wastewater collection system during wet weather events.

Infiltration is the intrusion of groundwater into system piping through defective joints, broken pipes, and manhole structures below the casting. The rate of infiltration will be dependent upon the depth of the groundwater table above a defect and the size of that particular defect. Infiltration rates will vary seasonally and are weather dependent, since groundwater levels are affected by the duration, frequency, and intensity of rainfall events.

Inflow is stormwater that enters into the sanitary sewers at points of direct connection to the system. Various sources can contribute to inflow, including footing and foundation drains, roof drains or leaders, downspouts, drains from window wells, outdoor basement stairwells, storm inlet connections, driveway drains, and basement sump pumps. These sources are typically improperly or illegally connected to the sanitary sewer system, via either direct connections or discharges into sumps or pits that are directly connected to the sanitary sewer. An improper connection allows water from sources other than sanitary fixtures and drains to enter the wastewater collection system.

1. Average Daily Dry Weather Flow

Some fluctuation in average daily dry weather flow can be attributed to variations in the domestic, commercial, and industrial components of the wastewater stream. Average Daily Dry Weather Flow (ADDF) for the utility is measured by monitoring flow at the wastewater treatment plant, and includes typical daily wastewater production plus that amount of base infiltration which occurs during low to normal groundwater conditions. Based upon existing records for the year 2009 and first half of 2010, the total Average Daily Dry Weather flow for the utility is approximately 0.75 million gallons per day (MGD). It should be noted that the Utility's Monthly Reports of Operation (MRO's) were reviewed to obtain a working figure for the Average Daily Dry Weather Flow. The MRO's listed only the total effluent flow from the plant following treatment. Therefore, the ADDF and other flows discussed below are based upon the effluent flows observed at the treatment plant.

2. Rainfall Derived Infiltration and Inflow (RDII)

a. Sustained Infiltration

Infiltration flow rates are naturally higher on days following a significant rain event. During the wet weather season, groundwater infiltration can significantly affect the available collection system capacity. Since flow monitoring data is not available for any sewer subsystems within the existing sanitary collection system, the amount of infiltration within each sewer basin had to be estimated. Distribution of total infiltration throughout the system was also estimated, based upon the percentage of inch diameter-miles of pipe present within each existing sewer subsystem.

Rates of rainfall derived infiltration can be estimated by subtracting the average daily dry-weather flow from metered flow rates observed following a significant wet weather event and after the initial surge of inflow. Based upon data available from the MRO's, it has been determined that the Town's maximum sustained infiltration rate is approximately 0.56 MGD.

b. Determination of Inflow

The volume of peak inflow is largely dependent upon the intensity, distribution, and duration of a particular wet-weather event. Prior groundwater conditions, and the types and locations of inflow sources are other key factors. Depending on the condition of the sanitary sewer system, direct inflow and rainfall induced infiltration can cause significantly higher peak flows than those which will be evident on non-rainfall days.

For this study, infiltration and inflow rates were derived by evaluating recorded plant flows and determining the total inch-diameter miles of pipe within the sanitary sewer collection system (approximately 575.3 in-mi). The maximum rainfall derived infiltration and inflow (RDII) rate was

determined by subtracting the average daily dry weather flow of 0.75 MGD from the peak observed treatment plant flow of 4.65 MGD. The maximum RDII rate therefore is approximately 3.90 MGD.

The total sanitary RDII on a system wide basis was determined to be:

3.90 MGD RDII ÷ 575.3 In-miles of pipe = 6,779 gpd/in-mi.

This is a common value for sanitary sewer systems in the Midwest, and within the range of 100 to 10,000 gal/day/in-mi as suggested by Metcalf & Eddy in *"Wastewater Engineering – Treatment and Reuse"*. The fact that the inflow/infiltration rate is at the high end of the range is a reflection of the age, material and general condition of many older segments of the existing wastewater collection system.

Total sanitary system inflow was derived by subtracting the maximum sustained infiltration rate of 0.56 MGD from the peak RDII rate of 3.90 MGD:

3.90 MGD RDII - 0.56 MGD Infiltration = 3.34 MGD Inflow

3. Future Infiltration and Inflow Reduction Measures

Reduction and control of inflow and infiltration in the Town's sanitary sewer system should be considered with the implementation of a disciplined, long-term monitoring and maintenance program. The first step in resolving an inflow and infiltration issue is to determine how significant the problem is within a specific area. Typically, a sanitary sewer evaluation survey is performed to assess the system and to identify problem areas where excessive quantities of inflow and infiltration are occurring. Once major sources are identified, a cost-effective corrective action plan can be developed.

The first step to managing excessive inflow and infiltration into a sanitary system is to determine the extent of problem. This will require a significant effort to locate and record information relating to a variety of issues, including but not

limited to observed overflows, documenting system surcharges and bypasses, and maintaining a record of customer backup complaints. The information should be obtained from different sources including maintenance records, sewer maps, complaint records, assorted department files, work orders, past studies, engineering reports, and interviews with personnel who are responsible for maintenance and management of the sanitary sewer system. Once the data has been collected, it must be recorded and displayed in a way that will show possible relations between overflows, bypasses and other factors.

4. Sub-Basin Distribution of ADDF and RDII

To facilitate the evaluation of the existing wastewater collection system, the system was broken down into three separate and distinct sewer basins. As discussed previously in Section 3, the sewer basins were further divided into sub-basins to allow for realistic estimates of wastewater flows generated throughout the existing service area. The sewer basins and associated sub-basins are identified in **Table No. 4-1** through **Table No. 4-3** below. Sub-Systems are listed in order hydraulically from upstream to downstream locations within each basin. Major wastewater flow contributors within each sub-system are identified by subdivision name, institution, or other appropriate identifier.

A map identifying the approximate boundaries of each sewer basin and sub-basin is included in **Appendix A**. For the reader's reference, the left column of the following tables have been color coded to match the highlighting system used to define the sub-basin boundaries as presented on the map.

Table No. 4-1

West Sewer Basin

Sewer Sub-basin	Subdivision or Other Significant Flow Contributor
W1	Rock Bridge Subdivision North Section of Spring Knoll Subdivision
W2	Middle and South Sections of Spring Knoll Subdivision Pleasant View Elementary School Methodist Church Zionsville Middle School American Legion Episcopal Church
W3	Cobblestone Lakes Subdivision
W4	Village Walk Subdivision Quail Run Apartments Zionsville Christian Church Approx. 1 Ac Commercial Development Three Restaurants
W5	Shannon Springs Subdivision The Enclave Subdivision Oldfields Subdivision Thornill Subdivision Irongate Subdivision Hunters Point Subdivision Hunt Club Village Subdivision Zionsville Meadows Subdivision Clifden Pond Subdivision Approx. 34 Ac Commercial Development 136 Apartment Units

Table No. 4-2

East Sewer Basin

Sewer Sub-Basins	Subdivision or Other Significant Flow Contributor
E1	Smith Meadows Subdivision Cedar Bend Subdivision Oak Ridge Subdivision Buttondown Farm Subdivision Colony Woods Subdivision Zionsville Upper Middle School
E2	Bloor Woods Subdivision Zionsville High School
E3	Ravinia Subdivision Coventry Ridge Subdivision Northview Subdivision Colonial Heights Subdivision Century Oaks Subdivision Clarkston Subdivision Northern Meadows Subdivision Lost Run Farm Subdivision
E4	Raintree Place Subdivision
E5	Zionsville Village Eagle Elementary School Zion Nature Center Approximately 20 Apartment Units

Table No. 4-3

South Sewer Basin

Sewer Sub-System	Subdivision or Other Significant Flow Contributor
S1	The Woodlands at Irishman's Run Subdivision Fox Hollow Subdivision Huntington Woods Subdivision Sugarbush Hill Subdivision

The distributions of estimated average daily dry weather flow (ADDF) and rainfall derived infiltration and inflow (RDII) for the existing sewer sub-basins are shown in **Table No. 4-4** through **Table No. 4-8**. These figures represent estimated base wastewater flow and RDII flows for the existing sanitary collection system only. The flows are initially distributed proportionally, based upon the total inch-miles of pipe present within each sub-basin, and the corresponding percentage relative to the overall system.

Table No. 4-4

Estimated Peak Daily Sanitary Sewer Flows
Existing Western Interceptor

Sewer Sub-Basin	In.-Mile Pipe	% of Total System	No. Homes	Avg. Daily Dry Weather Flow (GPD)	Infiltration (GPD)	Inflow (GPD)	Peak Flow (GPD)	Cumulative Peak Flow (GPD)
W1	39.8	7%	268	50,920	38,606	230,840	320,366	320,000
W2	48.7	8%	431	81,890	47,239	282,460	411,589	730,000
W3	34.7	6%	262	49,780	33,659	201,260	284,699	1,015,000
W4	33.9	6%	160	30,400	32,883	196,620	259,903	1,274,000
W5	90.8	16%	515	97,850	88,076	526,640	712,566	1,987,000
Total	**247.9**	**43%**	**1,636**	**310,840**				

Table No. 4-5

Estimated Peak Daily Sanitary Sewer Flows
Existing Eastern Interceptor

Sewer Sub-Basin	In.-Mile Pipe	% of Total System	No. Homes	Avg. Daily Dry Weather Flow (GPD)	Infiltration (GPD)	Inflow (GPD)	Peak Flow (GPD)	Cumulative Peak Flow (GPD)
E1	134.4	23%	760	144,400	130,368	779,520	1,054,288	1,054,000
E2	13.4	2%	103	19,570	12,998	77,720	110,288	1,165,000
E3	58.2	10%	345	65,550	56,454	337,560	459,564	1,625,000
E4	16.8	3%	111	21,090	16,296	97,440	134,826	1,760,000
E5	59.1	10%	663	125,970	57,327	342,780	526,077	2,287,000
Total	**281.9**	**49%**	**1,982**	**376,580**				

Table No. 4-6

Estimated Peak Daily Sanitary Sewer Flows
Existing South Basin Sewer

Sewer Sub-Basin	In.-Mile Pipe	% of Total System	No. Homes	Avg. Daily Dry Weather Flow (GPD)	Infiltration (GPD)	Inflow (GPD)	Peak Flow (GPD)	Cumulative Peak Flow (GPD)
S1	45.5	8%	324	61,560	44,135	263,900	369,595	370,000
Total	**45.5**	**8%**	**325**	**61,560**				

Table No. 4-7
Modeled Peak Daily Wastewater Flows Including I/I
Existing Wastewater Collection System

Interceptor	In.-Mile Pipe	% of Total	Avg. Daily Dry Weather Flow (GPD)	Infiltration (GPD)	Inflow (GPD)	Peak Flow (GPD)
Western	247.9	43%	310,840	240,000	1,437,000	1,987,000
Eastern	281.9	49%	377,000	274,000	1,635,000	2,287,000
South Basin	45.5	8%	61,560	44,000	264,000	370,000
Total	**575.3**	**100%**	**750,000**	**558,000**	**3,337,000**	**4,644,000**

(Totals are rounded to nearest thousand)

D. Sewer Collection System Modeling

In order to properly estimate wastewater flow rates in the major interceptors located in the Town of Zionsville's collection system, the planning area was divided into a number of sewer sub-basins as discussed in Section 3. These sub-basin boundaries are based upon the location of the major interceptor sewers found in the collection system, and the areas which are served by those interceptors and their tributaries. The sub-basin boundaries were also used to estimate reasonable and realistic wastewater loadings for modeling purposes. The sub-basin delineations serve to appropriately define where the wastewater flows and loadings were entered into the collection system model. Sub-basin boundaries were established through a review of the local topography and a study of the natural drainage patterns which exist within the planning area. A more technical definition of the term "sub-basin" is provided below:

Sub-basin Definition:

For the purpose of this study, a sub-basin is defined as a geographic or hydrologic region in which all wastewater flows are collected and conveyed to a single location before being transferred elsewhere in the collection system. Sub-basin size and shape are generally governed by topography. Typically, a sub-basin consists of a series of local collector sewers upstream of a major interceptor sewer or lift station. Sub-basins are mostly defined by prominent geographical features, such as high points and drainage-ways which define the natural surface drainage patterns.

After delineation of the sub-basins, wastewater flow allocations were then performed for each sub-basin within the collection system. Five (5) sub-basins were delineated for the West Sewer Basin along with five (5) sub-basins for the East Sewer Basin. Also, a South Sewer Basin was delineated as well. A map identifying the approximate boundaries for each sewer sub-basin is included in **Figure No. 3-4.**

Current wastewater flows, as entered into the model for any particular sub-basin, are based largely upon designated land use, including residential house counts and commercial acreage present within each sub-basin, obtained through the Town's

Geographical Information System (GIS) database and review of the most recently available aerial photography. These flows were utilized to calculate current loadings into the existing interceptors to which the individual sub-basins discharge. The flows into the interceptors were also used to calculate the capacity remaining in the interceptor and the limiting factor for each interceptor.

There was not any flow monitoring completed to calibrate the model. Much of the model input was based upon the best available information. The slopes of the interceptors were based on elevations obtained from the Town's GIS system. Where GIS data was not available, the minimum allowable slope was utilized for the interceptor.

1. Model and Flow Generation

An Excel spreadsheet based model was generated for the Zionsville wastewater collection system. A schematic diagram, **Figure No. 3-1**, of the collection system was prepared for the existing service area. The diagram provides a general orientation of the sub-basins and the critical elements within the collection system for the applicable sub-basin, i.e. residential subdivisions and other major flow contributors. Major gravity sewers, interceptor sewers, lift stations, and force mains are also illustrated in the figure. Information regarding each of the interceptors was derived from Town Utility personnel and from record drawings when available.

The distributions of estimated and adjusted average daily dry-weather flows (ADDF) and rainfall derived infiltration and inflow (RDII) for each sub-basin was generated through a hydraulic evaluation. All wastewater collection systems are affected to some extent by the intrusion of water from infiltration and inflow sources, and peak wastewater flows generally occur during wet weather periods due to the affects of RDII. Sewer collection system facilities must be adequately sized to convey the projected peak wastewater flows to downstream reaches and ultimately to the municipal treatment facilities.

Flows within each sub-basin and interceptor were based on a combination of factors. These factors include land use, drainage basin size, and the developed area within each sub-basin. Total ADDF was based upon observed and recorded flows taken from the Utility's monthly reports of operation. These reports provide daily flows monitored at the Town's wastewater treatment plant. Currently, Zionsville has an average daily dry weather flow of approximately 0.75 million gallons per day (MGD). It was calculated the Town's ADDF per household was approximately 190 gallons per day (GPD) per home. This resulted in 68 GPD per capita. Also, flow rates were assumed for commercial, industrial, and institutional areas. For commercial applications, a wastewater rate of 1,000 gallons per day per acre (gpd/ac) was applied. For those areas zoned as industrial land use, a rate of 1,500 gpd/ac was applied to those parcels. Finally, industry accepted flow rates were applied to each school utilizing number of students and staff from the 2009 – 2010 Department of Education summary report for each school.

Using the information gathered for each of the sub-basins and the calculated ADDF rate per household, flow numbers were generated for each sub-basin and the applicable interceptor(s). Based on the current ADDF measured at the plant, flows within the system were adjusted as necessary within the model to achieve values consistent with flow rates observed at the treatment facility.

It was more difficult to assign RDII numbers to the model for each sub-basin and interceptor. Site specific flow monitoring data was not available for use during the preparation of this report. Therefore, the amount of RDII for each sub-basin and interceptor had to be estimated. Distribution of the total infiltration throughout the system was initially based upon the percentage of inch diameter-miles of pipe present within each sub-system. To develop a reasonable and realistic RDII loading for each of the sub-basins, an allocation factor using percent relative to other sub-basins was generated for each area. This factor was used to compensate for the different types of pipes which exist within the system, ranging from vitrified clay pipe (VCP) to polyvinyl chloride (PVC) pipe, and for the age of the pipes found in each sub-basin. It was assumed the RDII

rate would be greater in those areas with older VCP pipes in relation to areas with newer sewers which incorporated PVC pipe. In the hydraulic model, the total inch diameter-miles of pipe were determined for each sub-basin, and the proportional RDII was calculated. The allocation or adjustment factor was then applied to adjust the RDII rate based upon the type of pipe and the average system age for each sub-basin. The final adjusted total infiltration and inflow rate varies by less than 1% from the measured value based upon observed treatment plant flows.

Table No. 4-8 provides a summary of the RDII distribution for the existing collection system. The left side of the table shows the RDII in each sub-basin based on the total inch diameter-mile of pipe found in the sub-basin. The right side of the table illustrates the adjusted RDII rate based on the age and type of pipe found in the sub-basin. To calculate the percentage of infiltration and inflow, data from the monthly reports of operation were utilized. It was determined that the total RDII was approximately 3.9 MGD based on the peak observed treatment flow of 4.65 MGD and subtracting the ADDF rate of 0.75 MGD. It was also determined from the MRO's that the total maximum sustained infiltration rate was approximately 0.56 MGD or approximately fourteen percent of RDII. Therefore, the total inflow rate was determined to be approximately 3.34 MGD or approximately eighty-six percent of RDII.

Table No. 4-8

RDII Rates for Existing Sewer Sub-Basins

Initial Distribution of RDII per Sub-Basin					Adjusted RDII Rate		
Sub-Basin	Inch Dia. - Mile Pipe	RDII (GPD)	Infiltration (GPD)	Inflow (GPD)	Adjustment Factor (%)	Infiltration (GPD)	Inflow (GPD)
W1	39.8	269,446	38,606	230,840	100%	38,606	230,840
W2	48.7	329,699	47,239	282,460	100%	47,239	282,460
W3	34.7	234,919	33,659	201,260	70%	23,561	140,882
W4	33.9	229,503	32,883	196,620	114%	37,487	224,147
W5	90.8	614,716	88,076	526,640	82%	72,222	431,845
S1	45.5	308,035	44,135	263,900	100%	44,135	263,900
E1	134.4	909,888	130,368	779,520	102%	132,975	795,110
E2	13.4	90,718	12,998	77,720	119%	15,468	92,487
E3	58.2	392,014	54,454	337,560	85%	46,286	286,926
E4	16.8	113,736	16,296	97,440	86%	14,015	83,798
E5	59.1	400,107	57,327	342,780	150%	85,991	514,170
TOTALS	575.3	3,895,000	558,000	3,337,000		558,000	3,345,000

Total peak flow rates generated within each sub-basin have been determined by adding the adjusted RDII shown in the table above to the average daily dry weather flow. These flows were then applied to the system model for evaluation of each of the main interceptors.

E. Capacity and Loading of Existing Interceptors

Based on the concepts discussed above, wastewater loadings have been estimated for the major interceptors within the Town's existing sanitary sewer collection system. As stated earlier, the critical information regarding each interceptor, i.e. size, slope, roughness factor, was based on information obtained from the Town's GIS database. This information was gathered and entered into the hydraulic model to calculate the current loading on the pipe and the remaining capacity available for future flow. Where slope information was not readily available, capacities were based upon the minimum allowable pipe slope as presented in the *Ten States Recommended Standards for Wastewater Facilities.*

Below is the list of interceptors within the Town of Zionsville's existing collection system which will be discussed. The list begins with the upstream sewers and interceptors and proceeds to downstream segments. The major sewers within each sewer basin are identified.

West Sewer Basin:

- *Railroad Interceptor*
- *Cobblestone Interceptor*
- *Hunters Point Sewer*
- *Western Interceptor*

East Sewer Basin:

- *Colony Woods Interceptor*
- *Willow Road Sewer*
- *Village Interceptor*
- *Eastern Interceptor*

South Sewer Basin:

- *South Basin Sewer*

Figure No. 3-1 provides a schematic diagram of the collection system showing the location of the interceptors relative to each other and to the Town's treatment facility. The schematic illustrates those major residential subdivisions which feed to the interceptors along with the general orientation of the various lift stations relative to overall flow scheme. Finally, the discharge points are also illustrated.

Table No. 4-9 summarizes each of the interceptor sewers illustrating pipe sizes for the interceptors (at the downstream end), the calculated maximum capacity, the current estimated ADDF and RDII in the interceptor, and the remaining capacity in each interceptor. The capacities were based on available information and known pipe data, most recent topographical information, and input from the Town's utility personnel.

Table No. 4-9

Capacity and Loading of Existing Interceptor Sewers

Interceptor	Pipe Size	Calc. Capacity	Calc. ADDF	Calc. RDII	Peak Flow	Remaining Capacity
	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
Railroad Interceptor	10	0.73	0.131	0.600	0.731	-0.001
Cobblestone Interceptor	12	1.09	0.05	0.234	0.284	0.806
Hunters Point Sewer	12	0.94	0.097	0.614	0.711	0.229
Western Interceptor	13.89	2.22	0.311	1.374	1.685	0.535
Colony Woods Interceptor	12	0.94	0.144	0.927	1.071	-0.131
Willow Road Sewer	12	1.08	0.066	0.333	0.399	0.681
Village Interceptor	12	0.94	0.126	0.600	0.726	0.214
Eastern Interceptor (Upstream 15")	15	1.50	0.336	1.530	1.866	-0.366
Eastern Interceptor (Downstream 24")	24	4.91	0.377	2.080	2.457	2.453
South Basin Sewer	8	0.43	0.06	0.250	0.310	0.120

1. West Sewer Basin:

a. Railroad Interceptor

The Railroad Interceptor's upstream end commences in the northern section of the Spring Knoll subdivision at Sedge Court and Greenthread Drive. The 10" sewer follows Greenthread Drive south to the abandoned Penn-Central railroad right-of-way. The sewer continues in a southeasterly direction following what is now the Rail Trail. The Railroad Interceptor discharges to the Ford Road Lift Station at the intersection of Ford and Cruise Road. No adjustments were made to the estimated base RDII rates for this sewer due to the relatively high levels of observed infiltration and inflow. The model estimates the current peak capacity of the interceptor to be approximately 0.73 MGD. The current ADDF loading on the pipe is approximately 0.131 MGD and calculated RDII entering the interceptor is approximately 0.60 MGD. Therefore, based upon the modeling results, there is no remaining capacity in the Railroad Interceptor.

b. Cobblestone Interceptor

The Cobblestone Interceptor begins in the Cobblestone Lakes subdivision at the intersection of Spring Violet Place and South Cobblestone Drive. The pipe size is initially 12" diameter. The interceptor flows in a southerly direction following South Cobblestone Drive to Whitestown Road. The interceptor continues south to Cruise Road where it turns east and discharges into the Irishman's Run Lift Station. The model indicates the capacity of the sewer is approximately 1.09 MGD. Currently, the model calculates the total flow, ADDF and RDII, to be approximately 0.28 MGD leaving capacity for approximately 0.81 MGD of additional wastewater flow. At this time, capacity is more than adequate for current conditions and allows for future growth in this area to be directed through this interceptor.

c. Hunters Point Sewer

The Hunters Point Sewer is a 12" diameter collector sewer, the downstream end of which flows from west to east between the Hunters Point Apartments and the Olde Dominion condominium complex. The sewer also serves several upstream developments to the west and south, including the Irongate, Thornhill, Clifden Pond, Enclave, Oldfields, and Shannon Springs subdivisions.

The Hunters Point Sewer flows eastward parallel to Starkey Branch Creek, crossing Ford Road south of Parkway Drive. The sewer discharges by gravity flow into the Western Interceptor near the Zionsville Municipal Services Building.

d. Western Interceptor

The Western Interceptor receives flow from all of the above interceptors and collects the majority of flow from the west side of the collection system. Several adjacent developments such as Village Walk and Hunt Club Village discharge directly into the interceptor.

The upstream end of the Western Interceptor begins with a 10" pipe near the intersection of Bloor Lane and Ford Road. The Ford Road Lift Station discharges to the Western Interceptor at that location. From this point the Western Interceptor flows south before turning east at the Quail Run Apartment complex. At Quail Run, the sewer is upsized to 14" diameter pipe and continues southward along the east side of the apartments and the Boone Village Shopping Center.

The Western Interceptor crosses State Road 334 and continues to flow south, ultimately crossing Starkey Branch Creek and paralleling the creek to the Boone Village Lift Station. All of the West Sewer Basin flows are conveyed by the Boone Village Lift Station to the Town's wastewater treatment plant.

Much of the original pipe which constitutes the Western Interceptor was repaired or replaced with pipe-bursting technology and open cut excavation in 2002.

The hydraulic model estimates the capacity of the downstream portion of the Western Interceptor to be approximately 2.22 MGD. The average day dry weather flow was calculated to be approximately 0.31 MGD with an RDII loading of approximately 1.374 MGD. This leaves an available capacity of approximately 0.535 MGD. Based upon existing as-built information, the lowest slope found on the interceptor is approximately 0.57%, significantly greater than the recommended minimum slope of 0.17% for 14" diameter nominal pipe. It is the Interceptor's steeper slope which significantly enhances the sewer's estimated capacity. Field confirmation of existing conditions is recommended before significant future loading is directed to this interceptor.

2. East Sewer Basin

a. Colony Woods Interceptor

The Colony Woods Interceptor is the northernmost interceptor within the eastern portion of the collection system. The interceptor begins at the discharge point from the Cedar Bend Lift Station between the Cedar Bend and Oak Ridge Subdivisions. The ten inch pipe flows to the southeast, increases in size to twelve inch pipe at the discharge point for the Oak Ridge Lift station, and continues southeast along the eastern border of Colony Woods. The interceptor discharges into the Eastern Interceptor at the southwest corner of the Zionsville Golf Course just after the Cross Branch Creek, east of Mulberry Street. The model estimates the capacity of the interceptor to be 0.94 MGD. The calculated ADDF is approximately 0.14 MGD with an RDII of approximately 0.93 MGD. Based on these calculations, the sewer capacity is exceeded by approximately 0.13 MGD. The lowest slope found on the interceptor is 0.22%, which is the recommended minimum slope for 12" diameter pipe.

In terms of physical size, the Colony Woods Interceptor serves the largest sewer sub-basin (E1) in the collection system, with a total area of nearly 1.3 square miles or approximately 830 acres. Couple this with the fact that the southern portion of the sewer basin consists of older homes and older sewer lines, the area is more likely to experience higher rates of infiltration and inflow than newer developments. The interceptor capacity is fully utilized and slightly exceeded during wet weather events due to the minimum slopes and the size of the sewer sub-basin and number of homes it serves.

b. Willow Road Sewer

The Willow Road Sewer serves the extreme northeastern portion of the sewer service system. The interceptor begins as a 12" diameter pipe on Willow Road south of Clarkston Road. The interceptor continues south on Willow Road to the Willow Road Lift Station located just north of Templin Road (County Road 550 South). The interceptor remains a 12" pipeline throughout its run. The hydraulic model estimates the capacity of the interceptor to be approximately 1.08 MGD. The current calculated ADDF is approximately 0.07 MGD and the RDII is estimated to be approximately 0.33 MGD. This leaves an available capacity of approximately 0.68 MGD. The minimum slope found on the interceptor is 0.22%, which is the recommended minimum for twelve inch pipe. There appears to be adequate capacity available for this interceptor to accommodate future development. The calculated RDII is low due to the relatively newer pipe found in the north section of the E3 Sewer sub-basin which feeds the interceptor. The only limiting factor would be the minimum slope found along several lengths of the pipeline.

c. Village Interceptor

The Village Interceptor provides service the Village of Zionsville, the oldest section of the Town. The interceptor begins as a 10 inch pipe at the intersection of Locust Street and Third Street. The pipe runs south on

Third Street to Oak Street where it increases in size to 12 inch pipe. From there the interceptor continues south on Third Street to Pine Street, turns west to Fourth Street, and then runs south to Sycamore Street. At that location the pipe again increases in size to 15 inch. The Village Interceptor then continues south before discharging into the Eastern Interceptor just east of the Main Lift Station. The length of the downstream section of 15 inch pipe is minimal, approximately 320'. The majority of the upstream segments of the interceptor are ten and twelve diameter inch pipe. The model estimates the capacity of the critical 12" portion of the interceptor to be approximately 0.94 MGD. The current ADDF was calculated at approximately 0.13 MGD, with an estimated RDII of approximately 0.60 MGD. This leaves an available capacity of approximately 0.21 MGD on the Village Interceptor. Additional flows are not expected to occur on this sewer since it serves the Village proper, which has reached a saturation development condition. Any future addition of large volume water users in the area should be reviewed by the Town to evaluate the potential for negative impacts to sewer capacity.

Data was not available regarding the constructed slope of the pipe. Therefore the minimum allowable slope for 12 inch pipe, 0.22%, was used to calculate the sewer capacity. The RDII rate is expected to be high for this sub-basin since the age of the pipe is some of the oldest to be found in the collection system. The limiting factors for this interceptor appear to be lack of slope and high RDII rates into the sewer.

d. Eastern Interceptor

The Eastern Interceptor collects all the flow for the eastern portion of the collection system. Flows from Colony Woods Interceptor, Willow Road Sewer, Bloor Lane, Village Interceptor, and other eastern subdivisions all directly discharge into the Eastern Interceptor. Currently the interceptor is fifteen inch pipe from its upstream end to the discharge point at the Main Lift Station.

The Eastern Interceptor begins at the discharge point of the Colony Woods Interceptor in the southwestern portion of the golf course. The interceptor runs easterly to the end of Elm Court Drive, east of Elm Street, and then turns south. The interceptor continues south through Lions Park, crosses State Road 334, and then turns west just north of Eagle Creek. The interceptor continues to the west where it discharges into the Main Lift Station.

The southernmost segment of the Eastern Interceptor from South Main Street to the Town's Main Lift Station is presently being paralleled with a new 24 inch sewer. When the new twenty-four inch section is placed into service, the downstream end of the interceptor will have a capacity of approximately 4.91 MGD. The current ADDF, according to the model, is approximately 0.38 MGD with an estimated RDII of 2.08 MGD. This would leave an available capacity of approximately 2.45 MGD. However, north of State Road 334 the existing Eastern Interceptor is deficient based upon the modeling results. The downstream section of the 15" interceptor north of State Road 334 has an estimated capacity of approximately 1.50 MGD. Under peak flow conditions, ADDF plus RDII, the model shows the fifteen inch portion of the interceptor capacity to be overloaded by approximately 0.36 MGD. Based upon available GIS information, the reported minimum slope on the interceptor is greater than the recommended minimum of 0.15%. Therefore the limiting factors appear to be excessive infiltration and inflow rates a high friction factor due to the age and observed condition of the existing interceptor.

3. South Basin Sewer

Wastewater in this portion of the system is collected through a combination of gravity sewers, low pressure sewers, and lift stations. The South Basin Sewer receives flow from The Woodlands, Fox Hollow, and Huntington Woods subdivisions. That flow plus wastewater generated within the Sugarbush Hill development are directed to the Sugarbush Lift Station. The Sugarbush Station

conveys all wastewater from the S1 Sewer Basin directly to the Town's wastewater treatment plant. The western portion of the Woodlands development is served by individual grinder stations and a low pressure sewer system which discharges to the Woodlands Lift Station. The Woodlands Station, located at the east end of the Woodlands subdivision and south of Fox Hollow, discharges to the west end of the South Basin Sewer via a 4" force main along Ford Road.

The calculated capacity of the eight inch South Basin Sewer is approximately 0.43 MGD. The model shows the current ADDF rate to be approximately 0.06 MGD with an RDII rate of approximately 0.25 MGD. This leaves a capacity of approximately 0.12 MGD in the eight inch gravity sewer.

SECTION 5
EXPANDING SYSTEM TO MEET DEVELOPMENT

A key to any wastewater utility master planning project is an understanding of current and future demands of the facilities. This requires a sound, reliable projection of future population, and an understanding of the land use and development trends occurring within the planning area. Throughout its history, Zionsville has experienced periods of robust growth, and a moderate to strong rate of growth is expected going forward. An important goal for community leaders will be the implementation of development policies which have a positive impact upon residential growth and commercial activities while promoting coordinated use of available land.

With regard to municipal infrastructure and wastewater collection and treatment, population projections play an important role in planning for the future. These projections are used by community leaders to establish policies aimed at meeting the demands created by future growth. Capital improvements programs are often dependent upon sound population projections to insure that needed improvements are in place in a timely manner. In a worst case scenario, failure to plan properly can lead to building moratoriums and inadequate conveyance and treatment facilities. For this study, land use information, historical census data, available mapping, and local zoning strategies were used as the basis for the estimation and distribution of future population and development density throughout the service area.

A. Future Sewer Sub-Basin Considerations

The intent of the Sewer Master Plan is to facilitate the provision of adequate wastewater collection and treatment plant cost-effectively and in a manner consistent with development policies. The land use guidelines are reflected by the Town's Comprehensive Plan and adopted zoning ordinances. A primary goal is to address existing and potential conditions that could otherwise adversely impact the natural environment and public health, safety, and welfare.

A critical aspect of any wastewater master planning project is an understanding of future demands and the available capacities of existing facilities. This requires a sound, reliable projection of population and wastewater generation based upon land use, growth potential, and anticipated development densities within the various portions of the

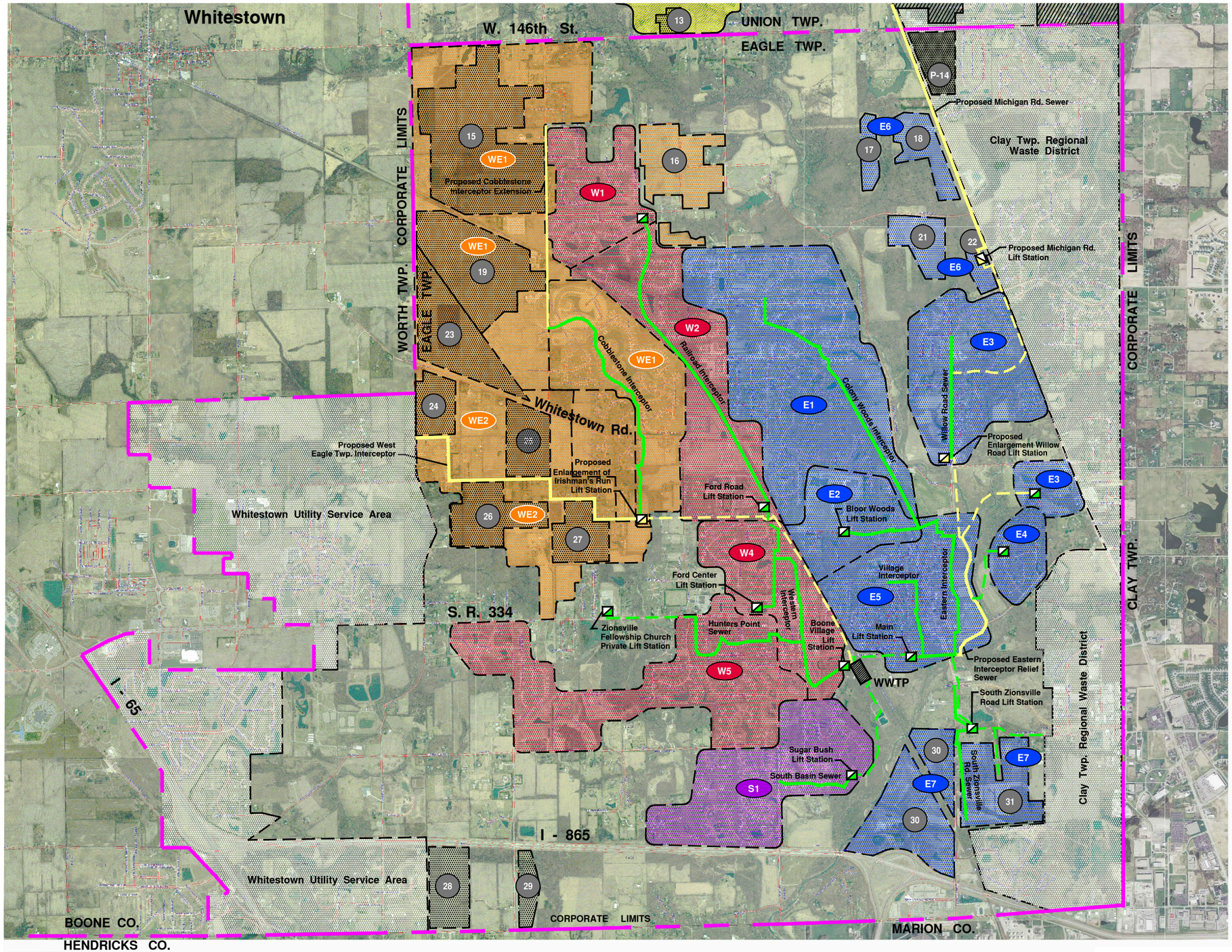
service area. The Town has recently completed a governmental consolidation which incorporated the entirety of Union Township. As discussed previously in this report, Union Township at this time is a predominantly agricultural area. The agricultural activity contributes significantly to the area's scenic and rural character which is highly valued by the local residents. Because of this, the Town's Comprehensive Plan has established a goal of preserving much of this agricultural land, especially in the northern portion of Union Township.

As described in Section 3, Zionsville and the existing Eagle Township service area were divided into three sewer basins for evaluation. Two of these basins, the East and West Sewer Basins, were further divided into five sub-basins. The boundaries of these sub-basins were determined by evaluating natural drainage patterns, local topography, pump station discharge locations, and the hydraulic characteristics of existing gravity sanitary sewer flow within each basin.

New development in Eagle Township is expected to occur in several areas. The most significant of these are the west and northwest portions of the Township where parcels of significant size exist which are contiguous to the existing service area. The construction of new sanitary sewers and a lift station in the southeast portion of the service area is likely to stimulate concentrated residential development along Zionsville Road north of Interstate 465.

Unpredictable, infill type development is likely to take place in other portions of Eagle Township. This may include the construction of sanitary sewers for small undeveloped parcels in scattered locations and the extension of sewers to developed areas which are not currently served.

Based on the proposed future areas targeted for development within Eagle Township, new sub-basins were developed to reflect the proposed conveyance plan discussed in Section 6 of this report. **Figure No. 5-2** illustrates the new sub-basins and the revised numbering system. The sub-basins were renumbered in conjunction with the proposed conveyance system. Sub-Basins W1, W2, W4 and W5 are those basins which will continue to discharge into the Western Interceptor.



UNION TOWNSHIP

Legend

- 10 — Targeted Parcels For Proposed Development
- Area To Be Served By Clay Twp. R.W.D.
- Western Interceptor Sewer Basin
- West Eagle Township Interceptor Sewer Basins
- Eastern Interceptor Sewer Basin
- South Sewer Basin

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

FUTURE SUB-BASINS FOR EAGLE TOWNSHIP
FIGURE 5-2

1. New West Eagle Township Sewer Sub-Basins WE1 and WE2:

WE1 and WE2 are new sanitary sewer sub-basins which are planned to discharge into the proposed West Eagle Township Interceptor. It should be noted that the existing Cobblestone Interceptor, which presently discharges via the Irishman's Run Lift Station to the existing Western Interceptor, is now proposed to become a part of Sewer Sub-Basin WE1 which will flow to the proposed West Eagle Township Sewer Basin.

As part of this plan, it is also recommended that the force main from the Irishman's Run Lift Station be redirected. All wastewater flows generated within future Sub-Basins WE1 and WE2 are recommended to be conveyed directly to the Town's existing wastewater treatment plant via the Irishman's Run Lift Station. This rerouting of flow is intended primarily to reduce loadings on the Western Interceptor. The redirection of this flow will allow the Town to accommodate future flows from areas which are currently unserved (such as Russell Lake and Lakeview) and from future infill development activity. Flows from these types of future developments will then be able to be conveyed to the existing Western Interceptor. The creation of the West Eagle Township Sewer Basin and the rerouting of the Irishman's Run force main serve to meet an important need: reducing loadings on the Western Interceptor, and thereby accommodating future infill development in the central and southwest portions of the existing service area.

Sub-Basins E1 through E7 are those basins where wastewater flows will be directed to the Eastern Interceptor or the proposed Eastern Interceptor Relief Sewer. Sub-Basin S1 will remain unchanged, discharging to the Sugar Bush Lift Station.

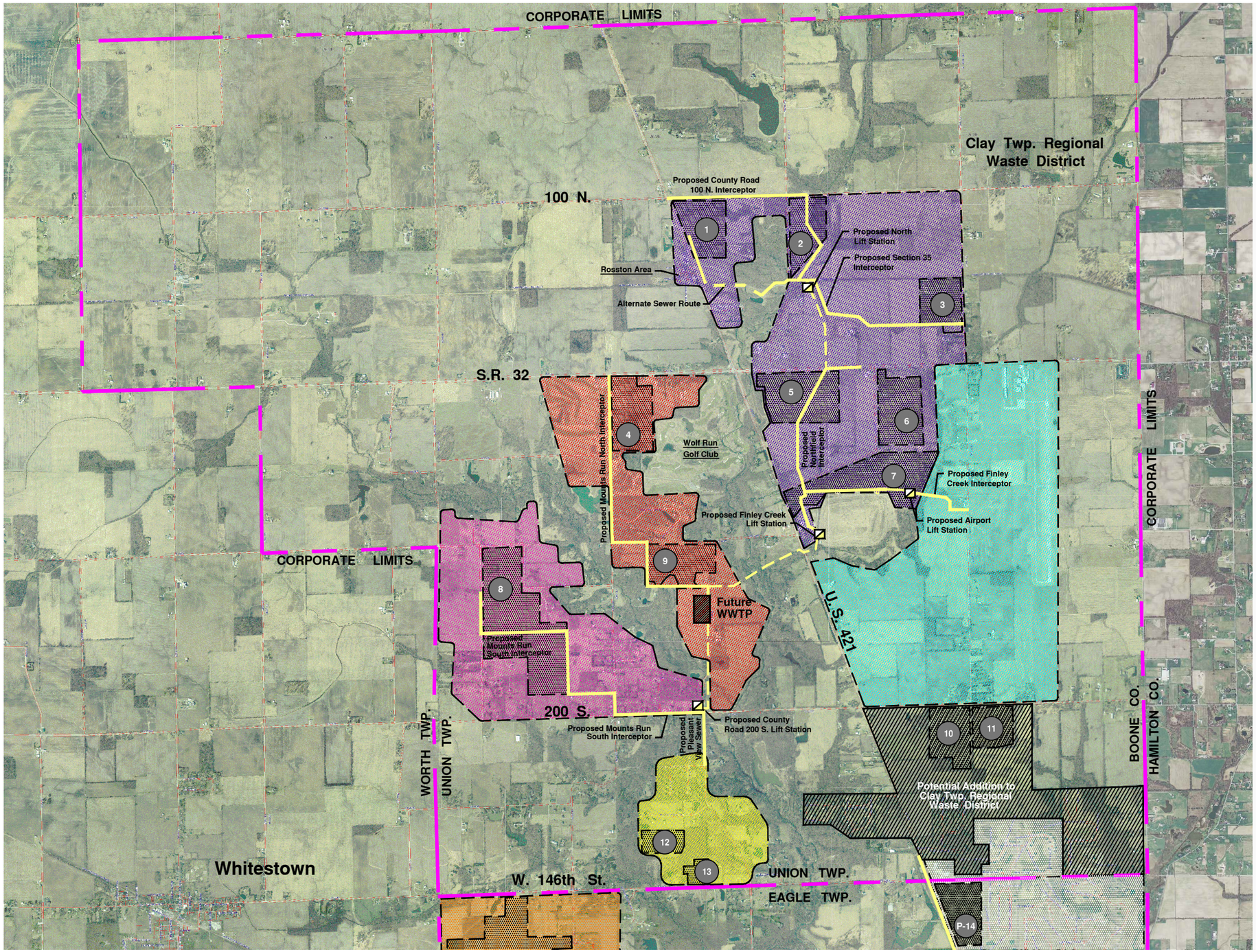
Roughly six (6) square miles, mostly within the central and southwestern portions of Union Township, have been zoned for rural residential land use. The zoning classifications include Rural R1, low density suburban land uses with large lot sizes, and Rural R2 with single and two family residential developments with a density range of 0.5 to 1.75 homes per acre. Future flows for Union Township will be based on infill development, which is expected to occur over the next fifty years and beyond.

Figure No. 5-3 illustrates the drainage basin boundaries which were utilized along with targeted parcels to project future wastewater flows within Union Township. A more detailed discussion regarding future flow projections is presented in a subsequent portion of this Section. Several parcels have already been targeted in the Town's Transportation Plan for future development. Many of these parcels are anticipated to be developed within the planning period of this report, or by the year 2035. With the recent Township consolidation, the Town will be able to maintain an increased level of control over the pace and scope of development activity which occurs in Union Township.

The Town's existing wastewater treatment plant, located on the south side of Zionsville, has an average day rated capacity of approximately 2.0 MGD. As development occurs within Eagle Township, the available remaining capacity will be fully utilized. The need for a second treatment facility will present itself in the future. The logical location will be to the north of Town in south-central Union Township to provide service to targeted parcels and future growth areas within Union Township. A location for the proposed treatment facility has been recommended northeast of the intersection of County Road 200 South and County Road 900 East. The location would be approximately ½ mile north of the confluence of Mounts Run and Eagle Creek.

Based on the needs presented above, targeted parcel development is likely to form the foundation for future interceptor sewer locations in Union Township. New conveyance facilities should be constructed to take advantage of natural drainage patterns, allowing a gravity-based collection system to the greatest extent possible. The natural drainage patterns are generally favorable, but utilizing them fully will be difficult due to the undulating terrain and the presence of densely wooded parcels in many areas. It is unlikely that Town Officials or members of the general public will be in favor of clear-cutting pathways in wooded areas to accommodate sanitary sewer construction. The conveyance plan developed as part of this study therefore intends to meet the following goals:

- Minimize impacts to wetlands and protected waters
- Allow limited conversion of wooded areas
- Minimize erosion potential during construction



EAGLE TOWNSHIP

Legend

- Targeted Parcels For Proposed Development
- Area To Be Served By Clay Twp. R.W.D.
- Mounts Run North Sewer basin
- Mounts Run South Sewer Basin
- Pleasant View Sewer Basin
- Finley Creek Sewer Basin
- Rosston–Northfield Sewer Basin

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

FUTURE SUB–BASINS FOR UNION TOWNSHIP
FIGURE 5–3

As presented in the Section 6 Conveyance Plan, interceptors are proposed along Finley Creek, Eagle Creek, and Mounts Run. The future improvements, including interceptors and treatment facilities, will be sized to accommodate future growth. From the location of the interceptors and the drainage ways, the topography of the land will determine where the flows will be directed. If needed, lift stations will also be recommended to convey flow to one of the three major interceptors if the existing terrain does not allow for a means of gravity flow. As stated earlier, those properties zoned for Rural Agricultural land uses are assumed to remain agricultural to maintain the rural character of the area.

In summary, future sewer sub-basins will be developed around the proposed treatment facility located at confluence of Mount Run and Eagle Creek, northeast of County Road 200 South and County Road 900 East. The boundaries of the sub-basins will follow natural land contours between the three major drainage ways: Mounts Run, Eagle Creek, and Finley Creek. Proposed future interceptors will be constructed to generally follow the drainage patterns created by these natural streams. The boundaries of each of the sub-basins are not expected to extend much beyond the targeted parcels already recommended for development due to the presence of rural agricultural zoning. **Figure No. 5-3** illustrates the proposed treatment facility location along with six major interceptor sewers proposed to serve future development in Union Township. Drainage information is also illustrated showing the natural relief of the land in relation to drainage patterns towards the interceptors.

B. Land Use and Zoning

Zionsville has adopted a zoning ordinance and prepared a zoning map to guide developers, citizens, and applicable governmental agencies through all phases of the development review process as they relate to zoning regulation. **Appendix C** illustrates the designated zoning and land use categories for Eagle and Union Township. Zoning regulations are land use policies that implement community goals and protect community resources while guiding new development. Zoning guidelines affect all new construction, most alterations, commercial occupancy changes, property line changes and most site development activity.

Properties within the Town of Zionsville have been placed within specific land use categories via zoning districts as described in the Town's adopted zoning ordinance. The ordinance defines the purpose and intent, permitted land uses, and development standards for each of the zoning districts. For sewer master planning purposes, the zoning was used in projecting the flows for undeveloped properties within the new service area. Residential zoning districts each have a target density based on the guidelines of the zoning ordinance.

By far, the predominant land use in Eagle Township is single family residential. Commercial uses are clustered at various locations, including the Village Business District which is the original cornerstone of Zionsville, and the business district in the vicinity of the intersection of State Road 334 and Ford Road.

The Town's Planning Department and local planning groups have worked together to determine the character and direction of future development. These efforts have recognized that growth which is organized and compact will have fewer detrimental effects on the environment, transportation, and municipal services. Past planning decisions have served to create an attractive community setting, with good definition and desirable transitions between the Village Center and residential and commercial areas.

With the exception of the mostly agricultural land use in northern Union Township, the Zionsville zoning map clearly illustrates the dominance of single-family residential land use. **Table No. 5-2** identifies the predominant land use designations for undeveloped land within the two township service area, along with general descriptions and applicable zoning densities for the residential land use classifications. The "Rural Zoning" classification applies to all of Union Township and those portions of Eagle Township located outside of the Zionsville corporate limit as it existed prior to the governmental consolidation. Any properties within the former corporate limits would be categorized under the "Urban Zoning" classification.

Table No. 5-1

Prominent Zoning Classifications
For Future Development

Zoning Classification	General Description	Density
Rural Zoning:		
R1	Rural, Single Family Residential Low density rural suburban with large lot sizes	≤ 0.5 Homes per Acre
R2	Rural, Single Family & Two Family Residential Low density suburban contiguous to urban center	0.5 to 1.75 Homes per Acre
R3	Rural, Single Family & Two Family Residential Low density suburban contiguous to urban center	1.75 to 3.0 Homes per Acre
RE	Rural Equestrian/Estate Large estate development, horse farms, agricultural operations and natural wooded tracts	≤ 0.33 Homes per Acre
AG	Rural, General Agricultural	N/A
GB	Rural General Business District	N/A
I2	Rural, General Industrial	N/A
AZ	Rural Airport Zoning	N/A
Urban Zoning:		
R-SF-2	Urban, Single Family Residential Moderate density development compatible with the surrounding residential neighborhoods	Approx. 2 Homes per Acre
I-2	Urban General Industrial Manufacturing and processing	N/A
I-3	Urban, Heavy Industrial	N/A

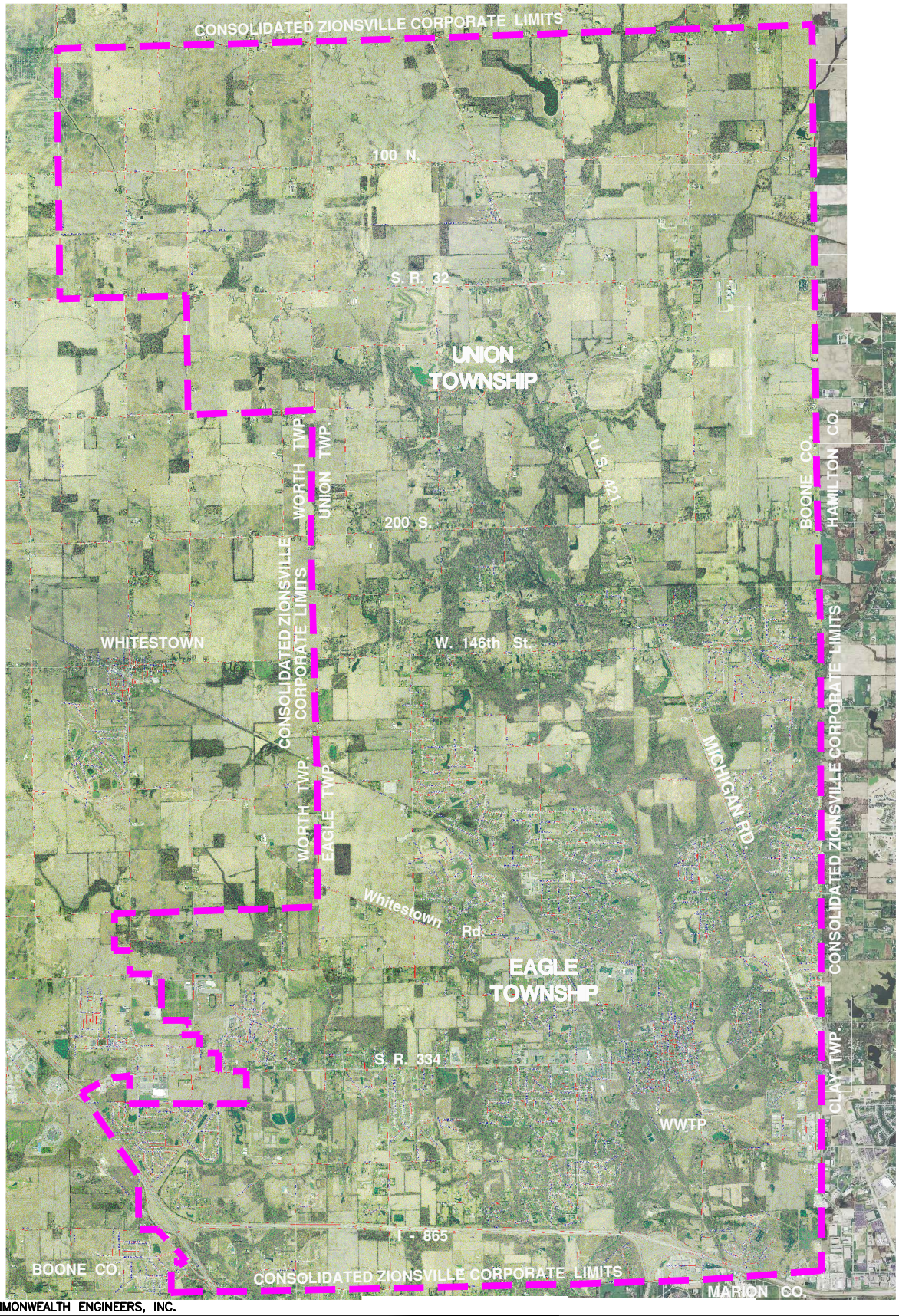
C. Population – Future Projections

In November, 2008 Zionsville became the first community in the State to implement a provision of the Government Modernization Act of 2006. Passage of a voter referendum began a process of consolidation, making all of Union and Eagle Townships a part of the Zionsville governmental body. The consolidation serves to define the community border to prevent annexation by neighboring municipalities, and to provide better control over local zoning, land development, and planning activities. **Figure No. 5-4** illustrates the new corporate limits for the Town of Zionsville after the consolidation was completed.

Together, Union and Eagle Townships encompass a total land area of approximately 50 square miles. Ultimately, the entire two township area will be incorporated as part of the Town of Zionsville. Since large portions of each township include rural areas and significant acreage dedicated to agricultural or equestrian estate land uses, two distinct taxation districts have been created: Urban and Rural. The urban taxation district includes all areas within the previous Zionsville corporate boundary. The rural district will include all of Union township and that portion of Eagle Township outside of the former corporate boundary.

A number of projection methods have been used in the past to estimate the future population of Zionsville. With the consolidation of Eagle and Union Townships, it is essential that a more detailed projection of population be performed by incorporating new land use categories and zoning classifications. The new projection scenario must also consider historical growth trends and anticipated development densities throughout the two-township area. Construction constraints which may hinder development must also be recognized, such as the presence of floodplains, woodlands, excessive slopes, or conservancy areas. In addition, much of the farmland in the northern portion of Union Township is expected to remain dedicated to agricultural use with limitations on future residential development.

Growth projections will be assigned on the basis of location, land use and the applicable Urban or Rural zoning classification per the adopted ordinance. Each area will have different development characteristics in terms of land use and density.



COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

ZIONSVILLE CORPORATE LIMITS (POST CONSOLIDATION)
FIGURE 5-4

Projections reflect existing and planned infrastructure, as well as current development already in place. The planning scenario and population projection provided in this report is intended to approximate where future growth is likely to be located. This has been done by using a set of factors that help determine which parcels and land areas are more "suitable" than others to accommodate new development. These factors include whether or not land is in proximity to existing developments, employment areas, and existing roadway infrastructure. As noted, floodplains, wetlands, woodlands, and similar construction restraints will limit development activity in some areas. Also considered is the type and location of existing development based upon the current zoning trends and the land use policies which are presently administered.

Population projections developed for planning purposes must be reasonable in order to effectively estimate future wastewater flows and to properly size new facilities. Since population projections are generally based upon a series of assumptions about the future, there is a need for careful analysis of the past. Population trends are generally not static. Therefore, they should be re-evaluated periodically as local conditions change and as new information and trends develop.

Change in an area's demographics is typically the result of three major facets of human activity: births, deaths, and migration. Migration is the most important factor, and population change attributed to migration depends on a number of forces which are difficult to predict. People move in or out of an area for a variety of reasons, such as economic conditions, employment opportunities, housing needs, and related factors. Employment opportunity is a foremost consideration and is usually a function of local resources and the regional economy.

The simplest and most common way of predicting the future population of an area is by examining the past and by extrapolating historical data. Population trends provide a frame of reference with regard to how the population of an area has changed over time and where it may be headed in the future. As discussed in Section 2, recent population trends in the area have been indicative of a strong and fairly steady rate of growth for the Town of Zionsville, Eagle Township, and Union Township. The Town of Zionsville has nearly tripled in population since 1980, experiencing a growth of approximately 255% from 1980 to 2009. During this same time period, Eagle Township has more than

doubled in population with a growth rate of approximately 128%. Union Township has grown by approximately 46% from 1980 to 2009.

Currently, Union Township is mostly rural and agriculturally based, with minimal development. However, with the recent consolidation Union Township will become a part of the sewer service area controlled by the Town. A dramatic up-trend in development in Union Township can be expected to occur if the Town wishes to accommodate growth and can successfully implement a shared cost mechanism with developers to provide the necessary infrastructure.

Several sources of information were referenced to assist in determining a population projection for the planning period of this report. Most notably was the Stats Indiana website. **Table No. 5-2** below presents population projections for Boone County along with key adjacent counties in five year increments. The percent change is the change in population during that five year period. The data was provided by the Indiana Business Research Center, Kelley School of Business, Indiana University, and are based largely on existing trends. The data was based upon U.S. Census Bureau's 2005 population estimate according the website.

Table No. 5-2

Population Projections
Boone and Nearby Counties - 2010 to 2035

County	Year					
	2010	2015	2020	2025	2030	2035
Boone County	58,303	62,958	66,186	68,164	69,599	70,696
% Change		8.0%	5.1%	3.0%	2.1%	1.6%
Marion County	872,883	888,494	915,850	941,945	967,547	992,040
% Change		1.8%	3.1%	2.8%	2.7%	2.5%
Hamilton County	301,091	352,433	380,611	396,859	409,402	420,034
% Change		17.1%	8.0%	4.3%	3.2%	2.6%
Hancock County	70,536	76,508	80,018	81,714	82,807	83,747
% Change		8.5%	4.6%	2.1%	1.3%	1.1%
Hendricks County	147,906	164,438	175,070	183,677	190,370	195,338
% Change		11.2%	6.5%	4.9%	3.6%	2.6%

With the exception of Marion, Boone and all other Counties are expected to experience fairly significant growth rates between 2010 and 2035, with a moderate decline in the rate of growth appearing during the latter part of the planning period. Marion, Hamilton, Hancock, and Hendricks Counties were shown in the table for comparison purposes. These counties are considered to be part of the Indianapolis Metropolitan area and are similarly affected by regional conditions.

The project presents a unique challenge in determining the population projection through 2035 for the Town of Zionsville and the two-township region. Union Township is particularly problematic due to demographic variables and uncertainties regarding the

economic climate. As discussed in Section 2, the growth rate for Union Township has been significant for the past thirty plus years. Prior to 1980 however, the population in the township was small and the growth minimal. In order to make an informed projection, the Town's Comprehensive Plan, zoning map, and zoning ordinance were consulted to gather information regarding planned land uses for all of Union and Eagle Townships. **Figure No. 5-4** shows the consolidated boundary for the Town of Zionsville which now includes all of Union Township.

In addition to the Comprehensive Plan, the Town's Transportation Plan (also prepared by the HNTB Corporation), was reviewed. This plan included a "Future Growth Areas" map which targeted certain parcels for development in the near future. These areas were chosen based upon the suitability factors discussed previously. The majority of new growth is expected to follow recent patterns, which primarily consist of low to moderate density residential development. Utilizing aerial photography, boundaries were created for a number of these targeted parcels. **Appendix B** shows the general locations of the targeted parcels.

Table No. 5-3 provides a general description of the various zoning classifications which were used to project future population. Included in the table are the allowable densities per the zoning ordinance, and the assigned density utilized in this study to project the number of new residential units and resultant population. The zoning descriptions are summarized from the applicable section of the zoning ordinance.

Table No 5-3

Zoning Classifications for Undeveloped Land in Planning Area

Zoning Classification	General Description	Density (Homes / Acre)	Assigned Residential Density (Homes / Acre)
Rural Zoning			
R1	Rural, Single Family Residential; Low Density rural suburban w/ large lot sizes	≤ 0.50	0.50
R2	Rural, Single Family & Two Family Residential; Low density suburban contiguous to urban center	0.5 to 1.75	1.50
R3	Rural, Single Family & Two Family Residential; Low density suburban contiguous to urban center	1.75 to 3.0	2.50
RE	Rural Equestrian/Estate; Large estate development, horse farms, agricultural operations & natural wooded tracts	≤ 0.33	0.25
AG	Rural, General Agricultural	N/A	0.10
I2	Rural, General Industrial	N/A	N/A
AZ	Rural Airport Zoning	N/A	N/A
Urban Zoning			
R-SF-2	Urban, Single Family Residential; Moderate density development compatible w/ the surrounding residential neighborhoods	2.0	2.0
I-2	Urban General Industrial; Manufacturing and Processing	N/A	N/A
I-3	Urban, Heavy Industrial	N/A.	N/A

It was assumed that the targeted parcels would achieve build-out conditions by plan year 2035. For the remainder of the study area, developable acreage was estimated for each zoning classification and the assigned (slightly lower) densities were used to project the number of future homes and resultant population.

Those areas in Eagle and Union Townships not specifically within targeted parcels were evaluated as general development. These regions were also divided into Drainage Basins based upon the local topography and natural drainage patterns. **Appendix E** shows the orientation of each Drainage Basin boundary. For each Basin, the total acreage was calculated and the acreage for targeted parcels, if applicable, was subtracted. Any area of the sewer basin already developed and sewered was also subtracted from the total acreage. Finally, the developable acreage was determined by subtracting areas of existing wetlands, floodplains, dense woodlands, and an allowance for future roadways and green space.

The final acreage was considered to be the developable acreage for each Sewer Basin. Utilizing the applicable zoning classification, the assigned residential density was multiplied by this acreage to estimate a future house count for each basin. Utilizing the combined results of the General and Targeted Parcel Developments, a projected population was developed for the Town of Zionsville using the historical figure of 2.8 persons per household. The year 2035 projected population for the Consolidated Town of Zionsville is presented in **Table No. 5-4** below.

ZIONSVILLE

Table No. 5-4

Year 2035 Population Projection
Consolidated Town of Zionsville

Zoning Class.	General Description	Developable Acreage	Density Homes/Ac	New Homes	Persons per Home	Projected Population
General Parcel Development						
AG	Rural, General Agricultural	10,176	0.10	1,125	2.8	3,220
R1	Rural, Single Family Residential	2,242	0.50	1,170	2.8	3,320
R2	Rural, Single & Two Family Residential	3,446	1.50	5,200	2.8	14,600
R3	Rural, Single & Two Family Residential	135	2.50	350	2.8	990
RE	Rural, Equestrian / Estate	1,459	.25	440	2.8	1,250
R-SF-2	Urban, Single Family Residential	456	2.00	930	2.8	2,620
Totals		**17,914**		**9,215**		**26,000**
Targeted Parcel Development						
R1	Rural, Single Family Residential	775	0.50	390	2.8	1,090
R2	Rural, Single & Two Family Residential	501	1.75	880	2.8	2,460
R3	Rural, Single & Two Family Residential	87	3.00	270	2.8	760
RE	Rural, Equestrian / Estate	140	0.33	50	2.8	140
R-SF-2	Urban, Single Family Residential	461	2.00	930	2.8	2,600
Totals		**1,964**		**2,520**		**7,050**
Projected 25-Year Population Growth, Town of Zionsville						**33,050**
Current Population, Town of Zionsville						**14,015**
Year 2035 Projected Population, Town of Zionsville						**47,065**

D. Future Wastewater Flow Projections

1. Introduction

A significant key to any wastewater master planning project is an understanding of future demands and the available capacities of existing facilities. This requires a sound, reliable projection of population and wastewater generation based upon land use, growth potential, and anticipated development densities within the various portions of the current service area and the future service area. Available mapping information, the Town of Zionsville Comprehensive Plan, land use policy, and the input of local planning and utility personnel were utilized to evaluate the impact of growth and development on existing facilities.

When investigating the needs and the alternatives available for providing sanitary sewage service to an undeveloped or un-sewered area, the Town has the opportunity to establish guidelines to help define location, size, and phasing of the necessary improvements. The goal is to properly plan and construct wastewater facilities which are adequately sized to serve the respective areas under projected peak flow conditions. Facilities must be cost effective while providing safe, reliable, and adequate means of meeting future demands.

Peak flow rates which are experienced during wet weather events are critical for pipe line and lift station sizing, since another goal of this study is to collect and convey wastewater from its source to municipal treatment facilities without causing overflows or sewer backups. In the projection of demands, assumptions were made with regard to the nature of future development. These assumptions include residential development density based on proposed zoning classifications in undeveloped areas, per household sewage flows, wet weather flows, and assumed wastewater flow rates for development other than residential. These assumptions were then keyed to the growth management concepts presented in the land use guidelines of the comprehensive plan. Town officials will have the responsibility of managing the growth of the community, and should be involved in the validation of these assumptions.

2. Flow Projections

Base wastewater flow, or average daily dry weather flow, is sanitary flow generated from domestic, commercial, industrial, or institutional sources that is discharged into the Town's wastewater collection system. Base flow will also include the level of infiltration which enters the system during dry weather conditions and a normal groundwater table. On a daily basis, volume will vary slightly in magnitude, but generally a predictable and repeatable diurnal pattern is apparent, with peak flow occurring during the mid-morning and early evening hours.

The collection system hydraulic model prepared as part of this study was utilized to project future wastewater flows within each sewer study area and sub-basin, based upon the major land use designations. Peak future wastewater loads for the existing study area sub-basins were calculated using the average daily dry weather flow of 190 gallons per household plus rainfall induced infiltration and inflow. For targeted parcels and future development areas, a figure of 310 gallons per day per household was used as the basis for average flow. The peak flow rate was derived by multiplying the average daily flow by a peaking factor based upon total population served, as shown below

a. Determination of Peak Projected Wastewater Flow Rates

For this report, peak domestic, commercial, and industrial (DCI) wastewater flow has been determined by applying a peaking factor to the estimated average daily dry weather flow for each of the targeted parcels and undeveloped or un-sewered study areas. The peaking factor applied is derived from the *Ten States Recommended Standards for Wastewater Facilities* as shown below:

Q peak Hourly: Maximum rate of wastewater flow

Q Design Average: Design average daily wastewater flow

Q Peak Hourly/Q Design Average = $\frac{18+\sqrt{P}}{4+\sqrt{P}}$

Where P = population in thousands

Tables No. 5-5 through **Table No. 5-11** present the year 2035 projected peak daily wastewater flows and cumulative peak flows for each of the existing and proposed sewer basins and interceptors. For presentation purposes, an effort has been made to color code the interceptor names to match the accompanying **Figures 5-2 and 5-3**, which show the applicable boundaries for each sewer basin and sub-basin. **Figure 5-2** indicates existing and proposed sewer sub-basins within Eagle Township, while **Figure 5-3** shows proposed sewer sub-basins for Union Township.

Table No. 5-5
Year 2035 Projected Daily Wastewater Flows
Existing West Sewer Basin

Interceptor	Sewer Sub-Basin	Targeted Parcel Number	Projected Population	Projected Daily Flows - Year 2035		
				Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
Railroad Interceptor	W1		750	51,000	0.320	0.320
		20	87	5,900	0.030	0.350
	W2		734	49,900	0.41	0.760
Village Walk Ford Center	W4		683	46,380	.359	1.110
Hunters Point Sewer	W5		1,862	126,700	0.823	1.933

(Note that the Cobblestone Interceptor, Sub-Basin W3, has been removed from the West Sewer Basin)

Table No. 5-6
Year 2035 Projected Daily Wastewater Flows
Existing East Sewer Basin

Interceptor	Sewer Sub-Basin	Targeted Parcel Number	Projected Population	Projected Daily Flows - Year 2035		
				Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
Bloor Woods Sewer	E2		285	19,380	0.110	0.110
Colony Woods Interceptor	E1 North		874	59,280	0.459	0.550
	E1 South		1,313	135,385	0.734	1.280
Willow Road Sewer	E6(Future)	17	146	15,160	0.072	1.340
		18	274	30,380	0.124	1.420
		21	266	29,450	0.121	1.520
		22	112	12,400	0.065	1.570
	E3		1,044	70,840	.490	(Conveyed to Eastern Interceptor Relief Sewer)
Raintree Sewer	E4		311	21,090	.134	
Eastern Interceptor Relief Sewer	Willow Road Sewer		1,842	160,860	0.490	2.050
	Raintree Sewer		311	21,090	0.134	2.170
South Zionsville Rd. Sewer	E7	30	580	64,200	0.256	2.350
		31	375	41,515	0.165	2.480
Village Interceptor	E5		1,814	141,946	0.726	3.180

Table No. 5-7
Year 2035 Projected Daily Wastewater Flows
South Basin Sewer

Interceptor	Sewer Sub-Basin	Targeted Parcel Number	Projected Population	Projected Daily Flows - Year 2035		
				Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
South Basin Sewer	S1	-	1,000	67,830	0.338	0.338

Table No. 5-8
Year 2035 Projected Daily Wastewater Flows
Proposed West Eagle Township Sewer Basin

Interceptor	Sewer Sub-Basin	Targeted Parcel Number	Projected Population	Projected Daily Flows - Year 2035		
				Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
Cobblestone Interceptor	WE1	16	722	72,780	0.283	0.283
		15	451	48,590	0.194	0.456
		19	857	94,860	0.365	0.831
	Cobblestone Lakes		759	51,490	0.214	0.966
West Eagle Twp. Interceptor	WE2	24	269	29,760	0.122	0.122
		23	759	83,650	0.324	0.430
		25	274	30,380	0.124	0.535
		26	619	61,310	0.241	0.738
		27	526	46,280	0.183	0.884

ZIONSVILLE

Table No. 5-9
Summary of Year 2035 Projected Daily Wastewater Flows – Eagle Township

Sewer Basin	Interceptor	Projected Population	Projected Daily Flows - Year 2035		
			Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
West	Railroad	1,571	155,694	0.760	0.760
	Village Walk	683	46,380	0.359	1.110
	Hunters Point	1,862	126,700	0.823	**1.933**
East	Bloor Woods	285	19,380	0.110	0.110
	Colony Woods	2,187	194,665	1.193	1.280
	Willow Road	1,842	158,230	0.490	1.570
	Michigan Rd. Sewer	798	87,390	0.382	2.050
	Raintree	311	21,090	0.134	2.170
	S. Zionsville Road Sewer	955	41,515	0.165	2.480
	Village	1,814	141,946	0.726	**3.180**
South	South Basin	1,000	67,830	0.338	**0.338**
West Eagle Twp.	Cobblestone	2,789	267,720	0.966	0.966
	West Eagle Twp.	2,447	251,380	0.884	**1.850**

Table No. 5-10
Future Conditions – Eagle Township
Proposed and Existing Interceptor Sewers and Capacities

Interceptor Name	Interceptor Size (in.) (Downstream End)	Max Capacity (MGD)	Dry Weather Flow (MGD)	Peak Hourly Flow (MGD)	Remaining Capacity (MGD)
Cobblestone Interceptor (Existing)	12	1.080	**0.268**	**0.966**	0.114
West Eagle Twp. Interceptor (New)	12	0.936	**0.251**	**0.884**	0.052
Railroad Interceptor (Existing)	10	0.730	0.156	0.760	-0.030
Village Walk Sewer (Existing)	12	0.936	0.047	0.359	0.577
Hunters Point (Existing)	12	0.936	0.126	0.823	0.113
Western Interceptor (Existing)	13.89	2.224	**0.395**	**1.942**	0.282
Bloor Woods Sewer (Existing)	12	0.936	0.019	0.110	0.826
Colony Woods Interceptor (Existing)	12	0.936	0.195	1.193	-0.257
Willow Road Sewer (Existing)	12	1.080	0.245	0.872	0.208
Raintree Sewer (Existing)	10	0.649	0.021	0.134	0.515
Eastern Interceptor Relief Sewer (New)	12	1.040	0.182	1.000	0.040
South Zionsville Rd. Sewer (Existing)	12	0.936	0.106	0.421	0.515
Village Interceptor (Existing)	12	0.936	0.142	0.726	0.210
Eastern Interceptor Upstream (Existing)	15	1.401	0.195	1.303	0.098
Eastern Interceptor Downstream (Existing)	24	4.906	**1.018**	**3.180**	1.726
South Basin Sewer (Existing)	8	0.428	0.068	**0.338**	0.090
		Total:	**1.932**	**7.310**	

Table No. 5-11
Projected Peak Daily Sanitary Sewer Flows
▪ Union Township ▪

Study Area	Sub-Basin	Targeted Parcel Number	Projected Population	Projected Peak Daily Flows - Year 2035		
				Average Daily Dry Weather Flow (GPD)	Peak Flow (MGD)	Cumulative Peak Flow (MGD)
Mounts Run North Interceptor	10		673.5	67350	0.263	0.263
		4	74	7420	0.032	0.290
	11		675	67500	0.264	0.526
		9	101	10100	0.043	**0.560**
Mounts Run South Interceptor	11		675	67500	0.264	0.264
		8	696	69600	0.271	0.508
	12		2670	267000	0.931	**1.345**
Northfield Interceptor		1	47	4700	0.020	0.020
		2	56	5600	0.024	0.044
	10		674	67350	0.263	0.300
		3	650*	65000	0.254	0.527
		5	154	15400	0.065	0.579
		6	91	9100	0.039	0.609
		7	1140*	114000	0.429	0.975
	7		570	57000	0.2248	**1.149**
Finley Creek Interceptor	Airport		1130*	113000	0.426	0.426
	7		190	19000	0.079	**0.491**
Pleasant View Sewer	18		1970	197000	0.707	0.707
		12	59	5900	0.025	0.727
		13	54	5400	0.023	**0.744**
			Total:	**1,235,000**		**4.289**

*Population based upon equivalent dwelling units.

SECTION 6
CONVEYANCE PLAN

This section of the master plan identifies general concepts and specific recommendations for wastewater collection system improvements needed to meet the projected future demands of the Town's sanitary sewer system and proposed future collection system in Union Township. The primary intent of this effort is to help insure that future improvements are implemented with a full consideration of the flow demands which are anticipated by plan year 2035.

Collection system planning is based primarily upon zoning regulation and the projected wastewater flow generated by local land use and development density. Peak flow rates are critical for pipeline sizing since the primary purpose of the collection system network is to convey wastewater to the wastewater treatment plant without the creation of overflow conditions or sewer backups. One focus of this master plan report is to create a gravity based system to the greatest extent possible by minimizing the use of lift stations in the design of the collection system layout when feasible. Gravity systems should be able to convey the peak flows without the creation of surcharging conditions.

In most cases, the future improvements will include new sewers which should be sized to accommodate the future growth at the time they are constructed. In some areas, the improvements include upgrades or reinforcements to existing facilities which are considered important elements of the system needed to meet future flow conditions. For the master plan, slopes of new gravity mains are based upon the minimum grades allowable for that pipe diameter per the *Ten States Recommended Standards for Wastewater Facilities,* commonly known as the "Ten State Standards." In some cases, steeper slopes with smaller diameter gravity mains may be possible based on final design grades.

Vital to the planning process was the data collection and numerical modeling used to assess the impact of growth on the existing facilities. Zoning information, land use trends, historical population records, the comprehensive plan, and the input of local planning personnel were all utilized in this effort.

An important step in the planning of municipal wastewater collection system improvements is the establishment of an implementation or "Conveyance Plan". Such a plan is intended to provide a guideline which will allow the Town to meet the peak wastewater flow demands anticipated for the ultimate plan or design year, in this case 2035. This would also provide a guideline for the Town to utilize as development occurs in areas needing new sewers or areas in need of upgrades to existing sewers or lift stations to accommodate the new development.

Union Township was evaluated in terms of areas of interest for future development. Parcels which are initially targeted for development in Union Township are likely to form the "foundation" for the future wastewater collection system which will ultimately be required to serve the Township. By identifying key parcels and evaluating the topography of the land, new interceptors and lift stations were proposed in four different Union Township areas. A new wastewater treatment plant in the south-central portion of Union Township will be needed to serve future development.

In some cases, the construction of new interceptor sewers will result in the rerouting of flows from certain sub-basins to the new interceptors. To achieve final recommendations, multiple modeling iterations were performed to insure that adequate sewer capacity would be achieved throughout the system. Most importantly, the capacities of future interceptors and the major existing interceptors were evaluated to insure their ability to convey year 2035 cumulative flows to downstream portions of the collection system and ultimately to applicable treatment facilities. It should be noted that the sizes provided for the proposed interceptors are preliminary. A more detailed engineering analysis is recommended at the time of design to insure that the pipe is correctly sized for the development(s) to be served.

Along with the study area schematics, a map was prepared to show the preliminary layout of new interceptor sewers and force mains as part of this study. The preliminary, proposed interceptor and sewer layouts which makeup the Conveyance Plan are shown on the map included in **Appendix G**. The following discussions describe the proposed conveyance plan for each of the sewer basins within the existing collection system and for Union Township.

A. Eagle Township

Eagle Township includes Zionsville's existing collection system and a significant amount of undeveloped land which is likely to come under development pressure in the near future. The vast majority of new growth is expected to occur in the west and northwest portions of the township. Residential development is also expected in the southeast along Zionsville Road north of Interstate 465, and in the northern part of the Eagle Township west of U.S. 421.

Developable areas within the Eagle Township study area are zoned primarily for single family residential land use. As shown in previous sections, existing interceptors are currently near or at capacity in the main sewer basins. New interceptors and new force mains have been proposed to route current and future wastewater flows to different connection points in order to relieve the capacity of current interceptors where necessary. Below is a discussion of the proposed conveyance plans for the Eagle Township Sewer Basins.

1. West Sewer Basin

The main trunk sewers contributing flow to the West Sewer Basin include the Cobblestone Interceptor, Railroad Interceptor, and the Hunters Point Sewer. **Table No. 4-9** on page 80 provided the approximate capacities for each interceptor as well as the current available capacity after subtracting the average daily flow and the rainfall derived infiltration and inflow. **Table No. 6-1** below summarizes the results for interceptors within the West Sewer Basin.

Table No. 6-1
Existing Conditions - West Sewer Basin Interceptors and Capacities

Sewer Name	Calc. Capacity (MGD)	Peak Flow (MGD)	Remaining Capacity (MGD)
Cobblestone Interceptor	1.09	0.28	0.81
Railroad Interceptor	0.73	0.73	0.00
Hunters Point Sewer	0.94	0.71	0.23

As shown, with the exception of the Cobblestone Interceptor, there is minimal available capacity to accommodate future growth within the west sewer basin. The Railroad Interceptor is already at capacity. This is not a significant concern since the area served by the Railroad Interceptor has nearly reached a saturation development condition and a significant volume of additional flow is not anticipated. The Cobblestone Interceptor is best suited in terms of remaining available capacity to handle additional flow from new development. The Cobblestone Interceptor, as discussed subsequently, will therefore be proposed for extension as part of the conveyance plan to provide service to residential growth areas in the northwest portion of Eagle Township.

a. New West Eagle Township Sewer Basin

For the Eagle Township conveyance plan, a new sewer basin has been created. For this study, the new basin is referred to as the West Eagle Twp. Sewer Basin. A critical need within the existing collection system is to eliminate overloading conditions within existing interceptors, and the West Eagle Twp. Sewer Basin is intended to remove a portion of current flows from the existing Western Interceptor and convey that flow directly to the Town's existing wastewater treatment plant. This can be done by redirecting the force main from the Irishman's Run Lift Station to the existing plant rather than to the north end of the Western Interceptor. By making this change, all flow from the existing Cobblestone Lakes subdivision will be removed from the Western Interceptor.

The size of the existing Cobblestone Interceptor (12" diameter) and depth (>20 feet at the proposed point of connection) are well suited to allow the extension of the sewer northward to serve new development in northwest Eagle Township. For this study, the proposed new gravity sewer is referred to as the Cobblestone Interceptor Extension, which would consist of 12" pipe extending north on County road 875 East to 141st Street. The Cobblestone Interceptor Extension would serve targeted parcels 15, 16, 19, and future infill development in contiguous areas. **Figure No. 6-1** shows the proposed location and route for the Cobblestone Interceptor Extension.

A second new gravity interceptor is proposed for the western portion of the Eagle Township to serve new development just east and northeast of the Whitestown Utility Service Area. This proposed gravity sewer is referred to as the West Eagle Township Interceptor, which will serve targeted parcels 23 through 27 and any adjoining infill development in the WE2 Sewer Sub-Basin. This proposed interceptor would begin as a 10" pipe at a point south of Whitestown Road near the township line. At parcel no. 25, the sewer would be upsized to 12" pipe and would flow in southward and eastward segments before discharging to the existing Irishman's Run Lift Station.

To accommodate the increase in flow from the Cobblestone Interceptor along with the additional flow from the new West Eagle Township Interceptor, the Irishman's Run Lift Station would need to be enlarged as part of the project. A new 12" force main from the lift station would be directed eastward along Cruise Road to the Rail-Trail and follow the trail to the existing wastewater treatment plant. The existing force main would be removed from service and abandoned in place. All flow from the Cobblestone Interceptor and the West Eagle Township Interceptor would entirely bypass the Western Interceptor and be pumped directly to the treatment facility. This would significantly reduce the loading on the Western Interceptor. **Figure No. 6-2** illustrates the proposed location and route of the West Eagle Township Interceptor along with the proposed route for the new force main from the upgraded Irishman Run Lift Station.

Union Twp.

Eagle Twp.

W. 146th St.

CR 400 S.

Corporate Limits

Worth Twp.

15

16

19

23

WE1

WE1

W1

W2

E1

Proposed Cobblestone Interceptor Extension

Existing Spring Knoll Lift Station

Penn Central Railroad

12"

10"

Railroad Interceptor

Cobblestone 12" Interceptor

Colony Woods Interceptor 12"

SCALE: 1"=1000'

1000' 0 1000'

LOCATION MAP

EAGLE TWP.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

EAGLE TOWNSHIP – PROPOSED COBBLESTONE INTERCEPTOR EXTENSION
FIGURE 6-1

24

WE2

25

10"

Whitestown Rd.

Cobblestone

12"

Interceptor

Proposed
Enlargement of
Irishman's Run
Lift Station

12"

26

WE2

12"

27

Whitestown Service Area

Proposed West Eagle
Township Interceptor

E1

12"

Colony Woods Interceptor

10"

Railroad Interceptor

Ford Rd.

Existing
Ford Road
Lift Station

12" Force Main

E2

Existing
Bloor Woods
Lift Station
12"

W4

Existing
Ford Center
Lift Station

8"

Western Interceptor

12" Force Main

15"

Village

Interceptor

E5

12"

S. R. 334

Existing Zionsville
Fellowship Church
Private Lift Station

Hunters Point
Sewer

12"

Existing
Boone
Village
Lift
Station

Existing Main
Lift Station

24"

W5

WWTP

Rd.

SCALE: 1" = 1000'

1000' 0 1000'

LOCATION MAP

EAGLE TWP.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

EAGLE TOWNSHIP – PROPOSED WEST EAGLE TOWNSHIP INTERCEPTOR
FIGURE 6-2

2. East Sewer Basin

The existing interceptor sewers in the East Sewer Basin include the Colony Woods, Willow Road, Village, and Eastern Interceptors. **Table No. 4-9** summarizes the approximate capacities for each of these interceptors. The Table also provides the estimated peak flows, and the remaining available capacity in each interceptor. The calculated capacity is based on current GIS information providing know pipe slope or an assumed minimum slope if as-built data is unavailable. The total flow is based on calculated average day flow plus estimated rainfall derived infiltration and inflow. **Table No. 6-2** below summarizes the flows for each interceptor.

Table No. 6-2
Existing East Sewer Basin Interceptors and Capacities

Interceptor Name	Calc. Capacity (MGD)	Peak Flow (MGD)	Remaining Capacity (MGD)
Colony Woods Interceptor	0.94	1.07	-0.13
Willow Road Sewer	1.08	0.40	0.68
Eastern Interceptor (15”)	1.50	1.87	-0.37
Village Interceptor	0.94	0.73	0.21
Eastern Interceptor (24”)	4.91	2.46	2.45

The interceptors are listed in order hydraulically from upstream to downstream locations within the basin. The most upstream flow contributor, the Colony Woods interceptor, appears to currently be over capacity. Of the main interceptors, Colony Woods serves the largest sub-basin in terms of geographical area. The southern portion of the interceptor also serves older residential neighborhoods with older sewers which are likely to be subject to higher infiltration and inflow rates, accounting for capacity concerns during wet weather periods.

The Village Interceptor, which serves Sub-Basin E5 and the downtown portion of Zionsville, is near capacity with minimal room for additional flow. Again, much of the problem for this interceptor appears to be age, minimal available slope, and high infiltration and inflow rates.

The Town recently completed a parallel, 650' long section of 24" sewer on the southern, most downstream end of the Eastern Interceptor. The calculated capacity of 4.91 MGD is based upon the designed slope of the 24" sewer.

Another focus of the Conveyance Plan for the East Sewer Basin will be to relieve over-capacity issues for the upstream portion of the Eastern Interceptor. According to the model, the upstream 15" section of the Eastern Interceptor is deficient by approximately 0.36 MGD. Therefore, even with the sewer upgrade completed on the south end, capacity issues remain in the existing Eastern Interceptor north of Sycamore Street. A parallel 12" Eastern Interceptor Relief Sewer will be recommended to eliminate this overloading condition. The primary means of reducing the excess flow will be the redirection of wastewater from three sources: the Willow Road Lift Station, and the Lost Run Farms and Raintree Lift Stations. Force mains from each of these lift stations are recommended to be redirected to the new relief sewer. The suggested route for the Eastern Interceptor Relief Sewer would follow Eagle Creek along its west bank. If site conditions allow, it may also be possible to parallel the existing 15" interceptor.

Several small developments are expected to occur in the northeast portion of Eagle Township within the next several years. The map included in **Appendix B** indicates projected development areas located on the west side of Michigan Road just south of West 146th Street. A new 8" gravity sewer, referred to as the Michigan Road Sewer is proposed along Michigan Road from north of West 146th Street and extending south to Brittany Drive, just north of Willow Road. At that location a new lift station is proposed, with a 6" force main to convey the flow down Michigan Road and eventually west to the Willow Road Sewer.

Due to the local topography, it will be necessary to provide lift stations or low pressure sewer systems to serve most of the undeveloped properties on the west side of North Michigan Road. These new lift stations would be incorporated as part of the collection system designs to serve the un-sewered parcels and will therefore be considered the responsibility of the local developer.

The areas which would be served by the new Michigan Road Sewer include targeted parcels 14, 17, 18, 21, and 22 which together comprise new Sewer Sub-Basin E6 in the East Sewer Basin. In order to properly convey flow from these areas, the Willow Road Lift Station would need to be enlarged as the development occurs. The force main for this station will also eventually need to be upsized to 8" pipe as development of these parcels nears completion.

Figure No. 6-3 shows the proposed route of the Michigan Road Sewer, the location of the proposed Michigan Road Lift Station, and expected route for the future force main. An option to consider in lieu of the construction of the Michigan Road Sewer and Lift Station would be to allow the Clay Township Regional Waste District to provide sanitary sewer service to the above described parcels.

B. Union Township – Future Facilities

1. Sewer Service by Town of Zionsville

The Town of Zionsville recently consolidated and incorporated Union Township. The consolidation was completed for a variety of reasons, most importantly to regulate development activity to the north, to solidify the border around Zionsville, and to prevent annexation from neighboring communities.

Several areas have already been targeted and identified for future development in Union Township. It is believed that local resident and Town Officials have a strong interest in maintaining the agricultural character of the area while allowing development to occur in a planned and orderly manner. Understandably, single

Potential Addition to Clay Twp. Regional Waste District

Union Twp.

Eagle Twp.

CR 300 S.

Michigan Rd.

P-14

SCALE: 1"=1000'

1000' 0 1000'

LOCATION MAP

EAGLE TWP.

Proposed Michigan Rd. Interceptor

E6

18

17

8"

Clay Twp. Regional Waste District

Oneal Rd.

21

22

Proposed Michigan Rd. Lift Station

E6

131st St.

6" Force Main

Willow Ave.

Turkeyfoot Ave.

Colony Woods Interceptor

12"

E3

6" Force Main

CR 500 S.

Willow Road Sewer

12"

Michigan Rd.

E1

12"

Colony Woods Inter

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

EAGLE TOWNSHIP – PROPOSED MICHIGAN ROAD INTERCEPTOR
FIGURE 6-3

family residential homes will be the main focus of development with some intermittent and contiguous commercial expansion allowed to accommodate the needs of local residents. **Figure No. 5-3** shows the locations of the areas in Union Township expected to experience development interest in the future. These areas include targeted parcels 1 through 14 and contiguous areas.

Utilizing these targeted development locations, a conveyance plan was created to provide the foundation for future sanitary sewer service in Union Township. In order to provide service to these anticipated development areas, a new wastewater treatment plant will be required. The proposed site of the new treatment facility is a location on Pleasant view Road approximately 2,700 feet north of County Road 200 South. This location is preliminary, subject to a full understanding of future development trends. The preliminary site for the proposed treatment facility was determined by locating a central point topographically downstream relative to the targeted development areas. The site must also be situated above the 100 year floodplain elevation. It would be expected that when development dictates, a more detailed study and preliminary design phase would finalize the location of the proposed treatment facility. Finally, based upon the proposed location of the future plant and anticipated development areas, sewer sub-basins and wastewater conveyance systems were generated for the Union Township.

The locations of the conveyance systems were in large part determined from the topography of the land along with features such as creeks and natural drainage patterns. For the most part, the proposed gravity interceptor sewer routes followed three separate, major drainage ways. These drainage ways are Finley Creek, Eagle Creek, and Mounts Run. The proposed interceptor sewers generally bear the names of these major water sheds. For planning purposes, five sewer basins have been created within Union Township. The sanitary sewer basins are shown along with targeted development parcels on **Figure No. 5-3**.

The preliminary Union Township Sewer Basins are as follows:

East of U.S. 421:

- Rosston-Northfield
- Finley Creek

West of U.S. 421:

- Mounts Run North
- Mounts Run South
- Pleasant View

Union Township Conveyance Plan – East of U.S. 421:

The northernmost basin is the Rosston-Northfield Sewer Basin which would provide service for Rosston, Northfield, and targeted parcels 1, 2, 3, 5, 6, and 7, lying mostly east of U.S. 421 between County Roads 100 N. and 100 S. The conveyance system for the Rosston-Northfield Sewer Basin would begin at U.S. 421 and C.R. 100 North. An 8" gravity sewer, the proposed 100 North Interceptor, would flow to the east following County Road 100 North to a point approximately 400 feet west of Eagle Creek. The interceptor would then turn south and run along the west side of Eagle Creek to the proposed North Lift Station. The east portion of the Rosston-Northfiled Basin would be served by the Section 35 Interceptor. This gravity sewer would flow east to west and also discharge to the proposed North Lift Station. **Figure No. 5-3** illustrates the interceptor routes and the location of the proposed lift station.

If residential and commercial growth in the Rosston area occurs during the early phases of development in Union Township, an alternative approach will be to construct a packaged treatment plant in lieu of the North Lift Station. Utilizing this option will allow development to occur in the northern portion of Union Township before the proposed treatment plant on Pleasant View Road is constructed. The treated flow from the packaged plant could be discharged to Eagle Creek.

As additional township development ensues, the proposed main treatment facility on Pleasant View Road would be constructed and the packaged plant could then be converted to a lift station to convey flows to the main plant.

The proposed North Lift Station would convey wastewater flows south to State Road 32 through a proposed 6" force main to the proposed Northfield Interceptor. The Northfield Interceptor would begin on S.R. 32 approximately ½ mile east of State Road 32, serving Parcel No. 5 and contiguous areas. The Northfield Interceptor would turn south and flow toward the landfill operated by Boone County Recovery Systems, Inc. At the northwest corner of the landfill, the Northfield Interceptor would converge with the proposed Finley Creek Interceptor. The Finley Creek Interceptor is intended to provide sanitary sewer service to Parcels 6 and 7 as well as to areas south and east of the landfill, and possibly to the Indianapolis Executive Airport which is located immediately south of State Road 32 approximately 1½ miles east of U.S. 421.

Flows from the Northfield and Finley Creek Interceptors would ultimately discharge by gravity to the proposed Finley Creek Lift Station, preliminarily sited on the west side of the landfill. An 8" force main from this lift station would carry the combined flows from the Rosston-Northfield and Finley Creek Sewer Basins to the new Union Township wastewater treatment plant.

Union Township Conveyance Plan – West of U.S. 421:

West of U.S. 421 in the central portion of Union Township, the Mounts Run North Interceptor is proposed to serve targeted parcels no. 4, 9, and contiguous areas. The Mounts Run North Sewer Basin is intended to be served entirely by gravity flow to the Union Township wastewater treatment plant proposed on the west side of Pleasant View Road at the south end of the sewer basin. The Mounts Run North Interceptor would begin as an 8" pipe at State Road 32 and County Road 900 East. The gravity sewer would continue south on County Road 900 East, and be upsized to 10" pipe south of south of parcel no. 4.

At parcel no. 9, the sewer would be upsized to 12" pipe and continue south and east to the proposed wastewater treatment plant. **Figure No. 6-7** shows the preliminary route for the Mounts Run North Interceptor.

In the southwest portion of Union Township, the Mounts Run South Interceptor is proposed. This interceptor would provide service to targeted parcel no. 8 and contiguous areas. The gravity interceptor would begin as 8" pipe on County Road 825 East. The sewer would continue in easterly and southerly directions to County Road 200 South. Along its route, the sewer line would be upsized to 12" and 15" diameter pipe to accommodate the projected wastewater flows for this sewer basin. Upon reaching County Road 200 South, the sewer would continue in an eastward direction before discharging to the proposed County Road 200 S. Lift Station to be located near the intersection of C.R. 200 S. and Pleasant View Road. The lift station would need to be situated to the west of the intersection due to the wide floodplain which exists in this area. The lift station would convey all wastewater generated within the Mounts Run South Sewer Basin to the proposed treatment facility on Pleasant View Road. **Figure No. 6-8** shows the proposed route for the Mounts Run South Interceptor and the preliminary location of the County Road 200 S. Lift Station.

In the south portion of Union Township, the 12" Pleasant View Sewer is proposed to serve targeted parcels no. 12 and 13, and the existing Saddlebrook subdivision if sanitary sewer service is desired for that development in the future. Parcels 12 and 13 are very small but they have been targeted for future development by the Town's Transportation Plan. These areas are expected to best be served by the installation of low pressure sewer systems, with all flow pumped to the proposed Pleasant View Sewer. The Pleasant View Sewer would flow northward along Pleasant View Road to the County Road 200 South Lift Station discussed above. Parcels 12, 13, and the preliminary route of the proposed Pleasant View Sewer are shown on **Figure No. 6-8**.

SR 32

CR 800 E.

CR 50 S.

Proposed Mounts Run
North Interceptor

8"

4

10"

Wolf Run
Golf Club

10"

10"

9

12"

8" Force Main
From Proposed Finley
Creek Lift Station

WWTP

8" Force Main To
Proposed County Road
200 S. Lift Station

CR 900 E.

CR 150 S.

8

8"

10"

12"

CR 100 S.

CORPORATE LIMITS

Proposed
Mounts Run South
Interceptor To
Proposed County
Road 200 S. Lift Station

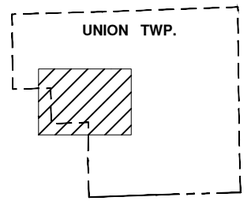
WORTH TWP.

UNION TWP.

SCALE: 1"=1000'

1000' 0 1000'

LOCATION MAP



COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP – PROPOSED MOUNTS RUN NORTH INTERCEPTOR
FIGURE 6–7

8

8"

10"

12"

Proposed
Mounts Run
South Interceptor

15"

15"

15"

15"

200 S.

Proposed Mounts
Run North Interceptor

12"

WWTP

8" Force Main
From Proposed Finley
Creek Lift Station

8" Force Main

Proposed County
Road 200 S. Lift Station

Proposed County
Road 200 S. Lift Station

Proposed Mounts Run
South Interceptor

Proposed
Pleasant
View Sewer

12"

U.S. 421

SCALE: 1"=1000'

1000' 0 1000'

LOCATION MAP

UNION TWP.

WORTH TWP.

UNION TWP.

Potential Addition to Clay Twp. Regional
Waste District

12

To Be Served By Low
Pressure Sewers

13

W. 146th St.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP – PROPOSED MOUNTS RUN SOUTH INTERCEPTOR
FIGURE 6-8

Future Union Township Wastewater Treatment Plant

A new wastewater treatment plant (WWTP) will be required once significant development begins and justifies the design and construction of the facility. **Figure No. 6-9** shows the proposed location of the WWTP in Union Township. It is recommended that a conventional mechanical plant be constructed. A mechanically oriented treatment system requires pumps, screening equipment, blowers or mechanical aerators, mechanical scrapers, and concrete or steel tankage. The mechanical plant under consideration for Union Township would be based on the "activated sludge" process which utilizes a controlled bacterial population for the removal of pollutants. The activated sludge process would be similar to the existing treatment facility currently owned and operated by the Town. Some of the components which may be required for the new facility include, but may not be limited to:

- Lift Stations – to convey wastewater to the new WWTP
- Influent and effluent flow monitoring and sampling
- Pretreatment – Screening of raw wastewater
- Flow Equalization
- Treatment Unit Processes – Aeration and clarification
- Disinfection
- Sludge Storage and Treatment

The overall size of a mechanical treatment plant would be dictated by the ultimate projected wastewater flows needing to be treated. Additionally, overall costs are a strong consideration. It is recommended that the treatment facility be constructed in "phases" to accommodate the gradual increase in wastewater flows projected through the year 2035. Initial construction will provide the capacity to treat wastewater for about one-fourth of the projected population growth within the Union Township service area. Facilities should be designed and constructed to facilitate expansion as needed to accommodate the remaining projected growth.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA
BOONE COUNTY

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP – PROPOSED LOCATION OF WASTEWATER TREATMENT PLANT
FIGURE 6–9

Constructing treatment facilities in this manner will allow lower initial capital costs. One means of achieving phased construction is to utilize modular treatment systems which better enable phased construction. There are a number of equipment manufacturers who can supply modular treatment systems. One such modular treatment system supplier of extended aeration wastewater treatment plants is Aero-Mod. Aero-Mod does not allow its equipment to be installed in steel tanks. Concrete tankage is required. Another feature of Aero-Mod is that it offers a sequencing aeration process (first and second stages of aeration) along with the incorporation of a "selector tank" section at the head of the package plant to precondition the raw wastewater to inhibit the growth of filamentous bacteria. This results in better coagulation and settling of biological floc and improved phosphorous and nitrogen removal. Aero-Mod treatment units are also easily expanded without significant additional site piping between the new and existing units.

Modular treatment systems will have their benefits as well as their detriments. The primary consideration when selecting any type of treatment system is the system's true ability to effectively treat wastewater. Another important consideration is providing the Owner with a treatment system they are both knowledgeable with and comfortable operating. The Aero-Mod system offers easy operation and is a proven means of wastewater treatment. The system would effectively treat wastewater flows and be capable of meeting the wasteload discharge requirements which would be established by the State of Indiana. Additionally, the Aero-Mod system is easily expandable. The system is designed so that additional tanks can simply be added onto the existing structures, requiring little piping modification when the treatment facility needs to be expanded.

Figure No. 6-9 shows the preliminary location of the proposed wastewater treatment plant to serve Union Township.

SECTION 7
CAPITAL IMPROVEMENTS

A. Recommended Projects

To develop the recommended capital improvements projects, multiple modeling iterations were performed to insure that adequate sewer capacity would be achieved throughout the system. Most importantly, the capacities of proposed and existing major interceptors were evaluated to insure their ability to convey Year 2035 cumulative flows to downstream portions of the collection system. Discussions were also held with Zionsville utility personnel and sewer planning team members to gain insight regarding where future development is likely to occur in both Eagle and Union Townships. The Comprehensive Plan, Transportation Plan, and applicable zoning guidelines were also utilized in the preparation of the Master Plan.

Based on the data generated from these sources, a wastewater Conveyance Plan was developed for Eagle and Union Townships. The conveyance plan was discussed in detail in Section 6. The discussion included a detailed layout of the gravity sewers and lift stations proposed to upgrade the existing collection system in Eagle Township and to provide sewer service to un-sewered areas and future developments in Union Township. The following discussion describes the improvement projects which are proposed within each township.

1. Eagle Township

Prior to the governmental consolidation, Zionsville's corporate boundary included most of the central and southeast portions of Eagle Township, located in the southeast corner of Boone County. Following the consolidation of Eagle and Union Townships, two separate zoning categories were created: Urban and Rural. The Urban Zoning classification pertained to all of those land areas located within the former Zionsville corporate limits. Land located outside of the prior corporate boundary is classified as "Rural" zoning.

The majority of the undeveloped areas in Eagle Township are targeted for low to moderate density single family residential land use. In order to properly evaluate the existing collection system and provide sound recommendations for upgrading the system and serving new areas, the collection system was divided into sewer basins. After evaluating the existing collection system, the model was utilized to identify deficiencies within the system. Targeted parcels were also identified and corresponding wastewater flows entered into the model to simulate future conditions.

Most future development in Eagle Township is expected to occur in the west and northwest parts of the township. Evaluation of the existing collection system led to the conclusion that an entirely new sewer sub-basin was needed in Eagle Township, and the flow from that sub-basin should be conveyed directly to the existing wastewater treatment plant to eliminate potential overloading conditions in the existing Western Interceptor. The creation of the new sewer basin will also serve to remove some existing flows (Cobblestone Lakes) from the Western Interceptor. This will provide the needed capacity in the Western Interceptor to serve existing developments which are currently unsewered, such as Russell Lake and Deer Ridge. It will also provide suitable capacity in the Western Interceptor to accommodate any low density infill development which may occur in the southwestern portions of Eagle Township.

For this study, the new sewer basin is referred to as the West Eagle Township Sewer Basin. Recommended projects within this sewer basin are discussed below:

a. New West Eagle Township Sewer Basin

The planning area for the New West Eagle Township Sewer Basin will include eight targeted parcels and contiguous areas in the western and northwestern portion of Eagle Township. In the northern portion of the sewer basin, it is recommended that all generated wastewater be discharged to the proposed Cobblestone Interceptor Extension.

Development in the southern portion of the new sewer sub-basin would discharge to the proposed West Eagle Township Interceptor. Recommended projects within the New West Eagle Township Sewer Basin include: 1) Extension of the Existing Cobblestone Interceptor, 2) The New West Eagle Township Interceptor, and 3) The enlargement of Irishman's Run Lift Station.

- **Extension of Existing Cobblestone Interceptor**

  The Cobblestone Interceptor is located in the northwestern portion of Eagle Township and currently serves the Cobblestone Lakes subdivision. The Cobblestone Interceptor flows from north to south to the Irishman's Run Lift Station, which discharges to the Western Interceptor. With the creation of the West Eagle Township Interceptor, it is proposed to redirect all flow from this lift station directly to the existing wastewater treatment plant. Redirecting this flow greatly reduces concerns regarding future overloading of the Western Interceptor. It will also allow full utilization of remaining capacity in the existing Cobblestone Interceptor. As discussed in the conveyance plan, the existing Cobblestone Interceptor is of adequate size and depth to allow it to be extended northward along County Road 875 East.

  It is recommended that the Cobblestone Interceptor be extended northward from Spring Violet Place approximately 6,000 feet to County Road 350 South. This extension will allow the interceptor to serve much of the future development which is anticipated in the northwest corner of Eagle Township in Sub-Basin WE1, including targeted parcels 15, 16, 19, and future infill development in adjacent areas. A 12" diameter gravity sanitary sewer is recommended as shown on **Figure No. 6-1**.

- **New West Eagle Township Interceptor**

  The new West Eagle Township Sewer Basin has been divided into two Sub-Basins: WE1 and WE2. We1 is to be served by the Cobblestone Interceptor as discussed above, while WE2 is to be served by the proposed West Eagle Township Interceptor. The WE2 Sub-Basin will include targeted parcels 24 through 27 and contiguous areas in the west-central portion of Eagle Township. This area lies just east of the Anson, a Duke Reality Corporation development served by Whitestown Utilities.

  In all, the West Eagle Township Interceptor will consist of approximately 9,700' of pipe, beginning with 10" sewer at the upstream west end. The sewer will begin near County Road 800 East south of Whitestown Road and continue south and east, mostly along County Roads 550 South, 575 South, and Cruise Road, ultimately discharging to the Irishman's Run Lift Station. The preliminary route of the proposed West Eagle Township Interceptor is shown on **Figure No. 6-2**.

- **Enlargement of Irishman's Run Lift Station**

  The Irishman's Run Lift Station located on County Road 600 South (Cruise Road) at the downstream ends of Cobblestone Interceptor and the proposed West Eagle Township Interceptor will need to be enlarged to accommodate the increased flows from future development.

  Projected average daily flow for the West Eagle Township Sewer Basin is 0.52 MGD, with an estimated peak hourly flow of 1.85 MGD (1,285 gpm). Along with the enlargement and conversion of Irishman's Run Lift Station to a "regional" station, the force main from the lift station will need to be enlarged and redirected to the existing wastewater treatment plant. The route of the force main would extend

eastward from the lift station along Cruise Road to the Rail-Trail. The force main would then follow the Rail-Trail to the treatment facility. To minimize disruption of trail use, it is possible that much of the installation along the Rail-Trail could be completed by incorporating horizontal directional drilling techniques. Approximately 9,100 feet of 12" force main will be required. **Figure No. 6-2** shows the location of the Irishman's Run Lift Station and the proposed routes for the West Eagle Township Interceptor and the Irishman's Run force main.

b. East Sewer Basin

The East Sewer Basin collects wastewater from Zionsville Village and the vast majority of flow generated north of the Village and east of the abandoned Penn-Central Railroad right-of-way. The collection system located within the East Sewer Basin has been divided into seven Sub-Basins, E1 through E7. Sub-Basins E1 through E5 consist of areas which are already served. Sub-Basin E6 includes future development areas in the northeast portion of Eagle Township, while Sub-Basin E7 includes the undeveloped region south of the Village and adjacent to Zionsville Road. A sanitary sewer and lift station are in construction as of this writing to provide service to the E7 Sub-Basin.

Based on existing conditions, three of the five interceptors in the East Sewer Basin have very limited remaining capacity or experience peak flows which exceed rated capacity. Hydraulic modeling indicates that the Colony Woods Interceptor and the upstream (15") section of the Eastern Interceptor experience peak flows which exceed the rated capacities of those sewers. The Village Interceptor has very limited available capacity, but this area has reached a saturation development condition and no additional flows are anticipated. The downstream portion of the Eastern Interceptor will have abundant available capacity following the completion of the current upgrade of the pipe to a 24" gravity sewer.

Several projects are proposed within the East Sewer Basin. These projects will serve to accommodate new developments in the northeast and southeast portions of Eagle Township, and to resolve capacity issues within existing interceptors:

- **New Eastern Interceptor Relief Sewer**

  Based upon modeling results, the upstream, 15" diameter section of the Eastern Interceptor is overloaded by approximately 0.36 MGD during periods of peak flow created by wet weather events. With additional future development expected to occur in northeast Eagle Township west of U.S. 421, measures must be taken to relieve this overloading condition.

  At this time, the Willow Road Lift Station, which serves numerous subdivisions within Sub-Basin E3, discharges to the north end of the existing Eastern Interceptor. Lost Run Farms and Raintree Place (Sub-Basin E4) also contain lift stations which discharge to the north end of the Eastern Interceptor. Together, Sub-Basins E3 and E4 contribute approximately 0.5 MGD to the Eastern Interceptor during peak flow periods.

  In order to reduce the overloading condition on the existing Eastern Interceptor, a new Eastern Interceptor Relief Sewer is proposed. The relief sewer will essentially parallel the existing 15" section of the Eastern Interceptor and discharge to the east end of the new 24" line recently installed on south Zionsville Road. All flows from the Willow Road Lift Station, as well as the Lost Run Farms and Raintree Lift Stations would be redirected into the new 12" diameter Eastern Interceptor Relief Sewer. **Figure No. 6-4** illustrates the preliminary route for the new relief sewer.

E1
E2
E3
E4
E5
W4
W5
12"
10"
Railroad Interceptor
Colony Woods Interceptor
Turkeyfoot Ave.
Willow Road Se
Whitestown Rd.
Proposed Enlargement Willow Road Lift Station
CR 550 S.
8" Force Main
6" Force Main
Existing Ford Road Lift Station
12" Force Main
Existing Bloor Woods Lift Station
12"
US 421
CORPORATE LIMITS
Existing Ford Center Lift Station
8"
Western Interceptor
12" Force Main
15"
Village
Interceptor
Main St.
Eastern Interceptor
SR 334
Clay Twp. Regional Waste District
CLAY TWP.
Hunters Point Sewer
12"
Existing Boone Village Lift Station
Existing Main Lift Station
24"
WWTP
Proposed Eastern Interceptor Relief Sewer
South Zionsville Rd. Sewer
8"
SCALE: 1"=1000'
1000' 0 1000'
LOCATION MAP
EAGLE TWP.

COMMONWEALTH ENGINEERS, INC.
TOWN OF ZIONSVILLE, INDIANA
SANITARY SEWER MASTER PLAN
EAGLE TOWNSHIP – PROPOSED EASTERN INTERCEPTOR RELIEF SEWER
FIGURE 6-4

- **Willow Road Lift Station Enlargement**

  Flow from future development along U.S. 421 north of Willow Road will ultimately need to be conveyed to the Willow Road Sewer and the Willow Road Lift Station. This would include flow from targeted parcels 17, 18, 21, and 22 in new Sewer Sub-Basin E6 located at the northeast corner of Eagle Township.

  The Willow Road Lift Station will need to be enlarged to accommodate the future increase in flow. Based upon modeling results, the station will need to be upgraded to accommodate an average daily flow of 0.23 MGD and a peak daily flow of approximately 0.74 MGD (515 gpm). The lift station would discharge all flow via an 8" diameter force main to the upstream end of the proposed Eastern Interceptor Relief Sewer.

- **Re-routing Force Mains from Lost Run and Raintree Lift Stations**

  Lost Run Farm and Raintree Lift Stations will need to be redirected to the proposed Eastern Interceptor Relief Sewer to aid in the elimination of overloading conditions in the existing Eastern Interceptor. The existing force mains will be re-used and can be reconnected to the new relief sewer at the point of interception.

- **New Michigan Road Sewer and Lift Station**

  New development in the northeast portion of Eagle Township will occur west of U.S. 421 (Michigan Road) and south of 146th Street. Land east of U.S. 421 in this area is already served by the Clay Township Regional Waste District. An 8" gravity sewer, referred to as the Michigan Road Sewer, is proposed to collect wastewater this corridor.

The gravity sewer will flow to the proposed Michigan Road Lift Station, which will discharge via a new 6" force main to the existing Willow Road Sewer. Preliminary locations for the proposed sewer and lift station are shown on **Figure No. 6-3.**

A possible alternative to the proposed Michigan Road Sewer and Lift Station will be to allow the north Michigan Road corridor to be served by the Clay Township Regional Waste District.

- **Colony Woods Interceptor – CIPP Lining**

As discussed during the evaluation of the existing collection system, the Colony Woods Interceptor is currently overloaded, most likely due to the age and condition of some of the gravity sewers in the south end of the E1 Sewer Sub-Basin. This basin has essentially been built out, and no significant new flows are anticipated. There are also no cost-effective means with which to transfer flows to other sewer basins.

The size of the existing sewer, 12" diameter pipe, should be adequate to handle flows based upon the total number of homes served. It is believed that the overloading which does occur is due to heavy levels of inflow and sustained infiltration during and following significant wet weather events. It is recommended that the Colony Woods Interceptor be evaluated further to investigate the sources of infiltration and inflow and to determine if the sewer is a good candidate for rehabilitation.

Cured-in-place pipe lining (CIPP) is a technology which serves to improve the structural integrity of existing pipe, eliminates many sources of infiltration, and in many cases increases the hydraulic capacity of the sewer. The technology is ideal for manhole to manhole repairs and may be a suitable means of reducing infiltration sources in the Colony Woods Interceptor.

Cured-in-place pipe lining is a mostly "trenchless" technology because open cutting is limited and the pipeline being repaired is usually accessed through existing manhole structures. The CIPP liner is pre-formed into a shape that will precisely fit inside the host pipe being repaired.

The composite materials used in CIPP are comprised of polyethylene mat and/or fiberglass strand reinforcements impregnated with a thermosetting resin. Once steam is applied, the liner cures to form a thin, high strength, protective wall around the inside of the deteriorating pipe. Prior to installation, the pipe is televised to document the locations of service lateral. Following curing, all affected service connections are reinstated by cutting the liner at the known location of the lateral connection.

2. Union Township

As discussed in the Conveyance Plan, there are several areas within Union Township which have been targeted for future development. A separate, “Rural” zoning classification for Zionsville has been established, primarily as a regulatory tool to manage land use and development in Union Township.

Other than agricultural, single family residential land use is the dominant zoning classification for Union Township. There are areas earmarked for commercial use to accommodate the needs created by residential development. Pockets of industrial development are also anticipated near the old landfill and north of State Road 32 along County Road 1100 East.

Future Development areas were determined by evaluating the existing roadway infrastructure and proximity to existing development. Parcels identified in the Town’s existing Transportation Plan were also considered. Topography and natural drainage patterns were then used to determine the most suitable locations for sewers, lift stations and a treatment facility to serve the Township.

a. Union Twp. East of U.S. 421

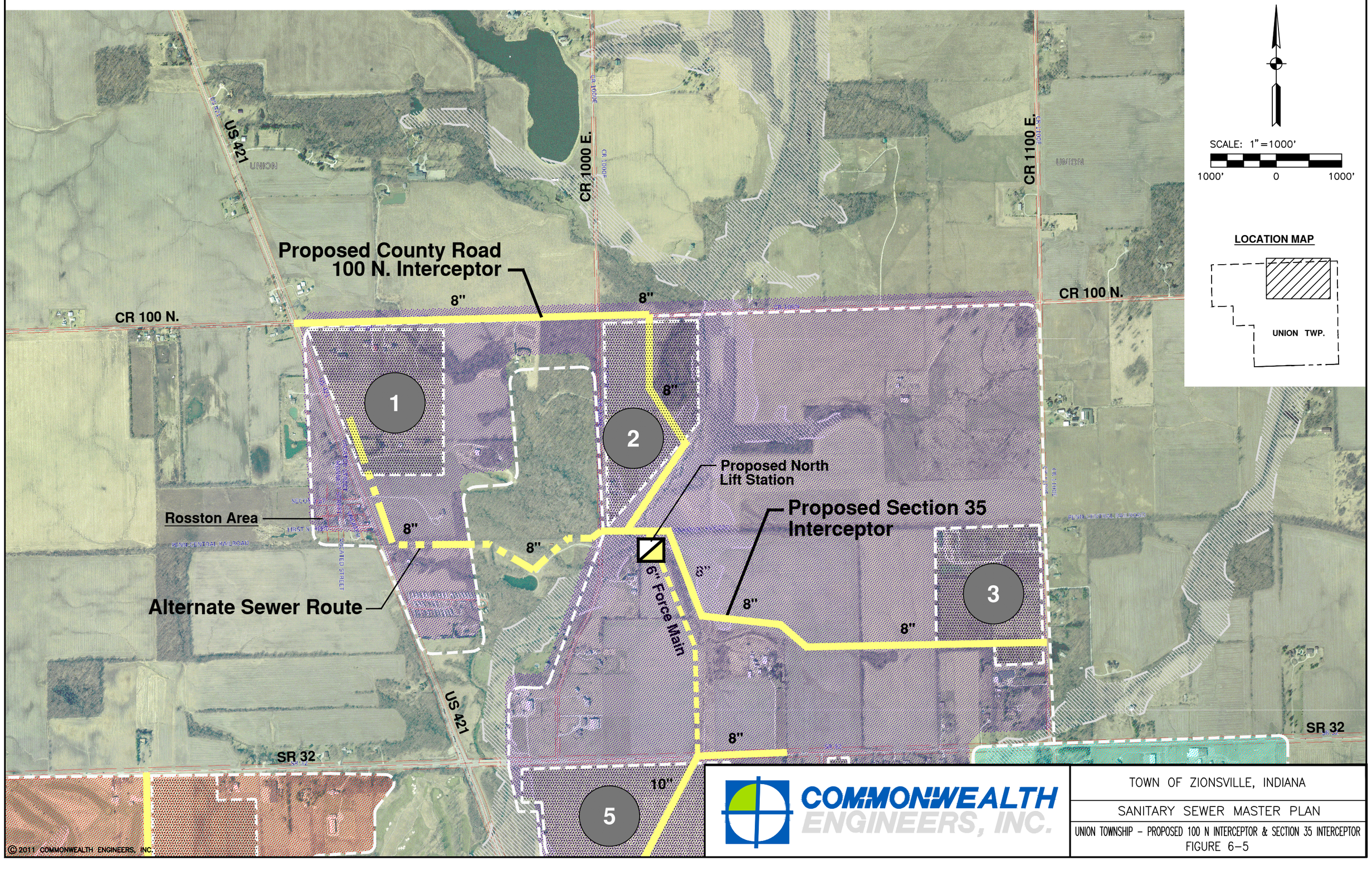
East of U.S. 421, there are eight targeted parcels in two future sewer sub-basins, with one of these sub-basins incorporating the Indianapolis Executive Airport. **Figure No. 5-3** shows the locations of these targeted parcels and sub-basins.

Targeted parcels no. 10 and 11 are located in the southeastern portion of Union Township in close proximity to areas already served by the Clay Township Regional Waste District (CTRWD). It is recommended that the Town consider allowing this general area, East of U.S. 421 and south of County Road 200 South, to be served by CTRWD. Projects recommended to serve the remaining area of Union Township east of U.S. 421 are discussed below:

- **County Road 100 North Interceptor**

  The County Road 100 North Interceptor is proposed in the northern portion of Union Township beginning at the intersection of U.S. 42 and continuing east along Co. Rd. 100 N., then south along Eagle Creek to the Proposed North Lift Station. The new interceptor would serve targeted parcels 1 and 2 and contiguous areas in the Rosston-Northfield Sewer Basin. The Proposed County Road 100 North Interceptor will be an 8" diameter gravity sewer pipe. Large flows are not expected due to the expanse of agricultural land to the north which is expected to remain unserved. **Figure No. 6-5** illustrates the proposed route for the Co. Road 100 N. Interceptor.

  An alternative alignment for this Interceptor would run south along U.S. 421 and then east to the proposed North Lift Station. This alternative alignment would potentially allow service to the Rosston mobile home park and the abandonment of the packaged treatment facility which serves that area.



COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP – PROPOSED 100 N INTERCEPTOR & SECTION 35 INTERCEPTOR
FIGURE 6–5

- **Section 35 Interceptor**

  The Section 35 Interceptor is located in the northern portion of Union Township east of the proposed North Lift Station. The proposed Section 35 Interceptor will serve the east portion of the proposed Rosston-Northfield Sewer Basin, which includes targeted parcel no. 3, an area zoned for light industrial land use.

  The interceptor is proposed to be an 8" diameter gravity sewer pipe. The Section 35 Interceptor will discharge into the proposed North Lift Station. **Figure No. 6-5** illustrates the proposed route for the Section 35 Interceptor.

- **North Lift Station**

  The North Lift Station will be located in the northern portion of Union Township east of U.S. 421, adjacent to Eagle Creek, and approximately ½ mile north of State Road 32. The station would receive flow from the County Road 100 North and the Section 35 Interceptors .

  The Station will need to be able to accommodate an average daily flow of 0.065 MGD and a peak daily flow of approximately 0.53 MGD (370 gpm). A 6" diameter force main approximately 2,500 feet long is anticipated with the downstream discharge to the proposed Northfield Interceptor. These projects are shown in **Figure No. 6-5.**

- **Northfield Interceptor**

  The proposed Northfield Interceptor is located in the central region of Union Township east of U.S. 421 and Eagle Creek. This sewer would provide service to the targeted parcels no. 5, 6, and contiguous areas within the Rosston-Northfield Sewer Basin.

The upstream end of the Northfield Interceptor along State Road 32 would consist of 8" pipe. Upon turning south the sewer would be upsized to 10" pipe and continue southward to the proposed Finley Creek Lift Station.

- **Finley Creek Interceptor**

  The proposed Finley Creek Interceptor is located at the south end of the Rosston-Northfield Sewer Basin. The Finley Creek Interceptor would be intended to provide sanitary sewer service to targeted parcel No. 7 in the vicinity of the former landfill operated by Boone County Resource Recovery. The sewer could also be extended eastward toward the Indianapolis Executive Airport to serve commercial and corporate development in the vicinity of the airport. A 10" diameter gravity interceptor is anticipated. The Finley Creek Interceptor will discharge into the Northfield Interceptor just north of the proposed Finley Creek Lift Station.

- **Airport Lift Station**

  The Airport Lift Station is located in the Eastern side of Union Township north of Finley Creek in the Finley Creek Interceptor run. Due to the drainage patterns within Union Township east of Northfield and north of the landfill, a lift station will be required to convey any future flows from airport area to the Finley Creek Interceptor. At this time it is estimated that the Airport Lift Station will need to be sized to accommodate a daily flow of 0.11 MGD and a peak daily flow of 0.49 MGD (340 gpm). A 6" diameter force main is anticipated.

- **Finley Creek Lift Station**

  The preliminary location for the Finley Creek Lift Station is just east of U.S. 421 and north of Finley Creek. This lift station will convey wastewater southwest to the site of a future wastewater treatment

plant in south-central Union Township. The Finley Creek Lift Station will need to be sized to accommodate an average daily flow of approximately 0.46 MGD and a peak daily flow of 1.64 MGD (1,140 gpm). To allow for much lower flows initially, dual, parallel 8" diameter force mains should be considered. The force mains can be installed simultaneously in a common trench to reduce construction costs. Once in service, one force main can be used, or the flows can be alternated until both are needed to convey the projected long-term peak daily flows. The proposed Finely Creek Lift Station and force main are illustrated on **Figure No. 6-6.**

b. Union Twp. West of U.S. 421

In Union Township west of U.S. 421, there are five targeted parcels lying within three proposed sewer sub-basins. **Figure No. 5-3** shows the locations of these targeted parcels and future sub-basins.

Four projects are proposed in Union Township west of U.S. 421, consisting of the following: The Mounts Run North Interceptor, Mounts Run South Interceptor, Pleasant View Sewer, and the Country Road 200 S. Lift Station.

i. Mounts Run North Interceptor

The Mounts Run North Interceptor is located north of Mounts Run in central Union Township, between Mounts Run and Eagle Creek. The proposed Mounts Run North Interceptor will provide service to the Mounts Run North sewer basin which contains targeted parcels 4, 9, and adjoining areas as shown on **Figure No. 6-7.**

8", 10" and ultimately 12" diameter sewer segments are anticipated for this interceptor sewer. At its downstream end, the interceptor will receive flow from the Finley Creek Lift Station before discharging to the proposed treatment plant discussed later in this section.

6" Force Main
To Proposed North
Lift Station

8"

SR 32

10"

5

US 421

Taylor Rd.

6

10"

7

Proposed Northfield
Interceptor

15"

10"

18"

6" Force Main

Proposed Finley
Creek Interceptor

10"

10"

Proposed Airport
Lift Station

Proposed Finley Creek
Lift Station

CR 100 S.

8" Force Main

WWTP

US 421

CORPORATE LIMITS

SCALE: 1"=1000'

1000' 0 1000'

LOCATION MAP

UNION TWP.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

UNION TOWNSHIP - PROPOSED NORTHFIELD INTERCEPTOR & FINLEY CREEK INTERCEPTOR
FIGURE 6-6

ii. Mounts Run South Interceptor

The Mounts Run South Interceptor is located south of Mounts Run in southwestern Union Township just east of the Union/Worth Township line. The proposed Mounts Run South Interceptor would provide sewer service to the Mounts Run South Sewer Basin which contains targeted parcel No. 8 and contiguous areas. An 8" sewer is proposed at the upstream end. The sewer would be upsized along its route, becoming 15" diameter pipe before discharging to the proposed County Road 200 South Lift Station.

Much of this interceptor is proposed to be installed south along County Road 900 East beginning at State Road 32. This could become problematic in certain areas, particularly where nearing the small water body located approximately ¼ mile south of County Road 50 South. Sheet piling and significant dewatering may be necessary to complete construction activities in this area. **Figure No. 6-8** illustrates the proposed route for the Mounts Run South Interceptor**.**

iii. Pleasant View Sewer

The proposed Pleasant View Sewer is located in the far south-central portion of Union Township and is intended to provide sewer service to the Saddlebrook subdivision, targeted parcels no. 12 and 13, and adjacent areas. The proposed Pleasant View Sewer Basin is located just south of the confluence of Mounts Run and Eagle Creek. The Pleasant View Sewer is proposed to consist of 12" diameter gravity sewer which would begin near the Saddlebrook subdivision and flow south along Pleasant View Road to the proposed Country Rd. 200 South Lift Station. Topography in the area would most likely require parcels 12 and 13 to be served by localized gravity sewers and lift stations or by low pressure sewer systems. The proposed Pleasant View Sewer is shown on **Figure 6-8**.

iv. Country Road 200 South Lift Station

The proposed County Road 200 South Lift Station is located near the intersection of County Road 200 South and Pleasant View Road. This lift station will collect wastewater flow from the Mounts Run South Interceptor and the Pleasant View Sewer and convey that flow directly to the proposed Zionsville-North wastewater treatment plant.

The Lift Station will need to be sized to accommodate an average daily flow of approximately 0.61 MGD and a peak daily flow of 1.30 MGD (900 gpm). Again, dual force mains may be preferred, in this case 6" diameter, in order to accommodate lower flow rates during the initial stages of development. The location of the proposed County Road 200 South Lift Station is shown on **Figure No. 6-8.**

3. Zionsville Wastewater Treatment Plant - North

The proposed location of the Zionsville - North wastewater treatment plant is a site on Pleasant View Road, approximately 2,700 feet north of County Road 200 South. This location was chosen following a review of a number of siting factors that can have a long-term impact on the use, operation, and maintenance of the system. Roadway infrastructure and sewer development need to be properly coordinated to support construction activities. The site must be outside of the established floodplain and must provide access to a suitable discharge point. The location of the future wastewater treatment plant must also fit with the overall physical plan for local development. Adjoining areas which may be considered for future development need to be clearly identified. Finally, the proposed wastewater treatment plant site needs to be able to accommodate buffer zones to minimize impacts with future nearby residential development areas. **Figure No. 6-9** illustrates the proposed location of the Zionsville – North wastewater treatment plant.

SECTION 8
PROJECT COSTS

A. General

The cost estimates prepared as part of this study are referred to as "budget estimates" and are considered appropriate for the level of detail associated with master planning concepts. Budget level estimates are made without detailed engineering data or information regarding site-specific conditions (i.e. final pipeline depths and alignment, land acquisition costs, aesthetics, etc.) No estimates can be considered final, however, until specific site conditions are known and complete construction plans and specifications have been prepared. The costs are intended to provide useful budget figures as the Town begins preparing a capital improvements plan for sanitary sewer improvements and expansion.

Cost estimates for wastewater collection and conveyance facilities are based on a comparison of historical construction costs from tabulations of publicly bid projects of comparable work. To estimate the total project costs, an allowance of twenty-five percent was added to cover expenses associated with engineering, legal, and general administrative fees. A fifteen percent contingency has also been added to pay for unanticipated costs which may be incurred during the course of construction. This approach reduces the likelihood of budget surprises when detailed design is completed. It is reasonable to consider budget estimates accurate within ± twenty-five percent.

B. Funding Resources

The Sanitary Sewer Master Plan has identified preliminary sizing and general locations for interceptor sewers, lift stations, and related facilities. The Town should understand the plan is flexible and the locations of sewers are subject to land acquisition, site requirements, and final design recommendations. Funding resources for capital improvements projects fall into two general categories. The first category would be "External Funding Sources." Examples include sources such as potential federal or state grants and developer financing. The second category would be "Internal Funding Sources."

Examples include sources such as federal and state loans, system revenue, revenue bonds, or the creation of Tax Increment Financing (TIF) districts. TIF is the use of utilizing future tax gains to finance current projects.

Public roads, water supply, and sanitary sewerage systems are essential to growth, but do not need to be provided solely at public expense without private investment. The developer community is a potential resource and should be expected to invest in the construction of infrastructure, including sanitary sewers. This can be done through the use of a capital recovery fee, sewer impact fees, or other form or proportionate cost sharing mechanism.

Should the Town wish to pursue the path of impact fees, an ordinance would be required. The purpose of an impact fee ordinance is to enable the Town, as a condition of approval for a development, to require an applicant to pay a fair share of any off-site improvements to public facilities which will be required to serve the development. An impact fee provision is intended to help prevent scattered or premature development in areas where existing public services and infrastructure may be inadequate to sustain the development's impact. An impact fee also serves to prevent the excessive expenditure of public funds to provide the necessary facilities.

In order for a community to enact an impact fee ordinance, it is important to have adopted a capital improvements program (CIP). The CIP is also used by the Town to develop an annual operating budget. Zionsville could establish a capital improvement program committee that consists of members of a number of other town committees and offices as well citizens at large appointed by the Council.

In order for an impact fee to be valid, there must be a rational nexus between the fee and the needs created by development; that is, the amount of the fee should be proportionate to the service demand generated by the development. The goal of such an analysis, usually conducted by a professional, is to determine a fee that balances needs that are *specifically and uniquely attributable* to the new development and needs that are reasonably related to the development.

1. Revenue Bonds

States, cities, towns, and municipal subdivisions have the authority to issue municipal bonds. Their purpose is to fund municipal projects such as water and sewer systems, parking facilities, housing, etc. Revenue bonds are municipal bonds that finance income producing projects. The income generated by these projects is used to make the required principal and interest payments to the bondholder to retire the debt. Revenue bonds are municipal bonds that are secured by a specific income source of the issuer. The method of securing the loan is what distinguishes a revenue bond from other forms of municipal funding such as general obligation bonds. General obligation bonds are secured by the full faith and credit of the municipality that issues them.

Most revenue bonds are sold in $5,000 units and mature in 20 to 30 years. Income from a municipal project such as sanitary sewer system extension is placed into a revenue fund. From this fund, expenses for operations and bondholder payments are paid. Because they are not backed by the full faith and credit of a municipality as are general obligation bonds, revenue bonds carry a somewhat higher default risk for which they offer higher interest rates.

2. Barrett Law

The Indiana Barrett Law process is a tool which communities may wish to consider using to fund projects that provide improvements to a clearly defined area and a specific group of property owners. The Barrett Law provides cities and towns with a mechanism to construct improvements such as sanitary sewers and assess the cost of those improvements to affected property owners. Under this law, homeowners may be assessed up to 10 percent of the value of their property to bring a municipal sewer into an un-served neighborhood. Depending on the size of the project, costs typically range between $8,000 and $15,000 per homeowner.

The law allows the governmental entity to secure a lien against each parcel of real property that is assessed for sewer improvements. A foreclosure action may

be brought against a property owner who defaults in the payment of an assessment. In order to raise money for construction costs, the Town may issue bonds in anticipation of the collection of the assessments. The Town may also establish an interest rate on Barrett Law assessments that is greater than the interest rate on the bonds issued in connection with those assessments. Funds accumulated through the interest rate differential may be used to create a debt service reserve and an administrative cost reserve for the Barrett Law bonds.

C. Preliminary Cost Estimates

Preliminary cost estimates have been prepared for recommended interceptor sewer and lift station projects and related facilities and improvements discussed in this Master Plan. Capital costs for these improvements projects are presented in the following tables, in the order of the sewer study areas discussed in Sections 6 and 7.

These estimates are based on 2011 dollars, and should be reviewed and updated as necessary to account for inflation and changes in local economic conditions. It should also be noted that these estimates do not include the costs associated with the construction of sanitary sewers within private developments or the costs for sewers which may be needed to convey wastewater from future developments to proposed interceptors. Estimates for such future conveyance facilities can be prepared after documentary evidence is provided to indicate a general plan for grading and wastewater collection within a planned development.

Unit costs presented in the following tables are base construction costs which include contractor overhead and profit and are based on historical publicly bid project data. Expenses for dewatering have been included, along with a provision for erosion control due to the environmentally sensitive nature of some of the proposed construction areas. A fifteen percent (15%) construction contingency has been added, along with a twenty-five percent (25%) allowance for engineering, legal, administrative, and management expenses.

Tables No. 8-1 through **8-21** provide the cost estimates for Eagle and Union Township recommended projects to improve the existing collection system and to provide sewer service to those areas targeted for future development. **Tables No. 8-1** through **No. 8-8** are the cost estimates for projects located in Eagle Township. **Tables No. 8-9** through **No. 8-21** are the cost estimates for those projects located in Union Township.

Table No. 8-1

Summary Table - Eagle Township Sewer Sub-Basins
Recommended Projects and Estimated Costs (2011)

Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Eagle Township Summary Table				
8" Dia. Gravity Sewer	L.F.	8,200	$ 55	$ 451,000
10" Dia. Gravity Sewer	L.F.	5,000	$ 75	$ 375,000
12" Dia. Gravity Sewer	L.F.	14,600	$ 85	$ 1,241,000
Standard Manhole	EA.	120	$ 3,500	$ 420,000
Michigan Road Lift Station	EA.	1	$ 125,000	$ 125,000
Proposed Enlargement Willow Rd. Lift Station	EA.	1	$ 150,000	$ 150,000
Proposed Enlargement Irishman's Run Lift Station	EA.	1	$ 150,000	$ 150,000
6" Force Main	L.F.	8,700	$ 35	$ 304,500
8" Force Main	L.F.	2,600	$ 42	$ 109,200
12" Force Main	L.F.	4,700	$ 85	$ 399,500
Directionaly Drill 12" Force Main	L.F.	4,300	$ 120	$ 516,000
Granular Backfill	L.F.	34,300	$ 45	$ 1,543,500
Paved Surface Restoration	L.F.	5,700	$ 40	$ 228,000
Dewatering	L.S.	1	$ 185,000	$ 185,000
Erosion Control	L.S.	1	$ 41,000	$ 41,000
Traffic Control	L.S.	1	$ 20,000	$ 20,000
Grading and Seeding	L.F.	40,000	$ 5	$ 200,000
Subtotal:				**$ 6,458,700**
20% Construction Contingency:				$ 1,292,000
Estimated Construction Cost:				**$ 7,750,700**
Land Acquisition:	Acre	26	$ 10,000	$ 260,000
Est. Non-Construction Cost @ 25%:				$ 1,939,000
Total Estimated Project Cost:				**$ 9,949,700**

Table No. 8-2

Eagle Township Sewer Sub-Basin - Extension of Existing Cobblestone Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Extension of Existing Cobblestone Interceptor					
	12" Dia. Gravity Sewer	L.F.	6,200	$ 85	$ 527,000
	Standard Manhole	EA.	30	$ 3,500	$ 105,000
	Granular Backfill	L.F.	9,100	$ 45	$ 409,500
	Paved Surface Restoration	L.F.	1,400	$ 40	$ 56,000
	Dewatering	L.S.	1	$ 25,000	$ 25,000
	Erosion Control	L.S.	1	$ 5,000	$ 5,000
	Traffic Control	L.S.	1	$ 5,000	$ 5,000
	Grading and Seeding	L.F.	5,000	$ 5	$ 25,000
	Subtotal				**$ 1,157,500**
	20% Construction Contingency				$ 232,000
	Estimated Construction Cost				**$ 1,389,500**
	Land Acquisition	Acre	4	$ 10,000	$ 40,000
	Est. Non-Construction Cost @ 25%				$ 347,000
	Estimated Total Project Cost				**$ 1,776,500**

Table No. 8-3

Eagle Township Sewer Sub-Basin - West Eagle Township Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
West Eagle Twp. Interceptor					
	10" Dia. Gravity Sewer	L.F.	5,000	$ 75	$ 375,000
	12" Dia. Gravity Sewer	L.F.	4,000	$ 85	$ 340,000
	Standard Manhole	EA.	40	$ 3,500	$ 140,000
	Granular Backfill	L.F.	9,100	$ 45	$ 409,500
	Paved Surface Restoration	L.F.	1,400	$ 40	$ 56,000
	Dewatering	L.S.	1	$ 20,000	$ 20,000
	Erosion Control	L.S.	1	$ 4,000	$ 4,000
	Traffic Control	L.S.	1	$ 4,000	$ 4,000
	Grading and Seeding	L.F.	8,000	$ 5	$ 40,000
	Subtotal				**$ 1,388,500**
	20% Construction Contingency				$ 278,000
	Estimated Construction Cost				**$ 1,666,500**
	Land Acquisition	Acre	5	$ 10,000	$ 50,000
	Est. Non-Construction Cost @ 25%				$ 417,000
	Estimated Total Project Cost				**$ 2,133,500**

Table No. 8-4

Eagle Township Sewer Sub-Basin - Enlargement of Irishman's Run Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Enlargement of Irishman's Run Lift Station					
	Proposed Enlargement Irishman's Run Lift Station	EA.	1	$ 150,000	$ 150,000
	12" Force Main	L.F.	4,700	$ 85	$ 399,500
	Directionaly Drill 12" Force Main	L.F.	4,300	$ 120	$ 516,000
	Granular Backfill	L.F.	2,000	$ 45	$ 90,000
	Paved Surface Restoration	L.F.	700	$ 40	$ 28,000
	Dewatering	L.S.	1	$ 5,000	$ 5,000
	Erosion Control	L.S.	1	$ 1,000	$ 1,000
	Traffic Control	L.S.	1	$ 1,000	$ 1,000
	Grading and Seeding	L.F.	4,000	$ 5	$ 20,000
	Subtotal				**$ 1,210,500**
	20% Construction Contingency				$ 242,000
	Estimated Construction Cost				**$ 1,452,500**
	Land Acquisition	Acre	3	$ 10,000	$ 30,000
	Est. Non-Construction Cost @ 25%				$ 363,000
	Estimated Total Project Cost				**$ 1,845,500**

Table No. 8-5

Eagle Township Sewer Sub-Basin - Eastern Interceptor Relief Sewer
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Eastern Interceptor Relief Sewer					
	12" Dia. Gravity Sewer	L.F.	4,400	$ 85	$ 374,000
	Standard Manhole	EA.	20	$ 3,500	$ 70,000
	Granular Backfill	L.F.	2,500	$ 45	$ 112,500
	Paved Surface Restoration	L.F.	400	$ 40	$ 16,000
	Dewatering	L.S.	1	$ 90,000	$ 90,000
	Erosion Control	L.S.	1	$ 18,000	$ 18,000
	Traffic Control	L.S.	1	$ 5,000	$ 5,000
	Grading and Seeding	L.F.	4,000	$ 5	$ 20,000
	Subtotal				**$ 705,500**
	20% Construction Contingency				$ 141,000
	Estimated Construction Cost				**$ 846,500**
	Land Acquisition	Acre	3	$ 10,000	$ 30,000
	Est. Non-Construction Cost @ 25%				$ 212,000
	Estimated Total Project Cost				**$ 1,088,500**

Table No. 8-6

Eagle Township Sewer Sub-Basin - Willow Rd. Lift Station Enlargement
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Willow Rd. Lift Station enlargement					
	Proposed Enlargement Willow Rd. Lift Station	EA.	1	$ 150,000	$ 150,000
	8" Force Main	L.F.	2,600	$ 42	$ 109,200
	Granular Backfill	L.F.	500	$ 45	$ 22,500
	Paved Surface Restoration	L.F.	100	$ 40	$ 4,000
	Dewatering	L.S.	1	$ 10,000	$ 10,000
	Erosion Control	L.S.	1	$ 2,000	$ 2,000
	Traffic Control	L.S.	0	$ -	$ -
	Grading and Seeding	L.F.	3,000	$ 5	$ 15,000
	Subtotal				**$ 312,700**
	20% Construction Contingency				$ 63,000
	Estimated Construction Cost				**$ 375,700**
	Land Acquisition	Acre	1	$ 10,000	$ 10,000
	Est. Non-Construction Cost @ 25%				$ 94,000
	Estimated Total Project Cost				**$ 479,700**

Table No. 8-7

Eagle Township Sewer Sub-Basin - Re-Routing Force Mains from Lost Run and Raintree Lift Stations
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Re-Routing Force Mains from Lost Run and raintree Lift Stations					
	6" Force Main	L.F.	2,800	$ 35	$ 98,000
	Granular Backfill	L.F.	100	$ 45	$ 4,500
	Dewatering	L.S.	1	$ 5,000	$ 5,000
	Erosion Control	L.S.	1	$ 1,000	$ 1,000
	Traffic Control	L.S.		$ 5,000	$ -
	Grading and Seeding	L.F.	3,000	$ 5	$ 15,000
	Subtotal				**$ 123,500**
	20% Construction Contingency				$ 25,000
	Estimated Construction Cost				**$ 148,500**
	Land Acquisition	Acre	2	$ 10,000	$ 20,000
	Est. Non-Construction Cost @ 25%				$ 37,000
	Estimated Total Project Cost				**$ 205,500**

Table No. 8-8

Eagle Township Sewer Sub-basin - Michigan Rd. Sewer and Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Michigan Rd. Sewer					
	8" Dia. Gravity Sewer	L.F.	8,200	$ 55	$ 451,000
	Standard Manhole	EA.	30	$ 3,500	$ 105,000
	Michigan Road Lift Station	EA.	1	$ 125,000	$ 125,000
	6" Force Main	L.F.	5,900	$ 35	$ 206,500
	Granular Backfill	L.F.	11,000	$ 45	$ 495,000
	Paved Surface Restoration	L.F.	1,700	$ 40	$ 68,000
	Dewatering	L.S.	1	$ 30,000	$ 30,000
	Erosion Control	L.S.	1	$ 10,000	$ 10,000
	Traffic Control	L.S.	1	$ 5,000	$ 5,000
	Grading and Seeding	L.F.	13,000	$ 5	$ 65,000
	Subtotal				**$ 1,560,500**
	20% Construction Contingency				$ 312,000
	Estimated Construction Cost				**$ 1,872,500**
	Land Acquisition	Acre	8	$ 10,000	$ 80,000
	Est. Non-Construction Cost @ 25%				$ 468,000
	Estimated Total Project Cost				**$ 2,420,500**

Table No. 8-9

Summary Table - Union Township Sewer Sub-Basins
Recommended Projects and Estimated Costs (2011)

Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Union Township Summary Table				
8" Dia. Gravity Sewer	L.F.	16,700	$ 55	$ 918,500.00
10" Dia. Gravity Sewer	L.F.	17,600	$ 75	$ 1,320,000.00
12" Dia. Gravity Sewer	L.F.	7,900	$ 85	$ 671,500.00
15" Dia. Gravity Sewer	L.F.	6,300	$ 115	$ 724,500.00
Standard Manhole	EA.	189	$ 3,500	$ 661,500.00
Proposed Airport Lift Station	EA.	1	$ 200,000	$ 200,000.00
Proposed County Rd. 200 S. Lift Station	EA.	1	$ 460,000	$ 460,000.00
Proposed Finley Creek Lift Station	EA.	1	$ 400,000	$ 400,000.00
Proposed North Lift Station	EA.	1	$ 130,000	$ 130,000.00
New Waste Water Facility - 0.25 MGD	L.S.	1	$ 1,600,000	$ 1,600,000.00
6" Force Main	L.F.	3,050	$ 35	$ 106,750.00
8" Force Main	L.F.	9,900	$ 42	$ 415,800.00
Granular Backfill	L.F.	17,100	$ 45	$ 769,500.00
Paved Surface Restoration	L.F.	2,680	$ 40	$ 107,200.00
Dewatering	L.S.	1	$ 605,000	$ 605,000.00
Erosion Control	L.S.	1	$ 121,000	$ 121,000.00
Grading and Seeding	L.F.	58,000	$ 5	$ 295,800.00
Subtotal:				**$ 9,507,050.00**
20% Construction Contingency:				$ 1,901,000.00
Estimated Construction Cost:				**$11,408,050.00**
Land Acquisition:	Acre	31	$ 8,000	$ 248,000.00
Est. Non-Construction Cost @ 25%:				$ 2,851,200.00
Total Estimated Project Cost:				**$14,507,250.00**

Table No. 8-10

Union Township Sewer Basin - County Road 100 North Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Co. Road 100 N. Interceptor					
	8" Dia. Gravity Sewer	L.F.	6,500	$ 55	$ 357,500.00
	Standard Manhole	EA.	24	$ 3,500	$ 84,000.00
	Granular Backfill	L.F.	2,500	$ 45	$ 112,500.00
	Paved Surface Restoration	L.F.	380	$ 40	$ 15,200.00
	Dewatering	L.S.	1	$ 80,000	$ 80,000.00
	Erosion Control	L.S.	1	$ 16,000	$ 16,000.00
	Grading and Seeding	L.F.	7,000	$ 5	$ 35,700.00
	Subtotal				**$ 700,900.00**
	+/-20% Construction Contingency				$ 140,000.00
	Estimated Construction Cost				**$ 840,900.00**
	Land Acquisition	Acre	4	$ 8,000	$ 32,000.00
	Est. Non-Construction Cost @ +/-25%				$ 210,000.00
	Estimated Total Project Cost				**$ 1,083,000.00**

Table No. 8-11

Union Township Sewer Basin - Section 35 Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Section 35 Interceptor					
	8" Dia. Gravity Sewer	L.F.	6,500	$ 55	$ 357,500.00
	Standard Manhole	EA.	24	$ 3,500	$ 84,000.00
	Granular Backfill	L.F.	2,000	$ 45	$ 90,000.00
	Paved Surface Restoration	L.F.	300	$ 40	$ 12,000.00
	Dewatering	L.S.	1	$ 60,000	$ 60,000.00
	Erosion Control	L.S.	1	$ 12,000	$ 12,000.00
	Grading and Seeding	L.F.	7,000	$ 5	$ 35,700.00
	Subtotal				**$ 651,200.00**
	+/-20% Construction Contingency				$ 130,000.00
	Estimated Construction Cost				**$ 781,200.00**
	Land Acquisition	Acre	4	$ 8,000	$ 32,000.00
	Est. Non-Construction Cost @ +/-25%				$ 195,000.00
	Estimated Total Project Cost				**$ 1,008,000.00**

Table No. 8-12

Union Township Sewer Basin - North Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
North Lift Station					
	Proposed North Lift Station	EA.	1	$ 130,000	$ 130,000.00
	6" Force Main	L.F.	2,500	$ 35	$ 87,500.00
	Dewatering	L.S.	1	$ 10,000	$ 10,000.00
	Erosion Control	L.S.	1	$ 2,000	$ 2,000.00
	Grading and Seeding	L.F.	2,000	$ 5	$ 10,200.00
	Subtotal				**$ 239,700.00**
	+/-20% Construction Contingency				$ 48,000.00
	Estimated Construction Cost				**$ 287,700.00**
	Land Acquisition	Acre	1	$ 8,000	$ 8,000.00
	Est. Non-Construction Cost @ +/-25%				$ 72,000.00
	Estimated Total Project Cost				**$ 368,000.00**

Table No. 8-13

Union Township Sewer Basin - Northfield Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Northfield Interceptor					
	8" Dia. Gravity Sewer	L.F.	1,100	$ 55	$ 60,500.00
	10" Dia. Gravity Sewer	L.F.	4,100	$ 75	$ 307,500.00
	12" Dia. Gravity Sewer	L.F.	1,500	$ 85	$ 127,500.00
	Standard Manhole	EA.	25	$ 3,500	$ 87,500.00
	Granular Backfill	L.F.	500	$ 45	$ 22,500.00
	Paved Surface Restoration	L.F.	100	$ 40	$ 4,000.00
	Dewatering	L.S.	1	$ 30,000	$ 30,000.00
	Erosion Control	L.S.	1	$ 6,000	$ 6,000.00
	Grading and Seeding	L.F.	7,000	$ 5	$ 35,700.00
	Subtotal				**$ 681,200.00**
	+/-20% Construction Contingency				$ 136,000.00
	Estimated Construction Cost				**$ 817,200.00**
	Land Acquisition	Acre	4	$ 8,000	$ 32,000.00
	Est. Non-Construction Cost @ +/-25%				$ 204,000.00
	Estimated Total Project Cost				**$ 1,053,200.00**

Table No. 8-14

Union Township Sewer Basin - Finley Creek Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Finley Creek Interceptor					
	10" Dia. Gravity Sewer	L.F.	4,400	$ 75	$ 330,000.00
	Standard Manhole	EA.	16	$ 3,500	$ 56,000.00
	Granular Backfill	L.F.	500	$ 45	$ 22,500.00
	Paved Surface Restoration	L.F.	100	$ 40	$ 4,000.00
	Dewatering	L.S.	1	$ 30,000	$ 30,000.00
	Erosion Control	L.S.	1	$ 6,000	$ 6,000.00
	Grading and Seeding	L.F.	5,000	$ 5	$ 25,500.00
	Subtotal				**$ 474,000.00**
	+/-20% Construction Contingency				$ 95,000.00
	Estimated Construction Cost				**$ 569,000.00**
	Land Acquisition	Acre	3	$ 8,000	$ 24,000.00
	Est. Non-Construction Cost @ +/-25%				$ 142,000.00
	Estimated Total Project Cost				**$ 735,000.00**

Table No. 8-15

Union Township Sewer Basin - Airport Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Airport Lift Station					
	Proposed Airport Lift Station	EA.	1	$ 200,000	$ 200,000.00
	6" Force Main	L.F.	550	$ 35	$ 19,250.00
	Dewatering	L.S.	1	$ 5,000	$ 5,000.00
	Erosion Control	L.S.	1	$ 1,000	$ 1,000.00
	Grading and Seeding	L.F.	1,000	$ 5	$ 5,100.00
	Subtotal				**$ 230,350.00**
	+/-20% Construction Contingency				$ 46,000.00
	Estimated Construction Cost				**$ 276,350.00**
	Est. Non-Construction Cost @ +/-25%				$ 69,000.00
	Estimated Total Project Cost				**$ 345,350.00**

Table No. 8-16

Union Township Sewer Basin - Finley Creek Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Finley Creek Lift Station					
	Proposed Finley Creek Lift Station	EA.	1	$ 400,000	$ 400,000.00
	8" Force Main	L.F.	4,100	$ 42	$ 172,200.00
	Dewatering	L.S.	1	$ 5,000	$ 5,000.00
	Erosion Control	L.S.	1	$ 1,000	$ 1,000.00
	Grading and Seeding	L.F.	3,000	$ 5	$ 15,300.00
	Subtotal				**$ 593,500.00**
	+/-20% Construction Contingency				$ 119,000.00
	Estimated Construction Cost				**$ 712,500.00**
	Est. Non-Construction Cost @ +/-25%				$ 178,000.00
	Estimated Total Project Cost				**$ 890,500.00**

Table No. 8-17

Union Township Sewer Basin - Mounts Run North Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Mounts Run North Interceptor					
	8" Dia. Gravity Sewer	L.F.	1,300	$ 55	$ 71,500.00
	10" Dia. Gravity Sewer	L.F.	8,200	$ 75	$ 615,000.00
	Standard Manhole	EA.	40	$ 3,500	$ 140,000.00
	Granular Backfill	L.F.	5,100	$ 45	$ 229,500.00
	Paved Surface Restoration	L.F.	800	$ 40	$ 32,000.00
	Dewatering	L.S.	1	$ 120,000	$ 120,000.00
	Erosion Control	L.S.	1	$ 24,000	$ 24,000.00
	Grading and Seeding	L.F.	9,000	$ 5	$ 45,900.00
	Subtotal				**$ 1,277,900.00**
	+/-20% Construction Contingency				$ 256,000.00
	Estimated Construction Cost				**$ 1,533,900.00**
	Land Acquisition	Acre	5	$ 8,000	$ 40,000.00
	Est. Non-Construction Cost @ +/-25%				$ 383,000.00
	Estimated Total Project Cost				**$ 1,956,900.00**

Table No. 8-18

Union Township Sewer Basin - Mounts Run South Interceptor
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Mounts Run South Interceptor					
	8" Dia. Gravity Sewer	L.F.	1,300	$ 55	$ 71,500.00
	10" Dia. Gravity Sewer	L.F.	900	$ 75	$ 67,500.00
	12" Dia. Gravity Sewer	L.F.	4,200	$ 85	$ 357,000.00
	15" Dia. Gravity Sewer	L.F.	6,300	$ 115	$ 724,500.00
	Standard Manhole	EA.	50	$ 3,500	$ 175,000.00
	Granular Backfill	L.F.	4,500	$ 45	$ 202,500.00
	Paved Surface Restoration	L.F.	700	$ 40	$ 28,000.00
	Dewatering	L.S.	1	$ 130,000	$ 130,000.00
	Erosion Control	L.S.	1	$ 26,000	$ 26,000.00
	Grading and Seeding	L.F.	12,000	$ 5	$ 61,200.00
	Subtotal				**$ 1,843,200.00**
	+/-20% Construction Contingency				$ 369,000.00
	Estimated Construction Cost				**$ 2,212,200.00**
	Land Acquisition	Acre	7	$ 8,000	$ 56,000.00
	Est. Non-Construction Cost @ +/-25%				$ 553,000.00
	Estimated Total Project Cost				**$ 2,821,200.00**

Table No. 8-19

Union Township Sewer Basin - Pleasant View Sewer
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Pleasant View Sewer					
	12" Dia. Gravity Sewer	L.F.	2,200	$ 85	$ 187,000.00
	Standard Manhole	EA.	10	$ 3,500	$ 35,000.00
	Granular Backfill	L.F.	2,000	$ 45	$ 90,000.00
	Paved Surface Restoration	L.F.	300	$ 40	$ 12,000.00
	Dewatering	L.S.	1	$ 130,000	$ 130,000.00
	Erosion Control	L.S.	1	$ 26,000	$ 26,000.00
	Grading and Seeding	L.F.	2,000	$ 5	$ 10,200.00
	Subtotal				**$ 490,200.00**
	+/-20% Construction Contingency				$ 98,000.00
	Estimated Construction Cost				**$ 588,200.00**
	Land Acquisition	Acre	1	$ 8,000	$ 8,000.00
	Est. Non-Construction Cost @ +/-25%				$ 147,000.00
	Estimated Total Project Cost				**$ 743,200.00**

Table No. 8-20

Union Township Sewer Sub-Basin - County Road 200 South Lift Station
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
County Rd. 200 S. Lift Station					
	Proposed County Rd. 200 S. Lift Station	EA.	1	$ 460,000	$ 460,000.00
	8" Force Main	L.F.	5,800	$ 42	$ 243,600.00
	Dewatering	L.S.	1	$ 5,000	$ 5,000.00
	Erosion Control	L.S.	1	$ 1,000	$ 1,000.00
	Grading and Seeding	L.F.	3,000	$ 5	$ 15,300.00
	Subtotal				**$ 724,900.00**
	+/-20% Construction Contingency				$ 145,000.00
	Estimated Construction Cost				**$ 869,900.00**
	Land Acquisition	Acre	2	$ 8,000	$ 16,000.00
	Est. Non-Construction Cost @ +/-25%				$ 217,000.00
	Estimated Total Project Cost				**$ 1,102,900.00**

Table No. 8-21

Union Township Sewer Sub-Basin - 0.25 MGD Phase I Wastewater Treatment Facility
Recommended Projects and Estimated Costs (2011)

Project No.	Description	Unit	Estimated Quantity	Unit Cost	Estimated Capital Cost
Proposed 0.25 MGD Wastewater Treatment Facility					
	New Waste Water Facility - 0.25 MGD	L.S.	1	$ 1,600,000	$ 1,600,000.00
	Subtotal				**$ 1,600,000.00**
	+/-20% Construction Contingency				$ 320,000.00
	Estimated Construction Cost				**$ 1,920,000.00**
	Est. Non-Construction Cost @ +/-25%				$ 480,000.00
	Estimated Total Project Cost				**$ 2,400,000.00**

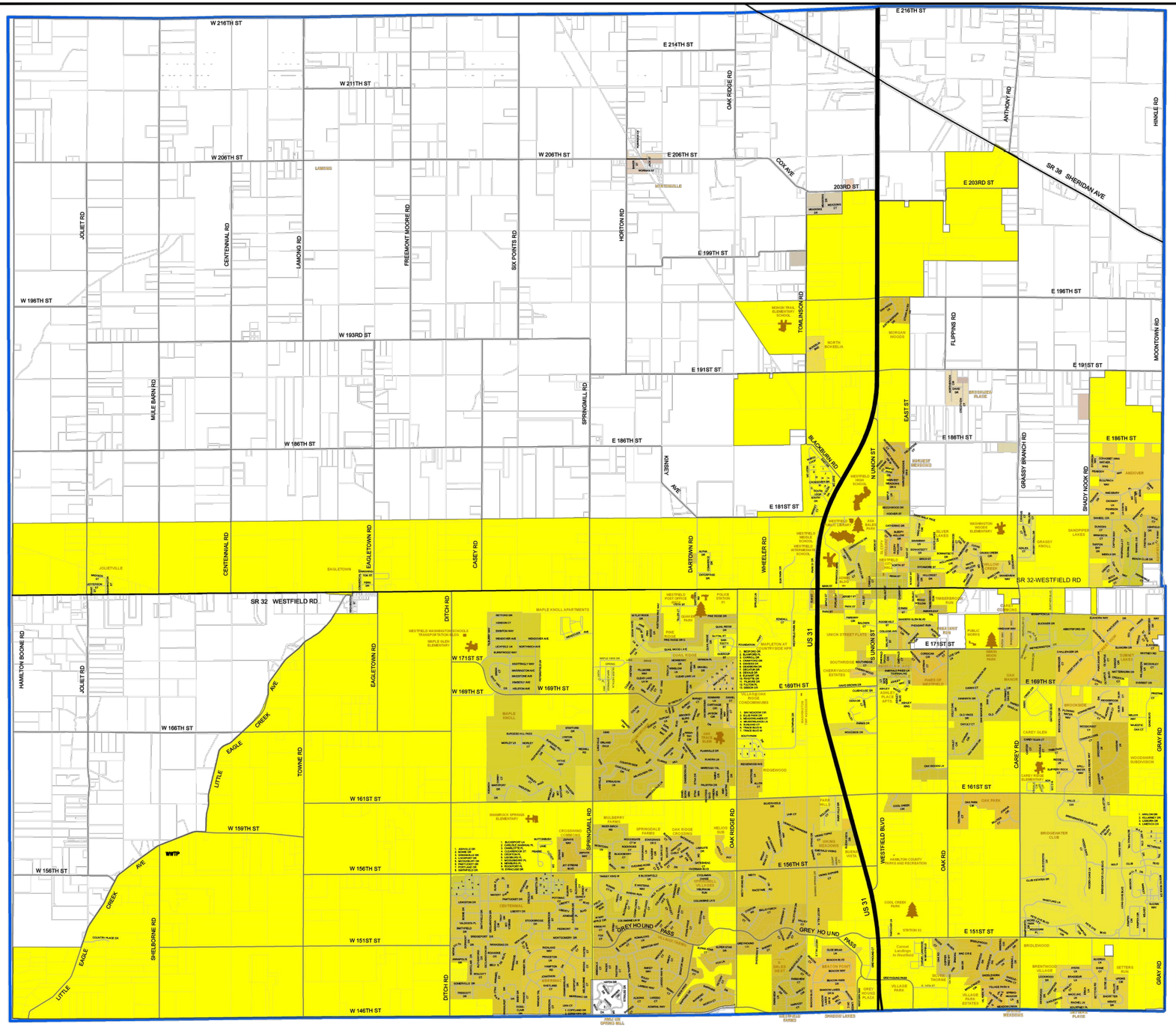
SECTION 9
STAKEHOLDERS/OPTIONS FOR SERVICE/ TREATMENT

A. Stakeholders Interested in Providing Wastewater Services to the Union Township Area of Zionsville

Project costs generated in the earlier Section were provided with the understanding that the Town of Zionsville would be the sole provider of services and treatment for future development and expansion. Prior to the passing of the new consolidated Town limits of Zionsville, Union Township Trustees were perceiving possible annexation pressures from the City of Westfield to their east in adjoining Hamilton County. Westfield had earlier annexed an East to West strip approximately ½ mile wide along the north side of SR 32 all the way to the Boone-Hamilton County line (See **Figure 7-0 City of Westfield and Washington Township**). Some time ago, Boone County had an opportunity to purchase the Terry Airport (in Union Township) but turned it down. Hamilton County later decided to purchase the airport which has been renamed the Indianapolis Executive Airport. This is located on the south side of SR 32, approximately one half mile west of the Boone-Hamilton County line. Concern was raised that a logical step for Westfield might be to annex the area around the airport to bring wastewater services to develop the area. Additionally, Whitestown had recently been expanding their corporate limits.

To reduce the possibility of having Union Township becoming split, the Township Trustees decided to approach Hamilton Southeastern Utilities, Inc., (HSE) a private utility. HSE later applied for, and was awarded, a Certificate of Territorial Authority ("CTA") for Union Township, granting tentative rights to provide sanitary sewer services for the Township.

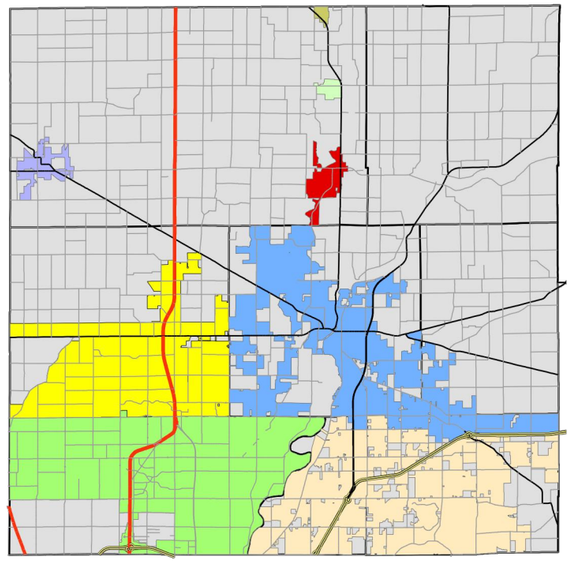
In 2008, Zionsville, Union and Eagle Township voters approved a Plan of Reorganization by which Union and Eagle Township will merge with and into Zionsville. In June of 2009, the Town of Zionsville, Union Township and HSE signed a Territorial Sewer Agreement whereby Zionsville, after the effective date of the Reorganization, shall have an option to direct whether HSE may retain or require withdrawal of its CTA.



City of Westfield
Indiana 1834
Old Town Charm, New City Style

City of Westfield and Washington Township March 22, 2010

- WASHINGTON TOWNSHIP PARCELS
- WASHINGTON TOWNSHIP
- WESTFIELD CITY LIMITS



Hamilton County Overview Map

Arcadia | Atlanta | Carmel | Cicero | Fishers | Noblesville | Sheridan | Westfield

DISCLAIMER: The City of Westfield, Indiana has created this map in an attempt to increase the availability of public information and enhance public knowledge. The city is continually collecting, maintaining and updating data. Information for the map themes was obtained from existing, and many times historical documentation. Because of this, the information displayed on this map is not guaranteed to be completely accurate or all inclusive. The City of Westfield retains the right to change the content of this map without prior notice. The City of Westfield assumes no liability for any actions or occurrences that may result from persons viewing the information contained on this map. This map is not meant to take the place of any existing guidelines, rules, regulations or legal procedures. No information displayed on this map should be used in place of legal documentation. Field investigations are still necessary for locating underground facilities, and contact with appropriate departmental staff is still required for determining location-based fees/designations.

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

CITY OF WESTFIELD AND WASHINGTON TOWNSHIP
FIGURE 7-0

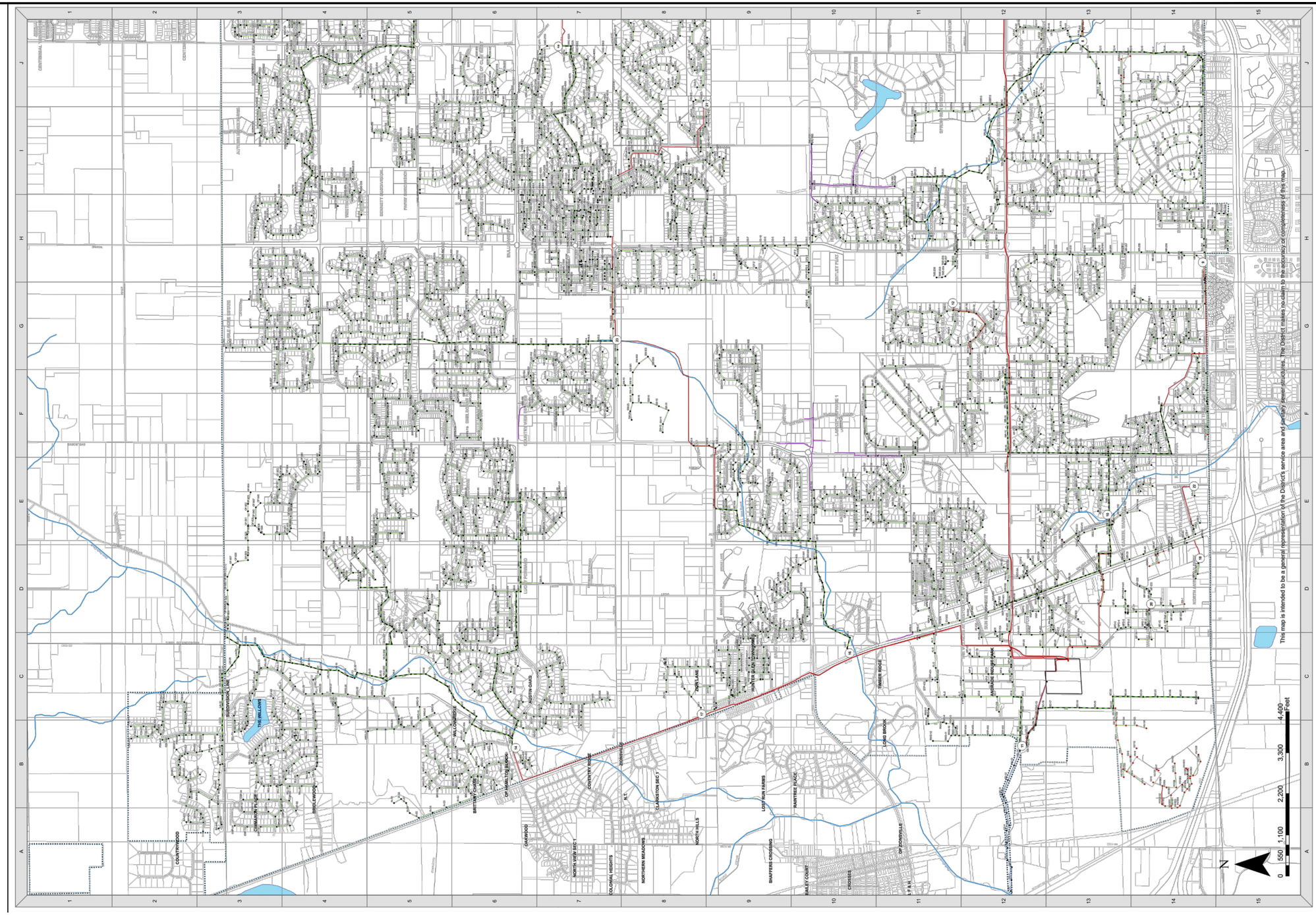
The reorganization of Zionsville, Union and Eagle Township became effective on January 2, 2010. One goal of this Master Plan is to provide the Town of Zionsville sufficient information to make a final determination on a sanitary sewer provider within the former Union Township area. In addition to the Zionsville Wastewater Department, Clay Township Regional Waste District and the City of Westfield Sanitary Sewer Utility are the other important utility stakeholders that may be determined to play a role in providing sanitary sewer service to some portion of the study area. Each of these utilities either border upon the study area or is otherwise an interested party (See **Figure 7-1 Clay Township Regional Waste District**).

We have provided some history and background information for each of the stakeholders in **Appendix F**. In addition, a meeting was conducted with Zionsville Town Manager, Edward J. Mitro; Wastewater Superintendent, Dennis Mackey; representatives from Commonwealth Engineers, Inc. and representatives from each of the Stakeholders. Below we have attempted to highlight the advantages and disadvantages of utilizing one of the stakeholders in providing sanitary sewer service to some portion of the study area.

1. Hamilton Southeastern Utilities, Inc.

Advantages:

- As a private sanitary sewer utility, HSE may be interested in starting sanitary sewer construction sooner than a public utility if it has the available funds and if it considers such a plan to be a sound investment.
- HSE indicates they utilize SAMCO for all their construction needs which provides them a known consistency in field operations.
- HSE has a reputation for having watertight sewer systems with very low infiltration rates.
- HSE may be willing to construct and pay for the collection system needed to take flow to adjacent WWTP (Westfield or Clay Township)
- Have prepared a Sanitary Sewer Master Plan for Study Area initially when applying for CTA approval but didn't reflect Zoning. Have since upgraded with three versions to address Zoning for Consolidated Town of Zionsville.



CLAY TOWNSHIP
REGIONAL WASTE DISTRICT
10701 N. College Avenue, Suite A Indianapolis, Indiana 46280
Providing high quality, cost-effective sanitary sewer service to our community

Sewer Main Type
Mains

Sewer Type
Interceptor
Low Pressure Force Main
Force Main
Outfall

Sewer Manholes
CTRWD
Private

Updated January 11, 2010

COMMONWEALTH ENGINEERS, INC.

TOWN OF ZIONSVILLE, INDIANA

SANITARY SEWER MASTER PLAN

CLAY TOWNSHIP REGIONAL WASTE DISTRICT
FIGURE 7-1

Disadvantages:

- HSE may determine that the capital expenditure in Union Township will not provide a timely return on investment. This could potentially lead to a delay in the development of the needed sewer infrastructure.
- HSE currently does not operate treatment facilities, although they have qualified people on staff who could. HSE would prefer that Zionsville Utilities hold an NPDES Permit for the plant and provide operations if a new WWTP is utilized for the Union Township area.
- If HSE constructs the sewer facilities, the Town relinquishes control of sewer rates unless some form of agreement is reached which would allow the Town to acquire the sewer assets in the future. The Town would also lose the ability to schedule construction activities. Zionsville would retain some degree of control through planning and zoning.

2. Clay Township Regional Waste District (CTRWD)

Advantages:

- Current Zionsville sanitary sewer customers east of Michigan Road are already served by the Clay Township Regional Waste District and have been utilizing CTRWD as their service provider for a number of years.
- CTRWD's Michigan Road WWTP currently has 0.50 MGD capacity available and it is expected that number to increase to 1.0 MGD next year.
- CTRWD's preliminary wholesale cost for bulk treatment of wastewater is the lowest of the neighboring utilities.
- As a municipal corporation, the CTRWD is a political entity created, organized, and operating under the laws of the State of Indiana. The District is governed by State statutes and by a nine member Board of Trustees. One member is appointed by the Boone County Commissioners. Zionsville therefore has an indirect representative on the Board, giving some degree of representation to the Town Council.
- The Boone County appointee is currently Eric Hand whose term will expire on 12-31-2012.

- Many of the recommended sewer projects would be privately funded by the development community, helping to reduce costs to the residential users.

Disadvantages:

- Private funding by developers may make sewer construction activities dependent upon economic conditions and the vitality of the local housing market. Given the current state of the housing market, Developers may postpone sewer installation activity until conditions improve.
- The connection point for the discharge of wastewater to the CTRWD would likely be south of 116th Street, requiring over 5 miles of force main for conveyance.

3. City of Westfield

Advantages:

- Westfield Wastewater Treatment Plant has a Design Average Flow capacity of 3.0 MGD, of which only 50 % is currently being utilized.
- There is capacity available that could allow Zionsville to work out an agreement in which a portion of the Westfield Plant capacity could be reserved for future use.

Disadvantages:

- As with the CTRWD, private funding of sewer projects could delay extension of sewers until significant development has begun.
- As with the utilization of any stakeholder, the Town relinquishes control of wastewater treatment rates.
- The preliminary bulk treatment rate is higher than that of the Clay Township Regional Waste District.

4. Zionsville Utilities

Advantages:

- Providing sanitary sewer collection, transporting and treatment keeps the rate determination for these services local and more controllable.

- The scheduling of new utility construction could be more easily controlled locally.
- If job generation could be documented, funding for utility extensions can be applied for through the State
- Many projects would be privately funded by developers or through fees collected which reduces cost to the residential users.

Disadvantages:

- Costs for construction of a wastewater treatment facility in Union township will require significant capital investment. Without an existing customer base, it will be difficult to generate the revenues necessary to meet associated debt service requirements.
- The existing WWTP would need to be expanded if it were to accommodate both the future Eagle Township build out and the future Union Township development. Due to the distance from Union Township and the long force mains that would be required, a new WWTP facility centrally located in Union township would be better suited for handling growth in the north.
- Operating a second WWTP site would require increased staff, higher operation costs and some duplication of equipment
- The current monthly sanitary sewer rate for unmetered users (flat rate) for Zionsville Utilities is higher than CTRWD, who is already providing service in parts of Zionsville. With new construction for Union Township sewer/treatment usage, a third rate may need to be created which would most likely be higher and less palatable to the local community.

B. Work Group Recommendation Regarding Wastewater Service to Union Township

As earlier noted, Hamilton Southeastern Utilities, Inc. ("HSE") has been granted a provisional CTA from the IURC to provide sanitary sewer service to a large portion of Union Township. This CTA is subject to an agreement with the Town of Zionsville and the former Union Township Trustees that a sanitary sewer study/plan would be

conducted to determine sanitary service to the area. The agreement allows the Town of Zionsville to make a final determination on a sanitary sewer provider within the former Union Township area of Zionsville. A variety of considerations need to be incorporated into that determination.

Since two of the stakeholders have wastewater treatment plants with reserve available capacity, it is possible that the final selection may involve utilizing a combination of one stakeholder to install and maintain the collection system and another to treat the wastewater. Another alternative would be that of the Town maintaining ownership of collection and conveyance facilities, with one of the stakeholders providing wastewater treatment services.

The final recommendation of the Master Plan Work Group was presented previously in the Executive Summary on Page 9 of this report. That recommendation favors an Interim Plan which would allow the Town of Zionsville to maintain ownership of all public wastewater collection and conveyance facilities in Union Township. Under this plan, the majority of future sanitary sewers in Union Township would be funded and constructed by the development community and subsequently dedicated to the Town.

Most of the recommended improvements in Eagle Township would also be developer funded. It is the intent of the Work Group that the Town be financially responsible only for those sewer collection facilities needed to provide the necessary foundation for future developer funded sewer extensions.

The recommendations of the Work Group are presented in a map included in **Appendix H** of this report. The sewer collection facilities which are shown to be locally funded should allow future development to take place in a largely unimpeded manner. The Work Group's recommendation also supports an interim plan to convey Union Township wastewater to the Clay Township Regional Waste District for treatment, subject to the successful execution of a mutually agreeable form of agreement with provisions for amendment, renewal, and termination upon successful vote of the Town Council.

SECTION 10
SERVICE TO DEVELOPED, UN-SEWERED AREAS

There are a number of existing developments within the Town's corporate limits which are not currently provided with sanitary sewer service. The best examples of un-served areas are the existing developments lying along or near State Road 334 west of Sheets Road, including Russell Lake, Deer Ridge, Lakeview, Boone Ridge, and Irish Hill. These areas are not served due most likely to the problematic nature of the local topography. Portions of these developments lie at lower elevations within the Irishman's Run watershed. Such areas will not be able to be served by gravity flow to the existing sanitary collection system due to their location relative to the Irishman's Run drainage-way. Conventional gravity sewers with lift stations or low pressure sewer systems will be required to serve these developments.

Timing of construction activity will be an important issue if these developments are to be served in the future. Sanitary sewer flows from the un-served areas could be directed to the 12" diameter upstream end of the Hunters Point Sewer or directly to the Western Interceptor. Serving these areas in this manner must not be done, however, until the Irishman's Run Lift Station flow has been removed from the Western Interceptor by redirecting it to the existing wastewater treatment plant. This is a key element of the overall sanitary sewer conveyance plan. Redirecting flow from the lift station will provide the additional capacity needed in the Western Interceptor to accommodate future wastewater flows from all of these un-sewered areas.

Future wastewater flow projections for the year 2035 have accounted for the conveyance of wastewater from these un-served areas to the upstream section of the 12" Hunters Point Sewer. An alternative means of serving the above mentioned developments would be to convey flow northward by pumping to the Irishman's Run Lift Station or to the future West Eagle Township Interceptor. Again, this should not be done until the Irishman's Run force main has been redirected to the existing wastewater treatment facility.

Another un-sewered development is Sycamore Bend, a subdivision of roughly 100 homes lying south of Cobblestone Lakes along Whitestown Road. Year 2035 flow projections provided in the Master Plan have accounted for the conveyance of wastewater from Sycamore Bend to the Cobblestone Interceptor.

A. Special Improvement Districts

Special Improvement Districts are often formed to extend sanitary sewer service or other needed infrastructure to developed but un-served areas. For homeowners in these areas, there are generally four costs associated with constructing and connecting to the public sanitary sewer system through a Special Improvement District:

1. Design and Construction Cost Assessment
2. Connection Permit
3. Private Plumbing Costs
4. Monthly Sewer Service Charges

Cost information for a Special Improvement District project is typically developed in an engineering and assessment report prepared for a specific improvement. Homeowners should be advised early in the process that the total cost for physically connecting to Utility owned facilities is the responsibility of the property owner and will be done solely at their expense. All benefited property owners share the costs for the design and construction of the sewers, including surveying, easements, construction contracts, and administration costs.

A private sewer lateral would be constructed from the main line to the homeowner's property line as part of the project. Additional costs which are the homeowner's responsibility include any applicable permits, connecting house plumbing to the sewer lateral, and decommissioning the existing septic system. The property owner typically hires a licensed plumbing contractor to perform this work.