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Town of Newburgh

Forest Park Drainage Improvements and Master Plan Update

May 2019

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TOWN OF NEWBURGH

FOREST PARK DRAINAGE IMPROVEMENTS &

MASTER PLAN UPDATE

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EXECUTIVE SUMMARY

A. Introduction

The Town of Newburgh is located in the southwest part of Indiana, with the southern border being the Ohio River. The Town resides in Ohio Township of Warrick County. The 2010 census population of Newburgh was shown to be 3,328; however, the Town is considered part of the larger Evansville metropolitan area.

Under the federal Clean Water Act's National Pollutant Discharge Elimination System (NPDES) program, the Town was required to become a permitted Municipal Separate Storm Sewer System (MS4) entity under the Phase II program (327 IAC 15-13). The Town currently operates under permit INR040062.

The Town has a three-member Storm Water Management Board of Directors, a Storm Water Management Commissioner – Liaison and Storm Water Management Administrator. The Board has general supervisory powers over the storm water utility, including, but not limited to: assessing and developing reasonable and just rates, reviewing and approving storm water plans, adopting rules for management and protection of the utility, and awarding of capital improvement projects.

The Town has general provisions and drainage regulations through the Town's adopted 2016-12 ordinance. Minimum design considerations are provided within Chapter 152: Drainage of this ordinance.

The Town presently assess a $7.50 per month storm water user fee per equivalent dwelling unit (EDU). This fee was recently raised in anticipation of the Town completing capital improvement projects. The EDU methodology is based on average impervious area for a single-family dwelling, equating to one EDU. All other properties are then assessed a fee based on land improvements and amount of impervious area divided by the single family swelling average impervious area.

The intent of this report is to provide a detailed review and analysis of the Forest Park Subdivision area and provide a comprehensive update to the Town's Master Plan. The focus of the report would be to evaluate the Town's priority storm areas within Town's incorporated limits. Key watersheds, which may extend beyond Town's incorporated limits, would be evaluated to determine need or improvements required for the Town's priority storm infrastructure. This evaluation includes visual observations, existing condition assessment, hydraulic capacity review, drainage ordinance review, risk assessment, and conceptual sizing and configuration options for future improvements. All alternatives presented here-in are consistent with the Town's long-term goals and established hydraulic criteria.

In addition, this report will discuss the current situation, evaluate future growth, identify feasible project alternatives, total project cost, and project implementation schedule. In general, this report will present the following:

- **Project Planning** – Identifies the location, environmental resources, population trends and community engagement.
- **Existing Facilities** – Describes the location, history, condition, and financial status of the existing facilities.
- **Need for Project** – Discusses the reasons for the project, including: health, sanitation, aging infrastructure and growth needs.
- **Alternatives Considered** – Identifies feasible solutions to address current and future issues facing the stormwater utility. This section evaluates each solution with regard to risk assessment (design criteria), costs, technical considerations, constructability, land requirements, and environmental impacts.
- **Selection of an Alternative** – Evaluates non-monetary impacts of the recommended alternatives.
- **Proposed Project** – Describes the proposed project to address current and future issues associated with the stormwater system. Includes total project costs, implementation scheduling, annual operating budget, and permit requirements.
- **Conclusion and Recommendations**

B. Existing Facilities

The Town of Newburgh has three major watersheds within the Town's incorporated limits. The Town's facilities contain open ditches, swales, culverts, detention basins, storm sewers, inlets and manholes. In general, much of the infrastructure is aging or below the minimum 25-year storm hydraulic capacity.

C. Recommended Project Solutions

This Stormwater Preliminary Engineering Report presents the results of an engineering evaluation of fifteen (15) identified priority flood prone areas within the incorporated limits of the Town of Newburgh. Each area was presented with different alternatives to help alleviate the drainage issues that were identified. The recommended alternatives resulting from this study can be found in **Section D** below.

D. Total Project Estimated Cost and Implementation Schedule

Total proposed recommended project cost are provided in **Table ES-1**. This Table is to assist the Town in prioritizing projects based on financial considerations. With the overall project cost, it is understandable that the Town would not want to finance, nor have the ability to, complete all said improvements in one single project. Rather the Town should consider prioritizing the projects, take advantage of any funding opportunities and phase

the work to accomplish smaller goals over longer time period in order to complete the overall objective.

Note, project costs shown are based on 2019 dollars. No inflation is included for construction that takes place after the year 2019. Typical, 3-5% inflation rate is recommended for each year construction takes place after 2019.

TABLE ES-1
TOTAL ESTIMATED PROJECT COST

AREA #	ITEM, DESCRIPTION	EST COST
ESTIMATED CONSTRUCTION COST:		
Area No. 1-A	Alternate 1 – 25-YR Storm Infrastructure (38" x 60" Elliptical Storm Sewer)	$ 400,055
Area No. 1-B	Alternate 3 – Articulated Concrete Block Mat Reinforcements	$ 138,150
Area No. 1-C	Alternate 1 – 25-YR Storm Event Infrastructure (6' x 3' Box Culvert)	$ 89,320
Area No. 1-D	Alternate 3 – Articulated Concrete Block Mat Reinforcements	$ 103,000
Area No. 1-E	Alternate 1 – 25-YR Storm Event Infrastructure (6' x 4' Box Culvert)	$ 218,370
Area No. 2	Alternative 1 – New Drainage Infrastructure Along Entirety of Forest Park Drive	$ 892,330
Area No. 3-A	Alternative 2 – Line Existing 30-inch Storm Sewer	$ 59,015
Area No. 3-B	Alternative 1 – Install New Storm Sewer Across Cypress Street	$ 83,955
Area No. 4	Alternative 1– New Concrete Curb, Gutter, Sidewalk, and Barrier Wall	$ 100,340
Area No. 5	Alternative 1 – Encapsulate Existing Ditch with Proposed Storm Sewer	$ 255,345
Area No. 6-A	Alternative 1 – New Storm Inlets at State Street	$ 36,830
Area No. 6-B	Alternative 1 – Clean, Realign & Armor Ditch and Install New Storm Inlets	$ 132,530
Area No. 6-C	Alternative 1 – Replace 60-inch Steel Pipe with Proposed 60-inch Storm Pipe	$ 336,545
Area No. 7	Alternative 1 – Install Riprap in Existing Open Ditch	$ 28,275
Area No. 8-A	Alternative 1 – New Storm Infrastructure at Washington Avenue	$ 348,580
Area No. 8-B	Alternative 1 – New Storm Infrastructure at Jefferson Street	$ 252,445
Area No. 8-C	Alternative 1 – New Storm Infrastructure at Market Street	$ 263,320
Area No. 8-D	Alternative 1 – New Storm Infrastructure at Madison Street	$ 263,755
Area No. 8-E	Alternative 1 – New Storm Infrastructure at Monroe Street	$ 239,685
Area No. 9	Alternative 3 – 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Jefferson Street	$ 137,750
Area No. 10	Alternative 1 – New Curb and Gutter and Accompanying Storm Pipes	$ 362,790

TABLE ES-1
TOTAL ESTIMATED PROJECT COST

Area No. 11	Alternative 1 – New Curb, Gutter, and Sidewalk with Accompanying Storm Sewers	$ 999,485
Area No. 12-A	Alternative 1 – Replace Existing 36-inch Storm Pipe	$ 50,605
Area No. 12-B	Alternative 1 – Regrade and Clean Existing Ditch	$ 116,000
Area No. 12-C	Alternative 1 – Install New 6' x 3' Box Culvert	$ 110,780
Area No. 13-A	Alternative 1 – Install New Storm Sewer to North of New Driftwood Subdivision	$ 352,060
Area No. 13-B	Alternative 1 – Repair Existing and Install New Storm Inlets	$ 45,240
Area No. 14	Alternative 1 – Divert Flow to North of Ellerbusch Road	$ 440,220
Area No. 15	Alternative 1 – New Storm Sewer and Inlets	$ 117,015
	Estimated Total Project Cost:	**$ 6,973,790**

General Total Project Cost Notes:

1. Construction Cost Based on 2019-dollar values and current construction trends.
2. For construction activities expected to take place beyond shown, an inflation percentage of 5.00% shall be utilized to develop future cost.

A summary of an example project implementation schedule is provided in **Table ES-2**.

TABLE ES-2
PROJECT SCHEDULE AND MILESTONE DATES

TASK DESCRIPTION	EST COMPLETION DATE
PER Presented to Public	March 2019
Town Approves PER	April 2019
Town Authorizes Design	May 2019
Town Submits All Necessary Construction Permits	September 2019
Town Begins Land Acquisition	September 2019
Town Receives All Construction Permits	November 2019
Final Design Complete	December 2019
Town Completes Land Acquisition	February 2020
Town Approves Design, Plans, and Specs: Authorizes to Bid Project	February 2020
Town Advertises for Construction Bids	February 2020
Town Receives Construction Bids	March 2020
Town Authorizes Construction	May 2020
Town Substantially Completes the Project	November 2020
Town Administratively Completes the Project	December 2020

SECTION 1 – PROJECT PLANNING

A. Project Planning

This section defines the project planning area and the planning period. Background information and current characteristics of the planning area are also provided. This information is important to the engineering analyses and the decision-making process in subsequent sections. The planning area for this project is equivalent to the corporate boundary for the Town of Newburgh. The project areas will be focused on several locations with known stormwater drainage issues within the Town's corporate limits.

B. Location

1. General Description

Newburgh is located approximately two miles to the east of I-69 in southern Indiana, situated on the Ohio River. **Figure 1-1 General Location Map** shows the location of Newburgh in the State of Indiana.

FIGURE 1-1
GENERAL LOCATION MAP
(Indiana Map from the Indiana Geographic Information Council, http://www.indianamap.org)

Figure 1-2 Topo Map and **Figure 1-3 Aerial Map** shows the planning area for the proposed project, all within Town limits (dark-blue outline). Topography of the Town promotes drainage to the Ohio River.

TABLE 1-1
PROJECT LOCATION

COMPONENT	COUNTY	U.S.G.S. QUADRANGLE MAP	TWP	RANGE	SECTION
Stormwater Infrastructure	Warrick	Newburgh	6S	9W	26, 27, 33, 34, 35
Stormwater Infrastructure	Warrick	Newburgh	7S	9W	2, 3, 4

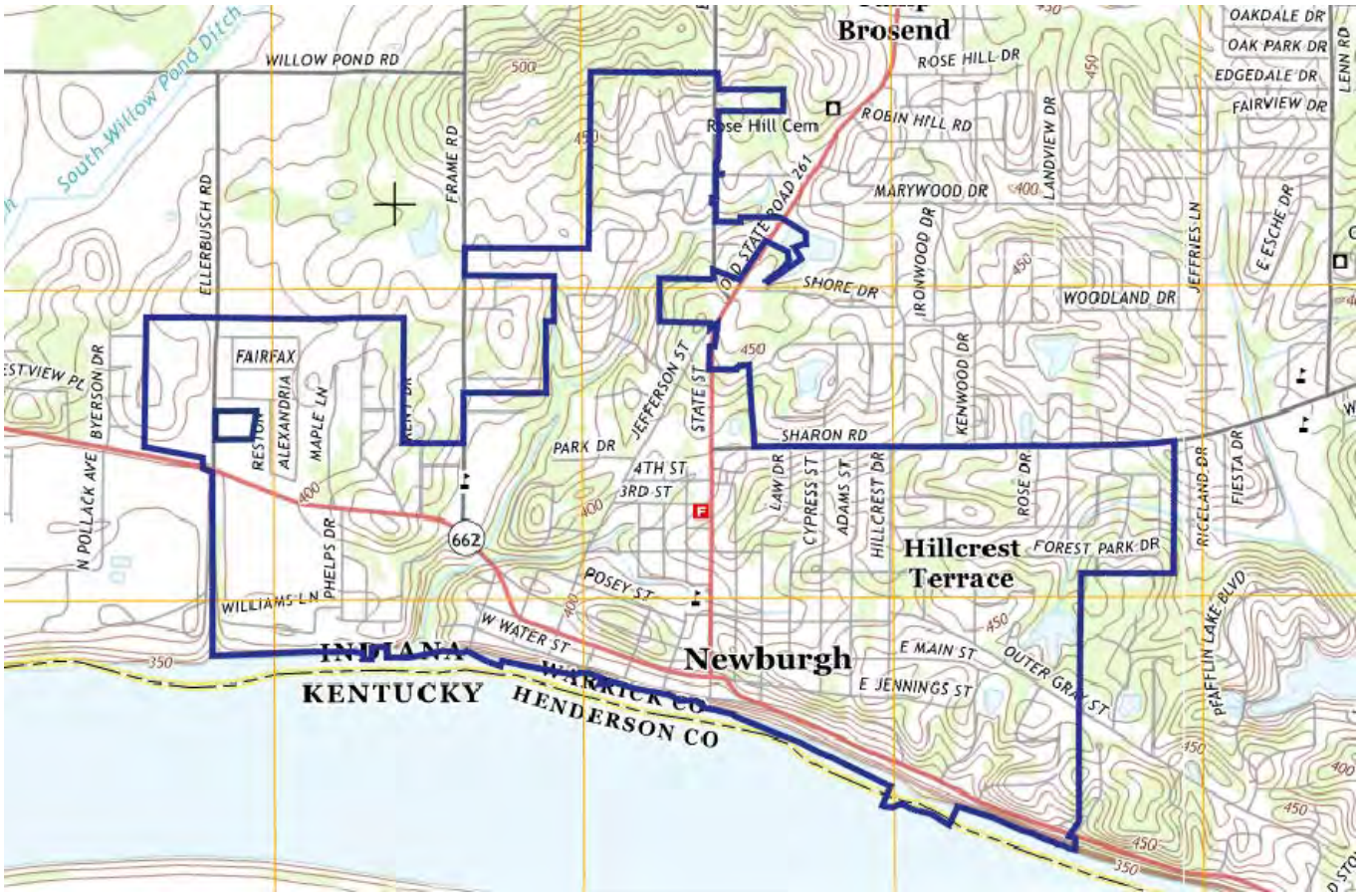


FIGURE 1-2
TOPOGRAPHY MAP
(Indiana Map from the Indiana Geographic Information Council, http://www.indianamap.org)

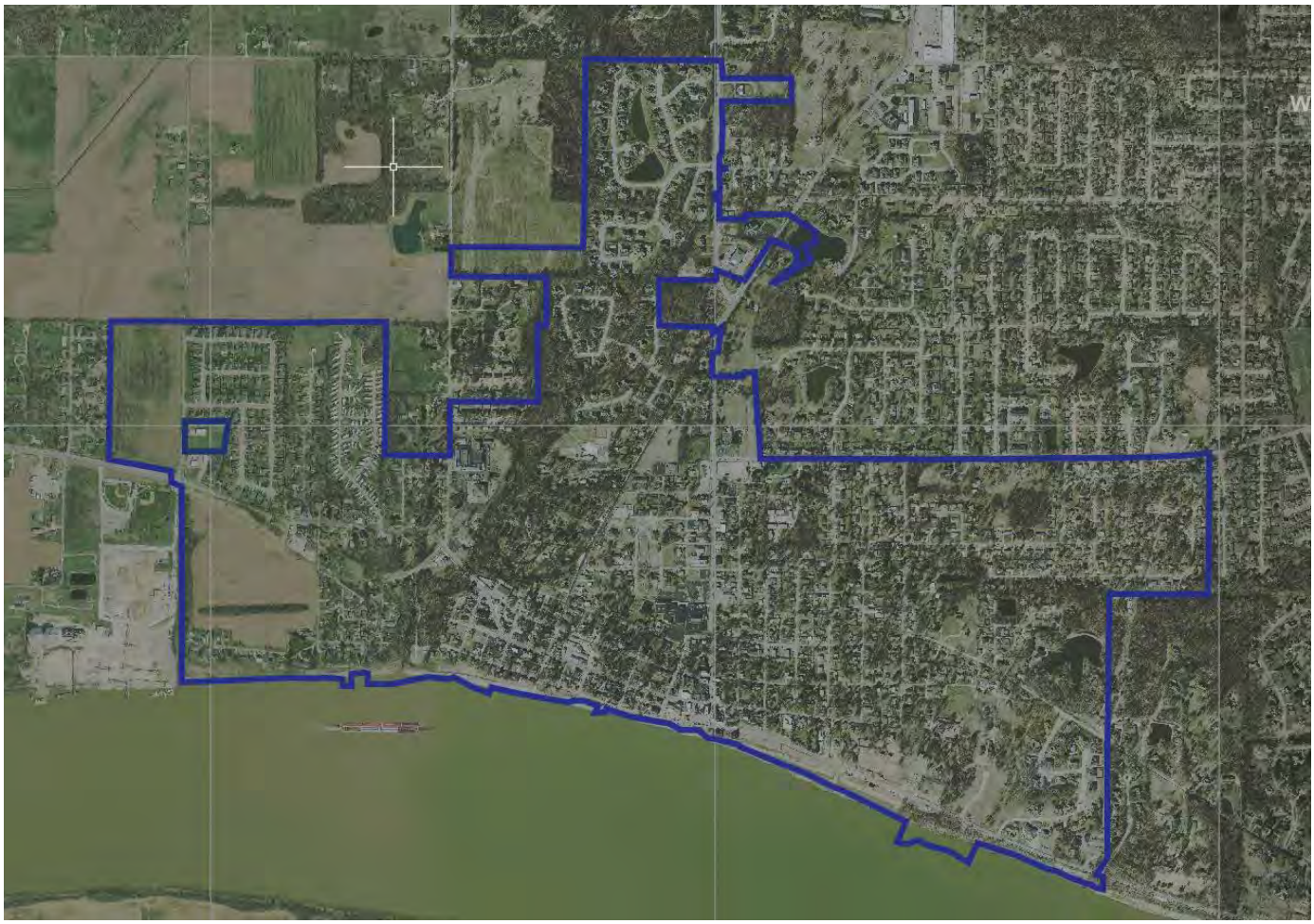


FIGURE 1-3
AERIAL MAP
(Indiana Map from the Indiana Geographic Information Council, http://www.indianamap.org)

C. Environmental Resources Present

This section summarizes the environmental resources present within the planning area, as shown in **Figure 1-2**. The proposed projects will be discussed in general terms to discuss the environmental impact associated for each area. The actual proposed project details will be discussed in Section 04 – Alternatives Considered.

1. Disturbed/Undisturbed Land

The majority of the land, within the Town limits and planning area, consist primarily of developed lands. Medium to high intensity developed land is found in the Town's corporate limits, with low density land and open space developed land, comprising the area outside of the Town.

The proposed improvements will be constructed on previously disturbed land, specifically within existing road right-of-way and where facilities are being replaced in the current location of the existing stormwater infrastructure. Construction projects are not expected to have any detrimental, long-term impacts on the soils. Short-term impact associated with material and equipment transport and installation is expected and will be mitigated through appropriate best management techniques. **Figure 1-4 Land Use Map** generally shows the land use for Newburgh.

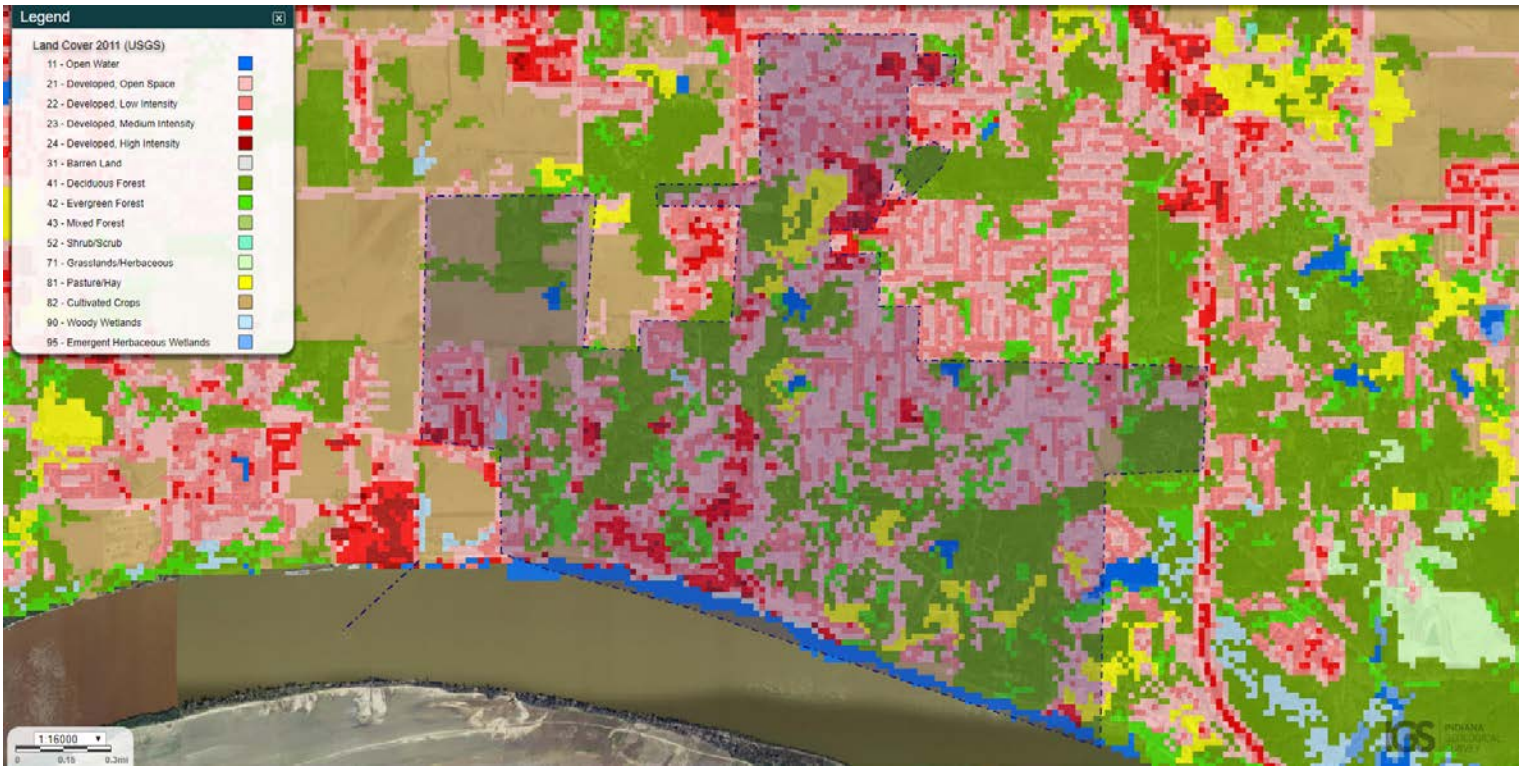


FIGURE 1-4
LAND USE MAP
(Indiana Map from the Indiana Geographic Information Council, http://www.indianamap.org)

2. Topography and Soils

Topography of the Town promotes drainage to the Ohio River. The Ohio River runs from east to west to the south of Town. The Town area contains steep hills (6-30% slopes) and low-lying river bottoms. Elevations in the Town range from nearly 500' at the highest ridge, to approximately 350' at the Ohio River.

Soil survey information, published by USDA Natural Resources Conservation Services through their website (http://websoilsurvey.nrcs.usda.gov), gives basic overall data within the general area that includes soil types, suitability, limitations, properties, and qualities. This information can be used to determine construction techniques and potential impacts. **Figure 1-5** presents the soil classification and hydric soils rating map and corresponding legend for the Planning Area. The soil types identified throughout the project area primarily consist of varying silt loams with differing slopes. Hydric rating is primarily 0%, however, in some of the frequently flooded areas, hydric ratings of 100% are shown.

Construction projects proposed within this Preliminary Engineering Report (PER) are not expected to have any detrimental, long term impacts on the soils. Short term impacts will relate only to excavation activities for the installation of the stormwater infrastructure and is expected to be minimal. These impacts can be easily mitigated by using appropriate techniques for erosion control and surface restoration during and following construction.

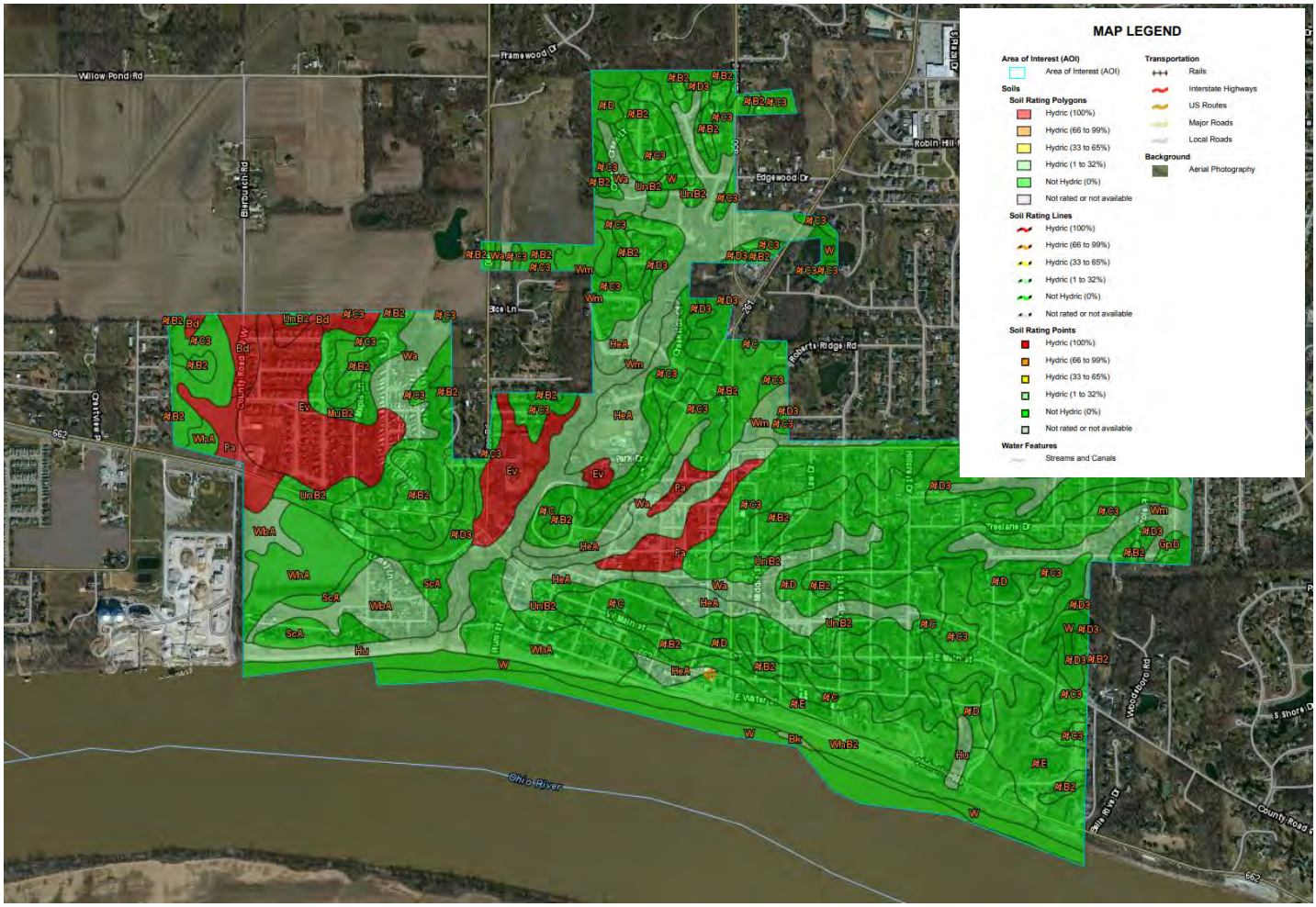


FIGURE 1-5
HYDRIC SOIL MAP
(Web Soil Survey from United States Department of Agriculture, http://www.websoilsurvey.sc.egov.usda.gov)

3. Prime Agricultural Land

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

Figure 1-6, Prime Farmland Classification, shows the project area soils within the service area in regard to farmland classification, including those that are considered prime farmland by the USDA. The Town has a mix of soils classified as "prime farmland", "prime farmland if drained and either protected from flooding or not frequently flooded during the growing season", or "not prime farmland". Portions of the project may be constructed on land classified as prime farmland; however, these project areas will be constructed under roadways and within drainage channels; along currently developed areas; or along road right-of-way.

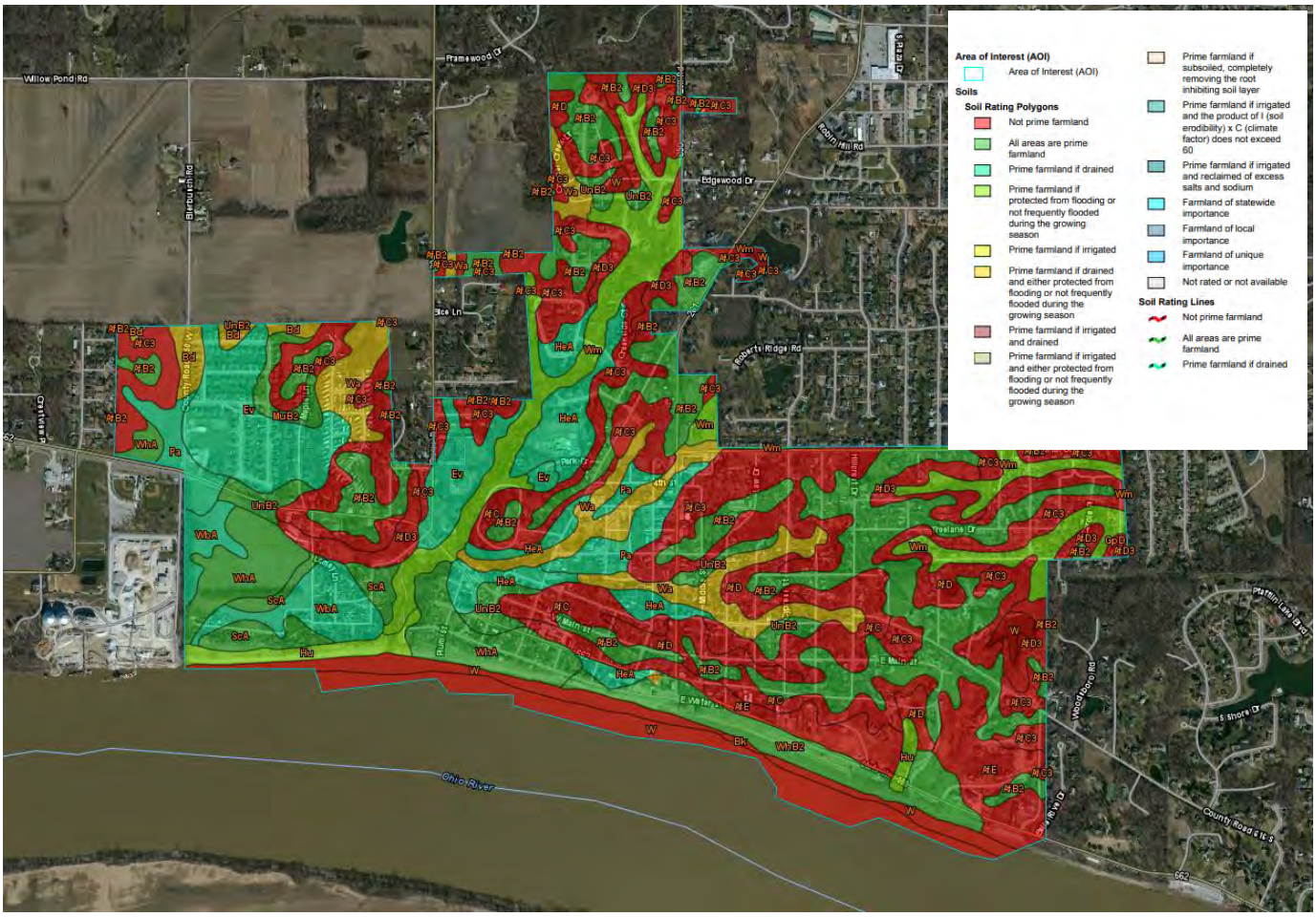


FIGURE 1-6
PRIME FARMLAND CLASSIFICATION
(Web Soil Survey from United States Department of Agriculture, http://www.websoilsurvey.sc.egov.usda.gov)

4. Drainage Basin

The Hydrologic Unit Code is a fourteen-digit code for the drainage basins developed by the U.S. Geological Survey (USGS) and National Resources Conservation Service (NRCS). The project is located within the HUC-14 area: 05140201160040 Ohio River – Kolb Ditch. This HUC designation indicates Newburgh drains to the Ohio River.

5. Wetlands

The U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency define wetlands as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturate soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Wetlands areas are particularly important due to their ability to sustain a vast array of plant and animal life that depend solely on the hydrologic and physiographic conditions. Because of this, wetlands have higher potential to support certain endangered species habitat.

The Indiana Geological Society and the National Wetlands Inventory online maps were examined to identify wetlands areas located within the project area that may be affected by the proposed projects. **Figure 1-7 Wetlands Map** shows wetlands in the project area as reported on Indiana Map. Construction is not anticipated to impact any wetland areas.

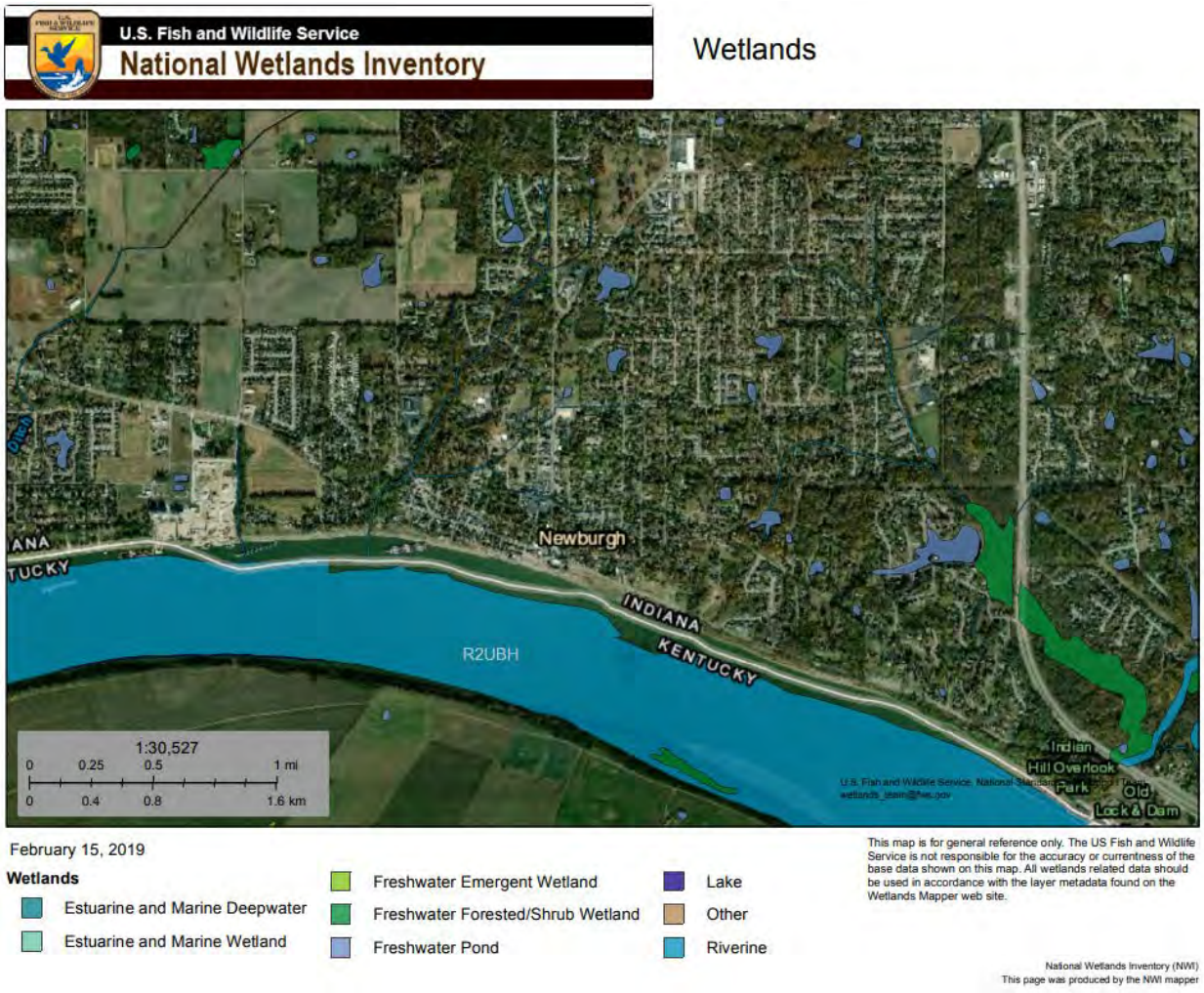


FIGURE 1-7
WETLANDS MAP
(US Fish & Wildlife Service National Wetlands Inventory, http://www.fws.gov/wetlands/Data/Mapper.html)

6. Floodways

The Federal Emergency Management Agency (FEMA) has created flood insurance rate maps, which are used on a national level for guidance regarding building code requirements and flood plain management. A detailed Flood Map, as shown by the Indiana Department of Natural Resources (IDNR) through the Indiana Floodplain Information Portal, is shown for the Town **Figure 1-7 Indiana Floodplain Map**. This figure shows that the Town is partially within the 1% Annual Chance Flood Hazard. The floodplain area for Newburgh is within Zone A floodplain area (approximate study). This Zone A is classified as a 1% (100-year) Annual Chance Flood Hazard Area with base flood elevations and floodway limits

determined. The Town's base flood elevation is between 381.6 and 381.7 (NAVD 88 Datum).

In areas where detailed flood analysis has been performed, base flood elevations have been computed at cross sections of the river or stream. It is important that no fill or structures be placed within the 1% Annual Chance floodway. The floodway is that portion of a river or watercourse and the adjacent areas that must be reserved in order to discharge the 1% Annual Chance flood without cumulatively increasing the water surface elevation. Adding structures, fill, or other encroachments to a floodway can significantly increase the upstream headwater elevations, in turn increasing the potential for damage.

Work within a floodway will require a permit from the IDNR when applicable. Qualified outfall projects (312 IAC 10-5-8) are permitted through a general license, restrictions and requirements must be met. Drainage areas, greater than one square mile, require an IDNR permit.

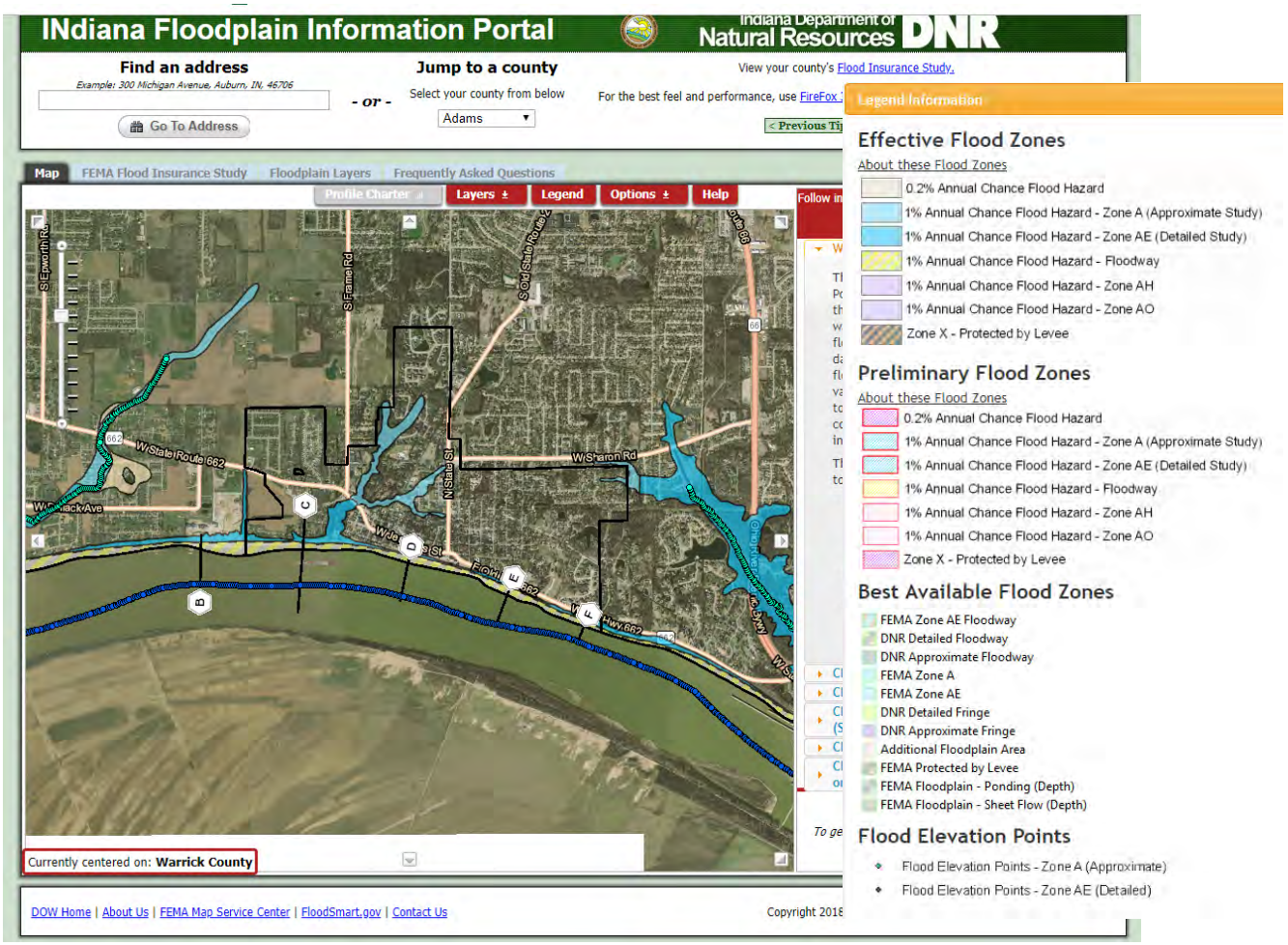


FIGURE 1-8
INDIANA FLOODPLAIN MAP
(IDNR Map from the Indiana Floodplain Information Portal, http://dnrmaps.dnr.in.gov/appsphp/fdms/)

7. Archaeological/Historic Sites

Indiana Department of Natural Resources SHAARD database online has been reviewed for archaeological/historical sites as well as the State and National Registers located within the project area. These sites are physically shown on a map in **Figure 1-8 Historical Sites**

Due to the nature of this project being primarily underground utilities or reconstructing existing structures, all construction for this project would remain within existing or new right-of-way areas. None of the sites identified by the State Register would be impacted by the proposed project.

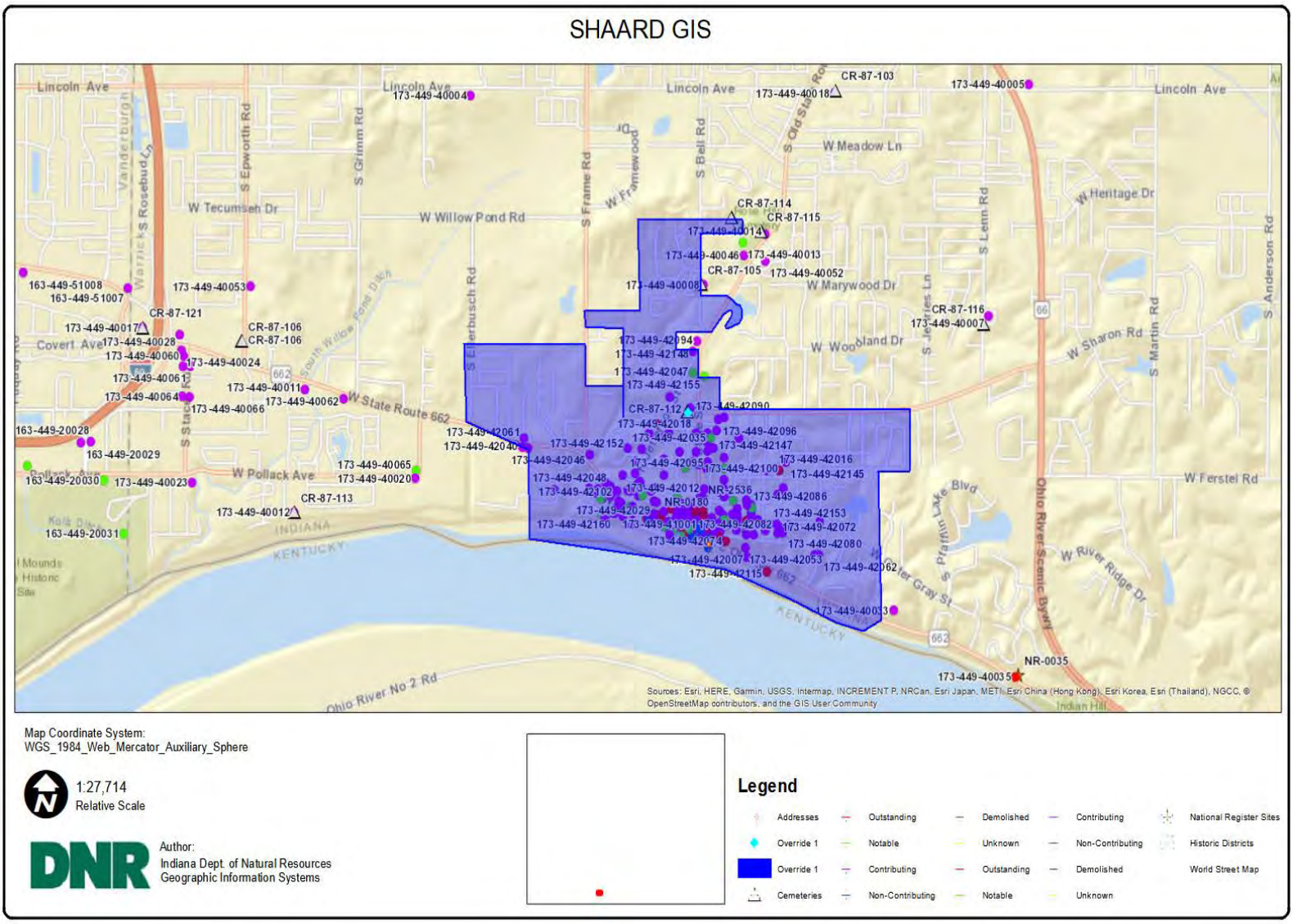


FIGURE 1-9
HISTORICAL SITES
(IDNR SHAARD GIS Map from IDNR Historic Preservation & Archaeology, https://dnrmaps.dnr.in.gov/apps/shaardgis/)

8. Plants and Animals

All construction activity performed, as a result of recommendations of the PER, will be completed on property owned by the Town, within right of way, or dedicated easements. The project will be implemented to minimize impact to non-endangered species and their habitat. Mitigation measures cited in any comment

letters received from the Indiana Department of Natural Resources and the U.S. Fish and Wildlife Service will be implemented.

D. Population Trends

1. Historical Population

The United States Census Bureau counts and tabulates population every 10 years. Locally, data is available for Warrick County and for Newburgh. **Table 1-2** shows the data from the year 1900 to the year 2010. This growth trend is valuable in considering the future population projection.

TABLE 1-2
HISTORICAL POPULATION BY CENSUS COUNT

YEAR	WARRICK COUNTY POPULATION	TOWN OF NEWBURGH POPULATION
1900	22,329	1,371
1910	21,911	1,097
1920	19,862	1,295
1930	18,230	1,262
1940	19,435	1,374
1950	21,527	1,324
1960	23,577	1,450
1970	27,972	2,302
1980	41,474	2,906
1990	44,920	2,880
2000	52,383	3,088
2010	59,689	3,325

2. Projected Population

Population for Newburgh has gradually increased since 1910. Warrick County has also experienced a large growth rate starting in 1930.

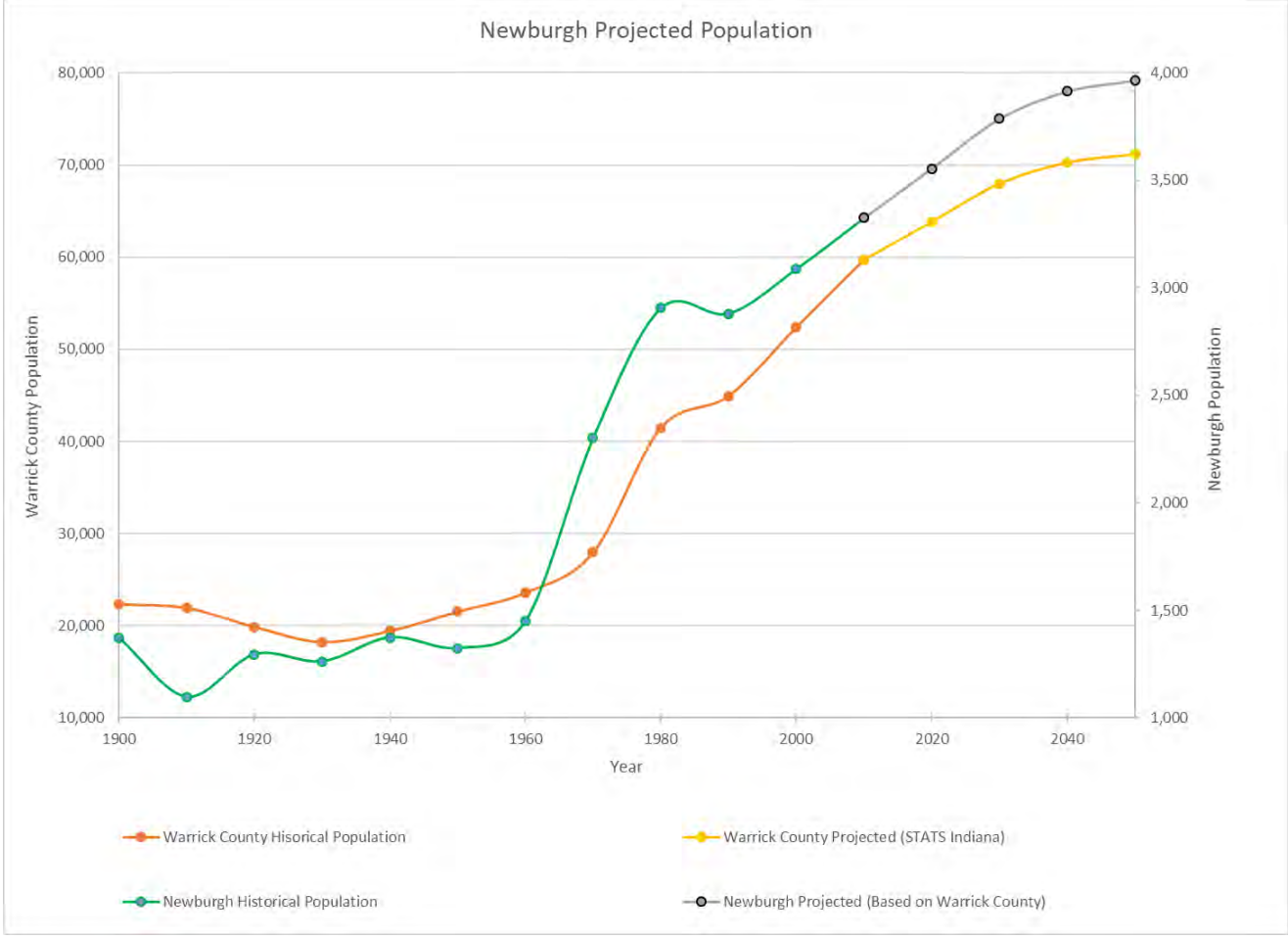


FIGURE 1-10
NEWBURGH POPULATION PROJECTION

As shown in **Figure 1-9 Newburgh Population Projection**, historical population data was plotted for Warrick County and the Town of Newburgh. Indiana STATS provides population projections for counties up to the year 2050, but not for the Town. The projected data shows a continual population incline for Warrick County. Since no projection was separately available through Indiana STATS for Newburgh, a projection was developed using Warrick County Indiana STATS projections. Since no large developments are expected to take place, the projection using Warrick County is considered reasonable to assume for Newburgh (grey line).

The storm infrastructure should be designed for a 20-year period. With most of the infrastructure being located in or already developed areas, the storm will be designed for the existing build out. Typically new larger developments require to retain stormwater (for either 2% or 1% annual chance storm events (50-year or

100-year) and release at the pre-developed 10% annual chance storm event (10-year), which would not impact the new storm infrastructure.

SECTION 2 – EXISTING FACILITIES

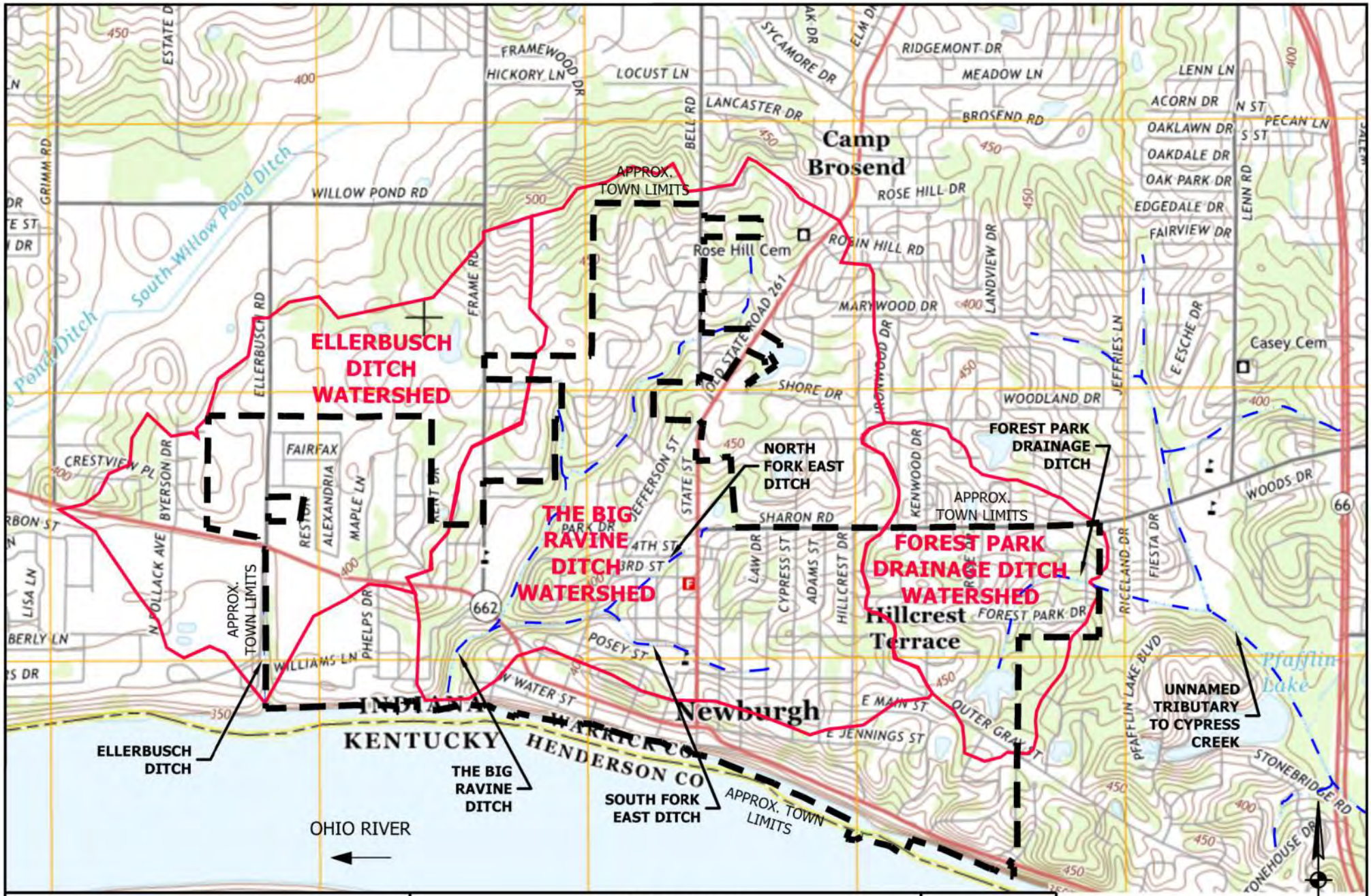
A. Location Map and General Drainage

A location map of the major existing storm watershed basins and channels are shown in **Figure No. 2-1**. In general, the Town drains directly to the Ohio River. The exception is the northeast portion of Town, the Forest Park Subdivision Area. This area outlets to an unnamed tributary to Cypress Creek, which discharges just upstream of the Newburgh Lock and Dam on the Ohio River.

B. History

Like many small communities, the Town's storm drainage facilities were often an afterthought as areas developed. Typically, developers or private property owners gave little anticipation for future development, resulting in minimally sized drainage ditches, pipes, and inlet structures. As roads, homes, churches, parking lots, and commercial and industrial facilities were constructed, impervious areas were added to the landscape. As the impervious areas increased for a given area, the time of concentration and peak flows increased. Existing conveyances became overwhelmed, creating flooding that may not have previously experienced flooding. Without Town ordinances or master planning, acceptable storm facility sizing was typically inadequate, downstream impact was generally not considered, construction material service life was inadequate and installation techniques was inappropriate. This lack of oversight caused the storm sewer system to become inadequately sized, disjointed, and insufficiently documented. In addition, the Town lacked proper funding to operate, maintain, and replace existing facilities; much less provide capital improvements or provide authority to oversee developers or private property owners.

In order to combat developers and private property owners from installing infrastructure without design criteria, downstream impact considerations, or construction oversight, the Town developed a Storm Water Drainage Board. This Board was formed in the late 1980's. The Board finalized a drainage ordinance and technical documents in 1990. Currently, the Town utilizes Ordinance 2016-12, which provides the latest drainage and development procedures. Chapter 152: Drainage, contains general provisions and drainage regulations, including minimum design considerations. The Town does not currently have standard drawings or Town specific design requirements. In addition, the Town has an established stormwater utility to provide a funding mechanism.



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TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

LOCATION MAP &
GENERAL TOWN DRAINAGE

FIGURE 2-1

SCALE: 1"=1600'
1600' 0 1600'

Since the Drainage Board formation, the Town has completed various drainage improvements throughout the Town, review and provide oversight for all developments, planning documents, and funded larger capital improvements projects.

The last Town major capital improvement project, hired by an outside Contractor through public bidding, includes the Westside Drainage Project in 2012 (funded by OCRA Disaster Recovery funds). This project installed a detention pond at Knob Hill Trailer Park and a 30" relief overflow pipe at Maple Lane. When possible, the Town has also worked to complete various small drainage projects through developments and road infrastructure improvements.

C. Condition of Existing Facilities and Priority Areas

The focus of this report is on the Town's established priority areas in which numerous complaints or known issues exist. These areas are shown in **Figure 2-2** and discussed in further detail here-in by the associated designation number.

1. Area No.1 – Forest Park Drainage Ditch Watershed, Downstream Facilities

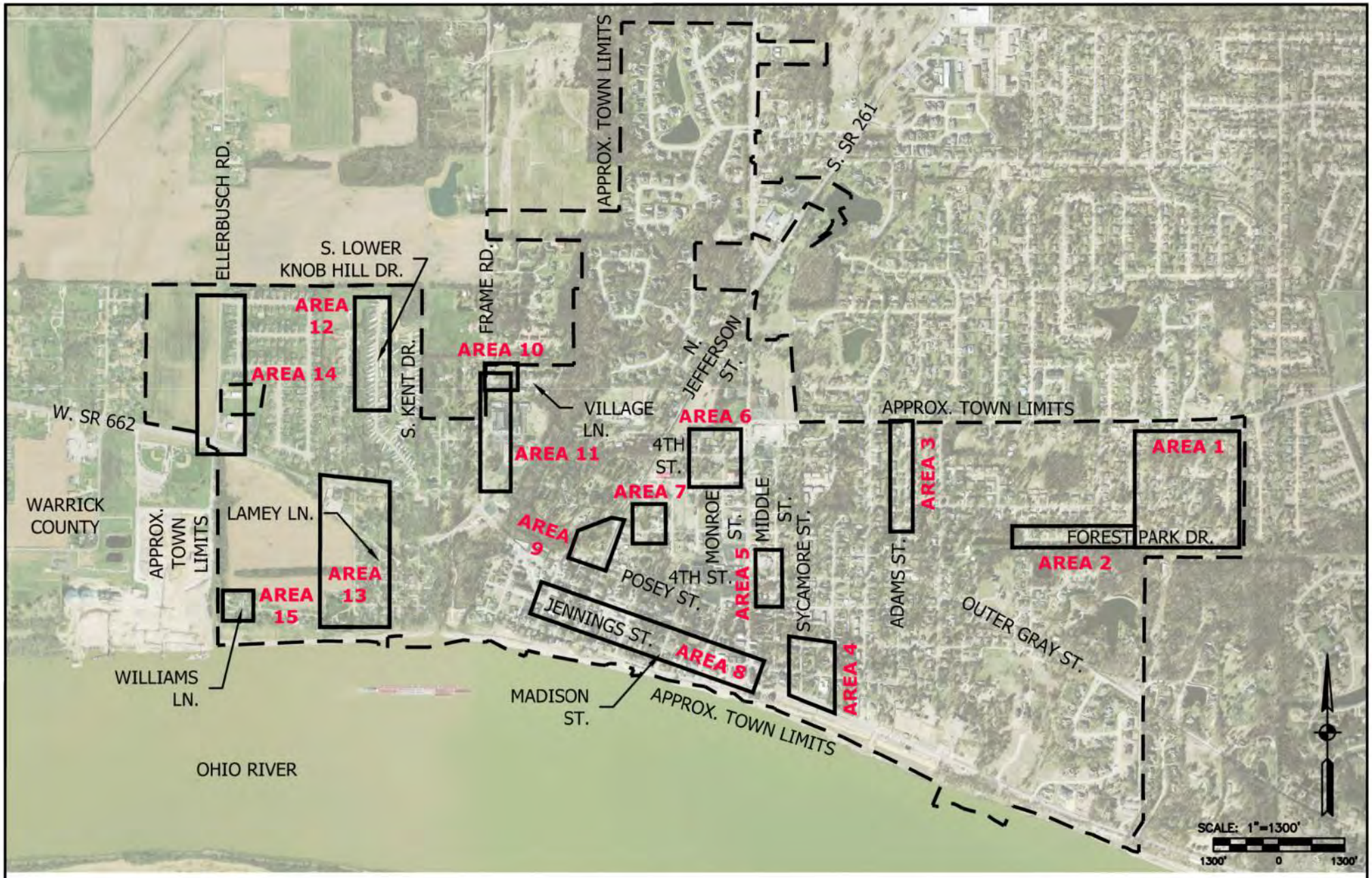
   This project area includes the downstream portion of the Forest Park Drainage Ditch watershed, from the eastern border of the Town's incorporated limits at Forest Park Drive to the intersection of St. Catherines Place and Forest Park Drive.

   At the outfall, east side of Forest Park Drive, a large box structure collects the entire watershed basin. This structure contains an existing 54"x34" pipe outlet, which drains the northern basin area along Sharon Road, and dual culvert pipes, 54"x34" and 30", across Forest Park Drive, which drains the southern basin area. This structure acts as an internal energy dissipation facility for the outfalls and has performed well to minimize downstream scour and erosion. The dual culvert system across Forest Park Drive, is rated to convey the 25-year storm event. It was noted, that this structure has been overtopped and erosion is occurring along the west roadway edge. These dual culverts are immediately downstream of an existing 48" concrete pipe, that has capacity for a 10-year storm event. This structure's outlet appears to be contributing to the scour at the dual culvert system due to the close proximity. In addition, a few sinkholes were visually seen above the existing pipe.

   Continuing upstream, existing sanitary sewer facilities and overhead support poles were seen within the ditch flow conveyance area from Forest Park Drive to Treelane Drive. At Carole Place, an existing dual culvert system, consisting of 30" and 36" concrete pipes, were rated for a 10-year storm event. The ditching upstream and downstream of Carole Place, contained small woody vegetation with

steep banks. This area also holds water for the bulk of the year, making maintenance difficult and place for mosquito breeding.

At Treelane Drive, an existing 30" HDPE culvert with an existing 15" CMP overflow, has a combined capacity of less than a 10-year storm event with evidence of overtopping that follows the road to the outlet. An existing shallow 8" gravity sanitary sewer crossing, has minimized the size of the existing storm infrastructure, due to inadequate cover limitations. From the Treelane Drive 30" culvert, an existing swale meanders behind existing properties, in which small garages and yard barns are located and subject to foundation erosion due to proximity of the channel. A second Treelane culvert, 21" concrete pipe, is also rated for much less than a 10-year storm event and has the top of pipe within 12" of the road pavement. Treelane Drive had large amounts of standing water near this culvert. Upstream of this facility, a shallow open ditch runs to St. Catherines Place and Forest Park Drive intersection, considered priority Storm Area No. 2. Portion of this open ditch is constructed with articulated concrete block, installed in 2018, to protect a shallow sanitary sewer crossing.



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TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

PROJECT AREA INDEX

FIGURE 2-2

FIGURE 2-3 (AREA 1)
6'X4' BOX CULVERT ENERGY DISSIPATION FACILTIY AT FOREST PARK DRIVE OUTFALL

FIGURE 2-4 (AREA 1)
EROSION ON WEST SIDE OF FOREST PARK DRIVE, SINKHOLES VISIBLE ABOVE EXISTING 48" CULVERT

FIGURE 2-5 (AREA 1)
EXISTING UTILITIES WITHIN EXISTING OPEN DITCH AREA

FIGURE 2-6 (AREA 1)
30" HDPE, WITH 15" CMP OVERFLOW, ACROSS TREELANE DRIVE

FIGURE 2-7 (AREA 1)
21" RCP CULVERT UNDER TREELANE DRIVE WITH GARAGE FOUNDATION EROSION IN BACKGROUND

2. Area No. 2 – Forest Park Drainage Ditch Watershed, Upstream Facilities

This priority area is a continuation of Area No. 1. This area consists of the upstream southern extremities of the Forest Park Drainage Ditch watershed, that includes the Timber Hills Subdivision. This area outlets at the northeast corner of the intersection of St. Catherine Court and Forest Park Drive and continues upstream and west along Forest Park Drive to the dead-end cul-de-sac. This area also includes the CC Wade Lake outlet, which crosses Forest Park Drive via 20" PVC pipe, which tends to overtop. The collection system along Forest Park Drive, contains numerous issues. First, the street functions as the main drainage conduit during rain events. The roadway sets in a bowl with much of the infrastructure set above the roadway, which limits the ability of storm discharge to be captured. This has caused areas of erosion and creates traffic safety issues. Second, the existing collection system had a failing pipe visually seen. Lastly, the main drainage conduit contains pipe reductions further downstream than the inlet (from 24" to 12"), which has created a bottleneck and storm surcharges boiling out of existing deteriorated joints.

FIGURE 2-8 (AREA 2)
CC WADE LAKE OUTLET DITCH

FIGURE 2-9 (AREA 2)
PIPE REDUCTION SURCHARGE BOIL

FIGURE 2-10 (AREA 2)
PONDING IN RESIDENTIAL LAWN

FIGURE 2-11 (AREA 2)
INLETS ABOVE ROAD ELEVATION

FIGURE 2-12 (AREA 2)
CONCENTRATED FLOW ALONG EDGE OF PAVEMENT

FIGURE 2-13 (AREA 2)
CONCENTRATED FLOW AT DEAD END OF CUL-DE-SAC ENTERING ROAD

3. Area No. 3 – Adams and Cypress Street Drainage

Area 3 is located on the ditch that perpendicular to Adams and Cypress Street, north of the intersection with Section Street. The Town replaced the existing failing culvert across Adams Street in 2018 and connect to an existing inlet. Downstream of this inlet, an existing 30" pipe, has numerous sinkholes along the pipe. Town crews filled the holes with flow fill, but this is expected to be a temporary fix. At the 30" outlet, an existing open ditch section was seen full of debris, limbs and

branches. Across Cypress Street, an existing 24" CMP was seen to be half full of sediment. At the outfall of this pipe, the swale abruptly completes two additional 90-degree bends, which has created roadside erosion. In addition, this swale runs in close proximity to 420 Cypress Street residence.

FIGURE 2-14 (AREA 3)
DEBRIS COVERED INLET ALONG 24" CMP

FIGURE 2-15 (AREA 3)
24" CMP HALF FULL OF SEDIMENT

4. Area No. 4 – Jennings and Sycamore Drainage

This area is located at the intersection of Jennings and Sycamore Street. Stormwater sheet flows off the steep hill, north of the intersection along Sycamore Street. To add to the problem, Jennings Street sits several inches higher than the surrounding sidewalk, which forces water into the property located at the southwest former of Jennings and Sycamore (115 E. Jennings St.). The Town has tried to alleviate the situation, in the past, by building an asphalt curb on the edge of the street; however, the water continues to jump the curb and cause issues to the property. The Town is reconstructing Jennings Street, east of Sycamore Street, as part of the 2019 Community Crossing Grant program. As part of that project, storm infrastructure improvements are being made along the south side of the road. The Town anticipates reconstructing the Jennings Street west of Sycamore Street in 2020 as part of the continuing CCG program. Storm water improvements could be made at this time to help resolve the issue.

FIGURE 2-16 (AREA 4)
ROAD PAVEMENT IS HIGHER THAN SIDEWALK

FIGURE 2-17 (AREA 4)
STORMWATER SHEET FLOWS DOWN HILL
TO RESIDENTIAL PROPERTY

5. Area No. 5 – Middle Street Drainage

This project area is located just east of the Newburgh Elementary School, between State and Sycamore Street, just north of Gray Street. An existing 30" HDPE culvert collects flows upstream of Sycamore Street and discharges into a narrow 4 – 5-foot-deep channel that traverses across three properties to Middle Street. This channel runs in close proximity to the property located at 328 Sycamore Street. At Middle Street, an existing 30" HDPE culvert was found to have approximately 9" of sediment. At the outlet, severe embankment erosion is on the verge of washing out 315 State Street driveway. At the 54" culvert under State Street, large amount of sediment and debris was found at the culvert entrance.

At 315 State Street, an existing berm was located perpendicular across the channel. The Town should investigate to determine if this is 315 State Streets sanitary sewer lateral. If so, this facility should be relocated (preferred) or provided adequate erosion protection to minimize damage from abrasive flows or freezing.

FIGURE 2-18 (AREA 5)
ERODING BANKS ALONG DITCH AT 315 STATE STREET

FIGURE 2-19 (AREA 5)
MIDDLE STREET 30" HDPE CULVERT WITH SEDIMENT ACCUMULATION

FIGURE 2-20 (AREA 5)
DOWNSTREAM OF 30" HDPE CULVERT AT SYCAMORE STREET – 328 SYCAMORE ST. RESIDENTIAL PROPERTY IN BACKGROUND IN CLOSE PRIXIMITY OF DITCH

6. Area No. 6 – Fourth and Monroe Drainage

This area focuses on the North Fork East Ditch upstream watershed area. The priority of this review was from State Street to Polk Street.

At Brenner Street, concentrated flow was found to run along the south edge of pavement and across State Street. Along State Street, flow was deep enough to create hydroplaning and traffic related issues. The existing inlets are not in locations that can collect this drainage.

At the commercial property, located at the northwest corner of 4th Street and State Street, the existing parking lot is experiencing pavement settling. The existing 60" concrete pipe appears to have offset joints which are taking in material from above.

At the 60" outfall, an existing open ditch is full of debris and small woody vegetation to the intersection of 4th and Monroe Street. This pipe appears to have adequate capacity to convey a 25-year storm event; however, a scour hole was identified at the discharge. At this intersection, ponding is creating traffic hazards at the southeast corner. No drainage facilities are located along the street and creates icing during the winter. In addition, water from this intersection drains to the outlet of the 54" pipe and is creating erosion along the pipe.

At Third Street, an existing 60" steel plate culvert is collapsing and has the bottom eroded out. There are numerous sinkholes from Third Street to Polk Street. Ponding was noted along Third Street and at Polk Street. In the front yard of 208 and 213 Third Street Duplex, an existing sinkhole was found along the street. Street crews should investigate if an existing storm tile is located in this area.

FIGURE 2-21 (AREA 6)
EXISTING OFFSET JOINTS WITHIN 60" CONCRETE PIPE CREATING PARKING LOT PAVEMENT SETTLEMENT

FIGURE 2-22 (AREA 6)
4TH AND MONROE STREET SURFFACE PONDING

FIGURE 2-23 (AREA 6)
DETERIORATION OF 60" STEEL CULVERT AT THIRD STREET

FIGURE 2-24 (AREA 6)
PONDING AT THIRD STREET

7. Area No. 7 – First Street Drainage

The channel from the Newburgh Elementary School to First Street was reviewed. The existing detention basin, at the school, was noted as being full of sediment with limited storage capabilities. The 48" concrete pipe outlet from the detention basin, had newer riprap placed around the inlet and outlet. Open ditch was encountered from this outlet to an existing 54" CMP. This ditch was full of trash, debris, and woody vegetation. The 54" pipe partially obstructed and settled. Small sinkholes were visible on the south side of First Street. A residential home, located at 309 First Street, has experienced basement flooding in the past. It was noted that the 54" CMP was installed across his property, and since that time no complaints have been made.

FIGURE 2-25 (AREA 7)
NEWBURGH ELEMENTARY SCHOOL DETENTION BASIN

FIGURE 2-26 (AREA 7)
INTERIOR OF 54" CMP, DOWNSTREAM OF SCHOOL DETENTION BASIN

FIGURE 2-27 (AREA 7)
SINK HOLES NEAR INLET SOUTH OF FIRST STREET

FIGURE 2-28 (AREA 7)
309 FIRST STREET RESIDENTIAL BASEMENT PRONE TO FLOODING

8. Area No. 8 – Jennings Street Corridor Drainage

In 2015, the storm infrastructure was evaluated along Jennings Street in advance of a paving project. In general, much of the piping and inlets were full of sediment, under capacity, and severely deteriorated. Detailed review of the existing infrastructure was provided. This evaluation is provided in **Appendix A**. In addition, MS4 Outfall Reconnaissance Inventory report was completed in 2015. Many of the existing outfalls, stemming from Jennings Street and discharging in the Ohio River, were not located or buried in riprap, or severely deteriorated.

FIGURE 2-29 (AREA 8)

MONROE STREET OUTLET – SEVERELY DETERIORATED AND BURIED

(PHOTO FROM MS4 – 2015 OUTFALL RECONNAISSANCE REPORT)

FIGURE 2-30 (AREA 8)

CULVERT AT MADISON AND JENNINGS STREET, FULL OF SEDIMENT

(PHOTO FROM 2015 JENNINGS STREET CORRIDOR STUDY)

9. Area No. 9 – Jefferson Street and Posey Street Drainage

The property at 402 Jefferson Street, located at the northwest corner of Jefferson and Posey Street, is subject to stormwater drainage being directed down the

southeast property corner. Stormwater sheet flows, from South Jefferson Street and east Posey Street to this southeast corner. There are currently no storm water drainage features located in this intersection.

FIGURE 2-31 (AREA 9)
402 JEFFERSON STREET PROPERTY AT NORTHWEST CORNER OF PSEY AND JEFFERSON STREET

FIGURE 2-32 (AREA 9)
STORMWATER SHEET FLOWS DOWN JEFFERSON AND POSEY STREET

10. Area No. 10 – Village Lane Drainage

The apartments along the south side of Village Lane, experiences ponding in the parking lots located along the roadway. In general, the drainage flows from the north to the south. On the west side of the apartments, one drainage swale diverts flows to an 8" culvert that crosses Village Lane. This ditch carriers flow to an existing tributary to the existing Big Ravine Ditch. The east side area of Village Lane does not contain storm infrastructure. The south last three apartment complexes, east, appear to be low enough in elevation that larger storm events could result in water reaching the finish floor elevation.

FIGURE 2-33 (AREA 10)
LOW AREA EXPERIENCING PONDING ON VILLAGE LANE

FIGURE 2-34 (AREA 10)
LOW AREA EXPERIENCING PONDING ON VILLAGE LANE

11. Area No. 11 – Frame Road Drainage

An open ditch runs adjacent and east of Frame Road from south of Village Lane to the southernmost entrance of St. John the Baptist Catholic School. Between Woodlawn Drive and Village Lane, inlets are located along the east edge of pavement; however, most these inlets fail to capture drainage due to being to high in grade. On the west side of Frame Road, curb and gutter runs along the edge of pavement, but does not contain storm infrastructure. Sheet flow runs along the edge of pavement and crosses Frame Road just north of the northern school entrance. This sheet flow has caused pavement erosion along the edge and creates a location for icing across the road during winter conditions. South of the school's north entrance, open ditch and culverts runs to the outlet. The open ditch is full of gravel and sediment and the existing culverts are experiencing erosion at the outlets.

FIGURE 2-35 (AREA 11)
INLET ALONG FRAME ROAD – NORTH OF VILLAGE LANE

FIGURE 2-36 (AREA 11)
SHEET FLOW ACROSS FRAME ROAD

FIGURE 2-37 (AREA 11)
OPEN DITCH ALONG FRAME ROAD

FIGURE 2-38 (AREA 11)
EROSION AT 14" X 23" RCP CULVERT INLET AT SCHOOL ENTRANCE

FIGURE 2-39 (AREA 11)
EROSION AT 19" X 30" RCP CULVERT OUTLET

12. Area No. 12 – Knob Hill Drainage

Maple Lane, Windsor Point Subdivision and Knob Hill Trailer Park, has had a long history of known storm issues. In 2012, the Town completed a large capital improvement project that included the construction of a detention basin within Knob Hill Trailer Park and a 30" overflow conduit at Maple Lane Subdivision. The 30" overflow conduit is located just north and upstream of the Windsor Point Subdivision 42" culvert. This overflow pipe redirects flows around the Subdivision by directly discharging to Ellerbusch Ditch, south of SR 662. Homes along Maple Lane were previously being flooded by the 42" culvert's inability to carry the required capacity, due to downstream outlet constraints. In conjunction, the detention acts to reduce peak flows being sent downstream, while the overflow pipe provides the necessary inlet relief at Maple Lane. On June 24, 2013, this system was tested and performed with no homes being flooded. The rain event dumped approximately 5.3 inches in about 6 hours. The City of Evansville had to perform 12 water rescues that day and took nine calls to assist stranded, but not in danger motorist.

Even with these large capital improvements, additional improvements were previously noted within the Westside Drainage Basin Study, dated June 13, 2009. This work included re-grading the Knob Hill Ditch, located between the trailer Park and Maple Lane Subdivision. In addition, the 54" x 32" concrete culvert at Maple Lane subdivision was noted as being rated under a 10-year storm capacity. Field visit from this PER, indicated woody vegetation and sediment obstructions within the existing detention basin main influent channels. The Town will need to develop a maintenance program to keep the outlet pipe clear from debris and remove woody vegetation off the embankment and channel areas. Debris can limit the hydraulic capacity of the facility to function as intended. In addition, sinkholes were observed along the 36" HDPE culvert, west of Lower Knob Hill Drive. This 36" outlet was noted as being submerged due to higher velocity discharges of the pipe mounding sediment and materials, while discharging into a flatter graded slope. Downstream of the Maple Lane culvert, bank erosion was noted from Maple Lane west to the 42" Windsor Point outfall.

FIGURE 2-40 (AREA 12)
36" HDPE OUTLET AT LOWER KNOB HILL DRIVE

FIGURE 2-41 (AREA 12)
MAPLE LANE 54" X 32" RCP CULVERT OUTLET

FIGURE 2-42 (AREA 12)
ERODING DITCH BANKS WEST OF MAPLE LANE

13. Area No. 13 – Pleasure Club Drainage

South of 662 / Jennings Street, the area along Phelps Drive and Yorkshire Drive have areas of ponding water. Along Yorkshire Drive, the following properties had large pools of standing water: 8 Yorkshire and 14 Yorkshire Drive. Along Phelps Drive, a new subdivision, Driftwood, is being currently being constructed. A small swale runs along the west side of Phelps Drive, which appeared to lack in capacity. In addition, a few residences, at 211 and 305 N Phelps Drive had standing water areas. At 211 Phelps Drive, it appeared water may be able to get in the garage and house.

FIGURE 2-43 (AREA 13)
8 YORKSHIRE DRIVE: STANDING WATER

FIGURE 2-44 (AREA 13)
PHELPS DRIVE; DRIFTWOOD SUBDIVISON ON THE LEFT AND 211 N. PHELPS DRIVE ON THE RIGHT

14. Area No. 14 – Ellerbusch Road Drainage

This area is a continuation of Area 12 – Knob Hill Drainage. Ellerbusch Ditch has limited capacity due to the north inlet side of the 72" CMP SR 662 crossing . Ellerbusch Ditch discharges directly to the Ohio River and runs directly north along Ellerbusch Road. The ditch on the east side, contains minimal channel grade and has areas of negative structure elevation grade, thus minimizing capacity. The Windsor Point 42" discharge, which services Maple Lane, hydraulic capacity is limited by this discharge, and the reason why the 30" overflow pipe was installed

at Maple Lane in 2012. In the Westside Drainage Basin Study, dated June 13, 2009, the report indicated that the Ellerbusch Ditch Watershed should be considered an impacted drainage basin to regulate future development stormwater discharges. Any increase in discharge within this watershed, can create additional flooding to the residents due to the minimal capacity. Town crews have re-graded the ditches to provide clear unimpeded flow; however, the existing major infrastructure elevation constraints drive the ultimate hydraulic capacity. In addition to the capacity issue, the east ditch is very steep and creates a traffic safety hazard

FIGURE 2-45 (AREA 14)
WINDSOR POINT 42" OUTFALL (FRONT) AND EXIST 36" HDPE CULVERT ACROSS SOUTHGATE BLVD. WITHIN ELLERBUSCH DITCH

FIGURE 2-46 (AREA 14)
ELLERBUSCH OPEN DITCH WITH STEEP DROP OFF AT CASEY'S GENERAL STORE

FIGURE 2-47 (AREA 14)
72" CMP – OUTELT SOUTH OF SR 662
(PHOTO FROM JUNE 24, 2013 STORM EVENT)

15. Area No. 15 – Williams Lane Drainage

Near the dead end of Williams Lane, inadequate drainage facilities cause localized ponding along the roadway and within the surrounding yards. At the outfall, no defined swale has lead to minor erosion and standing water.

FIGURE 2-48 (AREA 15)
WILLIAMS LANE PONDING IN YARDS AND ROAD

FIGURE 2-49 (AREA 15)
WILLIAMS LANE PIPE OUTLET

D. Financial Status of Existing Facilities

In 2006, the Town developed and passed a storm water management fee based on the impervious area of an improved parcel or subdivided lot. The fee was based on the equivalent dwelling (residential) unit (EDU or ERU) methodology.

The Town of Newburgh's specific EDU was calculated to be 3,000 square feet (the average amount of impervious area per single family property). All single-family residential parcels or lots are charged a rate of one (1) EDU. Nonresidential parcels or lots, EDU rate is determined by the amount of impervious area found on the property. Once impervious area is found for the nonresidential property, its divided by the average equivalent dwelling unit of 3,000 square feet to obtain the EDU for the nonresidential parcel. The Town has set the minimum EDU for nonresidential properties as one (1) with maximum EDU capped at eight (8). EDUs are taken to the nearest tenth.

Land exempt properties, subject to no storm fee, include Town owned properties only. In addition to land exempt properties, unimproved properties do not receive a stormwater fee. The Town defines an improvement as any residential lot or parcel of land within the corporate limits of Town that has been altered from its undeveloped states and includes apertures where impervious areas have been constructed or exist. Improvements, include human-made change to the real property, including, but not limited to, buildings and other structures, streets, parking lots, mining, dredging, filling, grading, paving or excavation. Impervious area includes human-made improvements that does not allow rain water to be absorbed or held, such as rooftops, driveways, parking lots, patios, storage areas, oiled macadam or hard-surface areas, or any other human-made obstruction which impedes absorption of precipitation into the earth's surface.

The Town's current storm water fee is $7.50 per month per EDU. This fee was increased in 2017, which was previously $5.00 per month per EDU. The Town's customer billing summary is provided in **Table 2-1**.

TABLE 2-1
CUSTOMER BILLING SUMMARY

CUSTOMER TYPE	NUMBER OF CUSTOMERS	TOTAL EDU	MONTHLY CHARGE
Single Family Residential	1,233	1,233	$9,191.25
Nonresidential Properties	137	337.8	$2,559.88
TOTAL	**1,370**	**1,570.8**	**$11,751.13**

The Town has jurisdiction to maintain facilities under its control. Facilities, such as channels, culverts, catch basins, etc., located within public right-of-way or public easements or drainage easements are within the Town's jurisdiction to maintain, but this does not include facilities on private land. County and State departments are responsible for maintaining the public facilities with their respective rights-of-way, including storm drainage structures. Any capital improvement project, involving private land, in which the Town would take ownership and provide future maintenance, would require the acquisition of a public utility or drainage easement.

The Town has instituted a private property cost share program, designed to aid private property owners with drainage related issues. With this program, private property owners present their storm issues and provide solutions that comply with Newburgh drainage ordinances. With Drainage Board approval, the Town and property owner would enter into an agreement. The property owner is required to obtain a drainage permit from the Zoning Administration and all other necessary associated permits required. The property owner is also required to grant the Town any easement or right of entry to complete the project. The Town would purchase all materials necessary for the project, with the cost being borne by the property owner. The Town would then provide the Town workforce labor and equipment to install such approved improvements. After project completion, ownership and maintenance would be released to the private property owner. A copy of this Cost Share Program Guidelines in found in **Appendix D**.

1. Annual Operation and Maintenance (O&M) Expenses

   Annual O&M expenses for the storm water system include: labor, material, and equipment costs. Like many small communities, the Town employees and their workforce efforts are split among other departments; for Newburgh it's street and/or sewer. **Table 2-2** presents the average detailed O&M costs based on information provided by the Town. The Town's storm infrastructure does not include any short lived assets.

TABLE 2-2
EXISTING STORM WATER OPERATIONS AND MAINTENANCE COSTS

ITEM	2016	2017	2018
Salaries	$23,189	$30,455	$41,466.18
Employee Benefits	$14,244	$12,590	$16,876.67
Materials and Supplies	$507	$2,687	$4,615
Contractual Services	$27,006	$10,102	$10,583
Miscellaneous	$5,275	$0	$0
Loan Payments	$0	$0	$0
TOTAL O & M	**$70,221**	**$55,834**	**$73,541**

2. Existing Loans and Capital Improvement Accounts

The Town Storm Water Utility does not currently have any outstanding debt or loans.

3. Financial Plan for Future Capital Improvement Projects

In 2018, the Town hired a financial consultant to review the existing stormwater utility and provide a financial plan to assist the Town with decisions on future capital improvement projects. This plan can be found in **Appendix E**.

SECTION 3 – NEED FOR PROJECT

The needs are identified and categorized in this section. These needs were established based on regulatory requirements, record review, site investigations, discussions with the Town Council, Town Manager, Storm Water Management Board, Storm Water Management Administrator, Town Staff, and input from Town citizens. Alternatives and recommendations are presented in other sections of the report.

A. Health, Sanitation, and Security (See Figure 2-1 for Area Location)

Flood waters and standing water, pose various health, sanitation and safety risks, including: infectious diseases, chemical hazards, injuries or even death. Flooding has created a financial burden on members of the community experiencing property damage.

Flood waters can impose various health and safety concerns. Buildings, commercial or residential, subject to interior flooding and water damage, can create mold exposure, which can lead to mold infections for people with immune suppressions. Furthermore, chemicals, such as household cleaners, caustic drain cleaners, fertilizers, pesticides and bleach, can directly enter waters contaminating water, exposing people to health risks and creating environmental spill risk. Eating or drinking, anything exposed to flood waters, can cause diarrheal infections. Anyone with open wounds or rashes, that are directly exposed to flood waters, has the potential for additional infections to occur. Floods can also increase waterborne diseases such as: typhoid fever, cholera, leptospirosis and hepatitis A.

Standing waters can create vector-borne diseases, which may not show up until 6-8 weeks upon receding floods. Standing water can create breeding grounds for arthropod species, such as mosquitoes, ticks, triatomine bugs, sandflies, and blackflies. Vector-borne disease such as: malaria, dengue and dengue hemorrhagic fever, yellow fever and west nile fever can be attributed to these species. In 2015, the Indiana Department of Health had indicated that mosquitoes in Warrick County had tested positive for west nile fever.

Flooding can pose various immediate safety concerns of drowning, injuries and trauma. Larger conveyances producing swift waters, can easily sweep a vehicle over the roadway. However, even small rainfall events can produce concentrated flow over intersections and sidewalks, to cause hydroplaning and reduction in brake distances. This temporary flooding and standing water, increases the likelihood of vehicular accidents, as well as vehicular accidents with pedestrians, especially near the Newburgh Elementary School and commercial businesses. In winter weather conditions, these conditions can multiply risks due to ice formation in roads and sidewalks.

Larger flooding events have caused substantial property damage for the Town and private property owners with flood waters entering residential homes or buildings. Furthermore, existing failing storm facilities have caused sinkholes to develop or structures to erode, which can cause road infrastructure failure and potential utility infrastructure collapse.

B. System Operations and Maintenance

Operation and maintenance is needed to keep channels, culverts, and other drainage facilities clean of debris, sediment, snow, deicing salts, and other miscellaneous items. Undersized facilities can lead to additional maintenance due to debris management. Storm sewers normally require little maintenance, but they can fill with sediment from deicing sands or silt laden runoff from construction sites. Channels, conveyances, or culverts can become obstructed from debris, trash, leaves, yard clippings, limbs, logs, etc. New storm drainage closed conduits should be generally designed for minimum slope and velocity requirements to minimize siltation. Culverts and conveyances can be over sized to account for watersheds that are subject to large limbs, logs or other debris. Effects of backwater can cause large material to collect or to become inserted into culverts or drainage facilities from the outlet. Closed conduits will typically have flap gates installed to eliminate the large debris from being drawn into the conduit.

New construction sites should utilize erosion control devices such as silt fences, sediment traps, inlet protection, and other methods that can minimize the amount of sediment laden water entering the drainage facilities.

A large portion of the stormwater drainage facilities studied as a part of the Master Plan Update consist of open-channels. Due to the need to keep these channels clean of the debris and other miscellaneous items mentioned above, the open-channels in Newburgh are difficult to maintain. The lack of maintenance compounds drainage issues presenting a greater stormwater drainage concern to the Town.

In addition, stormwater infrastructure should be sized to convey a 25-YR storm event. It is apparent that a majority of the stormwater infrastructure is ill-sized to convey smaller storm events, let alone a 25-YR storm event.

C. Aging Infrastructure

Failing pipe and structures can be attributed to aging infrastructure that has met its intended useful life. These facilities, like any other facilities, need replaced once maintenance becomes too costly. A majority, if not all, of the facilities that were reviewed

as a part of the Master Plan Update, have reached the end of their intended useful life. The infrastructure is beginning to noticeably fail and create larger, more dangerous drainage issues for the Town.

D. Reasonable Growth

As discussed in Section 1, the population for Newburgh has moderate growth, but could be subject to growth through annexation of surrounding vacant lands. The proposed projects are not driven by population growth; however, the Town should consider updating the Town storm standards manual to ensure developers follow minimum storm facility design and site detention times, in an effort to minimize downstream affects.

SECTION 4 – ALTERNATIVES CONSIDERED

A. OVERVIEW

1. The previous section highlighted the needs of the Town's stormwater infrastructure during the Planning Period. This section reviews the reasonable alternatives that can be used as a solution to address these needs. The following general design criteria section gives re-occurring overviews; that typically pertain to each improvement. This general design criteria includes, but not limited to design criteria, maps, environmental impacts, land requirements, construction problems, and cost estimate development. Individual alternatives and project areas are described in detail later in this section with any deviations or special circumstances from the general overview being documented within that individual project area description. The individual project schematic drawings and locations are shown in **Appendix B** and a detailed project cost for each of the alternatives is provided in **Appendix C**.

2. General Design Criteria

   General design criteria methodologies and computations for this this report include those generally accepted by most water resource engineers, including the following:

   a. Rational Method to determine peak discharge for a watershed basin, to determine storm sewer sizing in areas < 100 acres.

   b. USDA Urban Hydrology for Small Watersheds – Technical Release (TR) 55 for drainage area time of concentration calculations and hydrologic soil group curve numbers (antecedent runoff condition (ARC) II – "average conditions"). Warrick County soil survey maps (from USDA NRCS Web Soil Survey website) were utilized to determine the hydrologic soil group type for each watershed land-use

   c. USACOE – HEC-HMS, Hydrologic Modeling System for complex watersheds. Storm data source taken from NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server, specific to Town of Newburgh. For Newburgh, **Table 4-1** provides the rainfall depths, for specific durations and occurrence intervals that was utilized for the project area. For Newburgh,

the short duration storm events tend to produce the highest peak flow rates and would need to be implemented for storm infrastructure design. Where possible, models were calibrated based on actual storm events. Pictures and/or high-water marks can be used to calibrate a model with actual precipitation data.

TABLE 4-1
PRECIPITATION FREQUENCY ESTIMATES

AVG. RECURRENCE INTERVAL IN YEARS	PERCENT CHANCE OF OCCURRENCE IN ANY GIVEN YEAR	1-HR (INCHES)	6-HR (INCHES)	12-HR (INCHES)	24-HR (INCHES)
10	**10**	2.07	3.34	3.93	4.73
25	**4**	2.44	4.00	4.69	5.65
50	**2**	2.73	4.54	5.31	6.40
100	**1**	3.03	5.11	5.95	7.18

*Reference: NOAA Atlas 14, Volume 2, Version 3 Point Precipitation Frequency Estimates

d. USACOE – HEC-RAS, River Analysis System for one-dimensional hydraulic calculations for natural and constructed channels.

e. FHWA – HY-8 Culvert Hydraulic Analysis for culvert hydraulic computations and analysis. Road culverts, with smaller watersheds, may be designed for a 50-year or 2 percent occurrence interval or less, dependent upon average traffic counts. Bridges or culverts with larger drainage areas may be designed for a 100-year or 1 percent occurrence interval.

f. Bentley FlowMaster by Bentley Systems, Incorporated for general storm sewer pipe sizing. Town of Newburgh drainage ordinance requires all drainage facilities to be designed for a 25-year or 4 percent occurrence interval unless severe flooding warrants a storm sewer design capable of handling higher peak flow rates to reduce flooding. Unless indicated, storm sewer infrastructure for Newburgh would be designed for the 25-year or 4 percent occurrence interval.

g. Conceptual design elements and cost were based on limited planning information from Indiana GIS data and preliminary site assessment. A detailed field survey would be necessary to verify elevations, utilities, actual

property and/or right-of-way boundaries, etc. for final design location and sizing.

3. General Map Information

Maps for conceptual plans utilized Orthophotography of Indiana (2013), 1-foot standard resolutions for Warrick County; select Indiana Geological Survey, IndianaMap GIS layers; USGS Topographic Maps, 1996 (1:24,000); and LiDAR contour information. General vertical GIS elements are based on GeOID NAVD88 datum and general horizontal GIS elements are based on NAD83 spatial reference. Property lines from IndianaMap GIS were the basis of preliminary land requirements.

4. General Environmental Impacts

General environmental impacts for new storm drainage facilities typically fall within two categories; construction and post construction components. All work would need to follow the Town of Newburgh MS4 program requirements.

a. Construction impacts can include pollutants from equipment (fuel, oil, grease, concrete, etc.), materials (concrete placement and soil stockpiles), and land disturbing impacts, typically from storm water erosion due to excavations and unprotected soils. Design consideration should include construction provisions for safely handling or maintaining construction equipment as well as a material handling and spill prevention plan. Maintained concrete washout areas, with proper filter and barrier requirements should be utilized. Soil stockpiles should have silt fences provided to eliminate sediment runoff. Provisions should also be made for protecting land disturbances with proper erosion and sediment control measures, such as, installation of silt fences, sediment traps, or providing temporary surface stabilization. Land clearing impacts should try to be compensated by re-planting either native woody vegetation or grasses.

b. Post-construction impacts can include long term erosion or sediment transport from new outfall structures or not repairing damaged disturbed lands from construction that can potentially have long-term water quality effects. Outfall structures need proper energy dissipation to minimize erosion by placing a concrete headwall with a riprap apron for example. New ditches or swale designs may require permanent turf reinforcement to limit channel degradation. Native grasses and woody vegetation can be

incorporated into the design to be planted along ditches or swales to establish a riparian buffer to improve water quality.

5. General Land Requirements

Generally, the proposed projects attempt to follow existing road right-of-way, alleys, or dedicated easements; however, where work traverses through private property, a permanent easement would be required. Although provisions can be made to minimize the amount of easements required, utility conflicts or land acquisition issues may dictate where final alignments would need to be set.

Permanent easements are generally needed or required for future maintenance by the Town. These permanent easements are generally described from where the storm sewer line or ditch is actually constructed. Typically, a permanent easement along a storm sewer should be no less than 20 feet wide (10 feet on each side of the centerline). Where deep excavations are encountered or in an area with limited access, wider easements would be required to incorporate new drainage facilities. Easements can be less than 20 feet wide, in cases where the majority of the work or future maintenance can be contained within the right-of-way or along an existing easement or in cases where structures or constraints would limit such an area.

If possible, permanent easements for open ditches should contain the entire ditch plus 10 feet beyond the top of the bank of the channel for maintenance purposes. Regulated drains in Indiana are generally 75 feet in width from each top of bank. In Newburg's incorporated limits, the only regulated drain is Ellerbusch Ditch.

Temporary easements are typically only required for construction purposes and normally expire after construction is complete or some time thereafter. Temporary easements are used for construction equipment access, temporary storage of excavation material, and similar construction activities. Channel work will generally require more temporary construction area due to the amount of excavated material that may be required to be removed or for general incidental grading work along the embankments.

6. General Construction Problems

Generally, the most significant construction problems result from construction activities along busy streets, which can cause traffic delays and temporary traffic inconveniences. Construction may require temporary shutdown of entire streets or roads. Construction coordination will be required with local emergency

management authorities for emergency vehicle access and for local bus school route impacts. Traffic control issues and public frustrations can be addressed through advanced planning of traffic control by good public relations, advanced notices, and adherence by the contractor to traffic control that follows the guidelines set forth in the Manual on Uniform and Traffic Control Devices.

Additional construction problems expected would be impacts from utility conflicts or temporary disruptions, groundwater, limiting soil areas, and steep grade protection.

Utility conflicts can be a major expense for a project, whether through delay, relocation cost or both. Storm sewer design is based on gravity design principles and cannot always be adjusted to accommodate a utility conflict. Utilities, such as buried cables and force or pressure mains, which are not dependent upon gravity, can be adjusted to accommodate the new storm sewer facility. Dependent upon Owner's risk comfort level and potential critical utilities involved in the project area, a certain level of utility coordination effort can be conducted prior to construction to minimize conflicts. During the field survey and preliminary design, visible utilities can be located by contacting the Indiana Underground Plant Protection Service to have all utilities mark their facilities prior to the survey. Horizontal locations can be attained and a few vertical elements for gravity sanitary sewer or storm sewers with access points can be measured. However, some utilities do not have proper locating devices to give that utility the ability to provide accurate locations. Once preliminary design is complete, improvements can be sent, to the potentially impacted utility companies within project area, to complete a conflict analysis. However, dependent upon the utility type or if critical infrastructure is within the project site, potholing may be recommended to physically locate to provide horizontal and vertical coordinates. Exposing the utility will verify size and material to ensure conflicts are minimized or a plan is in place for said unavoidable conflict. Locating utilities in advance generally result in significant lower project cost by reducing change orders during construction. Many utilities cannot be avoided completely during construction and the contractor will be required to coordinate with the associated utility companies. The contractor may be required to permanently or temporarily relocate utilities or provide temporary bracing for the utilities until the storm sewer installation is complete.

Buried field tiles, unknown storm facilities, or basement drains can also be a source of conflicts. These utilities are typically found during excavations for the storm sewer. However, given the fact that this project will be a storm drainage project, these hard to find conflicts can generally be re-connected with minimal efforts.

Groundwater and limiting soil areas are expected for the project areas. The bulk of the proposed improvements are found within the lower lying channel areas, in which shallow groundwater and high percentage silt soil areas are encountered. A soils investigation would need to be conducted during design to identify the soil constituency and to determine the presence and depth of groundwater and limiting soil areas. Although groundwater may be present during soil boring investigations, it is a relative measure of its presence. Groundwater levels will tend to fluctuate depending on the amount of available groundwater entering the site being excavated. The limiting soils are important to ensure adequate infrastructure bedding is provided and to allow the contractor to design suitable trench excavation equipment for potentially unstable excavation walls. In addition, the high percentage of silt soil, in addition to steeper slope areas, are highly susceptible to erosion. Design should attempt to reduce discharge velocities prior to entering a channel or ditch area. In addition, energy dissipation is expected to be incorporated into the improvement area for each outfall to provide channel stability.

Steep grade protection may be required for the installation of new storm sewer piping, especially when laid in softer soils. Piping may need to be secured or anchored by concrete collars.

7. General Cost Estimates

The following basic assumptions were used in the estimated costs for the storm drainage facility's alternatives:

a. Where possible, storm drainage improvements will be placed within existing Town property and road rights-of-way, minimizing the need for easements.

b. The landowner, at no cost, would donate any easement for the improvements, even though each landowner is entitled to an appraisal.

c. Where preliminary site assessment indicated visible concerns for utility conflicts, costs reflected these potential necessary utility adjustments. In addition, allowance or percentage of construction was added to accommodate for any unforeseen utility relocation required for improvements.

d. Dewatering was developed based on construction percentage basis, dependent upon work location, depth of groundwater table, and associated risk for work within channels or ditches.

e. Construction costs shown are based on 2019-dollar values and current construction trends. For construction activities expected to take place beyond shown, an inflation percentage of 5.00% shall be utilized to develop future cost. This percentage is based on Indiana Department of Transportation – 2013 Design Manual Chapter 102 Project Development – Chapter 07 Environmental Procedures / Design Summary.

f. Basic annual and operation will be necessary to maintain and keep channel and other storm drainage facilities clear of sediments and debris. Typical new storm sewer facilities are designed to a minimum slope and velocity requirement to minimize siltation. Additional maintenance for channel may include occasional excavation of sediment accumulation, maintaining permanent vegetation, additional erosion protection for outfalls, and minimizing growth of involuntary trees. Furthermore, much of the new culverts are designed to adequately handle and allow debris to pass through the culverts, minimizing Town needs to remove debris. Much of the work is located at existing drainage features that were currently maintained by the Town. In general, the annual operations and maintenance should be minimized and; therefore, will not be provided unless significant maintenance is required.

g. Land cost was based on land assessment values from the respective county's GIS website to provide an estimate only. Actual purchase price is subject to landowner negotiation.

The cost estimates presented in this report are preliminary in nature and presented for the sole purpose of determining the financial feasibility of the proposed project and establishing an estimate of the financing requirements. The actual project costs, as well as any resulting user rate increases (if considered); will be dependent on the chosen method of financing and the actual design and construction costs. Non-construction cost and construction contingency will be presented in Section 6 – Proposed Project. If the proposed selected project changes, such as: alternative chosen, re-prioritization of projects (deducting or adding projects), and funding mechanism, then the associated non-construction cost would also need to be re-evaluated.

8. General Advantages and Disadvantages

The advantages for completing the proposed project are outlined below:

- Reduction in property damage
- Improved drainage
- Eliminate long-term flooding and/or maintenance due to reduced erosion

The disadvantages for completing the proposed project are outlined below:

- Potential increase in stormwater user fees
- Temporary construction impacts
- Customer complaints during construction

The long term advantages readily outweigh the short term disadvantages for completing the project.

B. NO ACTION

1. The no-action alternative includes not completing any repairs or infrastructure upgrades. This alternative would not alleviate any of the flooding issues or address the ongoing property damage associated with the flooding. Roadside and pedestrian hazards would continue. Aged facilities will likely lead to sporadic failures, causing localized property damage and ill-timed pedestrian and traffic hazards.

C. PROJECT AREA NO. 1 – FOREST PARK DRAINAGE

1. General Project Area Description

Forest Park Drainage was divided into five different project areas. The project areas start at the upstream watershed and work downstream; more specifically, starting at the outlet ditch from CC Wade Lake (northeast corner of the intersection of Forest Park Drive and St. Catherines Place) and working downstream to the outlet east of Forest Park Drive. The project areas were separated based on the

natural separations of the drainage facilities in the area and to break the cost out to phase the work as necessary.

2. Area 1-A – CC Wade Lake Outlet Ditch Across Treelane Drive

a. Description

The existing two Treelane Drive culverts would be re-routed and upgraded to accommodate a minimum 25-year storm event. The proposed culvert would be re-directed within the existing roadway.

The existing ditch, that currently flows north and east behind residential properties (including 944 Treelane Drive, with garage foundation erosion) would be re-graded and utilized to carry drainage behind the surrounding properties or act as an overflow for larger storm events, dependent upon the size of storm infrastructure selected.

For this area, 25-YR, 50-YR, and 100-YR infrastructure sizing was determined. This will allow the Town to weigh cost vs. risk as a means of decision making.

b. Design Criteria

Refer to General Design Criteria. This alternative examined and determined the infrastructure that would adequately handle the critical 4% storm occurrence interval (25 year, 1-hour storm event), 2% storm occurrence interval (50 year, 1-hour storm event), and 1% storm occurrence interval (100 year, 1-hour storm event).

c. Map

Refer to **Appendix B**, Exhibit 1-1, Area 1-A.

d. Environmental Impacts

This project installs a storm sewer trunk line within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Select locations may be installed within undisturbed locations. Minimal tree removal will be required to construct and install.

The proposed outfall will be located at an existing outfall location. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately nine permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure, utility conflicts or relocation may be required. A shallow gravity sanitary sewer was found and may be required to be lowered to provide necessary cover over the proposed storm infrastructure.

g. Cost Estimates

Total construction project cost is estimated to be **$400,055 for 25-YR** infrastructure, **$424,055 for 50-YR** infrastructure, and **$515,055 for 100-YR** infrastructure. See **Appendix C** for detailed cost estimates.

3. Area 1-B – Open Channel Improvements from Treelane Drive to Carole Place

a. Description

The ditch is generally not maintained by the residents due to the difficulty of the maintenance required. The proposed project would be to minimize this maintenance required, provide necessary capacity, and keep erosion to a minimum. This ditch typically carries baseflow throughout much of the year, which is the main reason for inadequate maintenance. In addition, existing utilities and housing locations constrain the channel shaping. The following alternatives are proposed: armor the ditch, (with high performance permanent turf reinforcement, riprap, articulated concrete block mats), line the embankment with large precast modular block system

and finally provide a low flow pipe and re-grade channel with high performance permanent turf reinforcement.

High performance turf mats can be utilized to armor the ditch. The mats can even be utilized in high velocity applications but are subject to intimate ground to mat contact. These mats will typically require riprap immediately around outlets and inlets. The mats are considered a green approach to resolving erosion issues; however, if not maintained, small woody vegetation can push the matting and lose the intimate soil contact causing undermining of the mats. In addition, though these mats have the name "permanent" the life of the material cannot be guaranteed past 10 years. If a low flow pipe is utilized, property owners would be able to maintain the ditch during the summer months as long as the channel embankments are no steeper than 3:1 typically.

Riprap on geotextile filter fabric is another armoring solution. Riprap is not considered a green approach and can be difficult to implement via long ditch applications due to permitting constraints. Riprap can be maintained, but as the material becomes silted in, can grow woody vegetation.

Articulated concrete block mats are typically utilized in very high velocity channel applications or energy dissipation applications. These blocks can be open or solid. The open cell blocks can allow vegetation to grow up through the blocks. However, woody vegetation should not be allowed to grow through the block, as the roots and trunks can push the block out of shape. The blocks performance is based on projection tolerance constraints that must strictly be adhered to during the installation process. This system may allow some of the existing utilities to remain in place.

Another option, can be to line the open channel embankment with large precast blocks. These blocks can be stepped back or vertical. This would minimize the maintenance of the embankment; however, permits may dictate the bottom of the channel to be planted with native plantings. This option may require a 7 to 10-foot-wide base with approximately three to four courses of blocks. Existing utilities are expected to be required to be relocated outside of the wall system.

This ditch was noted as carrying base flow throughout the year. A small 12" collector pipe can be installed at a sumped outlet at Treelane Drive. This collector pipe can be installed behind the ditch armoring and outlet

into the Carole Place culvert. The intent would be to pipe the low flow conditions outside of the ditch to allow for maintenance and to reduce stagnated areas for mosquito breeding.

All of these alternatives attempt to minimize ditch maintenance and control erosion. The Town would still have the responsibility of cleaning the ditch where permanent drainage easements are acquired. However, if maintenance is easier on the residents, property owners may take it upon themselves to maintain.

FIGURE 4-1
EXAMPLE OF A HIGH PERFORMANCE TURF REINFORCEMENT MAT FOR A SPILLWAY OVERFLOW; CREWS INSTALLING PERCUSSION GROUND ANCHORS (PHOTO VIA CEI – IDNR WHITE OAK DAM PROJECT)

FIGURE 4-2
EXAMPLE OF ARTICULATED CONCRETE BLOCK MAT SYSTEM INSTALLED IN UNNAMED TRIBUTARY TO SUMMER PECKA DTICH NORTH OF LINCOLN AVENUE
(PHOTO VIA CEI – TOWN OF NEWBURGH SANITARY SEWER PROJECT)

FIGURE 4-3
EXAMPLE OF LARGE PRECAST BLOCK WALL LINING CHANNEL WITHOUT STEP BACK (PHOTO VIA REDI-ROCK)

FIGURE 4-4
EXAMPLE LARGE PRECAST BLOCK WALL LINING CHANNEL WITH STEP BACK (PHOTO VIA REDI-ROCK)

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 1-1, Area 1-B.

d. Environmental Impacts

This project improves upon an existing open-channel ditch within Town limits. The largest portion of the drainage ditch will be installed within previously disturbed soil locations. Minimal tree removal will be required to construct and install. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Where required by permitting agencies, green infrastructure may be required.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$68,150** for High Performance Turn Reinforcement Mats, **$88,150** for Riprap Reinforcements, **$138,150** for an Articulated Concrete Block Mat Reinforcement System, and **$522,150** for a Precast Concrete Wall Reinforcement System. See **Appendix C** for detailed cost estimates.

4. Area 1-C –Carole Place Culvert Upgrade

a. Description

This proposed project alternative upgrades the existing culvert to provide minimum 25-YR storm capacity.

Similar to Area 1-A, 25-YR, 50-YR, and 100-YR infrastructure sizing was determined. This will allow the Town to weigh cost vs. risk as a means of decision making.

b. Design Criteria

Refer to General Design Criteria and the Design Criteria set forth for Area 1-A.

c. Map

Refer to **Appendix B**, Exhibit 1-1, Area 1-C.

d. Environmental Impacts

This project replaces an existing culvert under a roadway and in previously disturbed area. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately four permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Four temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$89,320 for 25-YR** infrastructure, **$104,320 for 50-YR** infrastructure, and **$114,320 for 100-YR** infrastructure. See **Appendix C** for detailed cost estimates.

5. Area 1-D – Open Channel Improvements from Carole Place to Existing 48-inch RCP Culvert

a. Description

The ditch is similar to Area 1-B open channel improvements. The same improvements are generally proposed for this stretch of ditch to allow for future maintenance, provide necessary capacity, and keep erosion to a minimum. This ditch typically carries baseflow, as well, and can be accommodated with a 12" collector pipe as noted from Area 1-B. Existing utilities and housing locations will again constrain the channel shaping. The same following alternatives are proposed: armor the ditch, (with high performance permanent turf reinforcement, riprap, articulated concrete block mats), line the embankment with large precast modular block system

and finally provide a low flow pipe and re-grade channel with high performance permanent turf reinforcement.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 1-1, Area 1-D.

d. Environmental Impacts

This project improves upon an existing open-channel ditch within Town limits. The largest portion of the drainage ditch will be installed within previously disturbed soil locations. Minimal tree removal will be required to construct and install. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Where required by permitting agencies, green infrastructure may be required.

e. Land Requirements

This project will require approximately four permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Four temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$58,000** for High Performance Turn Reinforcement Mats, **$78,000** for Riprap Reinforcements, **$103,000** for an Articulated Concrete Block Mat

Reinforcement System, and **$333,000** for a Precast Concrete Wall Reinforcement System. See **Appendix C** for detailed cost estimates.

6. Area 1-E –Forest Park Drive Culvert and Storm Pipe Upgrade

a. Description

This proposed project alternative upgrades the existing 48" storm sewer immediately upstream of Forest Park Drive and removes the short section of open ditch on the west side of Forest Park Drive. This will eliminate the erosion occurring at the edge of pavement. In addition, the entire culvert run will be designed to provide minimum 25-YR storm capacity. However, if 25-YR protection is provided, an overflow is recommended to ensure overtopping does not create property damage at 706 Forest Park Drive (property south of ditch on west side of Forest Park Drive).

Similar to Area 1-A, 25-YR, 50-YR, and 100-YR infrastructure sizing was determined. This will allow the Town to weigh cost vs. risk as a means of decision making.

b. Design Criteria

Refer to General Design Criteria and the Design Criteria set forth for Area 1-A.

c. Map

Refer to **Appendix B**, Exhibit 1-1, Area 1-E.

d. Environmental Impacts

This project replaces an existing storm sewer in place, upstream of Forest Park Drive and an existing culvert under a roadway, all in previously disturbed area. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Four temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$218,370 for 25-YR** infrastructure, **$308,370 for 50-YR** infrastructure, and **$338,370 for 100-YR** infrastructure. See **Appendix C** for detailed cost estimates.

D. PROJECT AREA NO. 2 – TIMBER HILLS DRAINAGE

1. General Project Area Description

The area has many various undersized and aging storm water drainage features that are a result of a lack of planning and supervision. In order to alleviate the flooding in this area, it is necessary that a complete overhaul of the stormwater drainage facilities be completed. This would start with the drainage ditch at the dead-end cul-de-sac of Forest Park Drive and continue east to the existing CC Wade Lake outlet ditch near the intersection of Forest Park Drive and St. Catherines Place.

2. Alternate 1: Timber Hills Drainage Improvements

a. Description

This alternative proposes to install open end sections to collect open ditch areas at the dead-end cul-de-sac of Forest Park Drive. As the proposed collection system continue east, collecting flows, the pipe size increases to the maximum size of 36” at the outfall. Curb and gutters are proposed to be installed along the entirety of Forest Park Drive in this area. All existing storm piping would be removed or retired as required.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 2-1, Alternate 1.

d. Environmental Impacts

This project installs a storm sewer trunk line within Town limits and generally follows street right-of-way or at the existing storm trunk line location, all in previously disturbed areas. Select locations may be installed within undisturbed locations. Minimal tree removal will be required to construct and install. The proposed outfall will be located at an existing outfall location. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately twenty-seven permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Additionally, twenty-seven temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road and drive closure are anticipated to complete the work. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction cost is estimated to be **$892,330**. See **Appendix C** for detailed cost estimates.

E. PROJECT AREA NO. 3 – ADAMS STREET DRAINAGE

1. General Project Area Description

This project area is divided into two separate improvements areas with two alternatives for each. The first area is located between Cypress St. and Adams Street, which involves improvements of the existing storm sewer. The second area is west of Cypress Street and replaces existing storm sewer piping and provides erosion protection of the downstream open ditch.

2. Area 3-A – Between Cypress and Adams Street – Alternate 1: Replace Existing 30-inch Storm Sewer

a. Description

The existing 30-inch storm sewer would be replaced in-kind at the existing storm sewer location. In addition, at the outfall, end section and riprap would be installed.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 3-1, Alternate 1.

d. Environmental Impacts

This project installs a storm sewer within an existing storm sewer location. Tree removal will be required to construct and install. Environmental impacts shall be minimal.

e. Land Requirements

This project will require approximately four permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Additional, four temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Road closure is anticipated to complete the work.

g. Cost Estimates

Total project cost is estimated to be **$381,930**. See **Appendix C** for detailed cost estimates.

3. Area 3-A – Between Cypress and Adams Street – Alternate 2: Line Existing 30-inch Storm Sewer

a. Description

The existing 30-inch storm sewer would be lined with a cured-place lining system. CCTV of the storm sewer would be required to ensure that this is a viable option before selecting this alternative. In addition to lining the pipe, similar to Alternate 1, at the outfall, end section and riprap would be installed.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 3-2, Alternate 2.

d. Environmental Impacts

This project installs a storm sewer within an existing storm sewer location. Environmental impacts shall be minimal. No trees are anticipated to be removed with this alternative.

e. Land Requirements

This project will require approximately four permanent storm sewer easements to be acquired in order to utilize and maintain the facilities.

Additional, four temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Road closure is anticipated to complete the work.

g. Cost Estimates

Total project cost is estimated to be **$59,015**. See **Appendix C** for detailed cost estimates.

4. Area 3-B – West of Cypress Street – Alternate 1: Install New 30-inch Storm Culvert Under Cypress Street to Re-route the Channel Flows

a. Description

The existing 24-inch corrugated metal culvert currently under Cypress Street would be removed and replaced with two storm inlets and storm pipes. A proposed 30" storm sewer would be installed south of the existing culvert, to eliminate two 90 degree bends within an open channel and subsequent downstream erosion along the roadway. The existing ditch would be filled, and additional riprap would be installed downstream of the 30" outlet to minimize erosion. Curbing would be installed along Cypress where the ditch was replaced.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 3-1, Alternate 1.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. The existing ditch will be filled and replaced with a storm trunk

sewer to provide additional capacity. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Additionally, three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Road closure is anticipated to complete the work.

g. Cost Estimates

Total project cost is estimated to be **$83,955**. See **Appendix C** for detailed cost estimates.

5. Area 3-B – West of Cypress Street – Alternate 2: Install New 24"x38" Elliptical Pipe Culvert Under Cypress Street at Existing Location

a. Description

The existing 24-inch corrugated metal culvert would be replaced with a 24" x 38" elliptical pipe in order to increase capacity. The existing ditch would be re-graded in the same location and provided riprap protection.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 3-2, Alternate 2.

d. Environmental Impacts

This project installs a storm sewer within an existing storm sewer location.

Environmental impacts shall be minimal.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Additional, three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Road closure is anticipated to complete the work.

g. Cost Estimates

Total project cost is estimated to be **$52,780**. See **Appendix C** for detailed cost estimates.

F. PROJECT AREA NO. 4 – JENNINGS AND SYCAMORE DRAINAGE IMPROVEMENTS

1. Description

This alternative proposes to install new concrete curb and gutter and replace the existing sidewalk along Jennings and Sycamore Street. In addition, a drainage inlet would be added and an existing inlet would be replaced. This work will require a short barrier wall system to provide necessary grade requirements at the curb ramp. This work may require an existing utility pole to be relocated. The Town may consider completing this project as part of a future Community Crossing Grant program project.

2. Design Criteria

Refer to General Design Criteria.

3. Map

Refer to **Appendix B**, Exhibit 4-1, Alternate 1.

4. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal tree removal will be required to construct and install. Minimal environmental impacts are anticipated.

5. Land Requirements

This project may require approximately two permanent storm sewer easements.

6. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

7. Cost Estimates

Total construction project cost is estimated to be **$100,340**. See **Appendix C** for detailed cost estimates.

G. PROJECT AREA NO. 5 – MIDDLE STREET DRAINAGE IMPROVEMENTS

1. General Project Area Description

a. This area comprises of an open ditch in close proximity of a home and open channel erosion. Two separate alternatives are proposed to enclose or relocate the drainage.

2. Alternate 1 – Encapsulate Existing Ditch with Proposed Storm Sewer

a. Description

This alternative proposes to encapsulate the existing ditch with a proposed 36-inch storm sewer. This would alleviate the operations and maintenance issues presented by the open-channel ditch running so closely to the 328 Sycamore Street home. However, with this option the storm sewer would still be in close proximity of this home. The existing storm sewer would be replaced and extended at Middle Street. By extending the outlet at 315 State Street property, it eliminates the embankment erosion at the driveway.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 5-1 – Alternate 1.

d. Environmental Impacts

This project installs a storm sewer trunk line within Town limits and generally follows the existing ditch or replaces the existing storm sewer in kind, with much of the work being in previously disturbed areas. Select locations may be installed within undisturbed locations. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

Six permanent easements may be necessary to complete the project. Six temporary easements will be required to provide drainage and allow installation of the structures.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation will be a concern, including a potential lateral at 315 State Street. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$255,345**. See **Appendix C** for detailed cost estimates.

3. Alternate 2 – Reroute Existing Ditch and Provide Existing Ditch Erosion Protection

a. Description

This alternative proposes to provide a 36" storm sewer to re-route flows south of 328 Sycamore Street property's residential home. The existing ditch, within close proximity of the home, would be filled but allow for drainage. The pipe would then be routed west to outlet to the existing ditch, which would be armored with riprap. The existing culvert at Middle Street would remain, but have end sections added to improve hydraulic performance. In addition, riprap would be installed on the channel embankment at 315 State Street to protect the existing driveway.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 5-1 Alternate 2

d. Environmental Impacts

This project installs a storm sewer trunk line within Town limits and generally follows street right-of-ways or existing utility easements in mostly previously disturbed areas. Select locations may be installed within undisturbed locations. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

Six permanent easements may be necessary to complete the project. Six temporary easements will be required to provide drainage and allow installation of the structures.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation will be a concern, including a potential lateral at 315 State Street. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$237,075**. See **Appendix C** for detailed cost estimates.

H. PROJECT AREA NO. 6 – FOURTH AND MONROE DRAINAGE IMPROVEMENTS

1. General Project Area Description

This project area covers multiple areas within the Big Ravine Upper Drainage Basin. These improvements are broken down to allow for Town to prioritize said improvements.

2. Area 6-A – State Street Drainage Improvements

a. Description

This alternative proposed to add storm inlets to reduce traffic safety issues along State Street, at the Brenner Street intersection. In addition, the pavement would be required to be reconstructed to divert and capture the sheet flow and ponding.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 6-1, Area 6-A.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits under existing pavement area, all in previously disturbed area. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and implementing best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately one permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. One temporary easement may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With shallow infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$36,830**. See **Appendix C** for detailed cost estimates.

3. Area 6-B – Fourth Street Drainage Improvements

a. Description

This proposed alternative repairs the existing 60" concrete pipe joints at State Street. Downstream of this 60" outfall, the option cleans, realigns, and armors the existing ditch to the existing 54" CMP at Fourth and Monroe Street. In addition, new inlets are proposed to alleviate the deep ponding and traffic concern area at the southeast corner of the intersection. Riprap armor is proposed at the 54" outlet to protect the channel from scour and erosion.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 6-1, Area 6-B.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal tree removal will be required to construct and install. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately seven permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Seven temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$132,530**. See **Appendix C** for detailed cost estimates.

4. Area 6-C – Third Street Drainage Improvements

a. Description

This alternative proposes to replace an existing failing 60-inch steel pipe with an in-kind 60" storm pipe south of Third Street to Polk Street. In addition, additional inlets are proposed along Third Street and Polk Street to reduce roadside ponding.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 6-1, Area 6-C.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately six permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Six temporary easements may be required for installation purposes.

f. Potential Construction Problems

Groundwater may be encountered. Temporary road closure is anticipated to complete the work. With large shallow infrastructure near the outfall, utility conflicts or relocation may be required. Large amount of work is within an existing ditch or active storm sewer area, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$336,545.** See **Appendix C** for detailed cost estimates.

I. PROJECT AREA NO. 7 – FIRST STREET DRAINAGE IMPROVEMENTS

1. Description

This alternative proposes to armor an existing ditch behind residential properties south of First Street. CCTV inspection would be required to review the structural integrity of the existing 54-inch storm sewer. Additional recommendations would be based on the result of this inspection.

2. Design Criteria

Refer to General Design Criteria.

3. Map

Refer to **Appendix B**, Exhibit 7-1.

4. Environmental Impacts

Minimal tree removal will be required to construct and install. Minimal environmental impacts are anticipated.

5. Land Requirements

This project will require approximately six permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Six temporary easements may be required for installation purposes.

6. Potential Construction Problems

Large amount of work is within an existing ditch or active storm sewer area, provisions must be made to protect excavations from storm events.

7. Construction Cost Estimates

Total construction project cost is estimated to be **$28,275**. See **Appendix C** for detailed cost estimates.

J. PROJECT AREA NO. 8 – JENNINGS STEET CORRIDOR DRAINAGE IMPROVEMENTS

1. General Project Area Description

   a. The stormwater infrastructure along Jennings Street was divided into five subareas, with each subarea consisting of the stormwater infrastructure at the intersection of Jennings Street and another street. These improvements are broken down to allow for Town to prioritize said improvements.

2. Area 8-A – Jennings and Washington Avenue

a. Description

This alternative proposes to replace and upgrade the existing storm infrastructure from the Ohio River outlet to Jennings Street. Much of the infrastructure is undersized or failing. At the outlet, the existing discharge will require a flap gate to protect the upstream infrastructure from back water flooding affects from the Ohio River.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 8-1 – Area 8-A.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately four permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Four temporary easements may be required for installation purposes.

f. Potential Construction Problems

With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Temporary road closure and private drive closures are anticipated to complete the work. In addition, work is along the Ohio River, special construction provisions may be required to protect all open trench excavations from flooding and sediment transport.

g. Cost Estimates

Total construction project cost is estimated to be **$348,580**. See **Appendix C** for detailed cost estimates.

3. Area 8-B – Jennings and Jefferson Street

a. Description

This alternative proposes to replace and upgrade the existing storm infrastructure from Water Street to Jennings Street. Much of the infrastructure is undersized or failing. Since multiple storm sewers run along Jefferson St., one is proposed to be replaced in the existing location. The other existing storm pipe would need to be grout filled, but Contractor would need to ensure all existing live connections are transferred prior to retirement.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 8-1 – Area 8-B.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Four temporary easements may be required for installation purposes.

f. Potential Construction Problems

With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Temporary road closure and private drive closures are anticipated to complete the work.

g. Cost Estimates

Total construction project cost is estimated to be **$252,445**. See **Appendix C** for detailed cost estimates.

4. Area 8-C – Jennings and Market Street

a. Description

This alternative proposes to replace and upgrade the existing storm infrastructure from the Ohio River outlet to Jennings Street. Much of the infrastructure is undersized or failing. At the outlet, the existing discharge will require a flap gate to protect the upstream infrastructure from back water flooding affects from the Ohio River.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 8-1 – Area 8-C.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Two temporary easements may be required for installation purposes.

f. Potential Construction Problems

With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Temporary road closure and private drive closures are anticipated to complete the work. In addition, work is along the Ohio River,

special construction provisions may be required to protect all open trench excavations from flooding and sediment transport.

g. Cost Estimates

Total construction project cost is estimated to be **$263,320**. See **Appendix C** for detailed cost estimates.

5. Area 8-D – Jennings and Madison Street

a. Description

This alternative proposes to replace and upgrade the existing storm infrastructure from the Ohio River outlet to Jennings Street. Much of the infrastructure is undersized or failing. At the outlet, the existing discharge will require a flap gate to protect the upstream infrastructure from back water flooding affects from the Ohio River. Since multiple storm sewers run along Jefferson St., one is proposed to be replaced in the existing location. The other existing storm pipe would need to be grout filled, but Contractor would need to ensure all existing live connections are transferred prior to retirement.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 8-2 – Area 8-D.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Two temporary easements may be required for installation purposes.

f. Potential Construction Problems

With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Temporary road closure and private drive closures are anticipated to complete the work. In addition, work is along the Ohio River, special construction provisions may be required to protect all open trench excavations from flooding and sediment transport.

g. Cost Estimates

Total construction project cost is estimated to be **$263,755**. See **Appendix C** for detailed cost estimates.

6. Area 8-E – Jennings and Monroe Street

a. Description

This alternative proposes to replace and upgrade the existing storm infrastructure from the Ohio River outlet to Jennings Street. Much of the infrastructure is undersized or failing. At the outlet, the existing discharge will require a flap gate to protect the upstream infrastructure from back water flooding affects from the Ohio River. Since multiple storm sewers run along Jefferson St., the existing storm pipe would need to be grout filled, but Contractor would need to ensure all existing live connections are transferred prior to retirement.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 8-2 – Area 8-E.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Two temporary easements may be required for installation purposes.

f. Potential Construction Problems

With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Temporary road closure and private drive closures are anticipated to complete the work. In addition, work is along the Ohio River, special construction provisions may be required to protect all open trench excavations from flooding and sediment transport.

g. Cost Estimates

Total construction project cost is estimated to be **$239,685**. See **Appendix C** for detailed cost estimates.

K. PROJECT AREA NO. 9 – JEFFERSON STREET AND POSEY STREET DRAINAGE IMPROVEMENTS

1. General Project Area Description

a. Three separate alternatives are presented for this street intersection. The first alternative would not collect any drainage, simply divert flows as a budgetary option. Alternative 2 and 3 would collect and transport flows.

2. Alternate 1 – 402 Jefferson Street Drive Approach Improvements

a. Description

This alternative proposes to install curb and gutter along the northwest intersection of Posey and Jefferson Street to shed sheet flow from entering the driveway for 402 Jefferson Street. This option would provide a concrete drive approach raised in elevation and adjust the curb ramp. This driveway could be relocated north to eliminate the drive at the corner of the intersection.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 9-1 – Alternate 1.

d. Environmental Impacts

This project installs Town infrastructure along existing road and drives of previously disturbed areas within Town limits. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately one permanent storm sewer easement to be acquired in order to utilize and maintain the facilities. One temporary easement may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$18,705**. See **Appendix C** for detailed cost estimates.

3. Alternate 2 – 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Posey Street

a. Description

This alternative proposes the same drive approach improvements from Alternate 1. This alternate adds storm inlets along the Posey and Jefferson

Street intersection and extends a new 24" pipe along Posey Street to drain to the Big Ravine Ditch.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 9-1 – Alternate 2.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal tree removal will be required to construct and install. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required

g. Cost Estimates

Total construction project cost is estimated to be **$198,215**. See **Appendix C** for detailed cost estimates.

4. **Alternate 3 – 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Jefferson Street**

a. Description

This alternative proposes the same drive approach improvements from Alternate 1. This alternate adds storm inlets along the Posey and Jefferson Street intersection and extends a new 18" pipe outside of the west right-of-way line of Jefferson Street to connect to an existing 18" storm pipe near 1st Street. This existing pipe outlets to the Big Ravine Ditch.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 9-1 – Alternate 3.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately one permanent storm sewer easement to be acquired in order to utilize and maintain the facilities. One temporary easement may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$137,750**. See **Appendix C** for detailed cost estimates.

L. PROJECT AREA NO. 10 – VILLAGE LANE DRAINAGE IMPROVEMENTS

1. Description

This alternative proposed to install a new 12" to 15" storm pipe with inverted gutter pan along the south side of Village Lane. This work would require pavement grading to provide smooth transition. The new storm pipe is proposed to outlet to existing open ditch east of Village Lane. To minimize erosion, riprap on geotextile filter fabric is proposed at the outlet.

2. Design Criteria

Refer to General Design Criteria.

3. Map

Refer to **Appendix B**, Exhibit 10-1.

4. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal tree removal will be required to construct and install. Minimal environmental impacts are anticipated.

5. Land Requirements

This project will require approximately eight permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Eight temporary easements may be required for installation purposes.

6. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

7. Cost Estimates

Total construction project cost is estimated to be **$362,790**. See **Appendix C** for detailed cost estimates.

M. PROJECT AREA NO. 11 – FRAME ROAD DRAINAGE IMPROVEMENTS

1. Description

This project proposes to encapsulate an existing ditch along the east side of Frame Road, replace existing failing infrastructure, install additional storm infrastructure where required and provide a six (6) foot wide sidewalk from Woodlawn Drive to south of St. John's property.

2. Design Criteria

Refer to General Design Criteria.

3. Map

Refer to **Appendix B**, Exhibit 11-1.

4. Environmental Impacts

This project installs a storm sewer trunk line within Town limits and generally follows street right-of-way or existing drainage conveyances in mostly previously disturbed areas. Select locations may be installed within undisturbed locations. Minimal tree removal will be required to construct and install. The proposed outfall will be located at an existing outfall location. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. No environmental impacts are anticipated.

5. Land Requirements

This project will require approximately five permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Seven temporary easements may be required for installation purposes.

6. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

7. Cost Estimates

Total construction project cost is estimated to be **$999,485**. See **Appendix C** for detailed cost estimates.

N. PROJECT AREA NO. 12 – KNOB HILL DRAINAGE

1. General Project Area Description

a. The stormwater infrastructure is divided into three individual sub areas for improvements. These improvements are broken down to allow for Town to prioritize said improvements. In general all the work involves improving the conveyance between the existing Knob Hill detention basin to Windsor Point Subdivision and 30" overflow pipe. The improvements do not include the cost to provide tree removal and maintenance along the existing Knob Hill Detention Basin. It is anticipated that the Town crews would complete this work.

2. Area 12-A – Lower Knob Hill Culvert Replacement and Outlet Improvements

a. Description

This alternative proposes to replace the downstream end of the existing 36" pipe that is failing, with an in-kind pipe. In addition, a headwall and riprap would be added at the outlet.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 12-1 – Area 12-A.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Two temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure and private drive closures are anticipated to complete the work. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$50,605**. See **Appendix C** for detailed cost estimates.

3. Area 12-B – Lower Knob Hill Drive Channel Improvements

a. Description

This alternative proposed to regrade an open-ditch at a constant minimum slope of 0.50% and remove trees as required. Areas of this ditch were found to have negative drainage slope. The ditch would be provided permanent turf reinforcement mats to protect the channel from erosion.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 12-1 – Area 12-B.

d. Environmental Impacts

This project provides channel improvements along an existing drainage conveyance, in areas that was previously disturbed for the original construction. Select locations may be installed within undisturbed locations. Large amount of tree removal will be required to construct and install. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately sixteen permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Sixteen temporary easements may be required for installation purposes.

f. Potential Construction Problems

Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$116,000**. See **Appendix C** for detailed cost estimates.

4. Area 12-C – Maple Lane Drainage Improvements

a. Description

This alternative proposes to replace an existing undersized culvert at Maple Lane with a new upgraded 6'x3' box culvert. The existing eroded channel,

downstream of Maple Lane, would be armored with riprap to the Windsor Point 42" outfall.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 12-1 – Area 12-C.

d. Environmental Impacts

This project is replacing existing infrastructure in place or along existing right-of-way. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately two permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Two temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$110,780**. See **Appendix C** for detailed cost estimates.

O. PROJECT AREA NO. 13 – PLEASURE CLUB DRAINAGE IMPROVEMENTS4

1. Description

The stormwater infrastructure is divided into two individual sub areas for improvements. These improvements are broken down to allow for Town to prioritize said improvements.

2. Area 13-A – Driftwood Subdivision – Alternate 1 – New Storm Pipe to North of Driftwood Subdivision

a. Description

This alternative proposes to install a new storm sewer along Phelps Drive. This alternative would connect to an existing 30" storm sewer and would provide new headwall and riprap at the existing outlet. This pipe would extend north to just south of Lamey Lane, along the east side of Phelps Drive to provide ponding relief. The swale along the west side of Phelps Drive would be re-grade to provide positive drainage to this new infrastructure.

b. Design Criteria

Refer to General Design Criteria

c. Map

Refer to **Appendix B**, Exhibit 13-1 – Area 13-A Alternate 1.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately eleven permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Eleven temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$352,060**. See **Appendix C** for detailed cost estimates.

3. Area 13-A – Driftwood Subdivision – Alternate 2 – New Storm Pipe to Driftwood Subdivision

a. Description

This alternative is similar to Alternate 1, which proposes to install a new storm along Phelps Drive. This alternative would also connect to an existing 30" storm sewer and would provide new headwall and riprap at the existing outlet. This alternate, however, would only extend the new storm pipe to just south of Driftwood Subdivision. From this point, open ditch with culverts on the east side of Phelps Drive would be utilized to alleviate ponding along the east side of Phelps Drive. The swale along the west side of Phelps Drive would be re-grade to provide positive drainage to this new infrastructure, in similar fashion as Alternate 1.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 13-2 – Area 13-A Alternate 2.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately six permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Six temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$230,550**. See **Appendix C** for detailed cost estimates.

4. Area 13-B – Phelps to Yorkshire Drive

a. Description

This alternate would replace an existing inlet along Phelps Drive. In addition, this alternate would extend a 12" storm sewer north of Phelps Drive along the west side of Yorkshire Drive to alleviate ponding.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 13-1 – Area 13-B.

d. Environmental Impacts

This project is altering an existing inlet in the same location and along the existing road right-of-way. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

g. Cost Estimates

Total construction project cost is estimated to be **$45,240**. See **Appendix C** for detailed cost estimates.

P. PROJECT AREA NO. 14 – ELLERBUSCH DITCH DRAINAGE IMPROVEMENTS

1. Description

This project area is a continuation of Project Area No. 12, the downstream segment of the Ellerbusch Drainage Basin. This work is to improve the hydraulic capacity of the existing Ellerbusch Ditch. This ditch capacity minimizes the discharge capability of the Windsor Point subdivision, including the 42" pipe from Maple Lane. Two alternatives are considered to improve this capacity of the ditch. Alternative 1 involves diverting a large portion of the flow from the east Ellerbusch Ditch to the west side of the road. This requires a new storm culvert crossing of SR 662. Alternative 2 involves lowering and upgrading the SR 662 culvert and encapsulating the existing ditch to Windsor Point Subdivision.

2. Alternate 1 – Ellerbusch Ditch Flow Diversion and New Culvert Crossing At SR 662

a. Description

This alternative would provide two new conduits across Ellerbusch Road to relieve and divert the existing east Ellerbusch ditch when it backs up. A new ditch would be created from approximately SR 662 to Windsor Point Subdivision on the west side of Ellerbusch Road. In addition, a 42" culvert would be installed across SR 662 to Ellerbusch Ditch.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 14-1 – Alternate 1.

d. Environmental Impacts

This project installs storm drainage facilities within Town limits and generally follows street right-of-ways or utilities in mostly previously disturbed areas. Temporary construction impacts will require provisions for protecting land disturbances; pollutants from equipment and construction materials; and compensation for land clearing with native grasses by instilling best management practices for storm water pollution prevention. Minimal environmental impacts are anticipated.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$440,220**. See **Appendix C** for detailed cost estimates.

3. Alternate 2 – Upgrade Existing Storm Pipe to 84" Equivalent CMP Pipe Arch

a. Description

This alternate proposes to substantially lower the outlet and upgrade the existing SR 662 72" culvert with a new 84-inch equivalent CMP pipe. This new pipe would run from the south side of SR 662 to just south of Windsor Point Subdivision. The inlet side of this proposed pipe would be a minimum of 12" lower than that of the Windsor Point Subdivision 42" drainage pipe to promote improved hydraulics of the outlet. A guardrail with wall system would be installed at this new 84" inlet to provide road side safety. In addition, by extending this culvert from SR 662 to Windsor Point, the steep embankment and traffic hazard would be removed along the east side of Ellerbusch Road.

b. Design Criteria

Refer to General Design Criteria.

c. Map

Refer to **Appendix B**, Exhibit 14-2 – Alternate 2.

d. Environmental Impacts

This project is upgrading an existing culvert and existing storm conveyance channel in the same location. No environmental impacts are anticipated.

e. Land Requirements

This project will require approximately three permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Three temporary easements may be required for installation purposes.

f. Potential Construction Problems

Temporary road closure is anticipated to complete the work. With relatively shallow storm infrastructure, utility conflicts or relocation may be required. Large amount of work is within an existing ditch, provisions must be made to protect excavations from storm events.

g. Cost Estimates

Total construction project cost is estimated to be **$1,565,275**. See **Appendix C** for detailed cost estimates.

Q. PROJECT AREA NO. 15 – WILLIAMS LANE DRAINAGE

1. Description

This alternate proposes to install new drain inlets and replace undersized piping and facilities at the dead-end area of Williams Lane to eliminate surface ponding. At the outfall, energy dissipation would be necessary, and a swale would be installed to discharge directly to Ellerbusch Ditch.

2. Design Criteria

Refer to General Design Criteria.

3. Map

Refer to **Appendix B**, Exhibit 15-1.

4. Environmental Impacts

Most of the work is replacing existing storm infrastructure in place and located along the existing right-of-way. Outlet improvements may require minimal tree clearing. No environmental impacts are anticipated.

5. Land Requirements

This project will require approximately five permanent storm sewer easements to be acquired in order to utilize and maintain the facilities. Five temporary easements may be required for installation purposes.

6. Potential Construction Problems

Temporary road closure is anticipated to complete the work across Williams Lane. With relatively shallow storm infrastructure, utility conflicts or relocation may be required.

7. Cost Estimates

Total construction project cost is estimated to be **$117,015**. See **Appendix C** for detailed cost estimates.

SECTION 5 – SELECTION OF AN ALTERNATIVE

A. GENERAL

The selection of alternatives must consider health, safety, regulatory impacts, costs, benefit to the utility and service community, contingency planning, and risk tolerance. A workgroup consisting of the utility staff, elected officials, and the engineer convened to provide input on these factors and select the alternatives.

B. PROJECT AREA NO. 1 – FOREST PARK DRAINAGE

1. Area 1-A – CC Wade Lake Outlet Ditch Across Treelane Drive

a. Criteria Evaluation

Four alternatives considered:

- No Action
- 25-YR Storm Event Infrastructure (Alternative 1)
- 50-YR Storm Event Infrastructure (Alternative 2)
- 100-YR Storm Event Infrastructure (Alternative 3)

The “No Action” alternative would continue to flood properties along Forest Park Drive and considering it is not a viable option. Alternative 1, 2 and 3, proposed storm infrastructure, would all provide storm risk protection to meet Town minimum design standards. Alternate 2 increases the risk protection to 50-year and Alternate 3 provide 100-year risk protection. As risk protection increases, infrastructure size increases, which drives cost up.

b. Selected Alternative

25-YR Storm Infrastructure (38” x 60” Elliptical Storm Sewer)

2. Area 1-B – Open Channel Improvements from Treelane Drive to Carole Place

a. Criteria Evaluation

Five alternatives considered:

- No Action
- High Performance Turf Reinforcements
- Riprap Reinforcements
- Articulated Concrete Block Mat Reinforcements
- Precast Concrete Wall Reinforcements

The “No Action” alternative would continue to flood properties along Forest Park Drive and considering it is not a viable option. Each of the alternatives presented would generally improve the maintenance, meet minimum design hydraulic capacities, and provide erosion control measures.

The high-performance turf reinforcement mats offer the cheapest improvements to the ditch. However, the relative ease at which these mats can lose intimate contact with the soil and begin to fail is a cause for concern. This option will also require the most future maintenance.

Reinforcing the ditch with riprap could be easily maintained and offers the next cheapest construction cost. However, riprap reinforcements are not considered a green approach and as such could lead to difficult permitting requirements.

Articulated concrete block mats are considerably more expensive than the next cheapest alternative. However, the mats would be very effective in armoring the ditch and reducing operations and maintenance concerns. This system would also reduce the amount of utility coordination that would be required.

Finally, the most expensive alternative is to line the open channel embankment with large precast blocks. Doing so would minimize the amount of maintenance of the embankment. Choosing this alternative would require increasing the size of the bottom of the channel. This would require existing utilities to need to be relocated outside of the wall system, which would further increase the construction cost.

b. Selected Alternative

Articulated Concrete Block Mat Reinforcements

3. Area 1-C – Carole Place Culvert Upgrade

a. Criteria Evaluation

Four alternatives considered:

- No Action
- 25-YR Storm Event Infrastructure (Alternative 1)
- 50-YR Storm Event Infrastructure (Alternative 2)
- 100-YR Storm Event Infrastructure (Alternative 3)

The "No Action" alternative would continue to flood properties along Forest Park Drive and considering it is not a viable option. Alternative 1, 2 and 3, proposed storm infrastructure, would all provide storm risk protection to meet Town minimum design standards. Alternate 2 increases the risk protection to 50-year and Alternate 3 provide 100-year risk protection. As risk protection increases, infrastructure size increases, which drives cost up.

b. Selected Alternative

25-YR Storm Event Infrastructure (6' x 3' Box Culvert)

4. Area 1-D– Open Channel Improvements from Carole Place to Existing 48-inch RCP Culvert

a. Criteria Evaluation

Five alternatives considered:

- No Action
- High Performance Turf Reinforcements
- Riprap Reinforcements
- Articulated Concrete Block Mat Reinforcements
- Precast Concrete Wall Reinforcements

The "No Action" alternative would continue to flood properties along Forest Park Drive and considering it is not a viable option. Each of the alternatives

presented would generally improve the maintenance, meet minimum design hydraulic capacities, and provide erosion control measures.

The high-performance turf reinforcement mats offer the cheapest improvements to the ditch. However, the relative ease at which these mats can lose intimate contact with the soil and begin to fail is a cause for concern. This option will also require the most future maintenance.

Reinforcing the ditch with riprap could be easily maintained and offers the next cheapest construction cost. However, riprap reinforcements are not considered a green approach and as such could lead to difficult permitting requirements.

Articulated concrete block mats are considerably more expensive than the next cheapest alternative. However, the mats would be very effective in armoring the ditch and reducing operations and maintenance concerns. This system would also reduce the amount of utility coordination that would be required.

Finally, the most expensive alternative is to line the open channel embankment with large precast blocks. Doing so would minimize the amount of maintenance of the embankment. Choosing this alternative would require increasing the size of the bottom of the channel. This would require existing utilities to need to be relocated outside of the wall system, which would further increase the construction cost.

b. Selected Alternative

Articulated Concrete Block Mat Reinforcements

5. Area 1-E – Forest Park Drive Culvert and Storm Pipe Upgrade

a. Selective Criteria Evaluation

Four alternatives considered:

- No Action
- 25-YR Storm Event Infrastructure (Alternative 1)
- 50-YR Storm Event Infrastructure (Alternative 2)

- 100-YR Storm Event Infrastructure (Alternative 3)

The "No Action" alternative would continue to flood properties along Forest Park Drive and considering it is not a viable option. Alternative 1, 2 and 3, proposed storm infrastructure, would all provide storm risk protection to meet Town minimum design standards. Alternate 2 increases the risk protection to 50-year and Alternate 3 provide 100-year risk protection. As risk protection increases, infrastructure size increases, which drives cost up.

b. Selected Alternative

25-YR Storm Event Infrastructure (6' x 4' Box Culvert)

C. PROJECT AREA NO. 2 – TIMBER HILLS DRAINAGE

1. Criteria Evaluation

Two alternatives considered:

- No Action
- New Drainage Infrastructure Along Entirety of Forest Park Drive

The "No Action" alternative would not provide any drainage benefit along Forest Drive and as such, was not considered as a viable option. Alternative 1 would improve flooding and safety concerns along Forest Park Drive.

2. Selected Alternative

Alternative 1 – New Drainage Infrastructure Along Entirety of Forest Park Drive

D. PROJECT AREA NO. 3 – ADAMS STREET DRAINAGE

1. Area 3-A – Between Cypress and Adams Street

a. Criteria Evaluation

Three alternatives considered:

- No Action
- Replace Existing 30-inch Storm Sewer (Alternative 1)
- Line Existing 30-inch Storm Sewer (Alternative 2)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 and 2 are both viable options to help alleviate the flooding in the area. Alternative 2 (lining existing pipe) offers the cheapest solution to the problem. However, CCTV must be completed to ensure that this option is possible. Alternative 1 (replace existing pipe) is viable, however it presents higher construction costs and greater construction and environmental impacts.

b. Selected Alternative

Alternative 2 – Line Existing 30-inch Storm Sewer

2. **Area 3-B – West of Cypress Street**

a. Criteria Evaluation

Three alternatives considered:

- No Action
- Install New Storm Sewer Across Cypress Street (Alternative 1)
- Replace Existing Storm Sewer Across Cypress Street (Alternative 2)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 and 2 are both viable options to help alleviate the flooding in the area. Alternative 2 (replacing existing pipe) offers the cheapest solution to the problem. Alternative 1 (install new storm sewer) offers the added benefit of filling the existing ditch that runs in close proximity to residential properties. Filling the ditch and replacing it with a new storm sewer (Alternative 1) reduces the erosion risk and steep drop off safety concern along Cypress Street and as such, appears to be the most viable alternative.

b. Selected Alternative

Alternative 1 – Install New Storm Sewer Across Cypress Street

E. PROJECT AREA NO. 4 – JENNINGS AND SYCAMORE DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Two alternatives considered:

- No Action
- Install New Concrete Curb, Gutter, Sidewalk, and Barrier Wall (Alternative 1)

The "No Action" alternative allows water to sheet flow down Sycamore Street and jump the sidewalk to the southwest corner of the residential property at the corner of Jennings and Sycamore. Water is being allowed to invade this residential property and cause damage. Alternative 1 would capture the water and divert it away from the residential property, preventing future damages and flooding concerns.

2. Selected Alternative

Alternative 1– New Concrete Curb, Gutter, Sidewalk, and Barrier Wall

F. PROJECT AREA NO. 5 – MIDDLE STREET DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Three alternatives considered:

- No Action
- Encapsulate Existing Ditch with Proposed Storm Sewer (Alternative 1)
- Reroute Existing Ditch and Provide Existing Ditch Erosion Protection (Alternative 2)

The "No Action" alternative would not provide any drainage improvements to the area. Alternate 1 and 2, would provide actual benefit to the Middle Street drainage corridor. The cost to complete Alternate 2 is much cheaper than the cost to complete Alternate 1. Alternate 1 would eliminate open-channel ditch operations and maintenance concerns, however permitting could become costly and difficult to obtain, since it proposes filling in an existing ditch.

Alternate 2 would move the open ditch away from residential properties, however it may be difficult to complete due to utilities in the area. Operations and maintenance cost would be higher for Alternative 2, since an open-ditch would still exist after the improvements. Based on cost and potential benefit, Alternative 1 appears to be the more viable solution.

2. Selected Alternative

Alternative 1 – Encapsulate Existing Ditch with Proposed Storm Sewer

G. PROJECT AREA NO. 6 – FOURTH AND MONROE DRAINAGE IMPROVEMENTS

1. Area 6-A – State Street Drainage Improvements

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Inlets at State Street (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 would provide drainage infrastructure to collect water that is sheet flowing down Brenner Street to Fourth and Monroe. This would help alleviated ponding and traffic safety concerns in the area.

b. Selected Alternative

Alternative 1 – New Storm Inlets at State Street

2. Area 6-B – Fourth Street Drainage Improvements

a. Criteria Evaluation

Two alternatives considered:

- No Action

- Clean, Realign & Armor Ditch and Install New Storm Inlets (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 repairs aging infrastructure, the 60" pipe, and improves the open ditch hydraulic capacity. Adding additional inlets would alleviate the ponding along the sidewalk and the road, reducing traffic safety concerns.

b. Selected Alternative

Alternative 1 – Clean, Realign & Armor Ditch and Install New Storm Inlets

3. **Area 6-C – Third Street Drainage Improvements**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Replace 60-inch Steel Pipe with Proposed 60-inch Storm Pipe (Alternative 1)

The "No Action" alternative would not provide any drainage improvements. Replacing the aging, failing storm sewer removes street infrastructure loss liability and school property damage liability near the track. The proposed pipe would improve hydraulics by providing a smooth interior pipe. Additional inlets and storm pipes would help to alleviate ponding along Third Street and Polk Street, eliminating traffic hazards.

b. Selected Alternative

Alternative 1 – Replace 60-inch Steel Pipe with Proposed 60-inch Storm Pipe

H. PROJECT AREA NO. 7 – FIRST STREET DRAINAGE IMPROVEMENTS

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Install Riprap in Existing Open Ditch (Alternative 1)

The "No Action" alternative would not provide any drainage improvements. Installing riprap in existing open-ditch would armor and protect the existing open channel and minimize debris and obstructions from clogging the existing storm sewer. CCTV inspection would be required to review the structural integrity of existing 54-inch storm sewer. Additional recommendations would be made based on the review of the inspection.

b. Selected Alternative

Alternative 1 – Install Riprap in Existing Open Ditch

I. PROJECT AREA NO. 8 – JENNINGS STEET CORRIDOR DRAINAGE IMPROVEMENTS

1. Area 8-A – Jennings and Washington Avenue

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Infrastructure at Washington Avenue (Alternative 1)

The "No Action" alternative would not replace any aging or failing storm infrastructure, which can create traffic and flooding. Alternative 1 would upgrade and replace all failing infrastructure.

b. Selected Alternative

Alternative 1 – New Storm Infrastructure at Washington Avenue

2. **Area 8-B – Jennings and Jefferson Street**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Infrastructure at Jefferson Street (Alternative 1)

The "No Action" alternative would not replace any aging or failing storm infrastructure, which can create traffic and flooding. Alternative 1 would upgrade and replace all failing infrastructure.

b. Selected Alternative

Alternative 1 – New Storm Infrastructure at Jefferson Street

3. **Area 8-C – Jennings and Market Street**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Infrastructure at Market Street (Alternative 1)

The "No Action" alternative would not replace any aging or failing storm infrastructure, which can create traffic and flooding. Alternative 1 would upgrade and replace all failing infrastructure.

b. Selected Alternative

Alternative 1 – New Storm Infrastructure at Market Street

4. **Area 8-D – Jennings and Madison Street**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Infrastructure at Madison Street (Alternative 1)

The "No Action" alternative would not replace any aging or failing storm infrastructure, which can create traffic and flooding. Alternative 1 would upgrade and replace all failing infrastructure.

b. Selected Alternative

Alternative 1 – New Storm Infrastructure at Madison Street

5. **Area 8-E – Jennings and Monroe Street**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Infrastructure at Monroe Street (Alternative 1)

The "No Action" alternative would not replace any aging or failing storm infrastructure, which can create traffic and flooding. Alternative 1 would upgrade and replace all failing infrastructure.

b. Selected Alternative

Alternative 1 – New Storm Infrastructure at Monroe Street

J. PROJECT AREA NO. 9 – JEFFERSON STREET AND POSEY STREET DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Four alternatives considered:

- No Action
- 402 Jefferson Street Drive Approach Improvements (Alternative 1)

- 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Posey Street (Alternative 2)
- 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Jefferson Street (Alternative 3)

The "No Action" alternative would not provide any drainage improvements to the area and would continue to create overland flows into the private drive due to inadequate facilities.

Alternate 1 is the cheapest alternative; however, it does not propose any collection of the storm water. Alternative 1 simply diverts the flow away from the private drive, creating potential issues along the roadway.

Alternates 2 and 3 both collect and transport all the drainage at the intersection and away from the private drive. Both options provide the same level of stormwater collection protection and transport the flows to the same existing open ditch, just at different locations. Alternative 3 is the cheaper alternative and would also install the infrastructure outside of the roadway.

2. Selected Alternative

Alternative 3 – 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Jefferson Street

K. PROJECT AREA NO. 10 – VILLAGE LANE DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Two alternatives considered:

- No Action
- New Curb and Gutter and Accompanying Storm Pipes (Alternative 1)

The "No Action" alternative would not provide any drainage improvements along Village Lane and would continue to create flooding in front of the apartments. Alternative 1 would collect the ponding water in on the southside of the street and transport the flows to an existing open ditch east.

2. Selected Alternative

Alternative 1 – New Curb and Gutter and Accompanying Storm Pipes

L. PROJECT AREA NO. 11 – FRAME ROAD DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Two alternatives considered:

- No Action
- New Curb, Gutter, and Sidewalk with Accompanying Storm Sewers (Alternative 1)

The "No Action" alternative would not provide any drainage improvements along Frame Road, would not replace aging and inadequate structures, would continue to erode and damage the edge of pavement, and would not eliminate the concentrated flows from crossing the road. Alternate 1 would replace and upgrade piping and structures, eliminate the steep ditch, collect sheet flows, and reduce traffic safety concerns. In addition, this option provides a community sidewalk near the St. John the Baptist Catholic School area.

2. Selected Alternative

Alternative 1 – New Curb, Gutter, and Sidewalk with Accompanying Storm Sewers.

M. PROJECT AREA NO. 12 – KNOB HILL DRAINAGE

1. Area 12-A – Lower Knob Hill Culvert Replacement and Outlet Improvements

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Replace Existing 36-inch Storm Pipe (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 improves the hydraulic capacity of the existing, failing 36" storm pipe.

b. Selected Alternative

Alternative 1 – Replace Existing 36-inch Storm Pipe

2. **Area 12-B – Lower Knob Hill Drive Channel Improvements**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Regrade and Clean Existing Ditch (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 would increase the hydraulic capacity of the existing ditch by increasing the slope and removing trees as needed.

b. Selected Alternative

Alternative 1 – Regrade and Clean Existing Ditch

3. **Area 12-C – Maple Lane Drainage Improvements**

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Install New 6' x 3' Box Culvert (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 replaces the existing, undersized culvert at Maple Lane.

b. Selected Alternative

Alternative 1 – Install New 6' x 3' Box Culvert

N. PROJECT AREA NO. 13 – PLEASURE CLUB DRAINAGE IMPROVEMENTS

1. Area 13-A – Driftwood Subdivision

a. Criteria Evaluation

Three alternatives considered:

- No Action
- Install New Storm Sewer to North of New Driftwood Subdivision (Alternative 1)
- Install New Ditch and Culverts North of New Driftwood Subdivision (Alternative 2)

The "No Action" alternative would not provide any ponding relief and considering it is not a viable option. Alternatives 1 and 2 provide infrastructure to collect and transport stormwater from north of the new Driftwood Subdivision. Alternative 1 has higher construction costs than that of Alternative 2; however, Alternate 1 would simplify maintenance for the residents and Town.

b. Selected Alternative

Alternative 1 – Install New Storm Sewer to North of New Driftwood Subdivision

2. Area 13-B – Phelps to Yorkshire Drive

a. Criteria Evaluation

Two alternatives considered:

- No Action
- Repair Existing and Install New Storm Inlets (Alternative 1)

The "No Action" alternative would not provide any flooding relief and considering it is not a viable option. Alternative 1 would provide drainage infrastructure to alleviate ponding along Phelps Drive.

b. Selected Alternative

Alternative 1 – Repair Existing and Install New Storm Inlets

O. PROJECT AREA NO. 14 – ELLERBUSCH DITCH DRAINAGE IMPROVEMENTS

1. Criteria Evaluation

Three alternatives considered:

- No Action
- Ellerbusch Ditch Flow Diversion and New Culvert Crossing At SR 662 (Alternative 1)
- Upgrade Existing Storm Pipe to 84" Equivalent CMP Pipe Arch (Alternative 2)

The "No Action" alternative would not provide any drainage or road improvements along Ellerbusch Road. This would continue to create steep drop offs for traffic and would not provide any additional hydraulic benefit for the existing local residences. Alternatives 1 and 2 both increase the capacity of Ellerbusch Ditch, which in turn improves Windsor Point, Maple Lane and Knob Hill Trailer Park drainage. Alternative 1 is the much cheaper alternative; however, it does not reduce traffic hazards along the east side of Ellerbusch Road.

In addition, both alternatives would require a large open cut crossing of State Road 662, which will create temporary road closure.

2. Selected Alternative

Alternative 1 – Divert Flow to North of Ellerbusch Road

P. PROJECT AREA NO. 15 – WILLIAMS LANE DRAINAGE

1. Criteria Evaluation

Two alternatives considered:

- No Action
- New Storm Sewer and Inlets (Alternative 1)

The “No Action” alternative would not provide any drainage or replace inadequate storm infrastructure along Williams Lane. Alternative 1 would provide drainage infrastructure to alleviate ponding along Williams Lane.

2. Selected Alternative

Alternative 1 – New Storm Sewer and Inlets

SECTION 6 – PROPOSED PROJECT

A. PROJECT DESIGN

The purpose of this chapter is to provide a discussion of the recommended alternative (Proposed Project), provide project related costs, and an example project implementation schedule. With the overall project cost, it is understandable that the Town would not want to finance, nor have the ability to, complete all said improvements in one single project. Rather the Town should consider prioritizing the projects, take advantage of any funding opportunities and phase the work to accomplish smaller goals over longer time period in order to complete the overall objective.

The Town of Newburgh should implement a feasible project based upon need, cost-effective analysis methods, overall benefit, and non-monetary impacts.

The overall selected project area alternatives are summarized below (in no particular order):

PROJECT AREA NO. 1 – FOREST PARK DRAINAGE

Area 1-A – CC Wade Lake Outlet Ditch Across Treelane Drive

Alternate 1 – 25-YR Storm Infrastructure (38” x 60” Elliptical Storm Sewer)

Area 1-B – Open Channel Improvements from Treelane Drive to Carole Place

Alternate 3 – Articulated Concrete Block Mat Reinforcements

Area 1-C – Carole Place Culvert Upgrade

Alternate 1 – 25-YR Storm Event Infrastructure (6’ x 3’ Box Culvert)

Area 1-D– Open Channel Improvements from Carole Place to Existing 48-inch RCP Culvert

Alternate 3 – Articulated Concrete Block Mat Reinforcements

Area 1-E – Forest Park Drive Culvert and Storm Pipe Upgrade

Alternate 1 – 25-YR Storm Event Infrastructure (6’ x 4’ Box Culvert)

PROJECT AREA NO. 2 – TIMBER HILLS DRAINAGE

Alternative 1 – New Drainage Infrastructure Along Entirety of Forest Park Drive

PROJECT AREA NO. 3 – ADAMS STREET DRAINAGE

Area 3-A – Between Cypress and Adams Street

Alternative 2 – Line Existing 30-inch Storm Sewer

Area 3-B – West of Cypress Street

Alternative 1 – Install New Storm Sewer Across Cypress Street

PROJECT AREA NO. 4 – JENNINGS AND SYCAMORE DRAINAGE IMPROVEMENTS

Alternative 1– New Concrete Curb, Gutter, Sidewalk, and Barrier Wall

PROJECT AREA NO. 5 – MIDDLE STREET DRAINAGE IMPROVEMENTS

Alternative 1 – Encapsulate Existing Ditch with Proposed Storm Sewer

PROJECT AREA NO. 6 – FOURTH AND MONROE DRAINAGE IMPROVEMENTS

Area 6-A – State Street Drainage Improvements

Alternative 1 – New Storm Inlets at State Street

Area 6-B – Fourth Street Drainage Improvements

Alternative 1 – Clean, Realign & Armor Ditch and Install New Storm Inlets

Area 6-C – Third Street Drainage Improvements

Alternative 1 – Replace 60-inch Steel Pipe with Proposed 60-inch Storm Pipe

PROJECT AREA NO. 7 – FIRST STREET DRAINAGE IMPROVEMENTS

Alternative 1 – Install Riprap in Existing Open Ditch

PROJECT AREA NO. 8 – JENNINGS STEET CORRIDOR DRAINAGE IMPROVEMENTS

Area 8-A – Jennings and Washington Avenue

Alternative 1 – New Storm Infrastructure at Washington Avenue

Area 8-B – Jennings and Jefferson Street

Alternative 1 – New Storm Infrastructure at Jefferson Street

Area 8-C – Jennings and Market Street

Alternative 1 – New Storm Infrastructure at Market Street

Area 8-D – Jennings and Madison Street

Alternative 1 – New Storm Infrastructure at Madison Street

Area 8-E – Jennings and Monroe Street

Alternative 1 – New Storm Infrastructure at Monroe Street

PROJECT AREA NO. 9 – JEFFERSON STREET AND POSEY STREET DRAINAGE IMPROVEMENTS

Alternative 3 – 402 Jefferson Street Drive Approach Improvements with 24” Pipe Along Jefferson Street

PROJECT AREA NO. 10 – VILLAGE LANE DRAINAGE IMPROVEMENTS

Alternative 1 – New Curb and Gutter and Accompanying Storm Pipes

PROJECT AREA NO. 11 – FRAME ROAD DRAINAGE IMPROVEMENTS

Alternative 1 – New Curb, Gutter, and Sidewalk with Accompanying Storm Sewers

PROJECT AREA NO. 12 – KNOB HILL DRAINAGE

Area 12-A – Lower Knob Hill Culvert Replacement and Outlet Improvements

Alternative 1 – Replace Existing 36-inch Storm Pipe

Area 12-B – Lower Knob Hill Drive Channel Improvements

Alternative 1 – Regrade and Clean Existing Ditch

Area 12-C – Maple Lane Drainage Improvements

Alternative 1 – Install New 6’ x 3’ Box Culvert

PROJECT AREA NO. 13 – PLEASURE CLUB DRAINAGE IMPROVEMENTS

Area 13-A – Driftwood Subdivision

Alternative 1 – Install New Storm Sewer to North of New Driftwood Subdivision

Area 13-B – Phelps to Yorkshire Drive

Alternative 1 – Repair Existing and Install New Storm Inlets

PROJECT AREA NO. 14 – ELLERBUSCH DITCH DRAINAGE IMPROVEMENTS

Alternative 1 – Divert Flow to North of Ellerbusch Road

PROJECT AREA NO. 15 – WILLIAMS LANE DRAINAGE

Alternative 1 – New Storm Sewer and Inlets

B. TOTAL PROJECT COST ESTIMATE

Total proposed recommended project cost are provided in **Table 6-1**. This Table is to assist the Town in prioritizing projects based on financial considerations.

TABLE 6-1
TOTAL ESTIMATED PROJECT COST

AREA #	ITEM, DESCRIPTION	EST COST
ESTIMATED CONSTRUCTION COST:		
Area No. 1-A	Alternate 1 – 25-YR Storm Infrastructure (38" x 60" Elliptical Storm Sewer)	$ 400,055
Area No. 1-B	Alternate 3 – Articulated Concrete Block Mat Reinforcements	$ 138,150
Area No. 1-C	Alternate 1 – 25-YR Storm Event Infrastructure (6' x 3' Box Culvert)	$ 89,320
Area No. 1-D	Alternate 3 – Articulated Concrete Block Mat Reinforcements	$ 103,000
Area No. 1-E	Alternate 1 – 25-YR Storm Event Infrastructure (6' x 4' Box Culvert)	$ 218,370
Area No. 2	Alternative 1 – New Drainage Infrastructure Along Entirety of Forest Park Drive	$ 892,330
Area No. 3-A	Alternative 2 – Line Existing 30-inch Storm Sewer	$ 59,015
Area No. 3-B	Alternative 1 – Install New Storm Sewer Across Cypress Street	$ 83,955
Area No. 4	Alternative 1– New Concrete Curb, Gutter, Sidewalk, and Barrier Wall	$ 100,340
Area No. 5	Alternative 1 – Encapsulate Existing Ditch with Proposed Storm Sewer	$ 255,345
Area No. 6-A	Alternative 1 – New Storm Inlets at State Street	$ 36,830
Area No. 6-B	Alternative 1 – Clean, Realign & Armor Ditch and Install New Storm Inlets	$ 132,530
Area No. 6-C	Alternative 1 – Replace 60-inch Steel Pipe with Proposed 60-inch Storm Pipe	$ 336,545
Area No. 7	Alternative 1 – Install Riprap in Existing Open Ditch	$ 28,275
Area No. 8-A	Alternative 1 – New Storm Infrastructure at Washington Avenue	$ 348,580
Area No. 8-B	Alternative 1 – New Storm Infrastructure at Jefferson Street	$ 252,445
Area No. 8-C	Alternative 1 – New Storm Infrastructure at Market Street	$ 263,320
Area No. 8-D	Alternative 1 – New Storm Infrastructure at Madison Street	$ 263,755
Area No. 8-E	Alternative 1 – New Storm Infrastructure at Monroe Street	$ 239,685
Area No. 9	Alternative 3 – 402 Jefferson Street Drive Approach Improvements with 24" Pipe Along Jefferson Street	$ 137,750
Area No. 10	Alternative 1 – New Curb and Gutter and Accompanying Storm Pipes	$ 362,790
Area No. 11	Alternative 1 – New Curb, Gutter, and Sidewalk with Accompanying Storm Sewers	$ 999,485

TABLE 6-1
TOTAL ESTIMATED PROJECT COST

Area No. 12-A	Alternative 1 – Replace Existing 36-inch Storm Pipe	$ 50,605
Area No. 12-B	Alternative 1 – Regrade and Clean Existing Ditch	$ 116,000
Area No. 12-C	Alternative 1 – Install New 6' x 3' Box Culvert	$ 110,780
Area No. 13-A	Alternative 1 – Install New Storm Sewer to North of New Driftwood Subdivision	$ 352,060
Area No. 13-B	Alternative 1 – Repair Existing and Install New Storm Inlets	$ 45,240
Area No. 14	Alternative 1 – Divert Flow to North of Ellerbusch Road	$ 440,220
Area No. 15	Alternative 1 – New Storm Sewer and Inlets	$ 117,015
	Estimated Total Project Cost:	**$ 6,973,790**

General Total Project Cost Notes:

1. Construction Cost Based on 2019-dollar values and current construction trends.
2. For construction activities expected to take place beyond shown, an inflation percentage of 5.00% shall be utilized to develop future cost.

C. ANNUAL OPERATING BUDGET

1. Income

The proposed project is not expected to make any additional income for the Town.

2. Debt Repayments

Debt, if incurred due to the proposed project will have to be re-paid on an annual basis and is dependent upon the funding sources used. It is anticipated that any debt would be re-paid over a 20 to 40 year period depending upon the funding method chosen.

3. Reserves

a. Debt Service Reserve

Debt Service Reserve will be dependent upon the funding sources used. A summary table of the most common of these is shown below.

Funding Source	Debt Reserve Percentage
Local Revenue Bond	25%

b. Short-Lived Asset Reserve

The project does not currently contain any short lived assets. The proposed improvements would be expected to have an average useful life of over 40 years; therefore, a short-lived asset reserve is not expected to be needed for replacement of them.

D. FINANCING SCENARIOS

1. Stormwater Utility

The Town of Newburgh currently has a stormwater utility in place. The Town recently raised stormwater fees in an effort to create preliminary financing for future capital improvement projects presented here-in.

2. Community Crossings Matching Grant Program (CCG)

Community Crossings Matching Grant Program provides funding to cities, towns, and counties across Indiana to make improvements to local roads and bridges. This offers an excellent funding option for projects that can utilize road and bridge improvements to help alleviate localized flooding. This funding option would be available to the Town on project areas such as Area 4, where improving the road and adding a curb and gutter and sidewalk would directly alleviate flooding of a residential property. The Town of Newburgh could apply for a 75/25% community crossing matching grant to help fund these projects.

3. Flood Control Revolving Fund Program (SRF)

The Flood Control Program offers funding opportunity in which financial assistance may be made to a Town for the purpose of instituting, accomplishing and administering any approved “flood control program” in the form of a low interest loan. Flood control programs may include the following: removal of obstruction and accumulated debris from channels, clearing and straightening of channels, creating new and enlarges channels, building or repairing of dikes, levees, or other flood protective works, construction of bank protection works for streams, establishment of floodways, and conducting all other activities that are permitted by the federal Flood Control Act and federal Clean Water Act. A SRF loan can be taken up to $250,000 and can be paid back at 2.0% interest for loan terms between 1 and 5 years, or at 2.5% for loan terms between 5 and 10 years.

E. PROJECT SCHEDULE

The schedule in **Table 6-2** provides an example time period the Town may expect to complete a large capital improvement project, from design to construction completion. This table includes key milestones, through the course of the project that will aid the Town in tracking progress.

TABLE 6-2
PROJECT SCHEDULE AND MILESTONE DATES

TASK DESCRIPTION	EST COMPLETION DATE
PER Presented to Public	March 2019
Town Approves PER	April 2019
Town Authorizes Design	May 2019
Town Submits All Necessary Construction Permits	September 2019
Town Begins Land Acquisition	September 2019
Town Receives All Construction Permits	November 2019
Final Design Complete	December 2019
Town Completes Land Acquisition	February 2020
Town Approves Design, Plans, and Specs: Authorizes to Bid Project	February 2020
Town Advertises for Construction Bids	February 2020
Town Receives Construction Bids	March 2020
Town Authorizes Construction	May 2020
Town Substantially Completes the Project	November 2020
Town Administratively Completes the Project	December 2020

F. PERMIT REQUIREMENTS

Permits that may be required prior to the project commencing includes:

- Warrick County Soil and Water Conservation District, administered through Indiana Department of Environmental Management (IDEM), require a Stormwater Pollution Prevention Plan ("Rule 5" through 327-IAC 15-5) for land disturbances of one acre or more. This plan requires a submission of erosion control plans and implementation of erosion control practices.
- US Army Corps of Engineers Section 404 of the Clean Water Act (33 U.S.C. 1344) for the discharge of dredged or fill material into water of the United States.

- Indiana Department of Environmental Management (IDEM) Section 401 (33 U.S.C. 1344) Water Quality Certification for purposed of water pollution control laws and environmental management laws for waters of the state.
- Indiana Department of Natural Resources permit application for construction within a floodway in accordance to IC 14-28-1.
- Project may require Overhead ROW Permit through Vectren's Encroachment Agreement.

SECTION 7 – CONCLUSIONS AND RECOMMENDATIONS

This plan has evaluated the existing facilities, identified existing and projected needs, developed alternatives and selected projects. This section will review conclusions and recommendations.

A. PROPOSED PROJECT

Fifteen project areas were identified as needing drainage improvements throughout the Town. It is not feasible to complete all project area improvements in one single project. The Town should consider prioritizing projects, utilize funding opportunities, and phase the work discussed in this report in order to accomplish small goals over a longer period of time, which will ultimately help towards completing the overall objective.

B. PUBLIC MEETING

A public meeting was held on March 18th, 2019 during the monthly Stormwater Drainage Board's meeting to solicit public comment on the Stormwater Preliminary Engineering Report. The Public had opportunities to voice opinion or discuss additional areas of concern during the meeting. Citizens were given an additional 45 days to provide comments to the Board. Comments received have been incorporated into **Appendix F**. Based on these comments, planning level costs and generalized layouts were provided for a few additional areas for future consideration.

C. ADDITIONAL NEEDS THROUGH THE PLANNING PERIOD

1. Drainage Standards

   The Town may want to consider updating stormwater standards and specifications established to ensure stormwater infrastructure is adequately sized, proper materials are utilized, and appropriate installation techniques are used. The Town may also want to consider providing standard stormwater details for developers to abide by.

2. Impacted Drainage Basins

   The Town may want to consider establishing impacted drainage basins, with special attention to Ellerbusch Ditch Watershed. Much of the upstream drainage basin is within the County and is currently not developed. The Town should consider working with the County to ensure future developments do not create additional flooding to the existing downstream residences. This area is very

sensitive due to the current hydraulic deficiencies. An impacted drainage basin would not restrict development, rather provide more stringent design risk criteria for storage or infrastructure sizing to reduce downstream residences flood risk.

APPENDIX A

JENNINGS STREET CORRIDOR
DRAINAGE STUDY
JULY 24, 2015

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

July 24, 2015

Mr. William F. Kavanaugh, Council President
Town of Newburgh
23 West Jennings Street
PO Box 6
Newburgh, Indiana 47630

RE: JENNINGS ST. DRAINAGE CORRIDOR STUDY

Dear Mr. Kavanaugh:

Commonwealth Engineers, Inc. was hired to perform an evaluation of the existing storm infrastructure on Jennings Street, from Washington Street to State Street. This evaluation was requested by the Town after recently finding a failed storm pipe under Jennings Street while doing the excavation on the Jennings Street Sidewalk Improvements Project. There is a sense of urgency to have this work completed because of the pending pavement improvements. This letter provides the results of our findings and recommendations.

The existing storm infrastructure evaluation includes documentation of inlets, headwalls, and limited interior pipe inspection still photos. The evaluation was originally planned for CEI to team with the Town of Newburgh Sewer Department crews to CCTV all existing storm lines. However, Newburgh crews were unable to get cameras through much of the lines due to blockages (sediment and gravel inhibiting camera access), inability to jet (clean), due to the induced risk of pipe failure, and blind connections not allowing cameras to access much of the existing sewers. Instead, where access was available, CEI personnel took interior still pictures of the piping. Visual still photo documentation was limited to piping with above grade access, the flash length within the pipe, the amount of obstructions or sediment found within the pipe, and blind connections or fittings restricting vision beyond that connection or fitting. State Street infrastructure had limited access points and much of the piping could not be thoroughly evaluated without CCTV inspection.

The conclusion drawn, from the evaluation of the existing infrastructure along Jennings Street, is the need for replacement or rehabilitation of much of the infrastructure. In general, the piping infrastructure was found to be shallow, typically 18-36 inches in depth, and experiencing corrosion or deterioration leading to failure. The non-coated corrugated metal piping was found to have a rusted bottom half of the pipe from years of service from water contact and abrasive flows. At multiple Jennings Street crossings, the corrugated metal pipe was so deteriorated that soil backfill was visible from the interior of the structure. In this case, pipe collapse is eminent.

The Town has told CEI that funds are limited and necessary repairs must be prioritized with emphasis on repairs under Jennings Street mainline. Other repairs could be completed once funds become available. With regard to prioritization of repairs, CEI evaluated failure risk potential for infrastructure under normal load conditions and the heightened construction load conditions.

101 Plaza East Boulevard, Suite 200
Evansville, Indiana 47715
812.474.1177
812.474.1176 Fax

Priority 1
Infrastructure directly under Jennings Street, which has a significant risk of failure based on current conditions and depth.

Priority 2
Infrastructure adjacent to Jennings Street, which has a moderate risk of failing during the Jennings Street re-construction and is at risk of failure in the future under normal loading conditions. If this work cannot be completed at this time, the Town should consider budgeting to complete the repairs within the next 1 to 5 years.

Priority 3
Infrastructure that has a minimal chance of failing during the Jennings Street re-construction, but may anticipate failure under normal loading conditions. If this work cannot be completed at this time, the Town should consider budgeting to complete the repairs within the next 5 to 10 years.

The construction cost estimate to complete Priority 1 repairs is $75,000. The construction cost estimate to complete Priority 1 and 2 repairs is $110,000. To complete all Priority repairs, the construction cost estimate is $127,000.

If you have any questions or we can be of any further assistance, please feel free to contact our office.

Sincerely,
COMMONWEALTH ENGINEERS, INC.

Drew O. Flamion, P.E.

Encl: Conceptual Plans
Existing Infrastructure Evaluation
Construction Cost Estimates

CC: Town Council
Christopher C. Wischer, Town Attorney

101 Plaza East Boulevard, Suite 200
Evansville, Indiana 47715
812.474.1177
812.474.1176 Fax

Jul 24, 2015 - 10:12am
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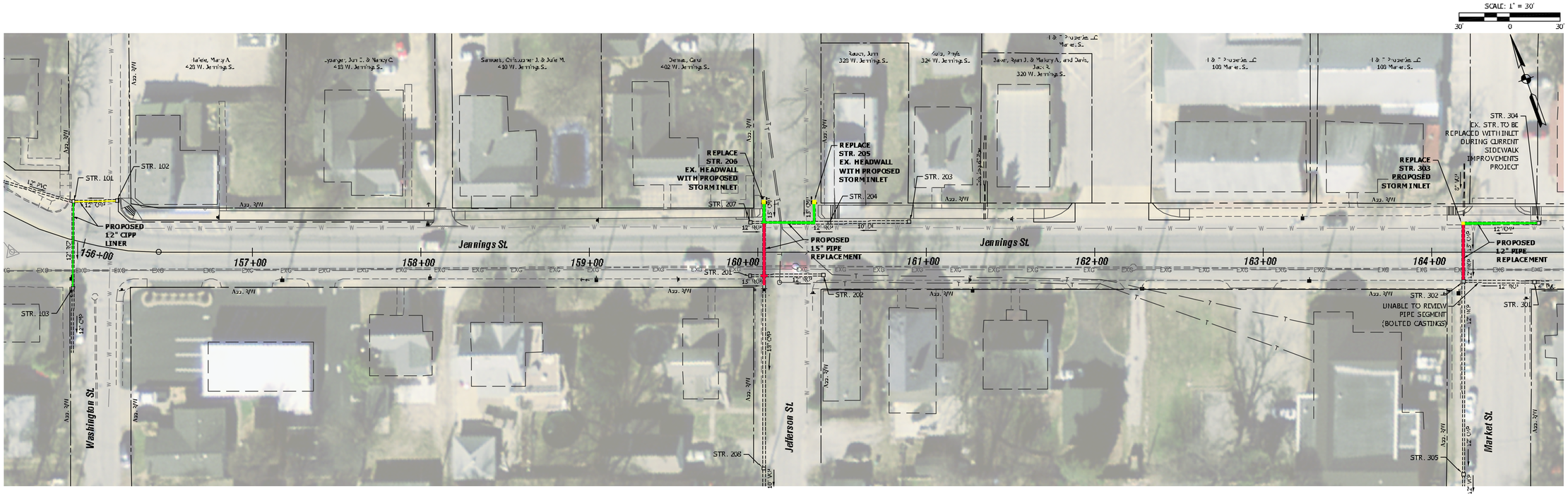
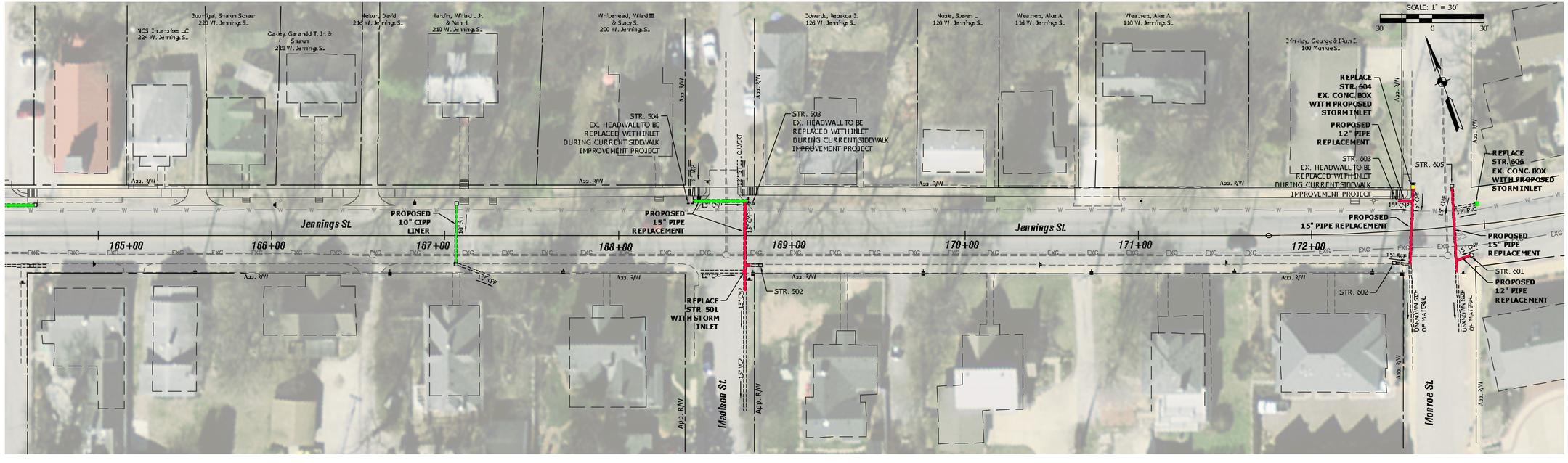
XREF: Pavement.dwg
XREF: TITLE BLOCK_2015_8X11.dwg





LEGEND

- PRIORITY 1
- PRIORITY 2
- PRIORITY 3

Jennings St Corridor Drainage.dwg

Indiana 811 Know what's below. Call before you dig.
OR 1-800-382-5544 (ITS THE LAW)

REVISIONS

No.	DATE	DESCRIPTION	REVISED BY

COMMONWEALTH ENGINEERS, INC.
7256 Company Dr. Indianapolis, IN 46237 (317) 888-1177
101 Plaza East Blvd. Ste. 200 Evansville, IN 47715 (812) 474-1177
9804 Coldwater Road, Suite 203 Fort Wayne, IN 46825 (260) 494-3223

DRAWN BY:	ALR
DESIGNED BY:	DOF
CHECKED BY:	DAH
DATE:	JULY 2015
JOB NO:	C13075(10)
SCALE:	AS NOTED

TOWN OF NEWBURGH
WARRICK COUNTY, IN

JENNINGS STREET CORRIDOR DRAINAGE STUDY

JENNINGS STREET FROM
WASHINGTON STREET TO MONROE STREET

DRAWING NO. 1

1 OF 2

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XREF: Pavement.dwg
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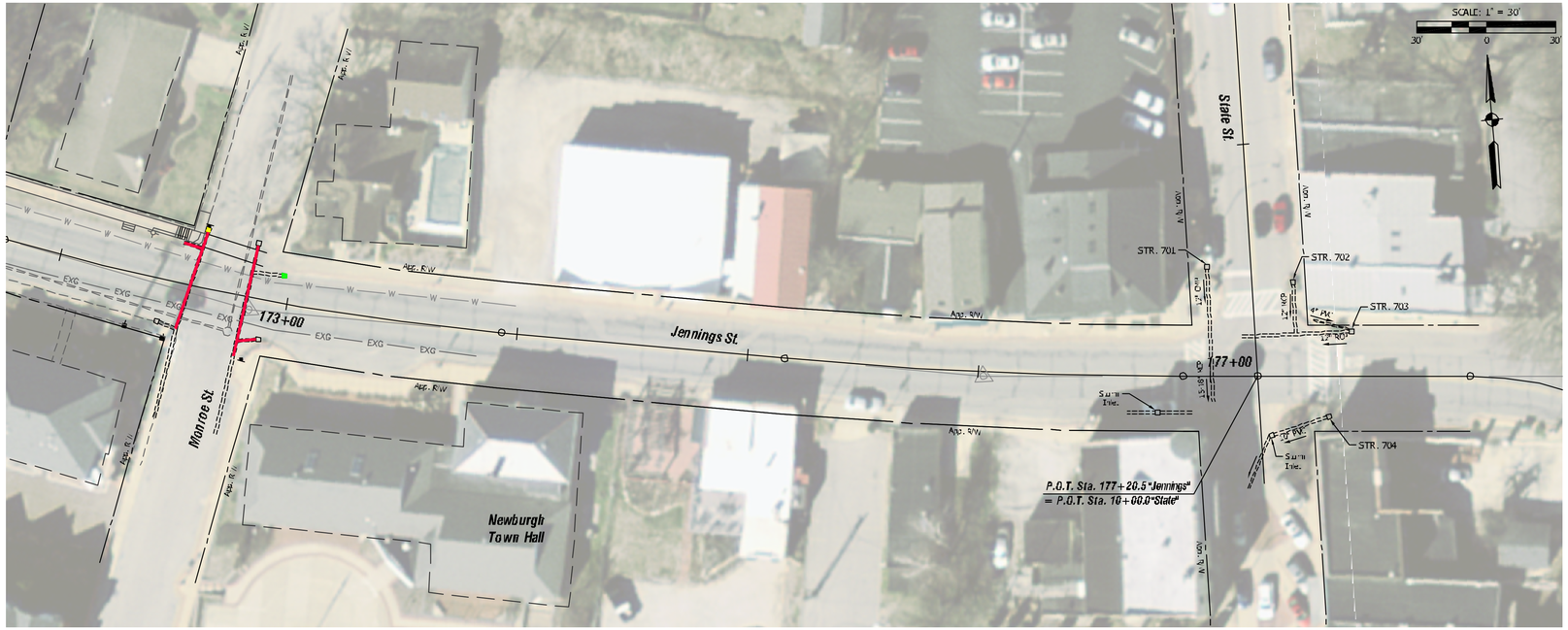

Jennings St Corridor Drainage.dwg

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SCALE:	AS NOTED

TOWN OF NEWBURGH
WARRICK COUNTY, IN

JENNINGS STREET CORRIDOR DRAINAGE STUDY

JENNINGS STREET FROM
MONROE STREET TO STATE STREET

DRAWING NO.
2
2 OF 2

WASHINGTON & JENNINGS ST. INTERSECTION

STRUCTURE #	101
LOCATION	NW Quad. of Washington & Jennings St.
STR. DESCRIPTION	24”x24” Conc. Box with Flat Grate Frame & Casting
PIPE INFLOW (1)	(W.) 12” PVC = - 2.35 ft.; 1-2” of silt at pipe bottom
PIPE INFLOW (2)	(E.) 12” CMP = -2.5 ft.; 1-2” of gravel at str.; pipe was noted as being non-coated
PIPE OUTFLOW	(S.) 12” RCP = -2.4 ft.; apparent joint infiltration, minor deterioration
NOTES	Sump of structure contained 3-4” of gravel and silt (bottom not verified).

Str.

Interior Str.

(W.) 12” PVC

(E.) 12” CMP

(S.) 12” RCP

WASHINGTON & JENNINGS ST. INTERSECTION

STRUCTURE #	102
LOCATION	NE Quad. of Washington & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 12” CMP = -2.15 ft.; pipe was noted as being non-coated
NOTES	Casting unable to be removed for detailed investigation

Str.

Top of Casting

(W.) 12” CMP

WASHINGTON & JENNINGS ST. INTERSECTION

STRUCTURE #	103
LOCATION	SW Quad. of Washington & Jennings St.
STR. DESCRIPTION	24”x24” Conc. Box with Flat Grate, No Frame
PIPE INFLOW	(N.) 12” RCP = - 3.15 ft.; apparent joint infiltration and offsets, 1” of gravel in pipe at str.
PIPE OUTFLOW	(S.) 12” CMP = -3.15 ft.; apparent joint infiltration, minor deterioration
NOTES	Sump of structure contained gravel and silt.

Str.

Interior Str.

(N.) 12” RCP

(S.) 12” CMP

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	201
LOCATION	SW Quad. of Jefferson & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(E.) 15” RCP = -2.45 ft.
NOTES	None

Str.

Top Str.

(E.) 15” RCP

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	202
LOCATION	SE Quad. of Jefferson & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 12” RCP = -2.3 ft.;
NOTES	None

Str.

Interior of Str.

(W.) 12” RCP

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	203
LOCATION	East of Jefferson & Jennings St Intersection, on north side of Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 10” D.I.P. = -2.1 ft.;
NOTES	None

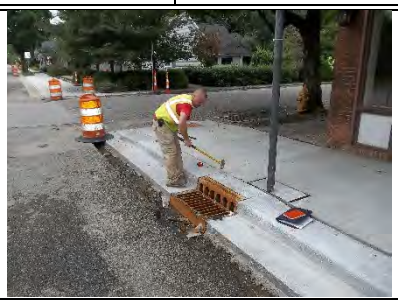
Str.

Interior Str.

(W.) 10” D.I.P.

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	204
LOCATION	NE Quad. of Jefferson & Jennings St.; on Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	(E.) 10” D.I.P. = -2.54 ft.
PIPE OUTFLOW	(W.) 12” RCP = -2.54 ft.
NOTES	None



Str.

Interior Str.

(E.) 10” D.I.P.

(W.) 12” RCP

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	205
LOCATION	NE Quad. of Jefferson & Jennings St.; on Jefferson St.
STR. DESCRIPTION	36”x36” Conc. Box and Weir; non traffic rated casting
PIPE INFLOW	(N.) notched section of conc. Box for asphalt swale
PIPE OUTFLOW	(S.) 15” CMP = -2.7 ft.; (1/3) pipe diameter full of sediment and gravel, pipe severely deteriorated, soil exposed behind pipe
NOTES	Bottom of Str. full of sediment and gravel, filling pipe

Str.

Interior Str.

(S.) 15” CMP

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	206
LOCATION	NW Quad. of Jefferson & Jennings St.; on Jefferson St.
STR. DESCRIPTION	Concrete Headwall converted to inlet with Brick; non-traffic rated casting
PIPE INFLOW	None
PIPE OUTFLOW	(S.) 15" CMP = -1.75 ft.; (1/3) pipe diameter full of sediment and gravel, pipe severely deteriorated, soil exposed behind pipe
NOTES	Bottom of Str. full of sediment and gravel, filling pipe; box collapsing

Str.

Top Str.

(S.) 15" CMP

Interior of Str.

JEFFERSON & JENNINGS ST. INTERSECTION

STRUCTURE #	207
LOCATION	NW Quad. of Jefferson & Jennings St.; on Jennings St.
STR. DESCRIPTION	24”x24” Conc. Box with Flat Grate Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(E.) 12” RCP = -2.54 ft.; Rock accumulations in pipe
NOTES	New Str.; rock in bottom of str.

Str.

Interior of Str.

(E.) 12” RCP

JEFFERSON ST.

STRUCTURE #	208
LOCATION	South of Jefferson & Jennings St. intersection; on west side of Jefferson St.
STR. DESCRIPTION	Poured in place Str. with flat grate, no frame
PIPE INFLOW	(N.) 18” CMP = -2.7 ft.; 2-3” rock accumulations in bottom of pipe
PIPE OUTFLOW	(S.) 10” VCP = -2.8 ft.; Offset joint and potential collapsing or cracked pipe
NOTES	Rock and soil entering structure; downstream pipe smaller than upstream pipe

Str.

Interior of Str.

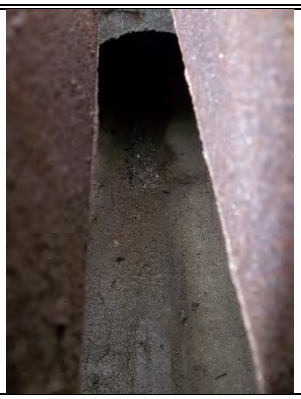
(N.) 18” CMP

(S.) 10” VCP

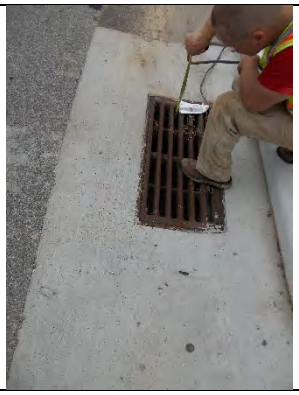
MARKET & JENNINGS ST. INTERSECTION

STRUCTURE #	301
LOCATION	SE Quad. of Market & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Bolted Down Flat Grate and Frame
PIPE INFLOW	(E.) 4” PVC = - 1.3 ft.
PIPE OUTFLOW	(W.) 12” RCP = -1.6 ft.
NOTES	Unable to remove casting for interior pipe picture. Str. appeared to be in good shape and pipes connected to str. appeared to be of newer construction.

Str.



Interior Str. Looking at 12” RCP



Top of Str.

MARKET & JENNINGS ST. INTERSECTION

STRUCTURE #	302
LOCATION	SW Quad. of Market & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Bolted Down Flat Grate and Frame
PIPE INFLOW (1)	(N.) 12” RCP = -1.75 ft.
PIPE INFLOW (2)	(E.) 12” RCP = -1.75 ft.
PIPE OUTFLOW	(S.) 12” RCP = -1.8 ft.
NOTES	Unable to remove casting for interior pipe picture. Str. appeared to be in good shape and pipes connected to str. appeared to be of newer construction.

Str.

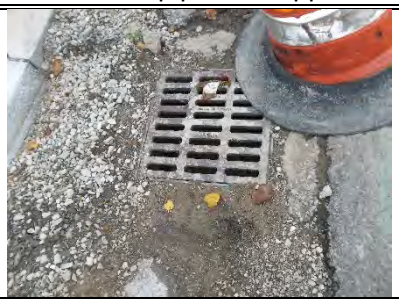
Top of Casting

(E.) 12” RCP

MARKET & JENNINGS ST. INTERSECTION

STRUCTURE #	303
LOCATION	NW Quad. of Market & Jennings St.
STR. DESCRIPTION	24”x24” Conc. Box with Flat Grate and Frame
PIPE INFLOW (1)	(N.) 8” VCP = -1.85 ft.; Full of sediment
PIPE INFLOW (2)	(E.) 12” RCP = -2.05 ft.; Appears to turn into CMP just upstream of the str. connection, pipe (1/2) full of sediment
PIPE OUTFLOW	(S.) 15” CMP = -1.8 ft.; Fully deteriorated pipe, pipe (1/2) full of sediment
NOTES	Bottom of str. full of sediment; All elevations and pipe sizes approximate

Str.



Top of Casting

(S.) 12” CMP

(E.) 12” RCP to CMP

(N.) 8” VCP

MARKET & JENNINGS ST. INTERSECTION

STRUCTURE #	304
LOCATION	NE Quad. of Market & Jennings St.
STR. DESCRIPTION	Concrete Headwall converted to inlet; non-traffic rated casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 12” CMP = -1.45 ft.; Fully deteriorated pipe, pipe (1/2) full of sediment
NOTES	Bottom of str. full of sediment; All elevations and pipe sizes approximate; road asphalt giving way from material loss around str.

Str.

(W.) 12” CMP

Road loss of material at Str.

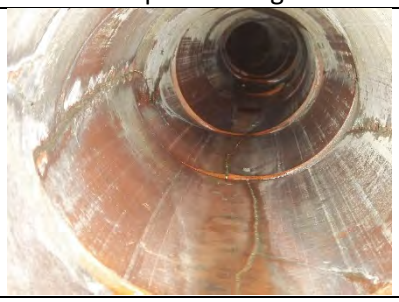
MARKET ST.

STRUCTURE #	305
LOCATION	South of Market & Jennings St. intersection, west side of Market St.
STR. DESCRIPTION	24”x24” Brick Str. with Flat Grate and Frame
PIPE INFLOW	(N.) 12” CMP = -1.55 ft.; Deteriorated, failing pipe
PIPE OUTFLOW	(S.) 12” VCP = -1.8 ft.
NOTES	

Str.

Top of Casting

(N.) 12” CMP



(S.) 12” VCP

Interior of Str.

JENNINGS ST.

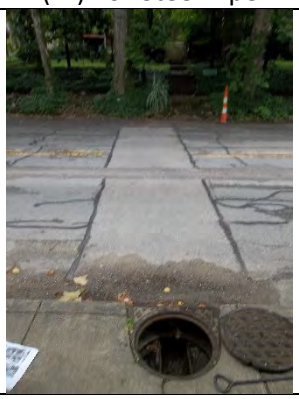
STRUCTURE #	401
LOCATION	South side of Jennings St.; between Market and Madison St.
STR. DESCRIPTION	Poured in Place Conc. Str. with MH Curb Casting
PIPE INFLOW	(N.) 10" Steel = - 1.55 ft.; ½" thick Steel pipe with severe flaking and deterioration; top of pipe cut to fit under casting, cover may be a few inches
PIPE OUTFLOW	(SE.) 10" CPP = -1.63 ft.
NOTES	Shallow pipe installation across Jennings St.

Str.

Interior Str. Looking at Steel Pipe

(N.) 10" Steel Pipe

(SE.) 12" CPP



Str.

JENNINGS ST.

STRUCTURE #	402
LOCATION	North side of Jennings St.; between Market and Madison St.
STR. DESCRIPTION	Poured in Place Conc. Str. with Flat Grate in Asphalt
PIPE INFLOW	None
PIPE OUTFLOW	(S.) 10" Steel; = -1.1 ft.; ½" thick Steel pipe with severe flaking and deterioration
NOTES	Shallow pipe installation across Jennings St.; Unable to remove casting for pipe interior photo inspection.

Str.

Top of Str.

(S.) 10" Steel Pipe

MADISON & JENNINGS ST. INTERSECTION

STRUCTURE #	501
LOCATION	SE Quad. of Madison & Jennings St.
STR. DESCRIPTION	48”Conc. Doghouse MH with Solid grate and Frame
PIPE INFLOW (1)	(W.) 12” CPP = - 2.8 ft.; 1” of fine sediment in bottom of pipe
PIPE INFLOW (2)	(N.) 15” CMP = - 3.05 ft.; (1/4 to 1/2) pipe diameter full of sediment and gravel, severely deteriorated CMP
PIPE OUTFLOW	(S.) 15” CMP = -3.05 ft.; Severely deteriorated CMP changes to VCP and contains large joint offset at connection
NOTES	

Str.

Interior of Str.

(W.) 12” CPP

(N.) 15” CMP

(S.) 15” CMP to VCP

MADISON & JENNINGS ST. INTERSECTION

STRUCTURE #	502
LOCATION	SE Quad. of Madison & Jennings St. on Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 12” RCP = -2.2 ft.; Joint offset in pipe
NOTES	

Str.

Top of Str.

Interior of Str.

(W.) 12” RCP

MADISON & JENNINGS ST. INTERSECTION

STRUCTURE #	503
LOCATION	NE Quad. of Madison & Jennings St.
STR. DESCRIPTION	Conc. Headwall
PIPE INFLOW (1)	(W.) 15” CMP 3/4 of pipe full of rock and sediment
PIPE INFLOW (2)	(N.) 12” Steel; Located above headwall, crushed end, experiencing deterioration
PIPE OUTFLOW	(S.) 15” CMP; (1/4 to 1/2) pipe diameter full of sediment and gravel, severely deteriorated CMP
NOTES	Str. full of gravel and sediment

Str.

Str.

(N.) 12”Steel

(W.) 15” CMP

(S.) 15” CMP

MADISON & JENNINGS ST. INTERSECTION

STRUCTURE #	504
LOCATION	NW Quad. of Madison & Jennings St.
STR. DESCRIPTION	Conc. Headwall
PIPE INFLOW	(N.) 8” VCP; Located above headwall, butt joint pipe experiencing joint separation
PIPE OUTFLOW	(E.) 15” CMP; (1/2) pipe diameter full of sediment and gravel, severely deteriorated CMP
NOTES	Str. full of gravel and sediment

Str.

Str.

(N.) 8” VCP

(E.) 15” CMP

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	601
LOCATION	SE Quad. of Monroe & Jennings St.
STR. DESCRIPTION	24”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 15” CMP = -3.2 ft.; Severely deteriorated CMP with minor sediment accumulations in pipe
NOTES	

Str.

Top of Str.

Interior of Str.

(W.) 15” CMP

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	602
LOCATION	SW Quad. of Monroe & Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(E.) 15” RCP = -2.5 ft.;
NOTES	Str. recently replaced

Str.

Top of Str.

Interior of Str.

(E.) 15” RCP

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	603
LOCATION	NW Quad. of Monroe & Jennings St. on Jennings St.
STR. DESCRIPTION	Conc. Headwall
PIPE INFLOW	None
PIPE OUTFLOW	(E.) 15” CMP; Severely deteriorated pipe, soil visible and sediment accumulations
NOTES	Sediment in str.

Str.

Top of Str.

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	604
LOCATION	NW Quad. of Monroe & Jennings St., on Monroe St.
STR. DESCRIPTION	Conc. Box with Flat non-traffic rated casting
PIPE INFLOW	None
PIPE OUTFLOW	(S.) 15” CMP = -2.5 ft.; Severely deteriorated with soil cavity’s forming
NOTES	Str. partly located under sidewalk, sidewalk is settling, potentially from loss of material from storm pipe

Str.

Settling sidewalk (potential loss of material from failing CMP)

Interior of Str.

(S.) 15” CMP; cavity forming on the left

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	605
LOCATION	NE Quad. of Monroe & Jennings St.
STR. DESCRIPTION	Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(S.) 15” CMP = -2.4 ft.; Severely deteriorated with soil evident
NOTES	Str. has areas exposed to soil near casting

Str.

Interior of Str.

(S.) 15” CMP

MONROE & JENNINGS ST. INTERSECTION

STRUCTURE #	606
LOCATION	NE Quad. of Monroe & Jennings St.
STR. DESCRIPTION	Conc. Box with Flat Grate
PIPE INFLOW	None
PIPE OUTFLOW	(W.) 12” PVC = -1.95 ft.
NOTES	Str. has structural cracking and deteriorated pipe connection

Str.

Top of Str.

Interior of Str.

Deteriorated Str. Connection

(E.) 12” PVC

STATE & JENNINGS ST. INTERSECTION

STRUCTURE #	701
LOCATION	NW Quad. of State & Jennings St., on State St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None visible
PIPE OUTFLOW	(S.) 12” CMP = -1.85 ft.; Interior bituminous coating eroding off bottom of pipe
NOTES	Unable to remove casting for full visual inspection.

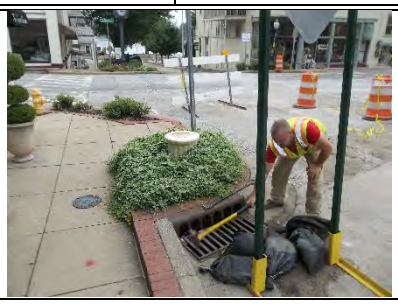
Str.

Top Str.

(S.) 12” CMP

STATE & JENNINGS ST. INTERSECTION

STRUCTURE #	702
LOCATION	NE Quad. of State & Jennings St., on State St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None visible
PIPE OUTFLOW	(S.) 12” RCP = -2.03 ft.;
NOTES	Unable to remove casting for full visual inspection.



Str.

Top Str.

(S.) 12” RCP

STATE & JENNINGS ST. INTERSECTION

STRUCTURE #	703
LOCATION	NE Quad. of State & Jennings St., on Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	(W.) 4” PVC Downspout Drain
PIPE OUTFLOW	(W.) 12” RCP = -1.6 ft.; Small sag evident, pipe makes bend with unknown type of fitting
NOTES	

Str.

Top Str.

(W.) 12” RCP

(W.) 4” PVC

STATE & JENNINGS ST. INTERSECTION

STRUCTURE #	704
LOCATION	SE Quad. of State & Jennings St., on Jennings St.
STR. DESCRIPTION	36”x18” Conc. Box with Curb and Gutter Frame & Casting
PIPE INFLOW	None
PIPE OUTFLOW	(SW.) 10” PVC = -1.7 ft.;
NOTES	

Str.

Top Str.

(SW.) 10” PVC

ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE
NEWBURGH, INDIANA
PRIORITY 1 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
1	Mobilization, Demobilization, Bond, Etc.	1	LS	$5,000.00	$5,000.00
2	Temporary Erosion and Sediment Control	1	LS	$1,250.00	$1,250.00
3	Maintenance of Traffic	1	LS	$8,500.00	$8,500.00
				SUBTOTAL	**$14,750.00**
	WASHINGTON & JENNINGS ST. INTERSECTION				
1	NONE				
				SUBTOTAL	**$0.00**
	JEFFERSON & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$750.00	$750.00
3	Concrete Junction Box	2	EA	$2,500.00	$5,000.00
4	Pipe Reconnection	1	EA	$800.00	$800.00
5	Pipe, 15" RC Storm Pipe (Jennings St.)	32	LF	$55.00	$1,760.00
6	Pipe, 18" RC Storm Pipe (Jennings St.)	8	LF	$65.00	$520.00
7	Granular Backfill	40	LF	$12.00	$480.00
8	Concrete Curb and Gutter Pan	6	LF	$75.00	$450.00
9	Asphalt Surface Replacement - City Street	32	LF	$23.00	$736.00
				SUBTOTAL	**$10,496.00**
	MARKET & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$750.00	$750.00
2	Pipe Reconnection	2	EA	$800.00	$1,600.00
3	Pipe, 12" RC Storm Pipe (Jennings St.)	32	LF	$48.00	$1,536.00
4	Granular Backfill	32	LF	$12.00	$384.00
5	Asphalt Surface Replacement - City Street	32	LF	$23.00	$736.00
				SUBTOTAL	**$5,006.00**

ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE
NEWBURGH, INDIANA
PRIORITY 1 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
JENNINGS ST. BETWEEN MARKET & MADISON ST.					
1	NONE				
				SUBTOTAL	**$0.00**
MADISON & JENNINGS ST. INTERSECTION					
1	Existing Str. Removal	1	**LS**	$1,500.00	$1,500.00
2	Storm Inlet	1	**EA**	$2,500.00	$2,500.00
3	Concrete Junction Box	1	**EA**	$2,500.00	$2,500.00
4	Pipe Reconnection	5	**EA**	$800.00	$4,000.00
5	Pipe, 15" RC Storm Pipe (Jennings St.)	52	**LF**	$55.00	$2,860.00
6	Granular Backfill	52	**LF**	$12.00	$624.00
7	Concrete Sidewalk, 4" Thick	6	**LF**	$65.00	$390.00
8	Compacted Aggregate Drive Replacement	4	**LF**	$12.00	$48.00
9	Asphalt Surface Replacement - City Street	42	**LF**	$23.00	$966.00
				SUBTOTAL	**$15,388.00**
MONROE & JENNINGS ST. INTERSECTION					
1	Existing Str. Removal	1	**LS**	$1,250.00	$1,250.00
3	Concrete Junction Box	3	**EA**	$2,500.00	$7,500.00
4	Pipe Reconnection	4	**EA**	$800.00	$3,200.00
5	Pipe, 12" RC Storm Pipe (Jennings St.)	16	**LF**	$48.00	$768.00
6	Pipe, 15" RC Storm Pipe (Jennings St.)	95	**LF**	$55.00	$5,225.00
7	Granular Backfill	111	**LF**	$12.00	$1,332.00
8	Concrete Curb and Gutter Pan	10	**LF**	$75.00	$750.00
9	Asphalt Surface Replacement - City Street	101	**LF**	$23.00	$2,323.00
				SUBTOTAL	**$22,348.00**
STATE & JENNINGS ST. INTERSECTION					
	REQUIRES CCTV INSPECTION				
				SUBTOTAL	**$0.00**
				CONSTRUCTION TOTAL	**$67,988.00**
				10% Construction Contingency	$6,798.80
				ESTIMATED TOTAL COST	**$74,786.80**

ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE

NEWBURGH, INDIANA

PRIORITY 1 & 2 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
1	Mobilization, Demobilization, Bond, Etc.	1	LS	$7,400.00	$7,400.00
2	Temporary Erosion and Sediment Control	1	LS	$1,750.00	$1,750.00
3	Maintenance of Traffic	1	LS	$11,000.00	$11,000.00
				SUBTOTAL	**$20,150.00**
	WASHINGTON & JENNINGS ST. INTERSECTION				
1	12" CIPP Liner (Across Jennings St.)	50	LF	$75.00	$3,750.00
				SUBTOTAL	**$3,750.00**
	JEFFERSON & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$1,200.00	$1,200.00
2	Concrete Junction Box	3	EA	$2,500.00	$7,500.00
3	Pipe Reconnection	1	EA	$800.00	$800.00
4	Pipe, 15" RC Storm Pipe	82	LF	$55.00	$4,510.00
5	Pipe, 18" RC Storm Pipe	8	LF	$65.00	$520.00
6	Granular Backfill	90	LF	$12.00	$1,080.00
7	Concrete Curb and Gutter Pan	6	LF	$75.00	$450.00
8	Concrete Sidewalk, Handicap Ramp	1	EA	$1,200.00	$1,200.00
9	Asphalt Surface Replacement - City Street	82	LF	$23.00	$1,886.00
				SUBTOTAL	**$19,146.00**
	MARKET & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$1,200.00	$1,200.00
2	Pipe Reconnection	3	EA	$800.00	$2,400.00
3	Pipe, 12" RC Storm Pipe	75	LF	$48.00	$3,600.00
4	Granular Backfill	75	LF	$12.00	$900.00
5	Asphalt Surface Replacement - City Street	75	LF	$23.00	$1,725.00
				SUBTOTAL	**$9,825.00**

ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE

NEWBURGH, INDIANA

PRIORITY 1 & 2 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
JENNINGS ST. BETWEEN MARKET & MADISON ST.					
1	10" CIPP Liner	38	LF	$70.00	$2,660.00
				SUBTOTAL	**$2,660.00**
MADISON & JENNINGS ST. INTERSECTION					
1	Existing Str. Removal	1	LS	$1,500.00	$1,500.00
2	Storm Inlet	1	EA	$2,500.00	$2,500.00
3	Concrete Junction Box	1	EA	$2,500.00	$2,500.00
4	Pipe Reconnection	5	EA	$800.00	$4,000.00
5	Pipe, 15" RC Storm Pipe	83	LF	$55.00	$4,565.00
6	Granular Backfill	83	LF	$12.00	$996.00
7	Concrete Sidewalk, 4" Thick	6	LF	$65.00	$390.00
8	Compacted Aggregate Drive Replacement	4	LF	$12.00	$48.00
9	Asphalt Surface Replacement - City Street	73	LF	$23.00	$1,679.00
				SUBTOTAL	**$18,178.00**
MONROE & JENNINGS ST. INTERSECTION					
1	Existing Str. Removal	1	LS	$2,000.00	$2,000.00
2	Storm Inlet	1	EA	$2,500.00	$2,500.00
3	Concrete Junction Box	3	EA	$2,500.00	$7,500.00
4	Pipe Reconnection	5	EA	$800.00	$4,000.00
5	Pipe, 12" RC Storm Pipe	16	LF	$48.00	$768.00
6	Pipe, 15" RC Storm Pipe	95	LF	$55.00	$5,225.00
7	Granular Backfill	111	LF	$12.00	$1,332.00
8	Concrete Curb and Gutter Pan	10	LF	$75.00	$750.00
9	Asphalt Surface Replacement - City Street	101	LF	$23.00	$2,323.00
				SUBTOTAL	**$26,398.00**
STATE & JENNINGS ST. INTERSECTION					
	REQUIRES CCTV INSPECTION				
				SUBTOTAL	**$0.00**
				CONSTRUCTION TOTAL	**$100,107.00**
				10% Construction Contingency	$10,010.70
				ESTIMATED TOTAL COST	**$110,117.70**

ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE

NEWBURGH, INDIANA

PRIORITY 1, 2 & 3 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
1	Mobilization, Demobilization, Bond, Etc.	1	LS	$8,500.00	$8,500.00
2	Temporary Erosion and Sediment Control	1	LS	$2,500.00	$2,500.00
3	Maintenance of Traffic	1	LS	$12,000.00	$12,000.00
				SUBTOTAL	**$23,000.00**
	WASHINGTON & JENNINGS ST. INTERSECTION				
1	12" CIPP Liner	80	LF	$70.00	$5,600.00
				SUBTOTAL	**$5,600.00**
	JEFFERSON & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$1,500.00	$1,500.00
2	Storm Inlet	2	EA	$2,500.00	$5,000.00
3	Concrete Junction Box	3	EA	$2,500.00	$7,500.00
4	Pipe Reconnection	1	EA	$800.00	$800.00
6	Pipe, 15" RC Storm Pipe	82	LF	$55.00	$4,510.00
7	Pipe, 18" RC Storm Pipe	8	LF	$65.00	$520.00
8	Granular Backfill	90	LF	$12.00	$1,080.00
9	Concrete Curb and Gutter Pan	6	LF	$75.00	$450.00
10	Concrete Sidewalk, Handicap Ramp	1	EA	$1,200.00	$1,200.00
11	Asphalt Surface Replacement - City Street	82	LF	$23.00	$1,886.00
				SUBTOTAL	**$24,446.00**
	MARKET & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$1,500.00	$1,500.00
2	Storm Inlet	1	EA	$2,500.00	$2,500.00
3	Pipe Reconnection	3	EA	$800.00	$2,400.00
4	Pipe, 12" RC Storm Pipe	75	LF	$48.00	$3,600.00
6	Granular Backfill	75	LF	$12.00	$900.00
7	Asphalt Surface Replacement - City Street	75	LF	$23.00	$1,725.00
				SUBTOTAL	**$12,625.00**

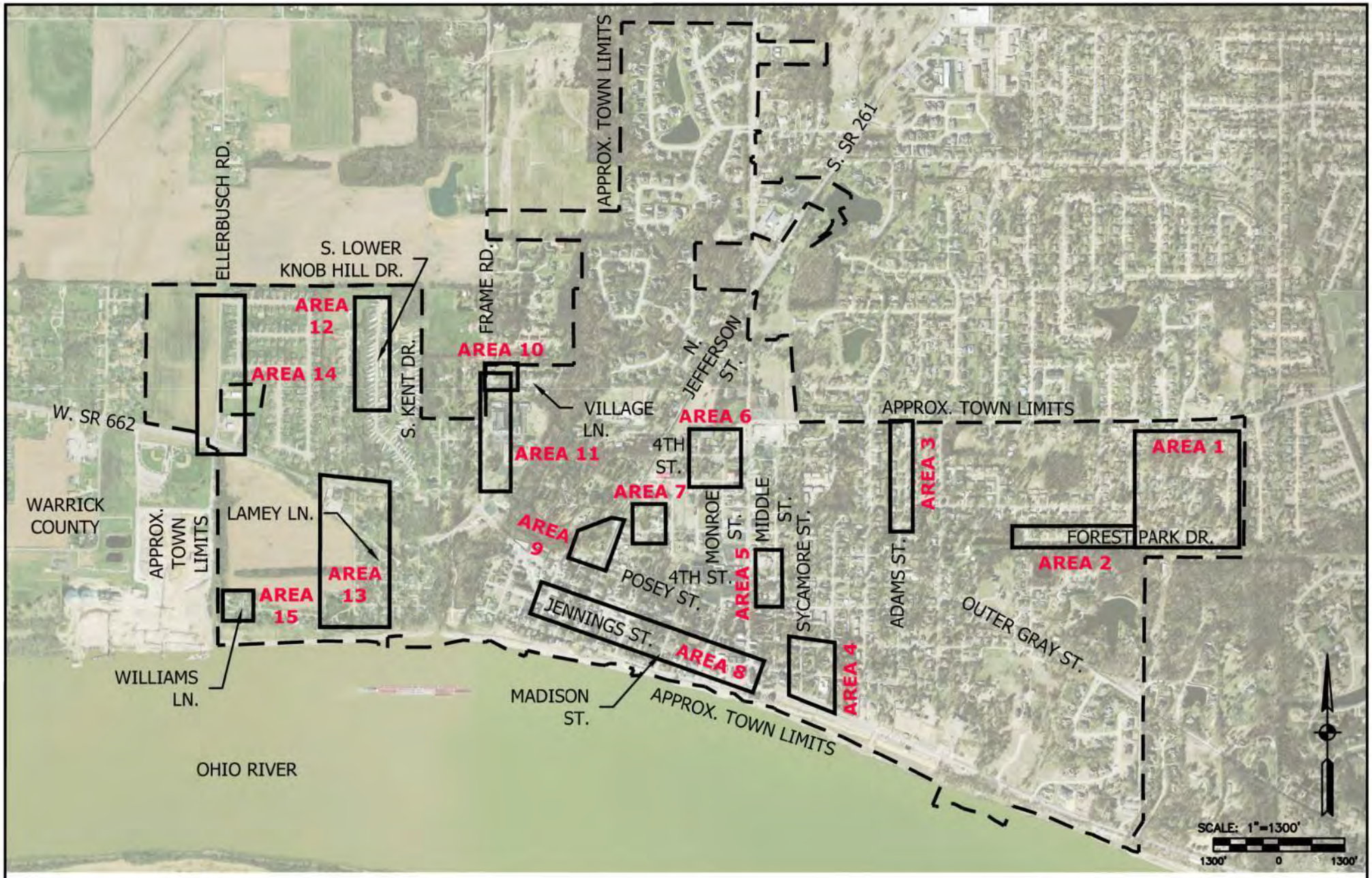
ENGINEER'S OPINION OF PROBABLE COST

010 JENNINGS STREET CORRIDOR DRAINAGE
NEWBURGH, INDIANA
PRIORITY 1, 2 & 3 REPAIRS

	DESCRIPTION	QTY.	UNIT	UNIT PRICE	TOTAL PRICE
	JENNINGS ST. BETWEEN MARKET & MADISON ST.				
1	10" CIPP Liner	38	LF	$65.00	$2,470.00
				SUBTOTAL	**$2,470.00**
	MADISON & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$1,500.00	$1,500.00
2	Storm Inlet	1	EA	$2,500.00	$2,500.00
3	Concrete Junction Box	1	EA	$2,500.00	$2,500.00
4	Pipe Reconnection	5	EA	$800.00	$4,000.00
5	Pipe, 15" RC Storm Pipe	83	LF	$55.00	$4,565.00
6	Granular Backfill	83	LF	$12.00	$996.00
7	Concrete Sidewalk, 4" Thick	6	LF	$65.00	$390.00
8	Compacted Aggregate Drive Replacement	4	LF	$12.00	$48.00
9	Asphalt Surface Replacement - City Street	73	LF	$23.00	$1,679.00
				SUBTOTAL	**$18,178.00**
	MONROE & JENNINGS ST. INTERSECTION				
1	Existing Str. Removal	1	LS	$2,000.00	$2,000.00
2	Storm Inlet	2	EA	$2,500.00	$5,000.00
3	Concrete Junction Box	3	EA	$2,500.00	$7,500.00
4	Pipe Reconnection	5	EA	$800.00	$4,000.00
5	Pipe, 12" RC Storm Pipe	16	LF	$48.00	$768.00
6	Pipe, 15" RC Storm Pipe	95	LF	$55.00	$5,225.00
7	Granular Backfill	111	LF	$12.00	$1,332.00
8	Concrete Curb and Gutter Pan	10	LF	$75.00	$750.00
9	Asphalt Surface Replacement - City Street	101	LF	$23.00	$2,323.00
				SUBTOTAL	**$28,898.00**
	STATE & JENNINGS ST. INTERSECTION				
	REQUIRES CCTV INSPECTION				
				SUBTOTAL	**$0.00**
				CONSTRUCTION TOTAL	**$115,217.00**
				10% Construction Contingency	$11,521.70
				ESTIMATED TOTAL COST	**$126,738.70**

APPENDIX B

CONCEPTUAL DRAWINGS



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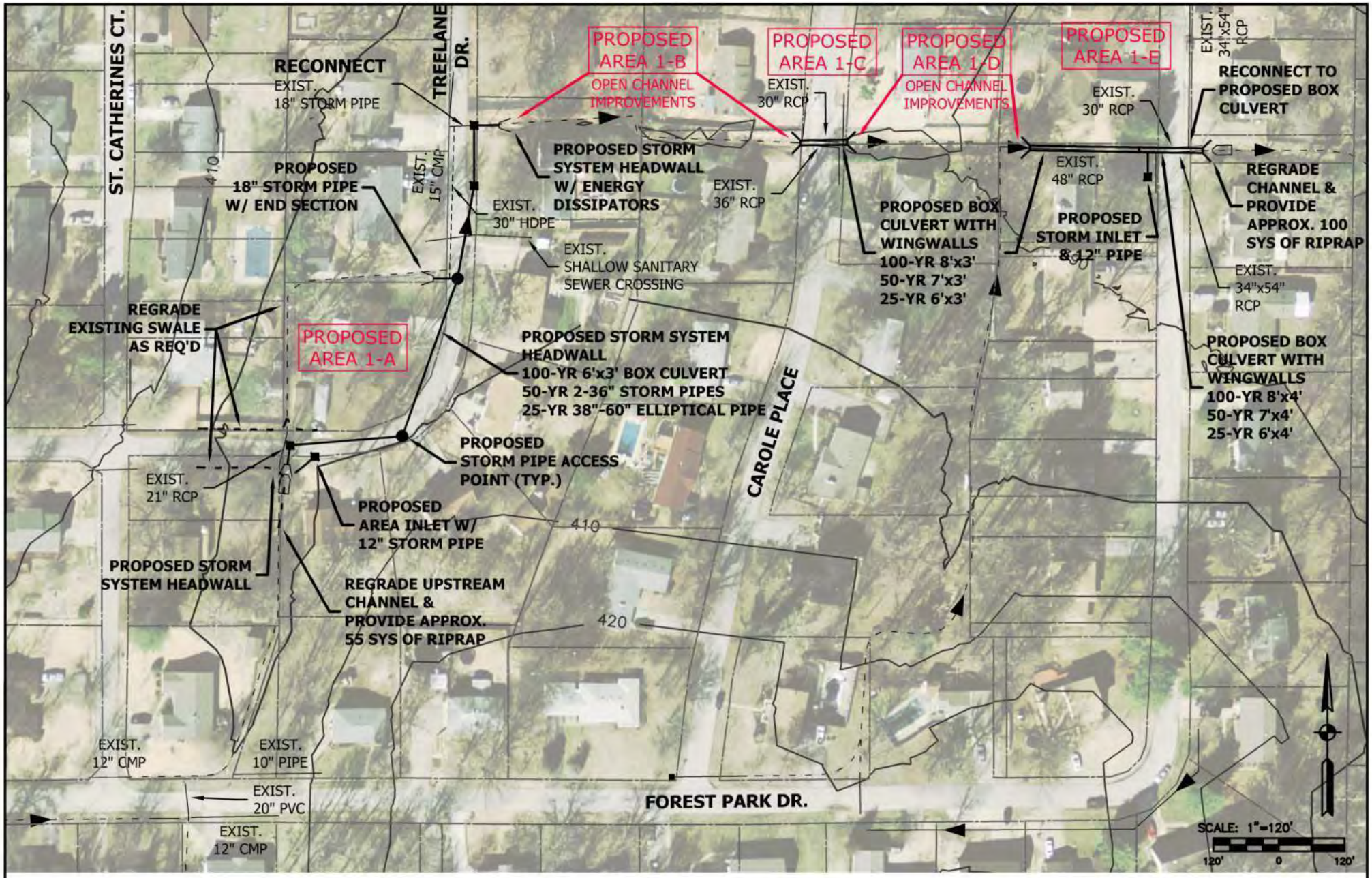
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

PROJECT AREA INDEX

EXHIBIT 0-1



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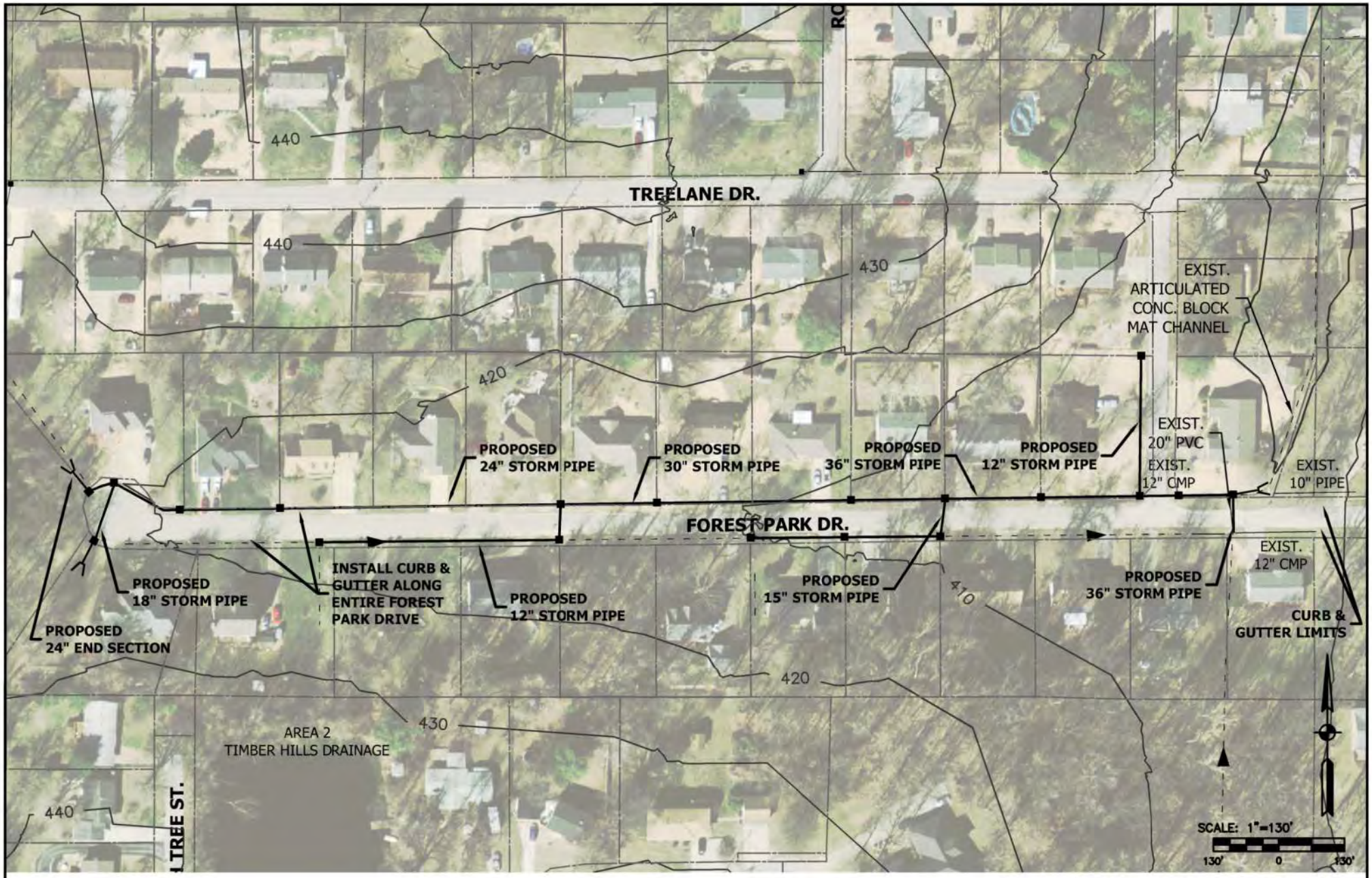
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 1
FOREST PARK DRAINAGE

EXHIBIT 1-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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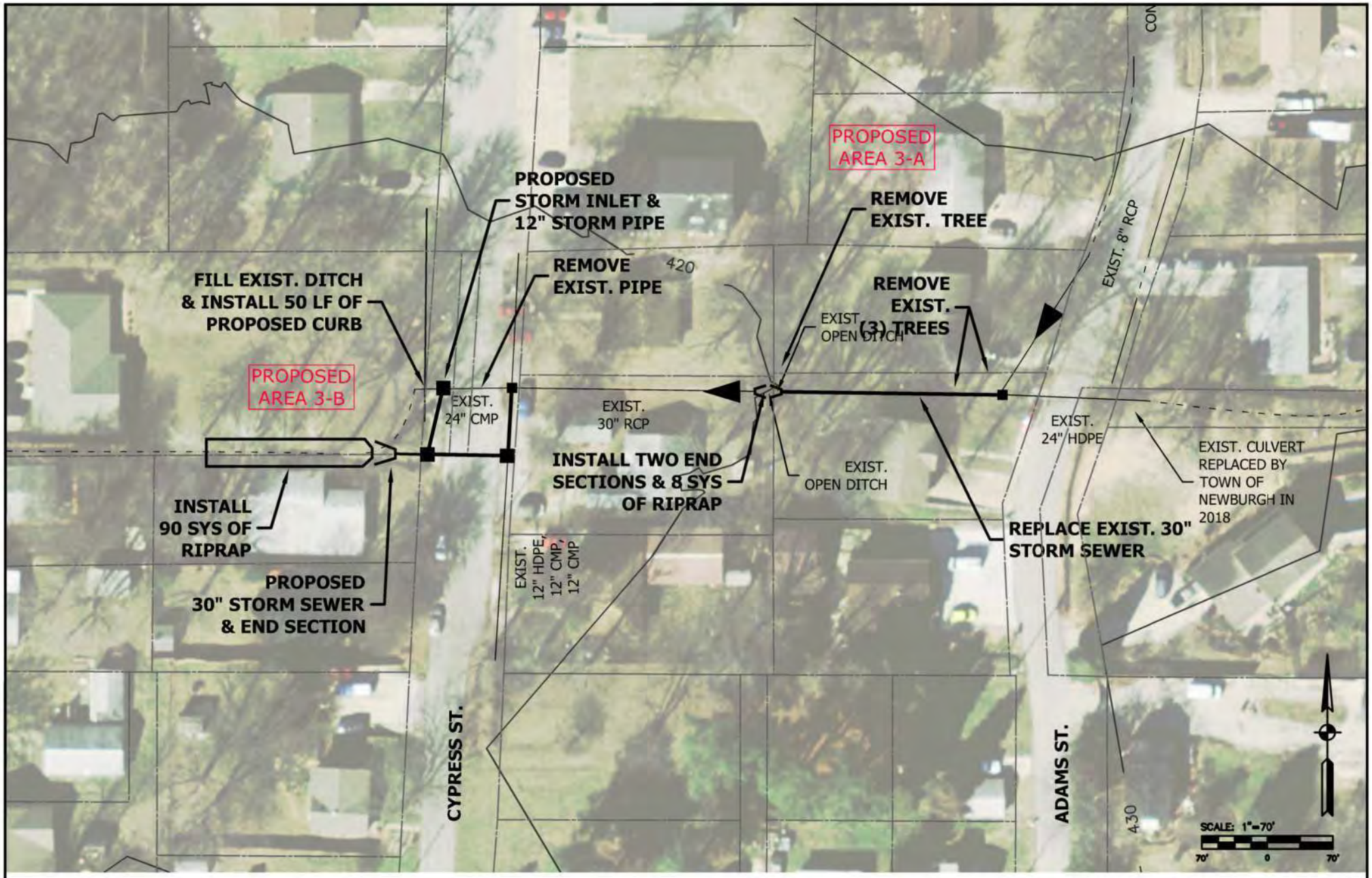
AREA 2
TIMBER HILLS DRAINAGE

EXHIBIT
2-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— — —	DITCH/SWALE



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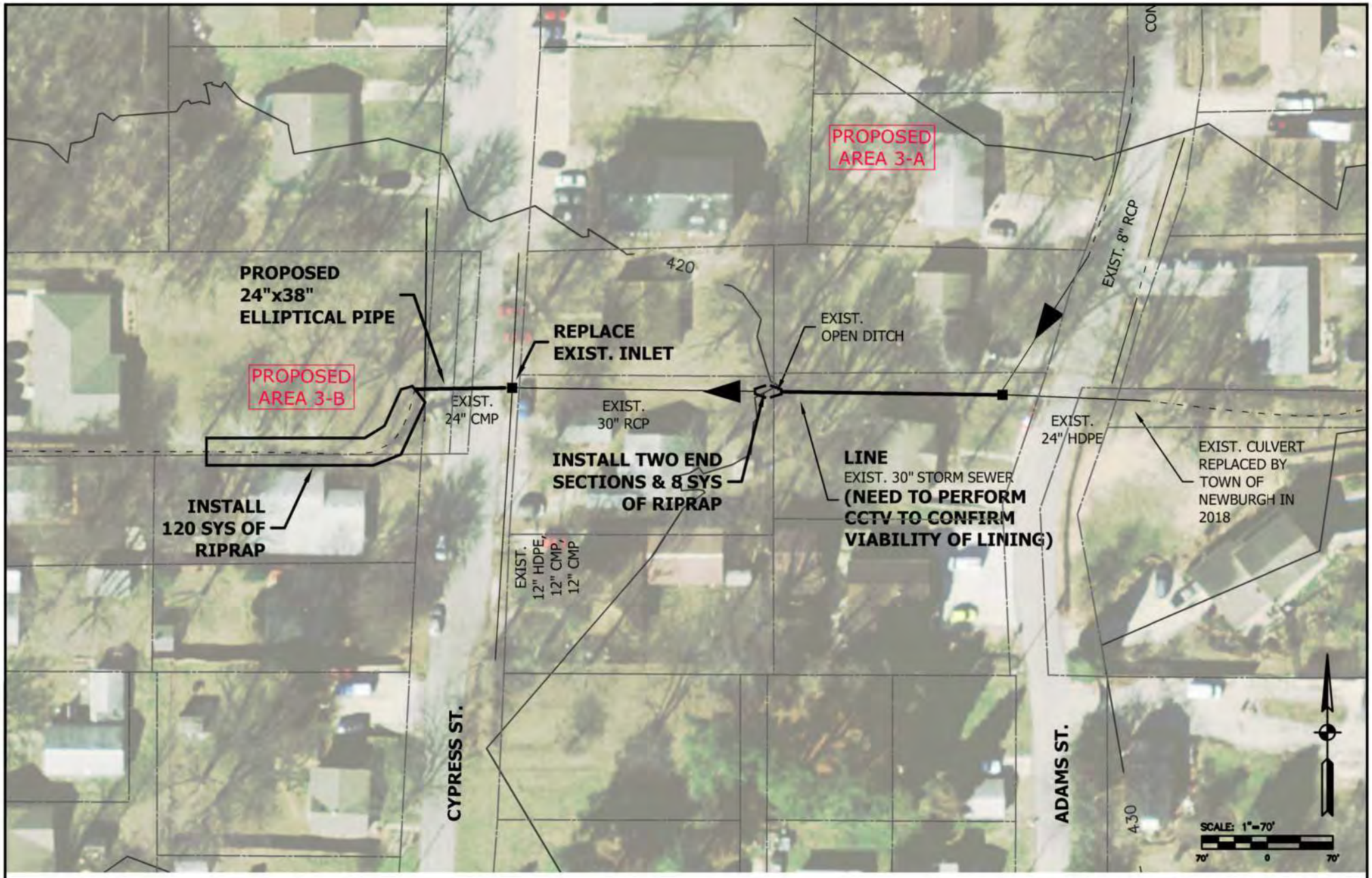
NEWBURGH MASTER PLAN UPDATE

AREA 3 - ALTERNATE 1
ADAMS STREET DRAINAGE

EXHIBIT 3-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · · —	DITCH/SWALE



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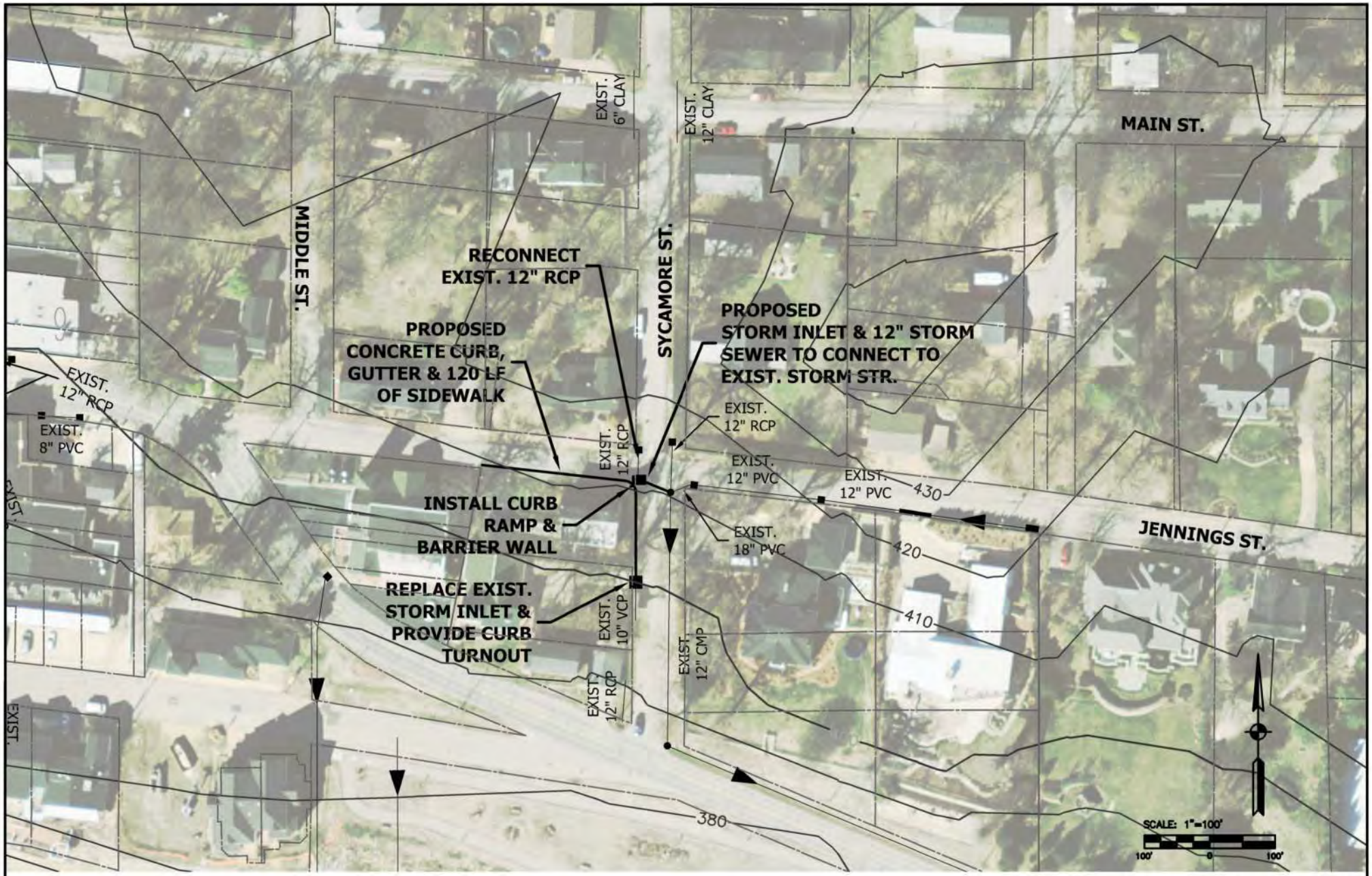
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 3 - ALTERNATE 2
ADAMS STREET DRAINAGE

EXHIBIT
3-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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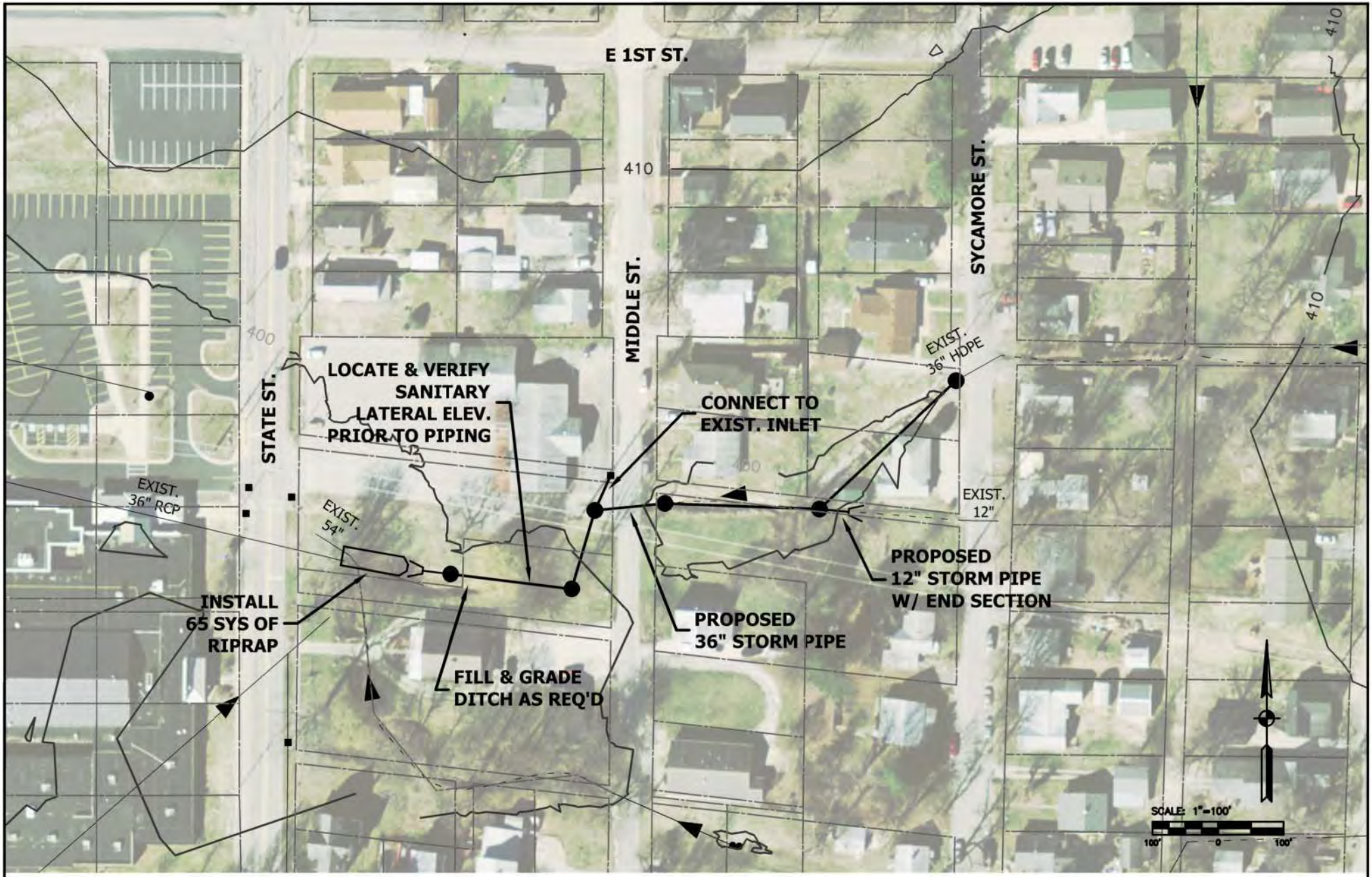
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 4
JENNINGS AND SYCAMORE DRAINAGE

EXHIBIT 4-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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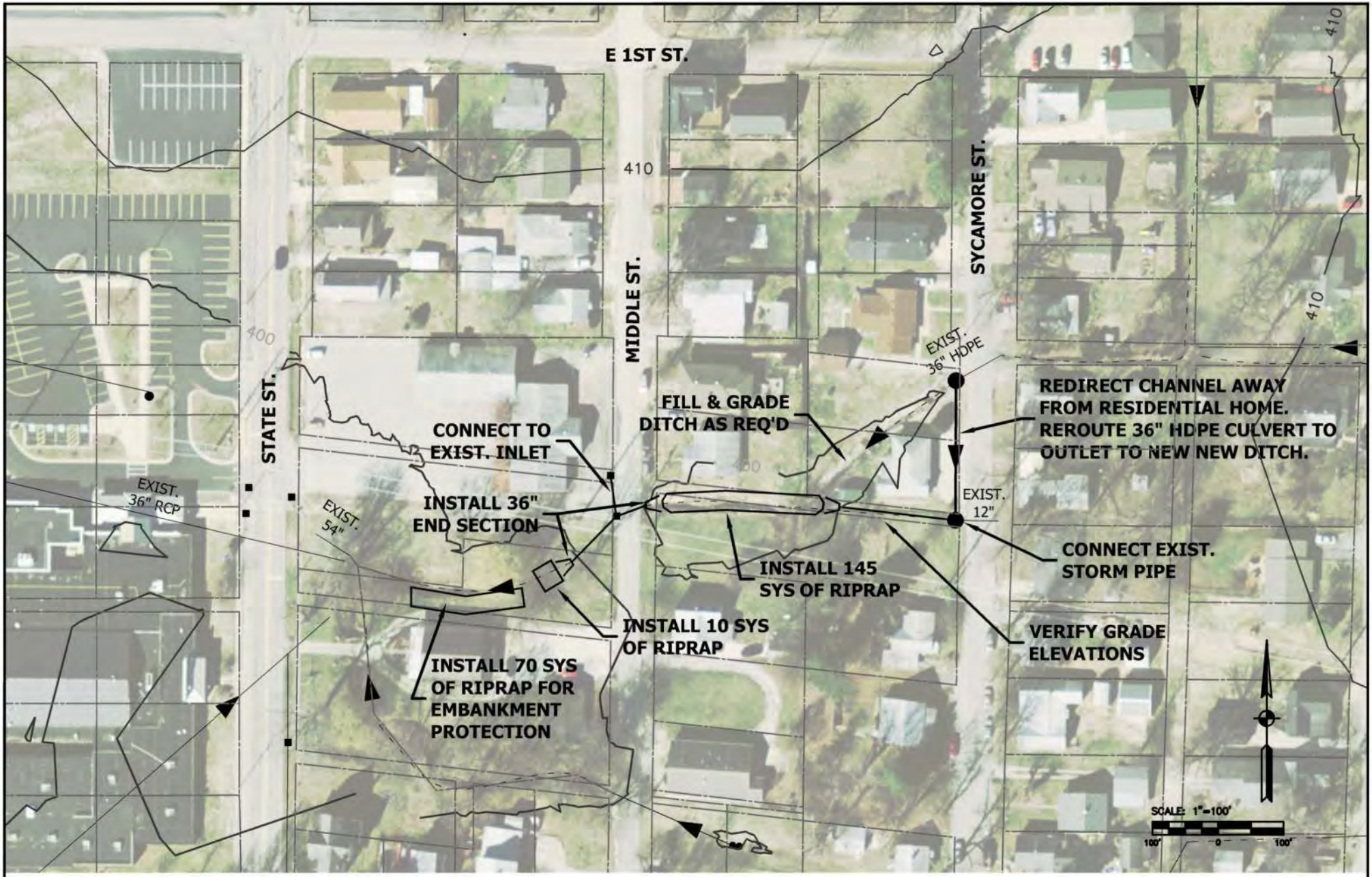
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 5 - ALTERNATE 1
MIDDLE STREET DRAINAGE

EXHIBIT 5-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · · —	DITCH/SWALE



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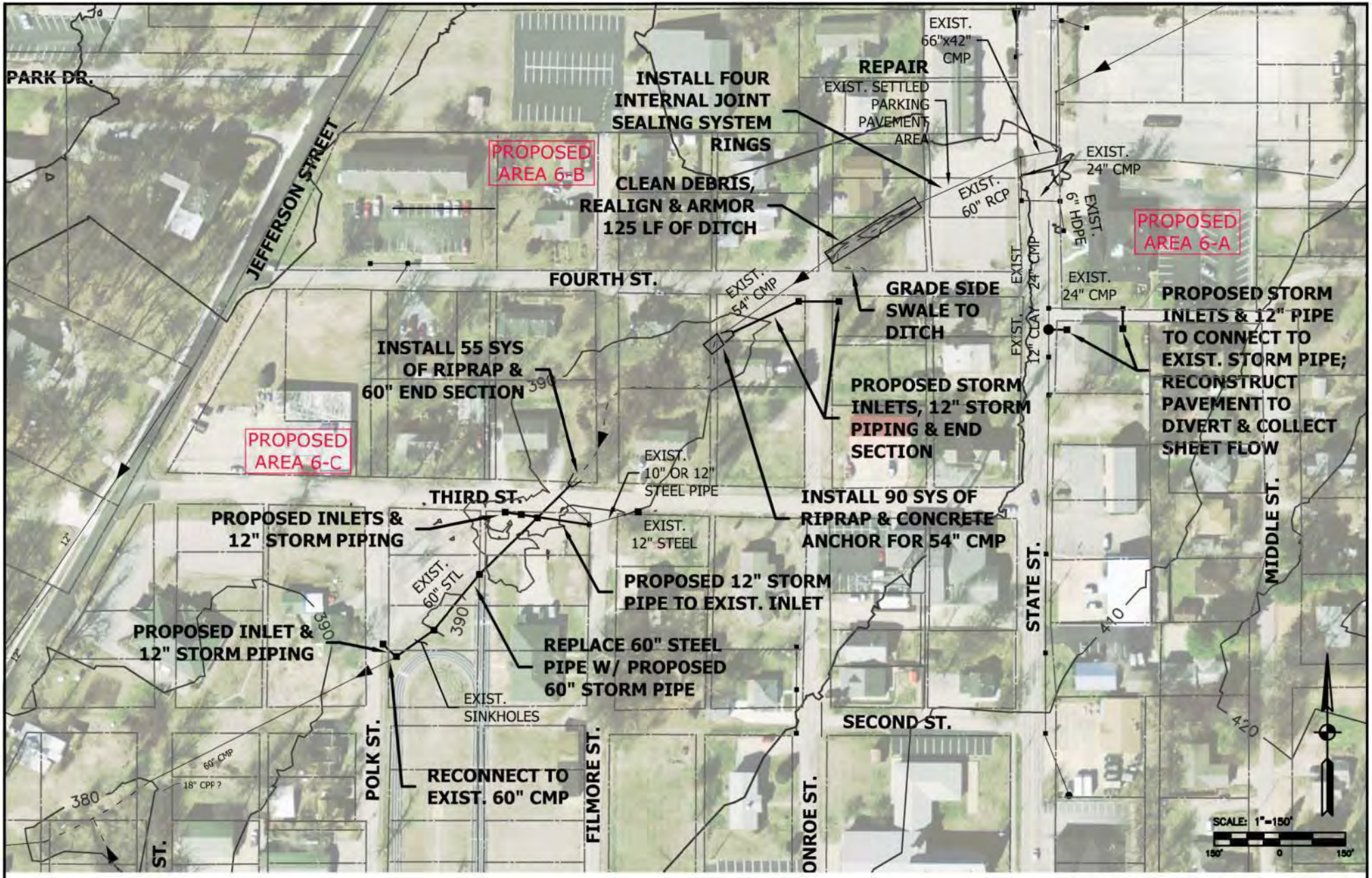
NEWBURGH MASTER PLAN UPDATE

AREA 5 - ALTERNATE 2
MIDDLE STREET DRAINAGE

EXHIBIT 5-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · · —	DITCH/SWALE



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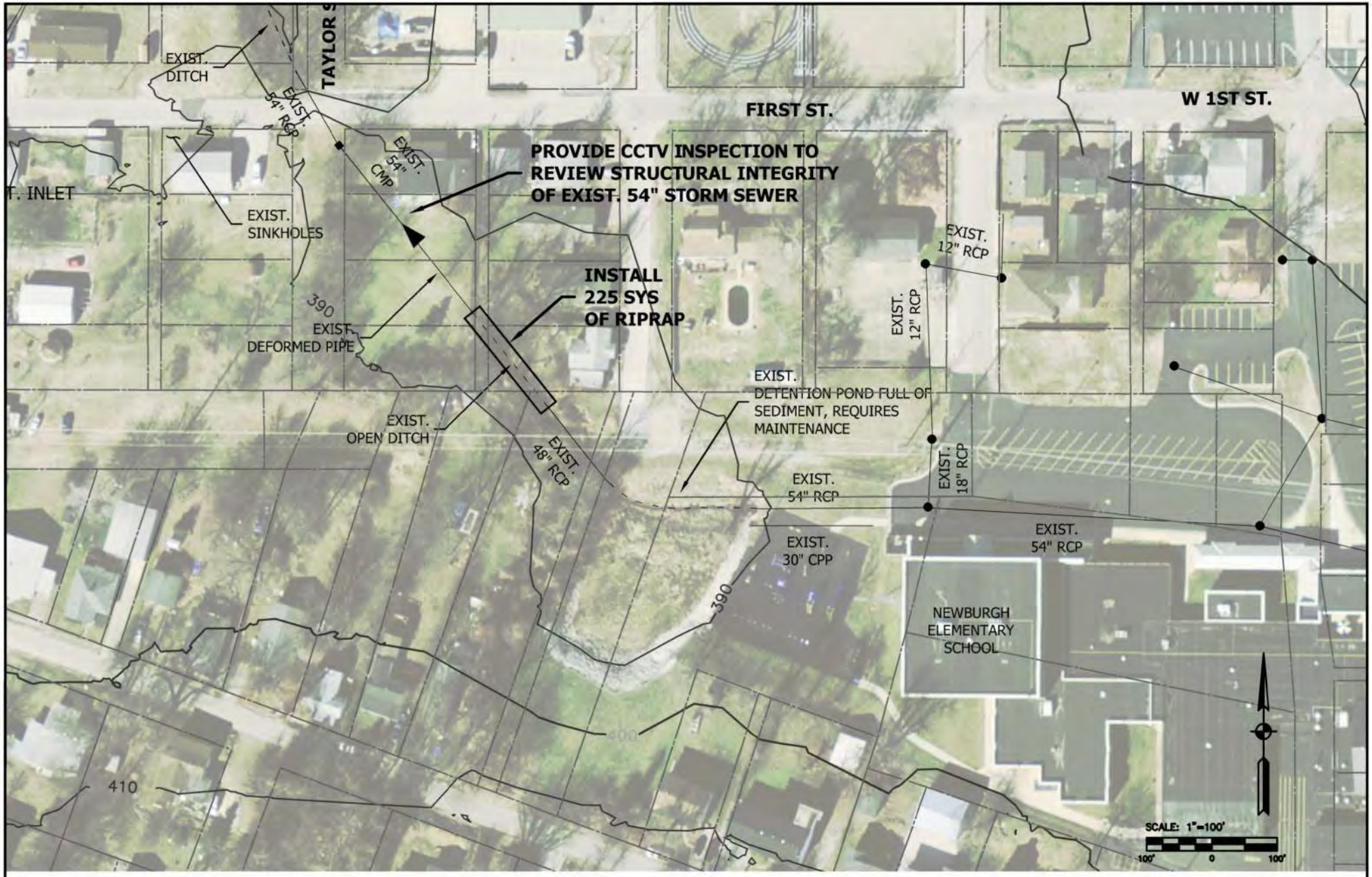
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 6
FOURTH AND MONROE DRAINAGE

EXHIBIT 6-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
◁	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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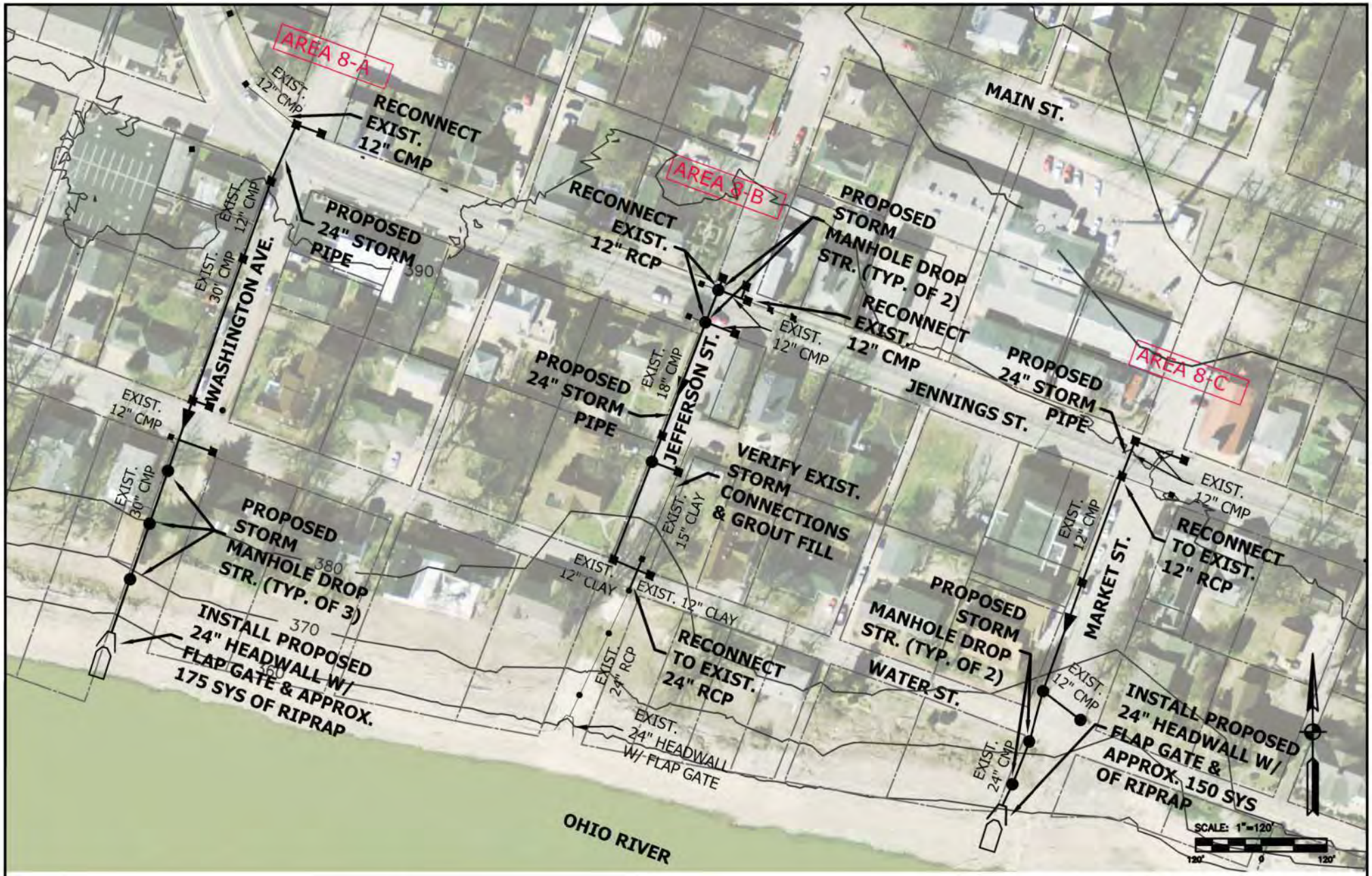
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 7
FIRST ST. DRAINAGE

EXHIBIT 7-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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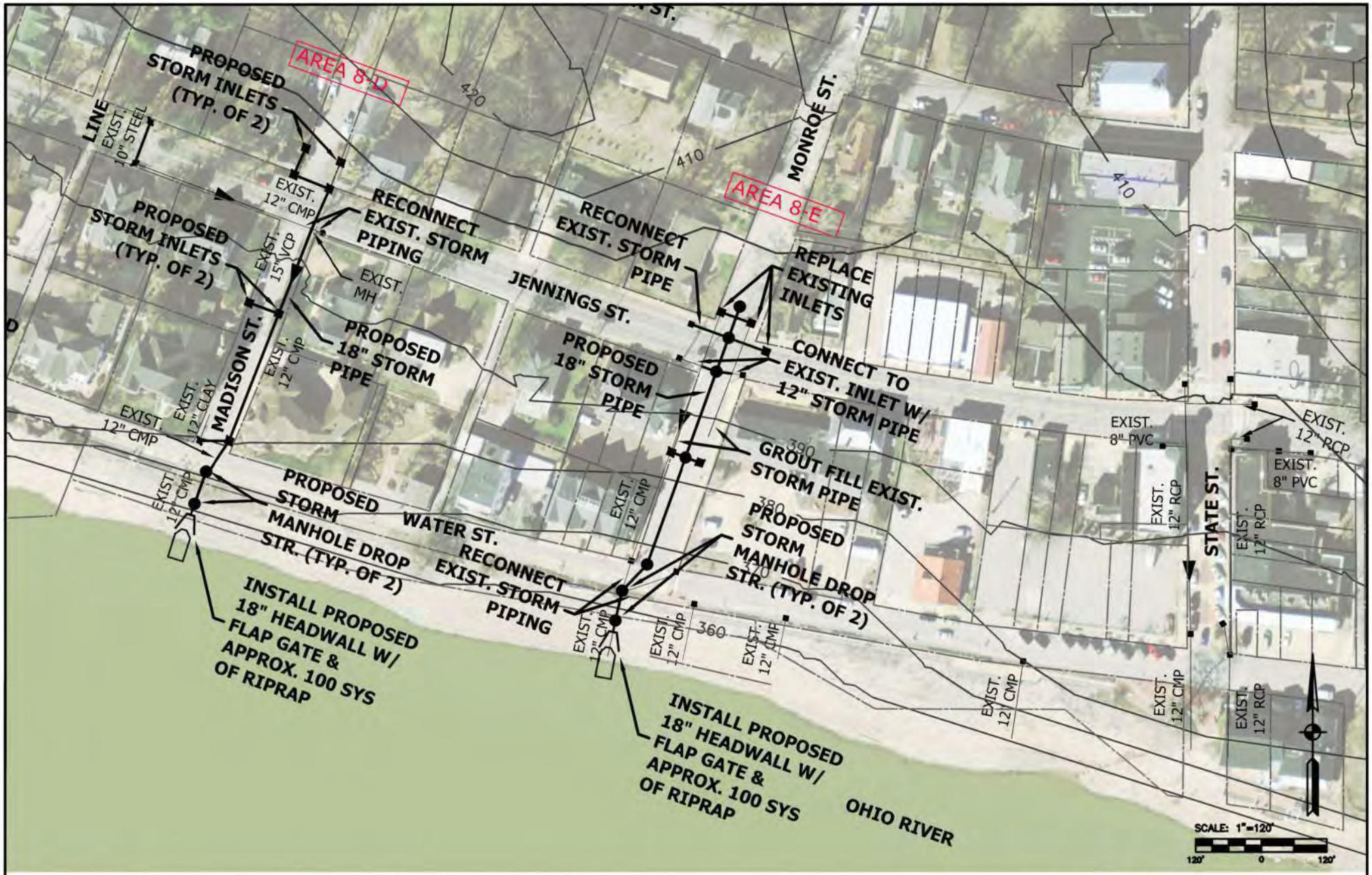
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 8 - A, B & C
JENNINGS ST. CORRIDOR DRAINAGE

EXHIBIT 8-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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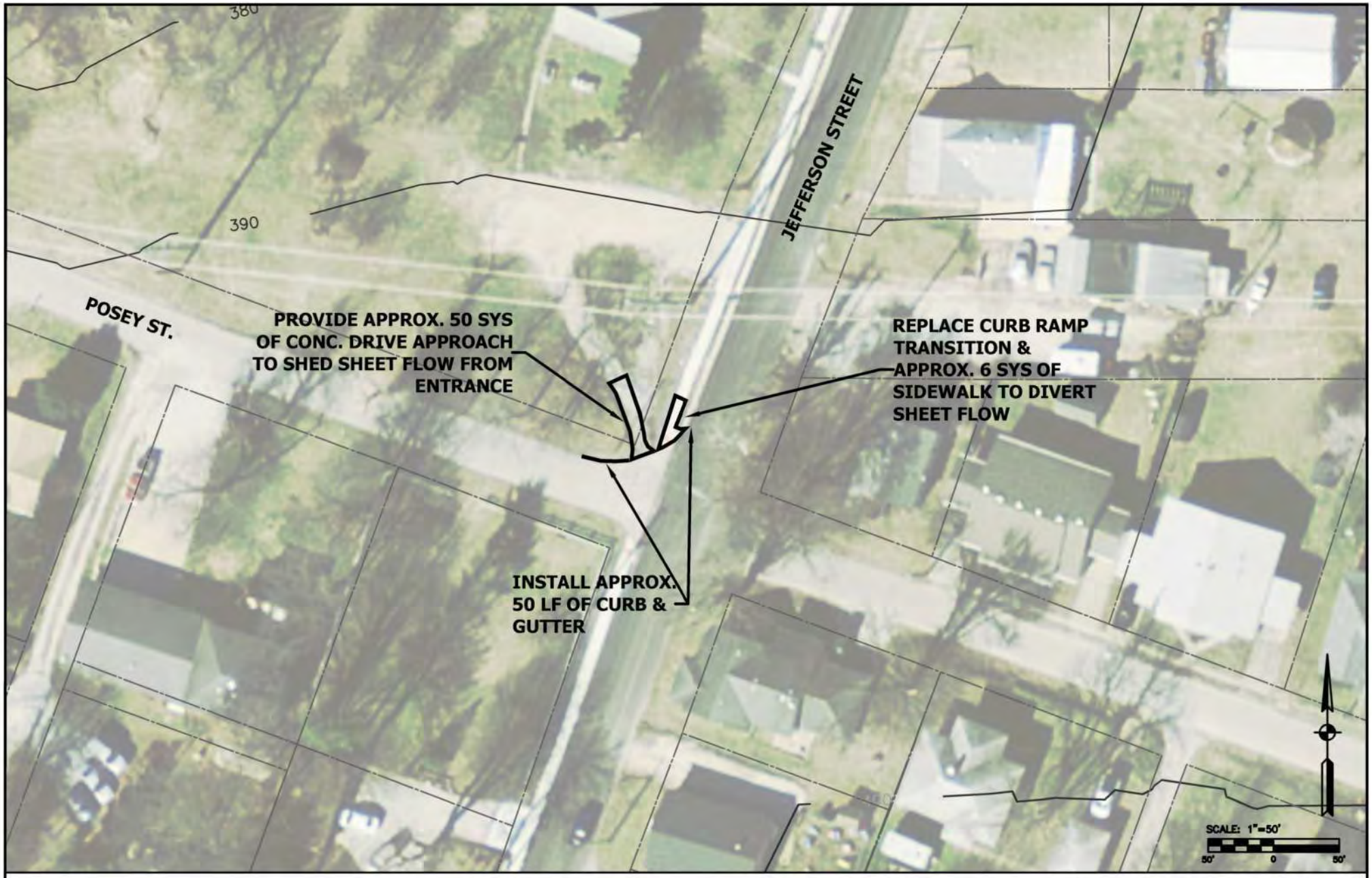
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 8 - D, E & F
JENNINGS ST. CORRIDOR DRAINAGE

EXHIBIT
8-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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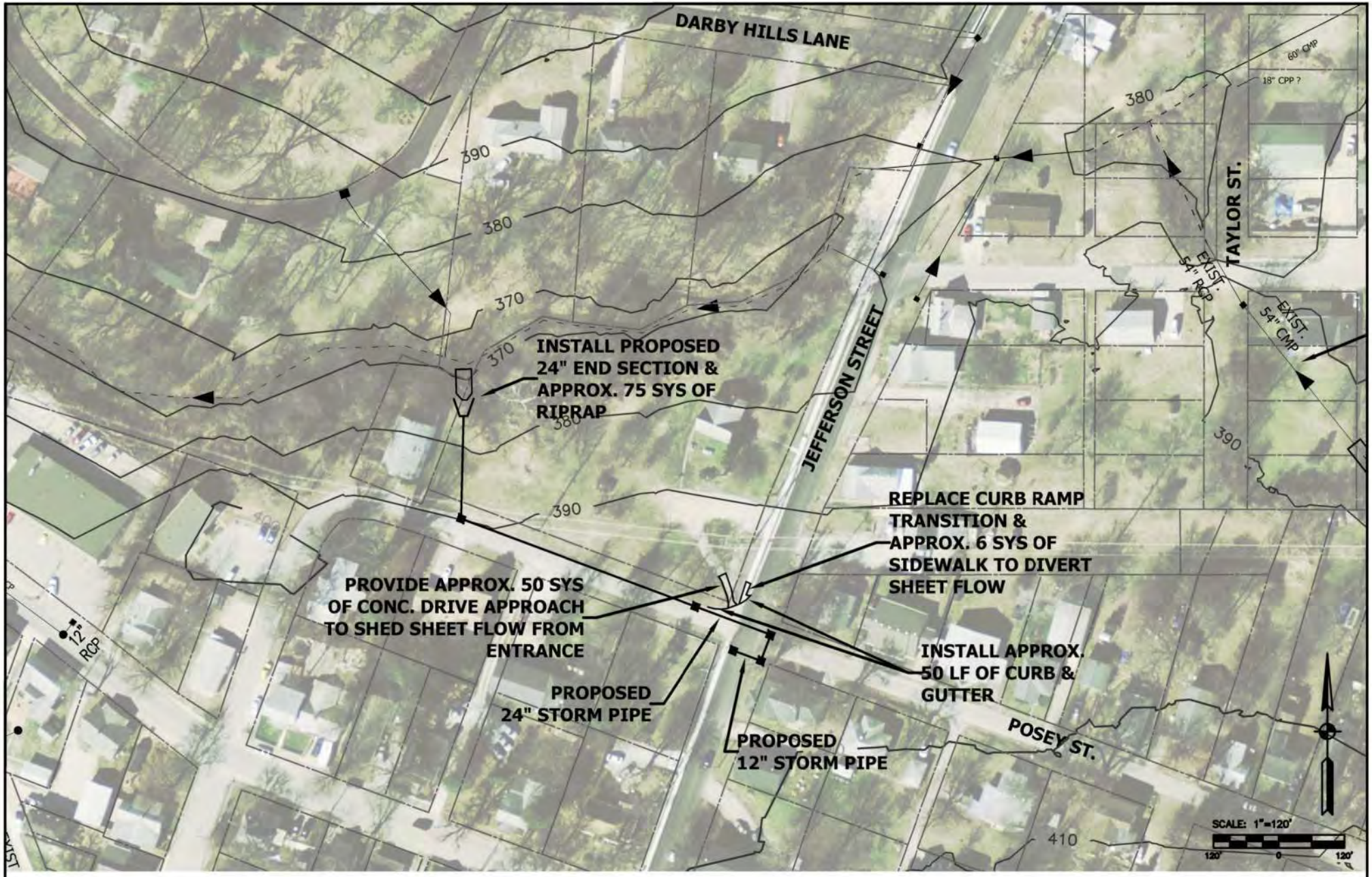
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 9 - ALTERNATE 1
JEFFERSON ST. AND POSEY ST. DRAINAGE

EXHIBIT
9-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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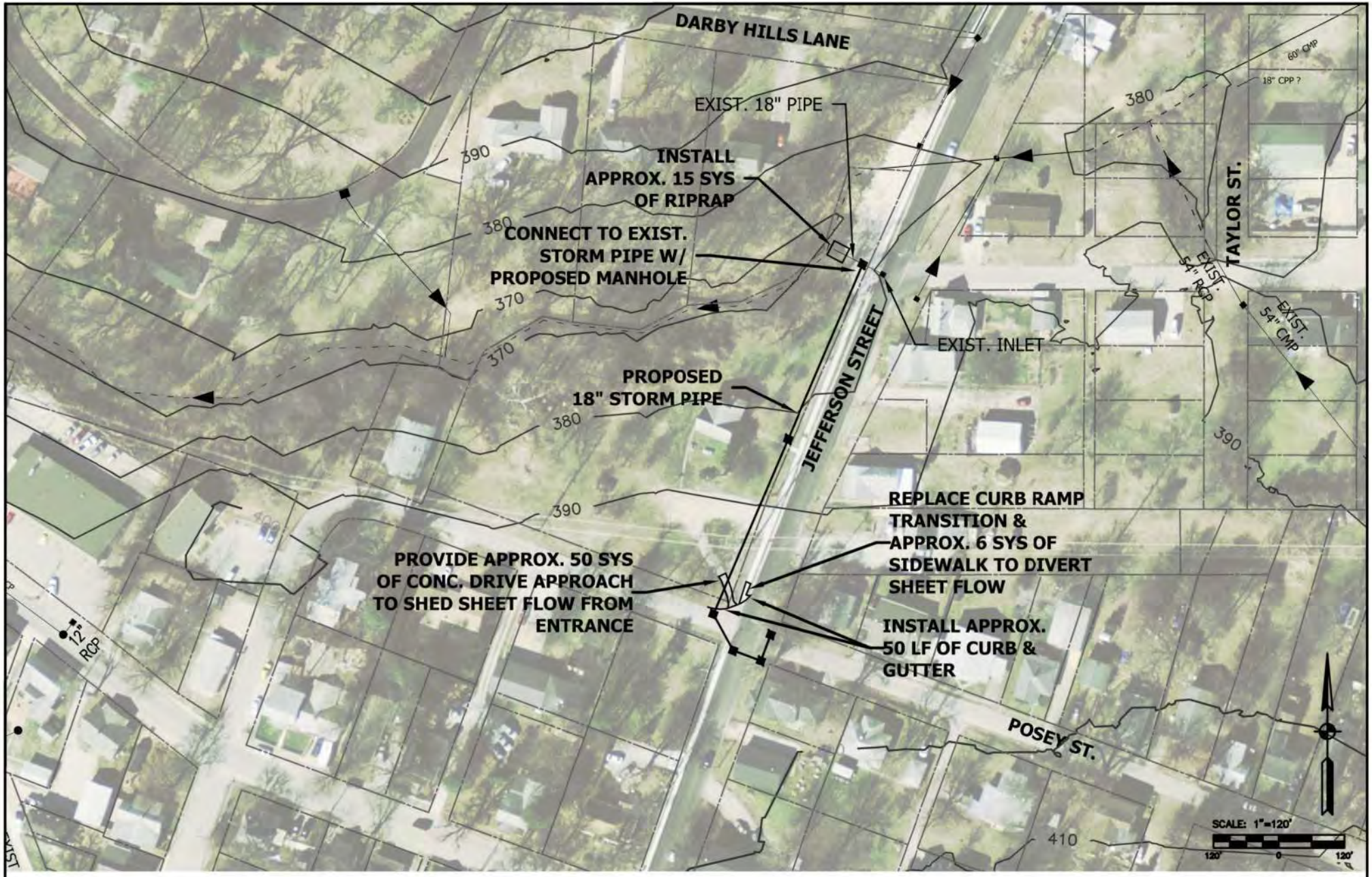
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 9 - ALTERNATE 2
JEFFERSON ST. AND POSEY ST. DRAINAGE

EXHIBIT
9-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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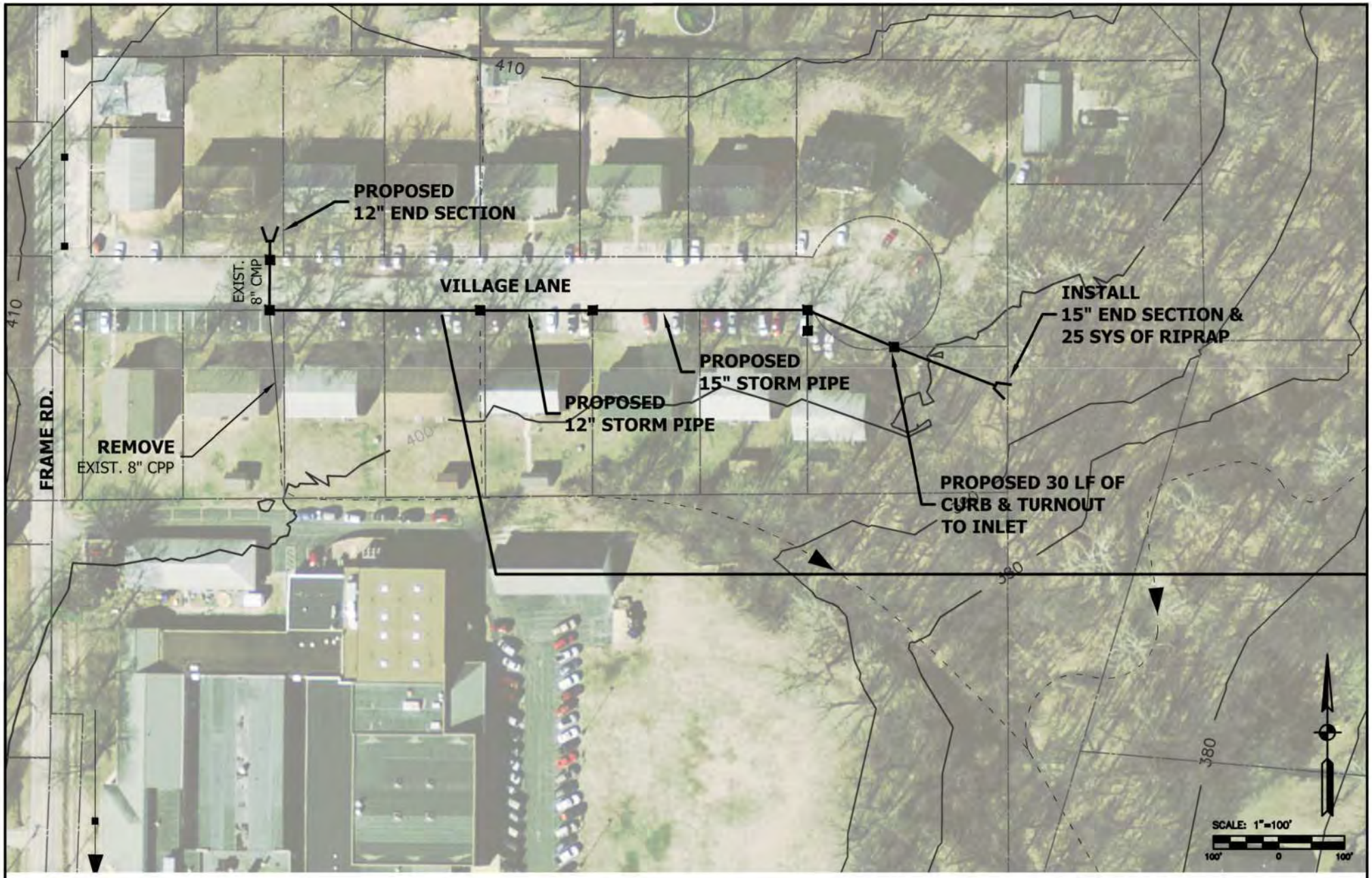
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 9 - ALTERNATE 3
JEFFERSON ST. AND POSEY ST. DRAINAGE

EXHIBIT
9-3

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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TOWN OF NEWBURGH
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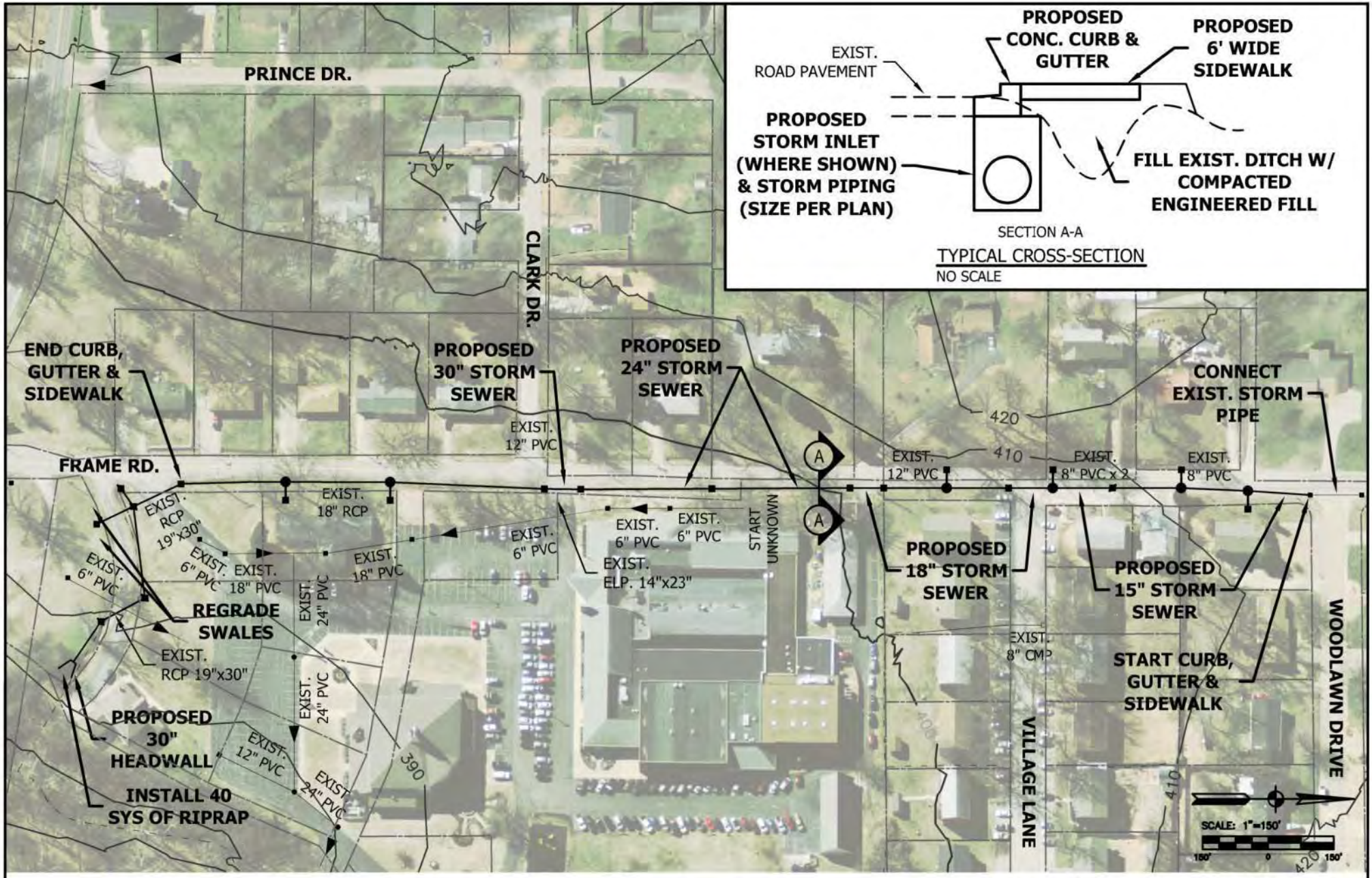
NEWBURGH MASTER PLAN UPDATE

AREA 10
VILLAGE LN. DRAINAGE

EXHIBIT
10-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
<	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



TYPICAL CROSS-SECTION
NO SCALE

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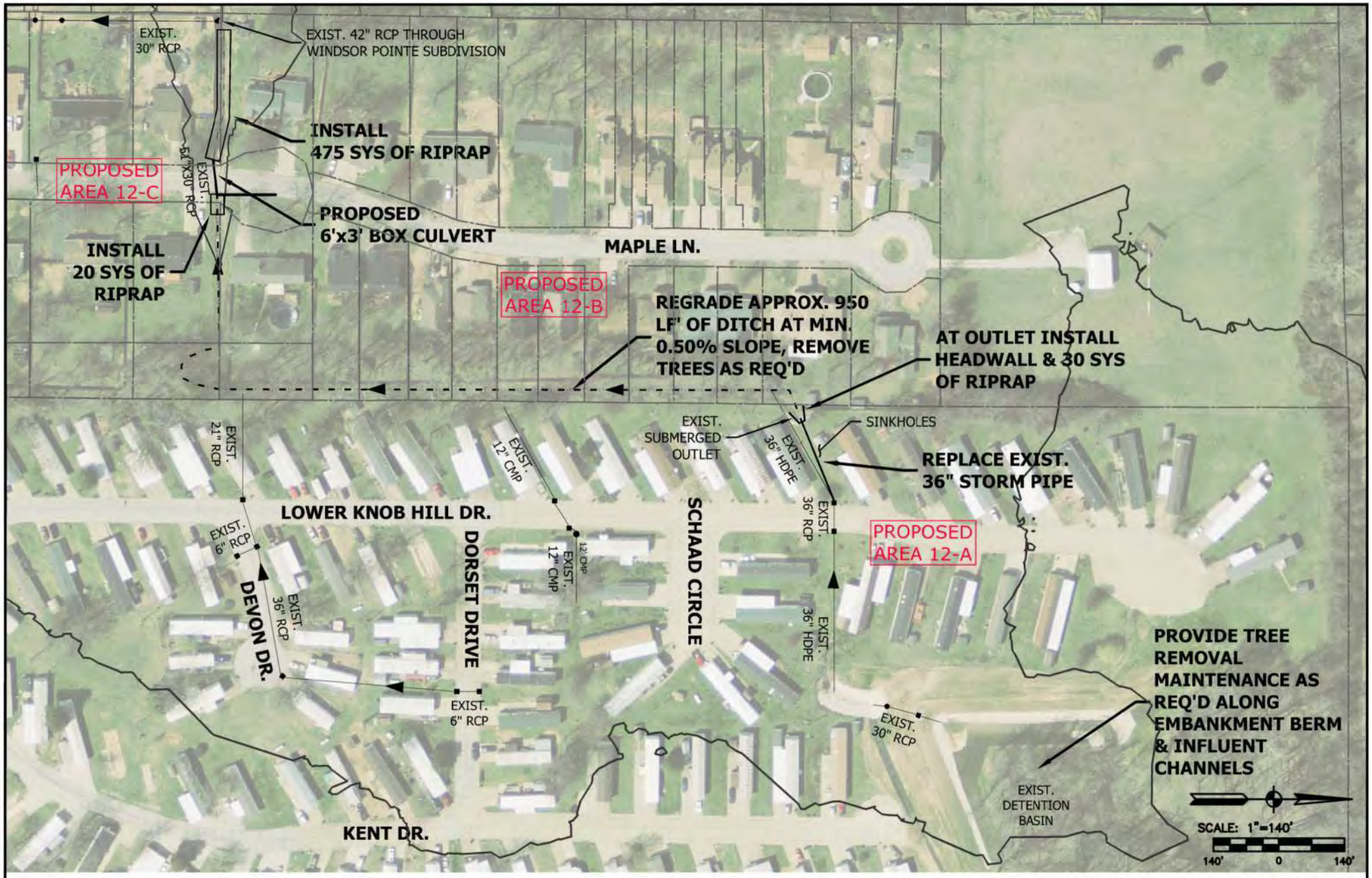
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 11
FRAME RD. DRAINAGE

EXHIBIT 11-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊻	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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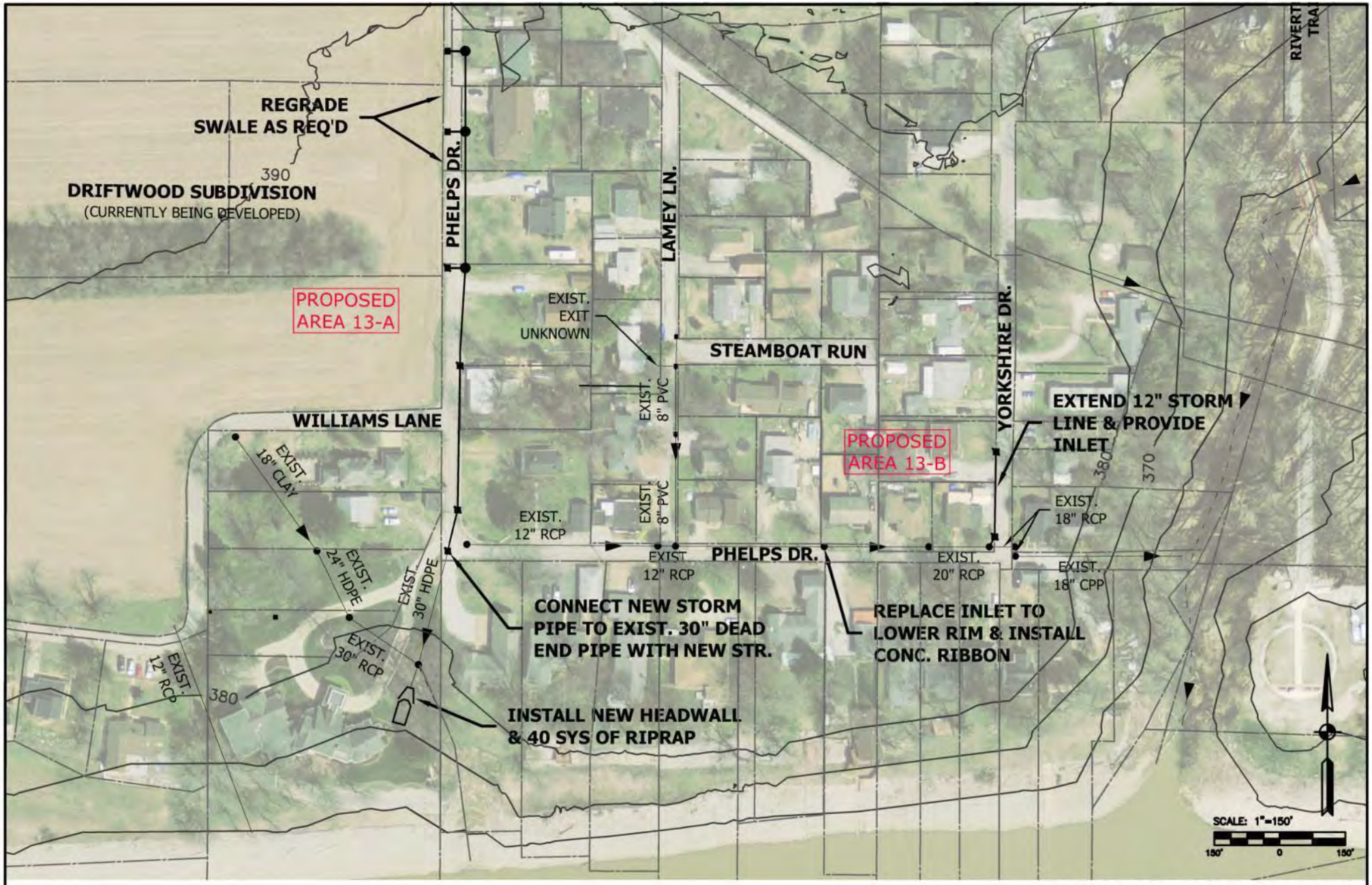
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 12
KNOB HILL DRAINAGE

EXHIBIT 12-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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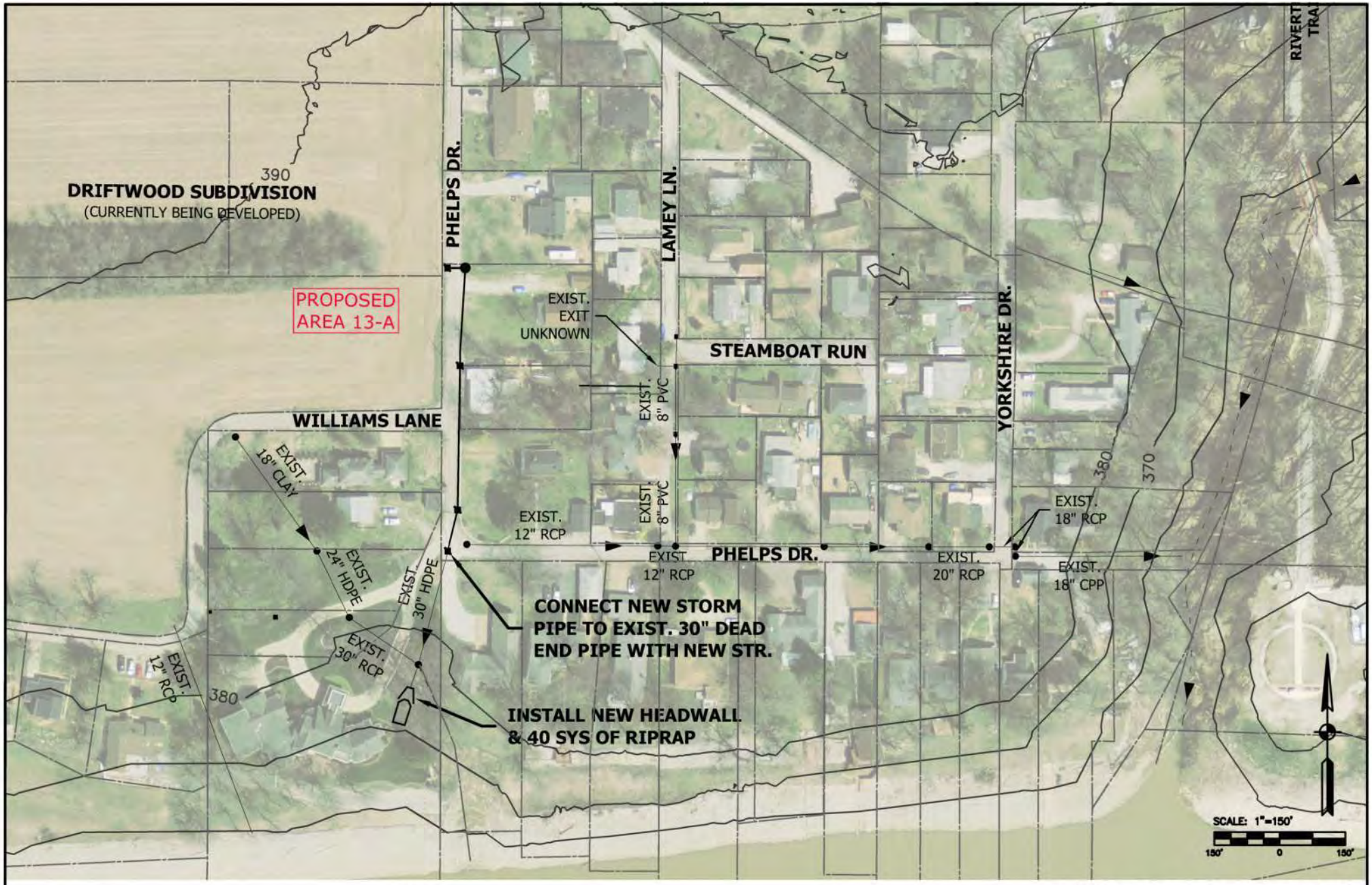
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 13 - ALTERNATE 1
PLEASURE CLUB DRAINAGE

EXHIBIT 13-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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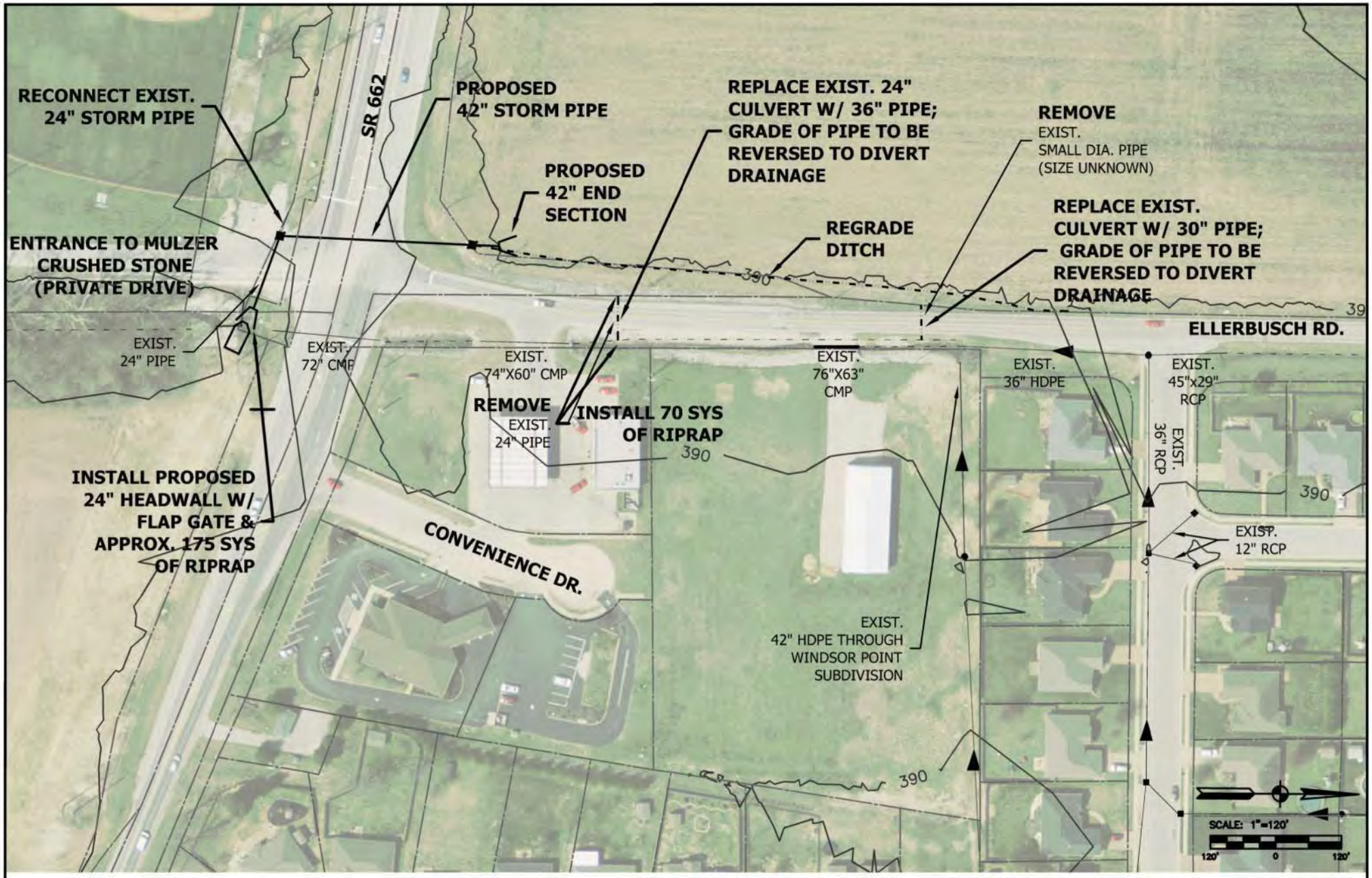
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 13A - ALTERNATE 2
PLEASURE CLUB DRAINAGE

EXHIBIT 13-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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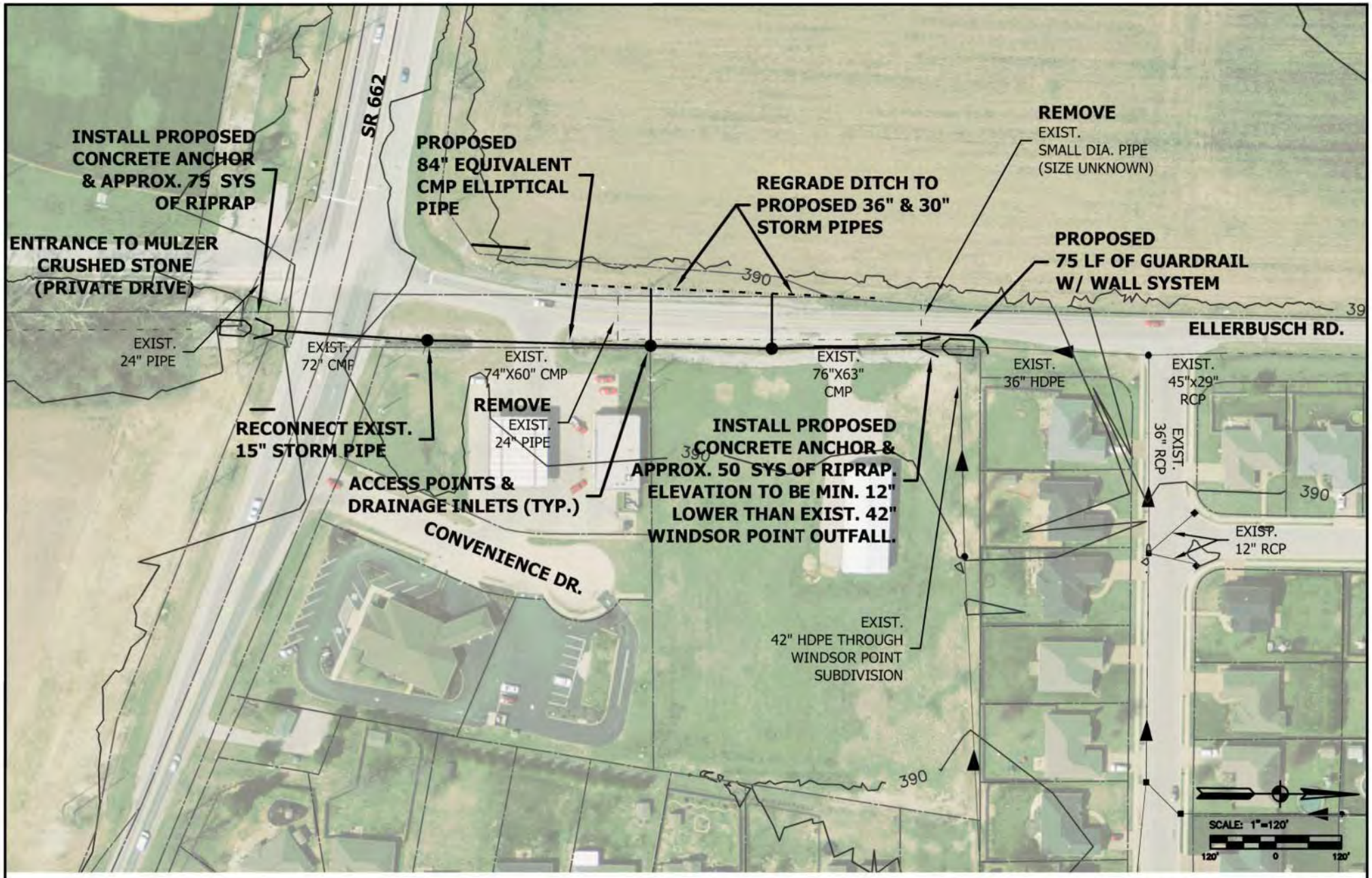
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 14 - ALTERNATE 1
ELLERBUSCH RD DRAINAGE

EXHIBIT 14-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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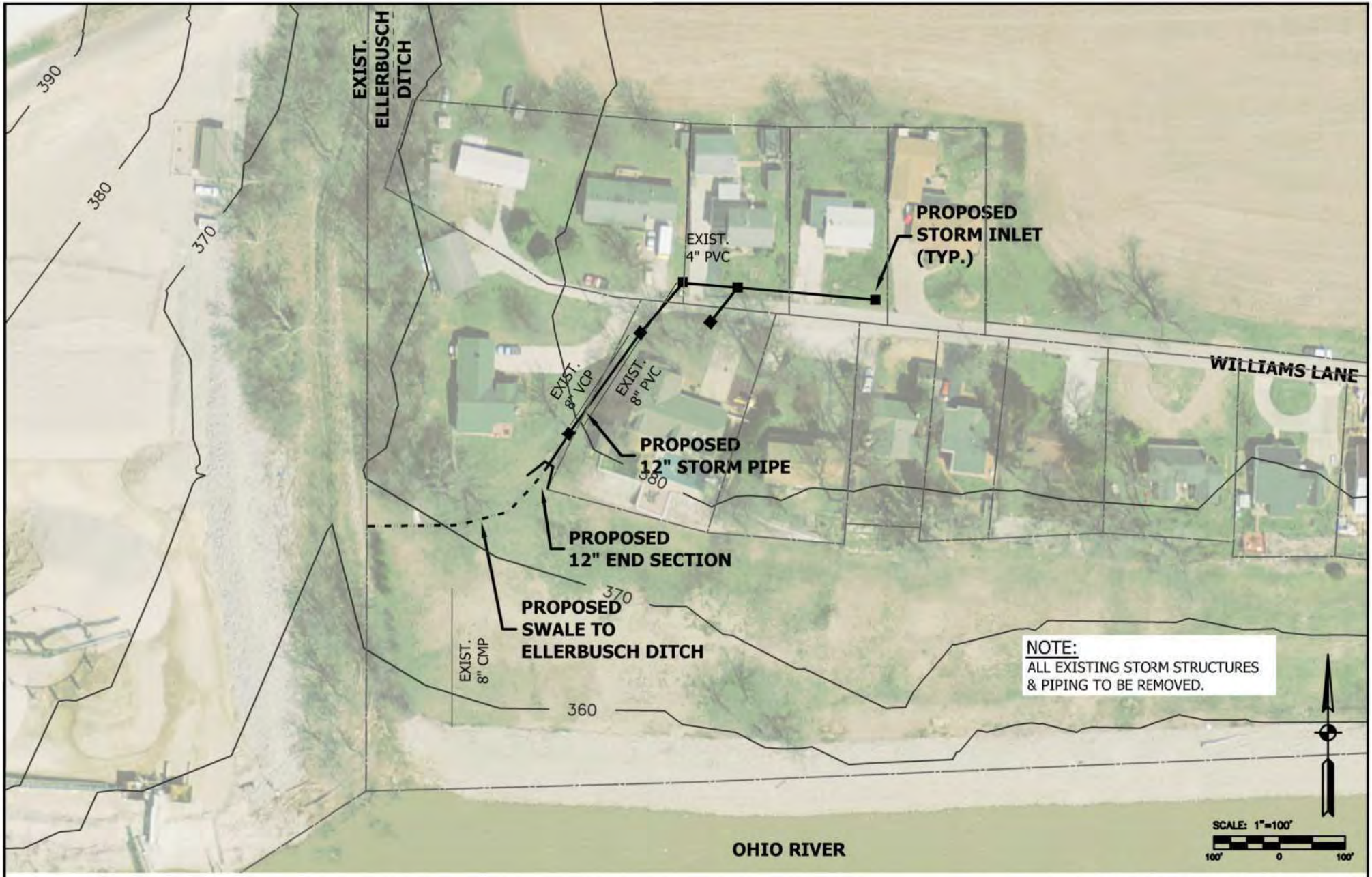
TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 14 - ALTERNATE 2
ELLERBUSCH RD DRAINAGE

EXHIBIT 14-2

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊻	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE



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TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

AREA 15
WILLIAMS LN. DRAINAGE

EXHIBIT 15-1

PROPOSED STORM FEATURES	
●	STORM MANHOLE
⊂	CONC. END SECTION
■	STORM INLET
———	STORM SEWER
— · —	DITCH/SWALE

APPENDIX C

DETAILED CONSTRUCTION COST ESTIMATE

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 1A - CC Wade Lake Outlet Ditch Across Treelane Drive
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	25	LF	$ 81	$ 2,100
18"Ø RCP, Depth 4'-8'	175	LF	$ 97	$ 17,000
38" x 60" Elliptical Pipe, Depth 4'-8'	290	LF	$ 348	$ 100,900
Granular Backfill, 12" and 18" Pipe	200	LF	$ 36	$ 7,200
Granular Backfill, 38" x 60" Elliptical Pipe	290	LF	$ 90	$ 26,100
Manholes, Inlets, and End Sections				
12" Inlet/Junction Box	1	EA	$ 1,500	$ 1,500
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
72" Inlet/Junction Box	1	EA	$ 6,500	$ 6,500
72"Ø Manhole, All Depths	2	EA	$ 8,100	$ 16,200
18" Headwall	2	EA	$ 1,750	$ 3,500
18" End Section	1	EA	$ 1,296	$ 1,300
Misc.				
Asphalt/Pavement Restoration	1	LS	$ 22,000	$ 22,000
Ditch Regrade	1	LS	$ 15,000	$ 15,000
18" Pipe Reconnection	1	EA	$ 2,000	$ 2,000
Concrete	20	SY	$ 125	$ 2,500
Class I Riprap	55	SY	$ 55	$ 3,100
Utility Relocation	5	%	$ 12,000	$ 12,000
Mobilization and Demobilization	6	%	$ 14,000	$ 14,000
Maintenance of Traffic	5	%	$ 12,000	$ 12,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 275,900**
			Contingency 15%	$ 41,385
			Non-Construction Cost 30%	$ 82,770
			TOTAL PROJECT COST[1]	**$ 400,055**
			Additional Cost for 50-YR Storm Infrastructure [2]	**$ 24,000**
			Additional Cost for 100-YR Storm Infrastructure [2]	**$ 115,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

[2] Additional cost includes construction contingency and non-construction cost increase.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 1B - Open Channel Improvements from Treelane Drive to Carole Place
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Reinforce Ditch				
High Performance Turf Reinforcement Mats	290	SY	$ 45	$ 14,000
Grading	1	LS	$ 10,000	$ 10,000
Misc.				
Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
Utility Relocation	1	LS	$ 10,000	$ 10,000
Mobilization and Demobilization	6	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	1	LS	$ 5,000	$ 5,000
SUB-TOTAL CONSTRUCTION COST				**$ 47,000**
Contingency			**15%**	$ 7,050
Non-Construction Cost			**30%**	$ 14,100
TOTAL PROJECT COST[1]				**$ 68,150**
Additional Cost for Riprap Reinforcements [2]				**$ 20,000**
Additional Cost for Articulated Concrete Block Reinforcements [2]				**$ 70,000**
Additional Cost for Concrete Block Wall Reinforcements [2]				**$ 454,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

[2] Additional cost includes construction contingency and non-construction cost increase.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 1C - Carole Place Culvert Upgrade
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
6' x 3' Box Culvert, Depth 4'-8'	50	LF	$ 585	$ 29,300
Granular Backfill, 6' x 3' Box Culvert	50	LF	$ 90	$ 4,500
Manholes, Inlets, and End Sections				
8' x 4" Wing Walls	2	EA	$ 3,000	$ 6,000
Misc.				
Ditch Regrade	1	LS	$ 6,750	$ 6,800
Pavement/Asphalt Restoration	1	LS	$ 2,000	$ 2,000
Culvert Inlet	1	EA	$ 5,000	$ 5,000
Utility Relocation	1	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 3,000	$ 3,000
Maintenance of Traffic	3	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 61,600**
			Contingency **15%**	$ 9,240
			Non-Construction Cost **30%**	$ 18,480
			TOTAL PROJECT COST[1]	**$ 89,320**
			Additional Cost for 50-YR Storm Infrastructure [2]	**$ 15,000**
			Additional Cost for 100-YR Storm Infrastructure [2]	**$ 25,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

[2] Additional cost includes construction contingency and non-construction cost increase.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 1D - Open Channel Improvements from Carole Place to Existing 48-inch RCP Culvert
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Reinforce Ditch				
High Performance Turf Reinforcement Mats	160	SY	$ 45	$ 8,000
Grading	1	LS	$ 10,000	$ 10,000
Misc.				
Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
Utility Relocation	1	LS	$ 10,000	$ 10,000
Mobilization and Demobilization	6	%	$ 1,000	$ 1,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	1	LS	$ 5,000	$ 5,000
SUB-TOTAL CONSTRUCTION COST				**$ 40,000**
Contingency			**15%**	$ 6,000
Non-Construction Cost			**30%**	$ 12,000
TOTAL PROJECT COST[1]				**$ 58,000**
Additional Cost for Riprap Reinforcements [2]				**$ 20,000**
Additional Cost for Articulated Concrete Block Reinforcements [2]				**$ 45,000**
Additional Cost for Concrete Block Wall Reinforcements [2]				**$ 275,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

[2] Additional cost includes construction contingency and non-construction cost increase.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 1E - Forest Park Drive Culvert and Storm Pipe Upgrade
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 0'-10'	40	LF	$ 81	$ 3,300
6' x 4' Box Culvert, Depth 0'-10'	175	LF	$ 634	$ 111,000
Manholes, Inlets, and End Sections				
8' x 4" Wing Walls	2	EA	$ 3,000	$ 6,000
Misc.				
Ditch Regrade	1	LS	$ 6,750	$ 6,800
Pavement Restoration	1	LS	$ 2,000	$ 2,000
Class I Riprap	100	SY	$ 55	$ 5,500
Utility Relocation	1	LS	$ 10,000	$ 10,000
Mobilization and Demobilization	6	%	$ 2,000	$ 2,000
Maintenance of Traffic	5	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 150,600**
			Contingency **15%**	$ 22,590
			Non-Construction Cost **30%**	$ 45,180
			TOTAL PROJECT COST[(1)]	**$ 218,370**
			Additional Cost for 50-YR Storm Infrastructure [(2)]	**$ 90,000**
			Additional Cost for 100-YR Storm Infrastructure [(2)]	**$ 120,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

[2] Additional cost includes construction contingency and non-construction cost increase.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 2 - TIMBER HILLS DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	395	LF	$ 81	$ 32,100
15"Ø RCP, Depth 4'-8'	225	LF	$ 86	$ 19,400
18"Ø RCP, Depth 4'-8'	75	LF	$ 97	$ 7,300
24"Ø RCP, Depth 4'-8'	510	LF	$ 122	$ 62,100
30"Ø RCP, Depth 4'-8'	290	LF	$ 146	$ 42,500
36"Ø RCP, Depth 4'-8'	430	LF	$ 182	$ 78,300
Granular Backfill, 12", 15", and 18" Pipe	695	LF	$ 36	$ 25,100
Granular Backfill, 24", 30", and 36" Pipe	1230	LF	$ 46	$ 56,600
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	3	EA	$ 2,000	$ 6,000
24" Inlet/Junction Box	1	EA	$ 3,500	$ 3,500
36" Inlet/Junction Box	7	EA	$ 3,700	$ 25,900
48" Inlet/Junction Box	8	EA	$ 4,000	$ 32,000
18" End Section	1	EA	$ 1,296	$ 1,300
24" End Section	1	EA	$ 1,404	$ 1,500
36" End Section	1	EA	$ 1,716	$ 1,800
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 19,000	$ 19,000
Curb and Gutter	1700	LF	$ 50	$ 85,000
Private Drive Repair	1	LS	$ 33,000	$ 33,000
Curb Turnouts	16	EA	$ 500	$ 8,000
Utility Relocation	2	%	$ 11,000	$ 11,000
Mobilization and Demobilization	6	%	$ 33,000	$ 33,000
Maintenance of Traffic	3	%	$ 17,000	$ 17,000
Dewatering	2	%	$ 11,000	$ 11,000
Erosion Control	0.5	%	$ 3,000	$ 3,000
			SUB-TOTAL CONSTRUCTION COST	**$ 615,400**
			Contingency **15%**	$ 92,310
			Non-Construction Cost **30%**	$ 184,620
			TOTAL PROJECT COST[(1)]	**$ 892,330**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 3A - Between Cypress and Adams Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
30"Ø RCP, Depth 4'-8'	1478	LF	$ 146	$ 216,200
Manholes, Inlets, and End Sections				
48" Inlet/Junction Box	1	EA	$ 4,000	$ 4,000
30" End Section	2	EA	$ 1,500	$ 3,000
Misc.				
Curb and Gutter	50	LF	$ 70	$ 3,500
Class I Riprap	8	SY	$ 55	$ 500
Tree Removal	1	LS	$ 4,000	$ 4,000
24" Tee-In Connection	1	EA	$ 3,000	$ 3,000
Existing Pipe Removal	122	LF	$ 42	$ 5,200
Utility Relocation	0.5	%	$ 2,000	$ 2,000
Mobilization and Demobilization	6	%	$ 15,000	$ 15,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 263,400**
			Contingency **15%**	$ 39,510
			Non-Construction Cost **30%**	$ 79,020
			TOTAL PROJECT COST[(1)]	**$ 381,930**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 3A - Between Cypress and Adams Street
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Cast-In-Place Pipe Lining				
30"Ø, CIPP Lining	125	LF	$ 200	$ 25,000
Manholes, Inlets, and End Sections				
36" Inlet/Junction Box	1	EA	$ 3,700	$ 3,700
30" End Section	1	EA	$ 1,500	$ 1,500
Misc.				
CCTV Existing Storm Sewer	1	LS	$ 5,000	$ 5,000
Class I Riprap	8	SY	$ 55	$ 500
Mobilization and Demobilization	6	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 40,700**
			Contingency **15%**	$ 6,105
			Non-Construction Cost **30%**	$ 12,210
			TOTAL PROJECT COST[(1)]	**$ 59,015**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 3B - West of Cypress Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	40	LF	$ 81	$ 3,300
30"Ø RCP, Depth 4'-8'	75	LF	$ 146	$ 11,000
Granular Backfill, 12" Pipe	40	LF	$ 36	$ 1,500
Granular Backfill, 30" Pipe	75	LF	$ 46	$ 3,500
Manholes, Inlets, and End Sections				
24" Inlet/Junction Box	1	EA	$ 3,500	$ 3,500
48" Inlet/Junction Box	3	EA	$ 4,000	$ 12,000
Misc.				
Ditch Fill	1	LS	$ 2,500	$ 2,500
Pavement/Asphalt Restoration	1	LS	$ 3,600	$ 3,600
Existing Pipe Removal with Stone	50	LF	$ 60	$ 3,000
Class I Riprap	90	SY	$ 55	$ 5,000
Utility Relocation	2	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 3,000	$ 3,000
Maintenance of Traffic	5	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	2	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 57,900**
			Contingency **15%**	$ 8,685
			Non-Construction Cost **30%**	$ 17,370
			TOTAL PROJECT COST[(1)]	**$ 83,955**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 3B - West of Cypress Street
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
30"Ø Elliptical Equivalent, Depth 4'-8'	50	LF	$ 168	$ 8,500
Granular Backfill, 30" Pipe	50	LF	$ 46	$ 2,300
Manholes, Inlets, and End Sections				
48" Inlet/Junction Box	1	EA	$ 4,000	$ 4,000
30" End Section	1	EA	$ 1,500	$ 1,500
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 4,500	$ 4,500
Existing Ripe Removal	50	LF	$ 40	$ 2,000
Class I Riprap	120	SY	$ 55	$ 6,600
Utility Relocation	1	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 2,000	$ 2,000
Maintenance of Traffic	5	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 36,400**
			Contingency **15%**	$ 5,460
			Non-Construction Cost **30%**	$ 10,920
			TOTAL PROJECT COST[(1)]	**$ 52,780**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 4 - JENNINGS AND SYCAMORE DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	30	LF	$ 81	$ 2,500
Granular Backfill, 12" Pipe	30	LF	$ 36	$ 1,100
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
24" Inlet/Junction Box	1	EA	$ 3,500	$ 3,500
Misc.				
Granular Fill	1	LS	$ 1,500	$ 1,500
Curb Turnout	1	EA	$ 500	$ 500
Pavement/Asphalt Restoration	1	LS	$ 20,000	$ 20,000
Curb and Gutter	120	LF	$ 70	$ 8,400
Concrete Sidewalk	53	SY	$ 100	$ 5,300
Curb Ramp	1	LS	$ 3,500	$ 3,500
Concrete Barrier Wall	9	CY	$ 600	$ 5,400
Utility Relocation	6	%	$ 4,000	$ 4,000
Mobilization and Demobilization	6	%	$ 4,000	$ 4,000
Maintenance of Traffic	5	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 69,200**
			Contingency **15%**	$ 10,380
			Non-Construction Cost **30%**	$ 20,760
			TOTAL PROJECT COST[(1)]	**$ 100,340**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 5 - MIDDLE STREET DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	60	LF	$ 81	$ 4,900
30"Ø RCP, Depth 4'-8'	500	LF	$ 146	$ 73,200
Granular Backfill, 30" Pipe	60	LF	$ 46	$ 2,800
Manholes, Inlets, and End Sections				
60"Ø Manhole, All Depths	6	EA	$ 6,800	$ 40,800
12" End Section	1	EA	$ 1,200	$ 1,200
36" End Section	1	EA	$ 1,716	$ 1,800
Misc.				
Ditch Regrade	1	LS	$ 6,750	$ 6,800
Pavement/Asphalt Restoration	1	LS	$ 8,000	$ 8,000
Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
Class I Riprap	65	SY	$ 55	$ 3,600
Utility Relocation	8	%	$ 12,000	$ 12,000
Mobilization and Demobilization	6	%	$ 9,000	$ 9,000
Maintenance of Traffic	2	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 176,100**
			Contingency **15%**	$ 26,415
			Non-Construction Cost **30%**	$ 52,830
			TOTAL PROJECT COST[(1)]	**$ 255,345**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 5 - MIDDLE STREET DRAINAGE
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
36"Ø RCP, Depth 4'-8'	325	LF	$ 182	$ 59,200
Granular Backfill, 36" Pipe	325	LF	$ 46	$ 15,000
Manholes, Inlets, and End Sections				
60"Ø Manhole, All Depths	2	EA	$ 6,800	$ 13,600
36" End Section	3	EA	$ 1,716	$ 5,200
Misc.				
Ditch Regrade	1	LS	$ 10,000	$ 10,000
Pavement/Asphalt Restoration	1	LS	$ 14,000	$ 14,000
12" Pipe Reconnection	1	LS	$ 2,000	$ 2,000
Class I Riprap	245	SY	$ 55	$ 13,500
Utility Relocation	7	%	$ 10,000	$ 10,000
Mobilization and Demobilization	6	%	$ 8,000	$ 8,000
Maintenance of Traffic	2	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	5	%	$ 7,000	$ 7,000
			SUB-TOTAL CONSTRUCTION COST	**$ 163,500**
			Contingency **15%**	$ 24,525
			Non-Construction Cost **30%**	$ 49,050
			TOTAL PROJECT COST(1)	**$ 237,075**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 6A - State Street Drainage Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	50	LF	$ 81	$ 4,100
Granular Backfill, 12" Pipe	50	LF	$ 36	$ 1,800
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
48"Ø Manhole, All Depths	1	EA	$ 4,000	$ 4,000
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 2,500	$ 2,500
Utility Relocation	0.5	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 1,000	$ 1,000
Maintenance of Traffic	1	LS	$ 5,000	$ 5,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 25,400**
			Contingency **15%**	$ 3,810
			Non-Construction Cost **30%**	$ 7,620
			TOTAL PROJECT COST[(1)]	**$ 36,830**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 6B - Fourth Street Drainage Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	150	LF	$ 81	$ 13,000
Granular Backfill, 12" Pipe	150	LF	$ 36	$ 5,400
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
36" End Section	3	EA	$ 1,716	$ 6,000
Misc.				
Internal Joint Sealing System Rings	4	EA	$ 2,500	$ 10,000
Pavement/Asphalt Restoration	1	LS	$ 5,000	$ 5,000
Ditch Clearing	1	LS	$ 10,000	$ 10,000
Pipe Anchor	1	EA	$ 3,500	$ 4,000
Grade Work	1	LS	$ 10,000	$ 10,000
Class I Riprap	250	SY	$ 55	$ 14,000
Mobilization and Demobilization	6	%	$ 5,000	$ 5,000
Maintenance of Traffic	2	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 91,400**
			Contingency **15%**	$ 13,710
			Non-Construction Cost **30%**	$ 27,420
			TOTAL PROJECT COST[(1)]	**$ 132,530**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 6C - Third Street Drainage Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	60	LF	$ 81	$ 4,900
60"Ø RCP, Depth 4'-8'	290	LF	$ 398	$ 115,400
Granular Backfill, 60" Pipe	50	LF	$ 90	$ 4,500
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	4	EA	$ 2,000	$ 8,000
72" Inlet/Junction Box	4	EA	$ 6,500	$ 26,000
60" End Section	1	EA	$ 3,200	$ 3,200
60"Ø Manhole, All Depths	2	EA	$ 6,800	$ 13,600
Misc.				
60" Pipe Reconnection	1	LS	$ 5,000	$ 5,000
Pavement/Asphalt Restoration	1	LS	$ 5,000	$ 5,000
Existing 60" Pipe Removal	290	LF	$ 60	$ 17,400
Class I Riprap	55	SY	$ 55	$ 3,100
Utility Relocation	0.5	%	$ 2,000	$ 2,000
Mobilization and Demobilization	6	%	$ 13,000	$ 13,000
Maintenance of Traffic	1.5	%	$ 4,000	$ 4,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 232,100**
			Contingency **15%**	$ 34,815
			Non-Construction Cost **30%**	$ 69,630
			TOTAL PROJECT COST[(1)]	**$ 336,545**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 7 - FIRST STREET DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
CCTV Existing Storm Sewer				
CCTV Inspection	1	LS	$ 1,500	$ 1,500
Misc.				
Class I Riprap	225	SY	$ 55	$ 13,000
Utility Relocation	2	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 1,000	$ 1,000
Maintenance of Traffic	1	%	$ 1,000	$ 1,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 19,500**
			Contingency **15%**	$ 2,925
			Non-Construction Cost **30%**	$ 5,850
			TOTAL PROJECT COST[(1)]	**$ 28,275**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 8A - Jennings and Washington Avenue
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	90	LF	$ 81	$ 7,400
24"Ø RCP, Depth 4'-8'	150	LF	$ 122	$ 18,300
30"Ø RCP, Depth 4'-8'	375	LF	$ 146	$ 54,900
Granular Backfill, 12" Pipe	90	LF	$ 36	$ 3,300
Granular Backfill, 24" and 30" Pipe	525	LF	$ 46	$ 24,200
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	3	EA	$ 2,000	$ 6,000
36" Inlet/Junction Box	2	EA	$ 3,700	$ 7,400
48" Inlet/Junction Box	2	EA	$ 4,000	$ 8,000
60"Ø Manhole Drop Structures, All Depths	3	EA	$ 6,800	$ 20,400
30" End Section	1	EA	$ 1,500	$ 1,500
30" Headwall w/ Flapgate	1	EA	$ 7,500	$ 7,500
Misc.				
12" Pipe Reconnections	1	LS	$ 2,000	$ 2,000
Pavement/Asphalt Restoration	1	LS	$ 17,500	$ 17,500
Curb Ramps	4	LS	$ 3,500	$ 14,000
Class I Riprap	175	SY	$ 55	$ 10,000
Utility Relocation	5	%	$ 11,000	$ 11,000
Mobilization and Demobilization	6	%	$ 13,000	$ 13,000
Maintenance of Traffic	3	%	$ 7,000	$ 7,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 240,400**
			Contingency **15%**	$ 36,060
			Non-Construction Cost **30%**	$ 72,120
			TOTAL PROJECT COST[(1)]	**$ 348,580**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 8B - Jennings and Jefferson Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	120	LF	$ 81	$ 9,800
24"Ø RCP, Depth 4'-8'	375	LF	$ 122	$ 45,600
Granular Backfill, 12" Pipe	120	LF	$ 36	$ 4,400
Granular Backfill, 24" Pipe	375	LF	$ 46	$ 17,300
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	7	EA	$ 2,000	$ 14,000
48"Ø Manhole Drop Structures, All Depths	3	EA	$ 4,000	$ 12,000
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 18,500	$ 18,500
Curb Ramps	5	EA	$ 3,500	$ 17,500
12" Pipe Reconnections	4	EA	$ 1,500	$ 6,000
24" Pipe Reconnections	1	EA	$ 2,000	$ 2,000
Utility Relocation	5	%	$ 8,000	$ 8,000
Mobilization and Demobilization	6	%	$ 9,000	$ 9,000
Maintenance of Traffic	4	%	$ 6,000	$ 6,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 174,100**
			Contingency **15%**	$ 26,115
			Non-Construction Cost **30%**	$ 52,230
			TOTAL PROJECT COST[(1)]	**$ 252,445**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 8C - Jennings and Market Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	90	LF	$ 81	$ 7,400
24"Ø RCP, Depth 4'-8'	375	LF	$ 122	$ 45,600
Granular Backfill, 12" Pipe	90	LF	$ 36	$ 3,300
Granular Backfill, 24" Pipe	375	LF	$ 46	$ 17,300
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
24" Inlet/Junction Box	1	EA	$ 3,500	$ 4,000
36" Inlet/Junction Box	2	EA	$ 3,700	$ 8,000
48"Ø Manhole Drop Structures, All Depths	4	EA	$ 4,000	$ 16,000
24" Headwall w/ Flapgate	1	EA	$ 6,500	$ 7,000
Misc.				
Curb Ramps	3	EA	$ 3,500	$ 11,000
Pavement/Asphalt Restoration	1	LS	$ 20,000	$ 20,000
12" Pipe Reconnection	1	EA	$ 2,000	$ 2,000
Class I Riprap	150	SY	$ 55	$ 9,000
Utility Relocation	5	%	$ 8,000	$ 8,000
Mobilization and Demobilization	6	%	$ 10,000	$ 10,000
Maintenance of Traffic	3	%	$ 5,000	$ 5,000
Dewatering	2	%	$ 4,000	$ 4,000
			SUB-TOTAL CONSTRUCTION COST	**$ 181,600**
			Contingency **15%**	$ 27,240
			Non-Construction Cost **30%**	$ 54,480
			TOTAL PROJECT COST[(1)]	**$ 263,320**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 8D - Jennings and Madison Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	110	LF	$ 81	$ 9,000
18"Ø RCP, Depth 4'-8'	330	LF	$ 97	$ 32,000
Granular Backfill, 12" and 18" Pipe	440	LF	$ 36	$ 15,900
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	4	EA	$ 2,000	$ 8,000
24" Inlet/Junction Box	3	EA	$ 3,500	$ 10,500
18" End Section	1	EA	$ 1,296	$ 1,300
48"Ø Manhole Drop Structures, All Depths	4	EA	$ 4,000	$ 16,000
18" Headwall w/ Flapgate	1	EA	$ 6,500	$ 6,500
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 18,700	$ 18,700
Curb Ramps	3	EA	$ 3,500	$ 10,500
12" Pipe Reconnections	1	LS	$ 5,000	$ 5,000
Existing Pipe Removal	375	LF	$ 40	$ 15,000
Class I Riprap	100	SY	$ 55	$ 5,500
Utility Relocation	5	%	$ 8,000	$ 8,000
Mobilization and Demobilization	6	%	$ 10,000	$ 10,000
Maintenance of Traffic	3	%	$ 5,000	$ 5,000
Dewatering	2	%	$ 4,000	$ 4,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 181,900**
			Contingency **15%**	$ 27,285
			Non-Construction Cost **30%**	$ 54,570
			TOTAL PROJECT COST[(1)]	**$ 263,755**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 8E - Jennings and Monroe Street
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 0'-10'	50	LF	$ 81	$ 4,100
18"Ø RCP, Depth 0'-10'	320	LF	$ 97	$ 31,000
Granular Backfill, 12" and 18" Pipe	370	LF	$ 36	$ 13,400
Manholes, Inlets, and End Sections				
18" End Section	1	EA	$ 1,296	$ 1,300
48"Ø Manhole, All Depths	5	EA	$ 4,000	$ 20,000
18" Headwall w/ Flapgate	1	EA	$ 6,500	$ 6,500
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 21,500	$ 21,500
Curb Ramps	4	EA	$ 6,500	$ 26,000
12" Pipe Reconnection	1	LS	$ 10,000	$ 10,000
Class I Riprap	100	SY	$ 55	$ 5,500
Grout Fill	20	SY	$ 150	$ 3,000
Utility Relocation	5	%	$ 8,000	$ 8,000
Mobilization and Demobilization	6	%	$ 9,000	$ 9,000
Maintenance of Traffic	1	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 165,300**
			Contingency **15%**	$ 24,795
			Non-Construction Cost **30%**	$ 49,590
			TOTAL PROJECT COST(1)	**$ 239,685**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 9 - JEFFERSON STREET AND POSEY STREET DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Entrance Improvements				
Curb and Gutter	50	LF	$ 70	$ 3,500
Concrete Drive	50	SY	$ 55	$ 2,800
Concrete Sidewalk	6	SY	$ 100	$ 600
Misc.				
Pavement Restoration	1	LS	$ 2,000	$ 2,000
Utility Relocation	2	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 1,000	$ 1,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 12,900**
			Contingency **15%**	$ 1,935
			Non-Construction Cost **30%**	$ 3,870
			TOTAL PROJECT COST(1)	**$ 18,705**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 9 - JEFFERSON STREET AND POSEY STREET DRAINAGE
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	60	LF	$ 81	$ 4,900
24"Ø RCP, Depth 4'-8'	400	LF	$ 122	$ 48,700
Granular Backfill, 12" Pipe	60	LF	$ 36	$ 2,200
Granular Backfill, 24" Pipe	300	LF	$ 46	$ 13,800
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	3	EA	$ 2,000	$ 6,000
24" End Section	1	EA	$ 1,404	$ 1,500
Misc.				
Clearing and Grubbing	1	LS	$ 1,500	$ 1,500
Pavement/Asphalt Restoration	1	LS	$ 20,000	$ 20,000
Curb Ramps	2	EA	$ 3,500	$ 7,000
Concrete Curb and Gutter	50	LF	$ 70	$ 3,500
Concrete Drive	50	SY	$ 55	$ 2,800
Concrete Sidewalk	6	SY	$ 100	$ 600
Class I Riprap	75	SY	$ 55	$ 4,200
Utility Relocation	2	%	$ 3,000	$ 3,000
Mobilization and Demobilization	6	%	$ 8,000	$ 8,000
Maintenance of Traffic	4	%	$ 5,000	$ 5,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 136,700**
			Contingency **15%**	$ 20,505
			Non-Construction Cost **30%**	$ 41,010
			TOTAL PROJECT COST(1)	**$ 198,215**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 9 - JEFFERSON STREET AND POSEY STREET DRAINAGE
ALTERNATE 3

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	75	LF	$ 81	$ 6,100
18"Ø RCP, Depth 4'-8'	375	LF	$ 97	$ 36,300
Granular Backfill, 12" and 18" Pipe	450	LF	$ 36	$ 16,200
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	5	EA	$ 2,000	$ 10,000
48"Ø Manhole, All Depths	1	EA	$ 4,000	$ 4,000
Misc.				
12" Pipe Reconnections	1	LS	$ 2,000	$ 2,000
Pavement Restoration	1	LS	$ 8,500	$ 8,500
Concrete Curb and Gutter	50	LF	$ 70	$ 3,500
Concrete Drive	50	SY	$ 55	$ 2,800
Concrete Sidewalk	6	SY	$ 100	$ 600
Class I Riprap	75	SY	$ 55	$ 4,200
Utility Relocation	5	%	$ 5,000	$ 5,000
Mobilization and Demobilization	6	%	$ 6,000	$ 6,000
Maintenance of Traffic	3	%	$ 3,000	$ 3,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 95,000**
			Contingency **15%**	$ 14,250
			Non-Construction Cost **30%**	$ 28,500
			TOTAL PROJECT COST(1)	**$ 137,750**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 10 - VILLAGE LANE DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	360	LF	$ 81	$ 29,300
15"Ø RCP, Depth 4'-8'	390	LF	$ 86	$ 33,500
Granular Backfill, 12" and 15" Pipe	750	LF	$ 36	$ 27,000
Manholes, Inlets, and End Sections				
18" Inlet/Junction Box	7	EA	$ 2,000	$ 14,000
12" End Section	1	EA	$ 1,100	$ 1,100
15" End Section	1	EA	$ 1,248	$ 1,300
Misc.				
Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
Pavement Restoration	1	LS	$ 50,000	$ 50,000
Concrete Curb and Inverted Gutter	522	LF	$ 100	$ 53,000
Class I Riprap	25	SY	$ 55	$ 2,000
Utility Relocation	2	%	$ 5,000	$ 5,000
Mobilization and Demobilization	6	%	$ 13,000	$ 13,000
Maintenance of Traffic	4	%	$ 9,000	$ 9,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 250,200**
			Contingency **15%**	$ 37,530
			Non-Construction Cost **30%**	$ 75,060
			TOTAL PROJECT COST[(1)]	**$ 362,790**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 11 - FRAME ROAD DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	130	LF	$ 81	$ 10,600
15"Ø RCP, Depth 4'-8'	300	LF	$ 86	$ 25,800
18"Ø RCP, Depth 4'-8'	250	LF	$ 97	$ 24,200
24"Ø RCP, Depth 4'-8'	310	LF	$ 122	$ 37,700
30"Ø RCP, Depth 4'-8'	750	LF	$ 146	$ 109,700
Granular Backfill, 12", 15", and 18" Pipe	680	LF	$ 36	$ 24,500
Granular Backfill, 24" and 30" Pipe	1060	LF	$ 46	$ 48,800
Manholes, Inlets, and End Sections				
12" Inlet/Junction Box	7	EA	$ 1,500	$ 10,500
15" Inlet/Junction Box	1	EA	$ 1,750	$ 1,800
18" Inlet/Junction Box	2	EA	$ 2,000	$ 4,000
24" Inlet/Junction Box	3	EA	$ 3,500	$ 10,500
30" Inlet/Junction Box	3	EA	$ 3,700	$ 11,100
48"Ø Manhole, All Depths	4	EA	$ 4,000	$ 16,000
60"Ø Manhole, All Depths	2	EA	$ 6,800	$ 13,600
30" Headwall	1	EA	$ 4,500	$ 4,500
Misc.				
Remove Existing Pipes	1	LS	$ 35,000	$ 35,000
Pavement/Asphalt Restoration	1	LS	$ 23,400	$ 24,000
Regrade Swales	1	LS	$ 5,000	$ 5,000
Engineered Fill	1	LS	$ 20,000	$ 20,000
Curb and Gutter	1300	LF	$ 50	$ 65,000
Concrete Sidewalk	870	LF	$ 100	$ 87,000
Class I Riprap	40	SY	$ 55	$ 3,000
Utility Relocation	2	%	$ 12,000	$ 12,000
Mobilization and Demobilization	6	%	$ 35,000	$ 35,000
Maintenance of Traffic	6	%	$ 35,000	$ 35,000
Dewatering	2	%	$ 12,000	$ 12,000
Erosion Control	0.5	%	$ 3,000	$ 3,000
			SUB-TOTAL CONSTRUCTION COST	**$ 689,300**
			Contingency **15%**	$ 103,395
			Non-Construction Cost **30%**	$ 206,790
			TOTAL PROJECT COST[(1)]	**$ 999,485**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 12A - Lower Knob Hill Culvert Replacement and Outlet Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
36"Ø RCP, Depth 0'-10'	100	LF	$ 182	$ 18,200
Manholes, Inlets, and End Sections				
36" Headwall	1	EA	$ 5,000	$ 5,000
Misc.				
Class I Riprap	30	SY	$ 55	$ 1,700
Existing Pipe Removal	120	LF	$ 50	$ 6,000
Mobilization and Demobilization	6	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 34,900**
			Contingency **15%**	$ 5,235
			Non-Construction Cost **30%**	$ 10,470
			TOTAL PROJECT COST[(1)]	**$ 50,605**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 12B - Lower Knob Hill Drive Channel Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Ditch Regrade				
Grading	1	LS	$ 10,000	$ 10,000
Tree Removal	1	LS	$ 20,000	$ 20,000
Turf Reinforcement Mats	1700	SY	$ 20	$ 34,000
Misc.				
Mobilization and Demobilization	6	%	$ 4,000	$ 4,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	1	LS	$ 10,000	$ 10,000
			SUB-TOTAL CONSTRUCTION COST	**$ 80,000**
			Contingency **15%**	$ 12,000
			Non-Construction Cost **30%**	$ 24,000
			TOTAL PROJECT COST(1)	**$ 116,000**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 12C - Maple Lane Drainage Improvements
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
6' x 3' Box Culvert, Depth 0'-10'	45	LF	$ 585	$ 26,400
Misc.				
Class I Riprap	500	SY	$ 55	$ 27,500
Pavement Restoration	1	LS	$ 2,500	$ 2,500
Curb Turnouts and Inlets	1	LS	$ 2,500	$ 2,500
Existing Pipe Removal	1	LS	$ 7,500	$ 7,500
Utility Relocation	2	%	$ 2,000	$ 2,000
Mobilization and Demobilization	6	%	$ 4,000	$ 4,000
Maintenance of Traffic	1	%	$ 1,000	$ 1,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 76,400**
			Contingency **15%**	$ 11,460
			Non-Construction Cost **30%**	$ 22,920
			TOTAL PROJECT COST(1)	**$ 110,780**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 13A - Driftwood Subdivision
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
30"Ø RCP, Depth 4'-8'	655	LF	$ 146	$ 95,800
Granular Backfill, 30" Pipe	655	LF	$ 46	$ 30,200
Manholes, Inlets, and End Sections				
30" Inlet/Junction Box	6	EA	$ 3,700	$ 22,200
60"Ø Manhole, All Depths	3	EA	$ 6,800	$ 20,400
30" Headwall	1	EA	$ 4,500	$ 4,500
Misc.				
30" Tie-In	1	LS	$ 5,000	$ 5,000
Pavement/Asphalt Restoration	1	LS	$ 17,000	$ 17,000
Prive Drive Repair	1	LS	$ 8,500	$ 8,500
Fence	1	LS	$ 5,000	$ 5,000
Class I Riprap	40	SY	$ 55	$ 2,200
Utility Relocation	2	%	$ 5,000	$ 5,000
Mobilization and Demobilization	6	%	$ 13,000	$ 13,000
Maintenance of Traffic	3	%	$ 7,000	$ 7,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	0.5	%	$ 2,000	$ 2,000
			SUB-TOTAL CONSTRUCTION COST	**$ 242,800**
			Contingency **15%**	$ 36,420
			Non-Construction Cost **30%**	$ 72,840
			TOTAL PROJECT COST[(1)]	**$ 352,060**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 13A - Driftwood Subdivision
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
30"Ø RCP, Depth 4'-8'	350	LF	$ 146	$ 51,200
Granular Backfill, 30" Pipe	350	LF	$ 46	$ 16,100
Manholes, Inlets, and End Sections				
30" Inlet/Junction Box	6	EA	$ 3,700	$ 22,200
60"Ø Manhole, All Depths	3	EA	$ 6,800	$ 20,400
30" Headwall	1	EA	$ 4,500	$ 4,500
Misc.				
30" Tie-In	1	LS	$ 5,000	$ 5,000
Pavement/Asphalt Restoration	1	LS	$ 9,400	$ 9,400
Prive Drive Repair	1	LS	$ 2,000	$ 2,000
Fence	1	LS	$ 5,000	$ 5,000
Class I Riprap	40	SY	$ 55	$ 2,200
Utility Relocation	2	%	$ 3,000	$ 3,000
Mobilization and Demobilization	6	%	$ 9,000	$ 9,000
Maintenance of Traffic	3	%	$ 5,000	$ 5,000
Dewatering	2	%	$ 3,000	$ 3,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 159,000**
			Contingency **15%**	$ 23,850
			Non-Construction Cost **30%**	$ 47,700
			TOTAL PROJECT COST[(1)]	**$ 230,550**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 13B - Phelps to Yorkshire Drive
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	115	LF	$ 81	$ 10,000
Granular Backfill, 12" Pipe	115	LF	$ 36	$ 4,200
Manholes, Inlets, and End Sections				
12" Inlet/Junction Box	3	EA	$ 1,500	$ 5,000
Misc.				
Concrete Curb	1	LS	$ 1,500	$ 2,000
Pavement/Asphalt Restoration	1	LS	$ 3,100	$ 4,000
Utility Relocation	2	%	$ 1,000	$ 1,000
Mobilization and Demobilization	6	%	$ 2,000	$ 2,000
Maintenance of Traffic	1	%	$ 1,000	$ 1,000
Dewatering	2	%	$ 1,000	$ 1,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 31,200**
			Contingency **15%**	$ 4,680
			Non-Construction Cost **30%**	$ 9,360
			TOTAL PROJECT COST[(1)]	**$ 45,240**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 14 - ELLERBUSCH DITCH DRAINAGE IMPROVEMENTS
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
30"Ø RCP, Depth 4'-8'	60	LF	$ 146	$ 8,800
36"Ø RCP, Depth 4'-8'	80	LF	$ 182	$ 14,600
42"Ø RCP, Depth 12'-15'	340	LF	$ 289	$ 98,200
Manholes, Inlets, and End Sections				
48" Inlet/Junction Box	2	EA	$ 5,000	$ 10,000
42" End Section	1	EA	$ 8,000	$ 8,000
42" Headwall w/ Flapgate	1	EA	$ 2,000	$ 2,000
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 16,500	$ 16,500
Ditch Regrade	1	LS	$ 15,000	$ 15,000
Existing Pipe Removal	1	LS	$ 5,000	$ 5,000
24" Pipe Reconnection	1	LS	$ 3,000	$ 3,000
Flowable Fill	430	CY	$ 130	$ 55,900
Class I Riprap	120	SY	$ 55	$ 6,600
Utility Relocation	4	%	$ 10,000	$ 10,000
Mobilization and Demobilization	6	%	$ 15,000	$ 15,000
Maintenance of Traffic	10	%	$ 25,000	$ 25,000
Dewatering	2	%	$ 5,000	$ 5,000
Erosion Control	2	%	$ 5,000	$ 5,000
			SUB-TOTAL CONSTRUCTION COST	**$ 303,600**
			Contingency **15%**	$ 45,540
			Non-Construction Cost **30%**	$ 91,080
			TOTAL PROJECT COST[(1)]	**$ 440,220**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 14 - ELLERBUSCH DITCH DRAINAGE IMPROVEMENTS
ALTERNATE 2

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
84"Ø Elliptical Equivalent, Depth 0'-10'	1200	LF	$ 487	$ 584,200
Granular Backfill, 84" Elliptical Equivalent	1100	LF	$ 200	$ 220,000
Manholes, Inlets, and End Sections				
96"Ø Manhole, All Depths	3	EA	$ 9,500	$ 28,500
Concrete Anchor	2	EA	$ 9,000	$ 18,000
Misc.				
Pavement/Asphalt Restoration	1	LS	$ 5,000	$ 5,000
Remove Existing 60" Pipe	60	LF	$ 125	$ 7,500
Flowable Fill	430	LF	$ 130	$ 55,900
Guardrail with Safety Block Wall	1	LS	$ 12,000	$ 12,000
15" Pipe Reconnection	1	EA	$ 2,500	$ 2,500
Ditch Regrade	1	LS	$ 5,000	$ 5,000
Class I Riprap	125	SY	$ 55	$ 6,900
Utility Relocation	2	%	$ 19,000	$ 19,000
Mobilization and Demobilization	6	%	$ 57,000	$ 57,000
Maintenance of Traffic	3	%	$ 29,000	$ 29,000
Dewatering	2	%	$ 19,000	$ 19,000
Erosion Control	1	%	$ 10,000	$ 10,000
			SUB-TOTAL CONSTRUCTION COST	**$ 1,079,500**
			Contingency **15%**	$ 161,925
			Non-Construction Cost **30%**	$ 323,850
			TOTAL PROJECT COST[(1)]	**$ 1,565,275**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
PROJECT AREA No. 15 - WILLIAMS LANE DRAINAGE
ALTERNATE 1

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	385	LF	$ 81	$ 32,000
Granular Backfill, 12" Pipe	150	LF	$ 36	$ 5,400
Manholes, Inlets, and End Sections				
12" Inlet/Junction Box	5	EA	$ 1,500	$ 7,500
12" End Section	1	EA	$ 1,100	$ 1,100
Misc.				
Tree Removal	1	LS	$ 5,000	$ 5,000
Private Drive Repair	1	LS	$ 1,500	$ 1,500
Pavement/Asphalt Replacement	1	LS	$ 3,000	$ 3,000
Regrade Swale	1	LS	$ 7,500	$ 7,500
Remove Existing 8" Pipe	190	LF	$ 30	$ 5,700
Utility Relocation	2	%	$ 2,000	$ 2,000
Mobilization and Demobilization	6	%	$ 5,000	$ 5,000
Maintenance of Traffic	2	%	$ 2,000	$ 2,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 80,700**
			Contingency **15%**	$ 12,105
			Non-Construction Cost **30%**	$ 24,210
			TOTAL PROJECT COST[(1)]	**$ 117,015**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

APPENDIX D

TOWN OF NEWBURGH
PRIVATE PROPERTY COST SHARE PROGRAM

Newburgh Department of Stormwater Management
Private Property Cost Share Program

Drainage issues on private property are the property owner's responsibility.
The Town of Newburgh, through the Newburgh Stormwater Management Board, is responsible for maintaining the Town's public stormwater collection and disposal system and the drainage structures and facilities that are a part of the public system. The Town is not responsible for ensuring proper drainage on privately owned property. Private drainage and erosion issues are the responsibility of the property owner. Driveways and their associated culverts that cross a public drainage system are also the responsibility of the property owner.

Private Property Cost Share Program
Due to the potential negative impact that private drainage issues can have on public drainage systems and the general welfare of the community, the Town has instituted a Private Property Cost Share Program to assist eligible and approved property owners in resolving private drainage issues. If a project is approved for the program, the Town will provide the labor for the project (using Town employees), and the property owner will be responsible for the cost of materials and other expenses associated with the project.

In order to be considered for participation in the program, a property owner must complete the attached application and provide a detailed drainage plan detailing the drainage issue and the improvements necessary to alleviate or resolve the issue. Unless waived by the Board, Drainage plans must comply with the requirements of Newburgh Ordinance 152.21. The Board may require additional detail or information, including a professionally prepared drainage plan meeting the requirements of Newburgh Ordinance 152.20, as it deems necessary. Upon receipt of a complete application, the Board, with the assistance of staff, will review the proposed project and determine whether it is in the best interest of the Town of Newburgh to approve the project for participation in the Cost Share Program. The Board may consider any factors it deems relevant to its determination, including without limitation the nature of the alleged drainage problem, feasibility of the project, time necessary to complete the project, the ability and experience of the Town's personnel who would perform work on the project, availability of funds, and the certainty of the project to alleviate or resolve the alleged drainage problem. All projects must comply with applicable drainage standards. Approval of projects for participation in the Cost Share Program shall be within the discretion of the Board.

If the project is approved the following will be expected of the property owner:

1. The property owner will execute a written Agreement in a form provided by the Town.
2. The property must obtain a drainage permit from the Zoning Administrator and any other applicable permits.
3. The property owner will grant to the Town any easements or other rights of entry necessary to complete the project.
4. The Town will purchase the materials necessary for the project. Prior to the Town ordering materials, the Owners make payment to the Town in an amount equal to the cost of the materials.

5. The Town may supply dirt for the project if dirt is available at no cost to the Town. Otherwise, the property owner will be responsible for supply any dirt necessary for completion of the project.
6. The property owner shall be responsible for maintenance of the completed project, including any improvements made in connection with the project.

If approved, your property and project will be placed on a list of approved projects to be completed by Town personnel as time and the availability of town personnel permit.

APPENDIX E

TOWN OF NEWBURGH
AUGUST 13, 2018
PRELIMINARY FINANCIAL PLAN
FOR PROJECT

UMBAUGH

H. J. Umbaugh & Associates
Certified Public Accountants, LLP
8365 Keystone Crossing
Suite 300
Indianapolis, IN 46240-2687
Phone: 317-465-1500
Fax: 317-465-1550
www.umbaugh.com

August 13, 2018

Town Council
Town of Newburgh
23 W. Jennings
P.O. Box 6
Newburgh, IN 47630

Re: Town of Newburgh (Indiana) Municipal Stormwater Utility – Preliminary Financial Plan for Project

Dear Members of the Council:

The attached schedules (listed below) present unaudited and limited information for the purpose of discussion and consideration in the preliminary planning stage of the proposed Stormwater improvement projects by the appropriate officers, officials and advisors of the Newburgh Municipal Stormwater Utility. The use of these schedules should be restricted to this purpose, for internal use only, as the information is subject to future revision and final report.

We would appreciate your questions or comments on this information and would provide additional information upon request.

Very truly yours,

UMBAUGH

Douglas L. Baldessari

PROPERTY TAX SUPPORTED BOND ISSUE SCENARIOS

TOWN OF NEWBURGH, INDIANA

Proposed Stormwater Project

2018 DEBT LIMITATION CALCULATION

Estimated 2018 Maximum Debt Limitation - General Obligation Bonds

Certified 2018 Net Assessed Value	$139,206,129
Divided by three	3
Sub-total	46,402,043
Times Debt Limit	8%
Estimated 2018 Maximum Debt Limitation	3,712,163
Less: Current Outstanding General Obligation Bonds	-
Remaining Debt Limitation	$3,712,163

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(For Internal Use Only)

TOWN OF NEWBURGH, INDIANA

Proposed Stormwater Project

ILLUSTRATIVE PROJECT COSTS AND FUNDING

	Illustrative Bond Principal Amount		
	$500,000	$750,000	$1,000,000
Illustrative Project Costs:			
Illustrative project costs	$420,000	$665,000	$890,000
Allowance for underwriting fees (1%)	5,000	7,500	10,000
Allowance for costs of issuance and contingencies	75,000	77,500	100,000
Total Illustrative Project Costs	$500,000	$750,000	$1,000,000
Illustrative Project Funding:			
Illustrative Stormwater Bonds of 2018	$500,000	$750,000	$1,000,000

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(For Internal Use Only)

TOWN OF NEWBURGH, INDIANA

Proposed Stormwater Project

ILLUSTRATIVE DEBT SERVICE PAYMENTS

	Illustrative Bond Principal Amount		
	$500,000	$750,000	$1,000,000
Type of Bond Issuance	General Obligation	General Obligation	General Obligation
Rated/Unrated (1)	Unrated	Unrated	Rated
Assumed interest rate (2)	4.50%	4.50%	4.20%
Assumed years of principal (3)	19	19	19
Illustrative average annual payment	$39,710	$59,560	$77,440
Estimated Tax Rate (4)	$0.0271	$0.0406	$0.0528

(1) Assumes bond of $1 Million of greater would be rated.
(2) Assumed interest rate for $1 Million issue would be the same as other issues if unrated.
(3) Bonds are limited to not more than a 20 year term resulting in bonds that have 19 years of principal payments.
(4) Based on the 2018 certified assessed value of $139,206,129 and assumes license excise factor of 5%.

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(For Internal Use Only)

TOWN OF NEWBURGH, INDIANA

Proposed Stormwater Project

ESTIMATED MONTHLY TAXPAYER IMPACT (1)

	Illustrative Bond Principal Amount		
	$500,000	$750,000	$1,000,000
Estimated Annual Debt Levy Amount	$39,710	$59,560	$77,440
Estimated Tax Rate Impact (2)	$0.0271	$0.0406	$0.0528
Estimated Monthly Increase On:			
Residential Homeowners (3):			
$50,000 Home Value	$0.23	$0.34	$0.44
$75,000 Home Value	$0.37	$0.56	$0.73
$100,000 Home Value	$0.74	$1.11	$1.44
$150,000 Home Value	$1.47	$2.21	$2.87
$200,000 Home Value	$2.21	$3.31	$4.30
Farmland (4):			
1 acre	$0.04	$0.05	$0.07
100 acres	$3.64	$5.45	$7.09
Business Owners			
$100,000 Commercial/Rental Property	$2.26	$3.39	$4.40

(1) If taxpayer is currently at their tax cap, they will not be impacted by a new debt service tax rate.
(2) Based upon a 2018 net assessed value of $139,206,129.
(3) Assumes homestead deduction, 35% supplemental homestead deduction, and $3,000 mortgage deduction.
(4) Assumes farmland assessed at Pay 2019 State Base Rate of $1,610 per acre. Actual impact will vary based on productivity.

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(For Internal Use Only)

TOWN OF NEWBURGH, INDIANA

Proposed Stormwater Project

ILLUSTRATIVE IMPACT ON CIRCUIT BREAKER CREDITS (1)

Current Circuit Breaker Impact

	Certified Levy	Estimated Circuit Breaker Credits			% of Cert. Levy
		Over 65	1%/2%/3% (2)	Total	
General	$779,972.00	$444.53	$99,544.57	$99,989.10	12.82%
Current Debt Service	174,008.00	99.17	0.00	99.17	0.06%
CCD	55,682.00	31.73	7,106.52	7,138.25	12.82%
Totals	$1,009,662.00	$575.43	$106,651.09	$107,226.52	10.62%

Illustrative Circuit Breaker Impact - $500,000 Bond Issue

	Certified Levy	Estimated Circuit Breaker Credits			% of Cert. Levy
		Over 65	1%/2%/3% (2)	Total	
General	$779,972.00	$444.53	$103,438.53	$103,883.06	13.32%
Current Debt Service	174,008.00	99.17	0.00	99.17	0.06%
Illustrative Debt Service	39,710.00 (3)	22.63	0.00	22.63	0.06%
CCD	55,682.00	31.73	7,384.51	7,416.24	13.32%
Totals	$1,049,372.00	$598.06	$110,823.05	$111,421.11	10.62%
Illustrative Increase in Circuit Breaker Credits				$4,194.59	

Illustrative Circuit Breaker Impact - $750,000 Bond Issue

	Certified Levy	Estimated Circuit Breaker Credits			% of Cert. Levy
		Over 65	1%/2%/3% (2)	Total	
General	$779,972.00	$444.53	$105,383.83	$105,828.36	13.57%
Current Debt Service	174,008.00	99.17	0.00	99.17	0.06%
Illustrative Debt Service	59,560.00 (3)	33.94	0.00	33.94	0.06%
CCD	55,682.00	31.73	7,523.39	7,555.12	13.57%
Totals	$1,069,222.00	$609.37	$112,907.21	$113,516.59	10.62%
Illustrative Increase in Circuit Breaker Credits				$6,290.07	

Illustrative Circuit Breaker Impact - $1,000,000 Bond Issue

	Certified Levy	Estimated Circuit Breaker Credits			% of Cert. Levy
		Over 65	1%/2%/3% (2)	Total	
General	$779,972.00	$444.53	$107,135.96	$107,580.49	13.79%
Current Debt Service	174,008.00	99.17	0.00	99.17	0.06%
Illustrative Debt Service	77,440.00 (3)	44.13	0.00	44.13	0.06%
CCD	55,682.00	31.73	7,648.47	7,680.20	13.79%
Totals	$1,087,102.00	$619.56	$114,784.43	$115,403.99	10.62%
Illustrative Increase in Circuit Breaker Credits				$8,177.47	

(1) Based on 2018 Circuit Breaker Credit percentage. Actual percentage loss could be higher and is dependent on many factors including: assessed valuation changes and Town and other taxing unit levy changes.

(2) Circuit Breaker Credits in the 1%/2%/3% categories are not applied to debt service levies and are allocated to other Town funds.

(3) See page 4.

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(For Internal Use Only)

REVENUE BOND ISSUE SCENARIOS

NEWBURGH (INDIANA) MUNICIPAL STORMWATER UTILITY

SCHEDULE OF BUDGET AND PRO FORMA CASH RECEIPTS AND DISBURSEMENTS
(Unaudited)

	Budget 2018	Pro-forma 2018
Operating Receipts:		
Stormwater fees (1)	$113,300	$137,800
Drainage permits	200	200
Total Operating Receipts	113,500	138,000
Operating Disbursements:		
Salaries and wages	40,000	40,000
Employee pensions and benefits	18,000	18,000
Materials and supplies	1,600	1,600
Contractual services	14,680	14,680
Total Operating Disbursements	74,280	74,280
Net Operating Receipts	39,220	63,720
Non-Operating Disbursements:		
Capital improvements (2)		5,900
Increase (decrease) in cash and cash equivalents	39,220	57,820
Beginning cash and cash equivalents	96,497	96,497
Ending Cash and Cash Equivalents	$135,717	$154,317

(1) Assumed based on billings 7/1/2017 - 6/30/2018 at current EDU rate of $7.50/unit.
The stormwater fee was adjusted from $5.00 per ERU per month to $7.50 per ERU per month.
Historical collections does not represent total collections received by Sewer Utility each year.

(2) Assumed historical average improvements Years 2015 - 2017.

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(Internal Use Only)

NEWBURGH (INDIANA) MUNICIPAL STORMWATER UTILITY

PRO FORMA ANNUAL REVENUE REQUIREMENTS
AND ANNUAL OPERATING RECEIPTS
See Explanation of References, page 9
(Amounts rounded to the nearest $100)

	Assumed Bond Issue Alternative		
	I	II	III
	($500,000)	($750,000)	($1,000,000)
Revenue Requirements:			
Operation and maintenance disbursements (1)	$81,200	$81,200	$81,200
Debt service:			
Proposed bonds (2)	39,300	58,900	78,600
Debt service reserve (3)	7,900	11,800	15,700
Replacements & improvements (4)	9,600	8,800	11,800
Total Annual Revenue Requirements	138,000	160,700	187,300
Less budgeted permit fees (1)	(200)	(200)	(200)
Net Annual Revenue Requirements	$137,800	$160,500	$187,100
Annual Receipts:			
Stormwater collections (5)	$137,800	$137,800	$137,800
Additional Receipts Required	$0	$22,700	$49,300
Approximate Across-The-Board Increase In Present Rates and Charges		16%	36%
Change in Monthly Residential Bill (Current Bill $7.50)	$0.00	$1.25	$2.70
Average Residential Monthly Bill	$7.50	$8.75	$10.20

(Continued on next page)

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(Internal Use Only)

(Cont'd)

PRO FORMA ANNUAL REVENUE REQUIREMENTS AND ANNUAL OPERATING RECEIPTS

(Explanation of References)

(1) Assumes Year 2018 approved budget information plus an allowance for an assumed 3% inflation per year for 3 years.

(2) Assumes 20-year amortizations at the par amounts on page 3 at a 4.75% average interest rate.

(3) To provide an allowance for the funding of a debt service reserve over a 5 year period.

(4) Equal to an amount equal to depreciation expense. This amount is reduced to an amount based on debt service coverage of 135%.

(5) Assumes annual collection equal to Sewer Utility monthly billings for the period 7/1/2017 - 6/30/2018.

NEWBURGH (INDIANA) MUNICIPAL STORMWATER UTILITY

COMPARATIVE SCHEDULE OF SELECTED FINANCIAL INFORMATION ARISING FROM CASH TRANSACTIONS

(Unaudited)

	As of		
Cash and Cash Equivalents:	12/31/15	12/31/2016	12/31/2017
Operating fund	$29,049	$30,197	$96,497
Total Cash and Cash Equivalents	$29,049	$30,197	$96,497

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(Internal Use Only)

NEWBURGH (INDIANA) MUNICIPAL STORMWATER UTILITY

COMPARATIVE SCHEDULE OF CASH RECEIPTS AND DISBURSEMENTS
(Unaudited)

	Calendar Year Ended		
	12/31/2015	12/31/2016	12/31/2017
Operating Receipts:			
Stormwater fees	$73,820	$69,451	$81,182
Drainage permits	750	2,390	640
Total Operating Receipts	74,570	71,841	81,822
Operating Disbursements:			
Salaries and wages	21,962	23,189	30,455
Employee pensions and benefits	11,647	14,244	12,590
Materials and supplies	2,050	507	2,687
Contractual services	20,585	27,006	10,102
Miscellaneous		5,275	
Total Operating Disbursements	56,245	70,222	55,834
Net Operating Receipts	18,326	1,620	25,988
Non-Operating Receipts:			
Miscellaneous receipts	2,987	10,907	44,109
Total Non-Operating Receipts:	2,987	10,907	44,109
Non-Operating Disbursements:			
Capital improvements	2,560	11,379	3,797
Total Non-Operating Disbursements:	2,560	11,379	3,797
Increase (decrease) in cash and cash equivalents	18,752	1,147	66,300
Beginning cash and cash equivalents	10,297	29,049	30,197
Ending Cash and Cash Equivalents	$29,049	$30,197	$96,497
Supplemental Information			
Ending cash and cash equivalents	$29,049	$30,197	$96,497

(Subject to the attached letter dated August 13, 2018)
(Preliminary - Subject to Change)
(Internal Use Only)

APPENDIX F

PUBLIC COMMENT AND ADDITIONAL PROJECT AREAS

Town of Newburgh
Storm Water Management Meeting
Minutes March 19, 2019
6:00 PM

Members Present:
JT McCarty, Dan Woolen, Scott Thomas

Administrative Present:
William F. Kavanaugh, Council Liaison; Chris Wischer, Town Attorney; Christy Powell, Town Manager; David Hynes, Town Engineer; DrewFlamion, Engineer, Tavi Wydicks, Zoning Administrator

Members/Administrative Absent:

Citizens Present:
There were thirty-two (32) residents present. The following residents spoke during the meeting:
Diane Reese, 611 Forest Park Drive
Laura Roth, 311 Phelps Drive
Barry Ransom, 205 Phelps Drive
David Garrett, 323 Sycamore Street
Becky Casey, 409 Sycamore Street
Melinda Mitchell, 101 Yorkshire Drive
Katie Perkins, 713 Forest Park Drive
Tryllis Hendren, 400 Sycamore Street
Carrie Newman, 1116 State Road 662
Khalil Jalilpour, 601 Forest Park Drive

Minutes:
Dan Woolen made a motion to approve the minutes from the last meeting.
Scott Thomas seconded the motion. Minutes were approved.

REPORTS:
Town Council Liaison:
No Report.

Town Attorney:
No Report.

Town Engineer:
No Report.

Staff:
Tavi Wydicks stated that the Financial Report for February and the Project List were in the meeting packets.

Project List Update:
No Report.

MS4 Report and Update:
1. MCM #1 Public Education and Outreach
2. MCM #2 Public Participation and Involvement
3. MCM #3 Illicit Discharge Detection and Elimination (IDDE)
4. MCM #4 Construction Site Run-Off

5. MCM #5 Post Construction Run-Off
6. MCM #6 Pollution Prevention and Good Housekeeping

No Report.

Unfinished Business:
None

New Business:
Forest Park Drainage Improvements and Master Plan Update
David Hynes started the presentation of the Master Plan, and then turned the presentation over to Drew Flamion so he could go over the details of the Plan. Mr. Flamion explained the current existing situation problems as being aging infrastructure, hydraulic capacity limitations, erosion, property damage, ponding water, and safety concerns. Mr. Flamion presented photos detailing the current existing situation problems. Mr. Flamion detailed the proposed project overview as replacing aging and failing infrastructure, increase hydraulic capacity, armor embankments/channels/outfalls, provide drainage facilities where none are located, update ordinances, and consider impacted drainage basins. Chris Wischer stated that the draft plan is a fluid document and changes can be made to the draft. Mr. Wischer stated that if a resident feels as though their property was missed, to let the Board know. Diane Reese voiced her concerns regarding the lake south of her property in C.C. Wade Subdivision. Dan Woolen stated that the lake in C.C. Wade Subdivision has been in existence since the 1940's, long before Forest Park was developed. JT McCarty asked for all comments and questions to be held until the end of the presentation. Mr. Flamion continued the presentation. Mr. Flamion stated that the total estimated cost to complete all projects listed in the Master Plan is $6,973,790.00. Mr. Flamion provided some details for the proposed Forest Park project. Mr. Flamion explained the need for prioritization, project phasing, and supplemental funding; and presented an example project timeline showing a project takes approximately 1 ½ years to complete. Mr. McCarty addressed the citizens regarding raising drainage fees to increase available funds and the Private Property Drainage Project Cost Share Program. Mr. Wischer stated that the Master Plan will not identify every drainage issue in the Town, only systemic issues, and that the Cost Share Program is intended to be used for the smaller private property issues. Bill Kavanaugh stated that there are funding options available to finance the drainage projects, and that without raising fees or taxes the Board could borrow $500,000.00 but anything more would require an increase in drainage fees or taxes.
Laura Roth, 311 Phelps Drive: Mrs. Roth stated that drainage from Driftwood Parke Subdivision is causing drainage issues on Phelps and that she is concerned that the elevated trail will increase the drainage issues. Chris Wischer stated that the trail is designed to alleviate drainage issues and Christy Powell stated that staff is working with Driftwood to address the issues.
Barry Ransom, 205 Phelps Drive: Mr. Ransom voiced his concerns with the drainage issues on Phelps Drive and Lamey Lane.
David Garrett, 323 Sycamore Street: Mr. Garrett discussed the issues with and maintenance requirements for the drainage ditch located on his property.
Mr. McCarty stated that homeowners need to maintain their ditches and keep them clean and free of debris.
Becky Casey, 409 Sycamore Street: Mrs. Casey stated that the ditch located on her property is not adequate for the amount of water that comes through. Mrs. Casey stated that any rain event causes her garage to flood and that her husband has tried multiple fixes, but nothing has helped.
Melinda Mitchell, 101 Yorkshire Drive: Ms. Mitchell stated that she has two main issues with her property. Ms. Mitchell stated that the first issue is that anytime there is heavy rain; her front yard, the ditch on the north side of her property, and the south side of her property all flood. Ms. Mitchell stated that her second issue is that when the river floods, her entire back lot floods and the flooding is causing erosion at the back of her house.
Katie Perkins, 713 Forest Park Drive: Mrs. Perkins stated that when Forest Park Drive was repaved it raised the elevation of the road causing flooding in her front yard and the bottom of her driveway.
Tryllis Hendren, 400 Sycamore Street: Mrs. Hendren stated that the issue is drainage from Law Drive and the ditch located on her property not being deep enough to carry the water off the property.

Carrie Newman, 1116 State Road 662: Mrs. Newman stated that she spoke to staff earlier in the day and she wanted to allow them time to inspect her issue. Mrs. Newman thanked the Board and Staff for taking the time to listen.
Khalil Jalilpour, 601 Forest Park Drive: Mr. Jalilpour stated that the lake to the south of his property in C.C. Wade Subdivision is causing the flooding on his property.
Chris Wischer stated that the Town cannot change the direction of the water coming off of the lake, all the Town can do is change how the water in handle, and that is what the Master Plan is for.
David Garrett, 323 Sycamore Street: Mr. Garrett stated that the drainage ditch located on his property is 13 feet wide. Mr. Garrett asked the Board to define storm water. Dan Woolen provided the definition and clarified that the Board can only control how storm water moves through.
Chris Wischer clarified that it is not the Boards responsibility to fix everyone's drainage issues, and that the Board's duty is to create and maintain a drainage system to move storm water to the river. Mr. Wischer outlined the drainage project process – identify the systemic issues, identify the corrective action, determine the funding, obtain funding, secure easements, and complete the project. Mr. Wischer stated that the funding option would be bonds backed by an increase in taxes or drainage fees.
Dan Woolen moved to approve the Forest Park Drainage Improvements and Master Plan Update draft. Scott Thomas seconded the motion and the motion carried.

Aurand Trailhead Parking Lot Drainage Plan
David Hynes stated that he went back and forth with the project's engineer a few times, and the plan is now acceptable and CEI recommends the approval of the drainage plan. Christy Powell explained the project to the Board.
JT McCarty moved to approve the Aurand Trailhead Parking Lot Drainage Plan. Scott Thomas seconded the motion and the motion carried.

Announcements:
Bill Kavanaugh stated that he drove around Town immediately after the 3/14/2019 rain event and the flooding was one of the worst he has seen.

Adjourn:
Dan Woolen made a motion to adjourn.
Scott Thomas seconded and the motion carried.

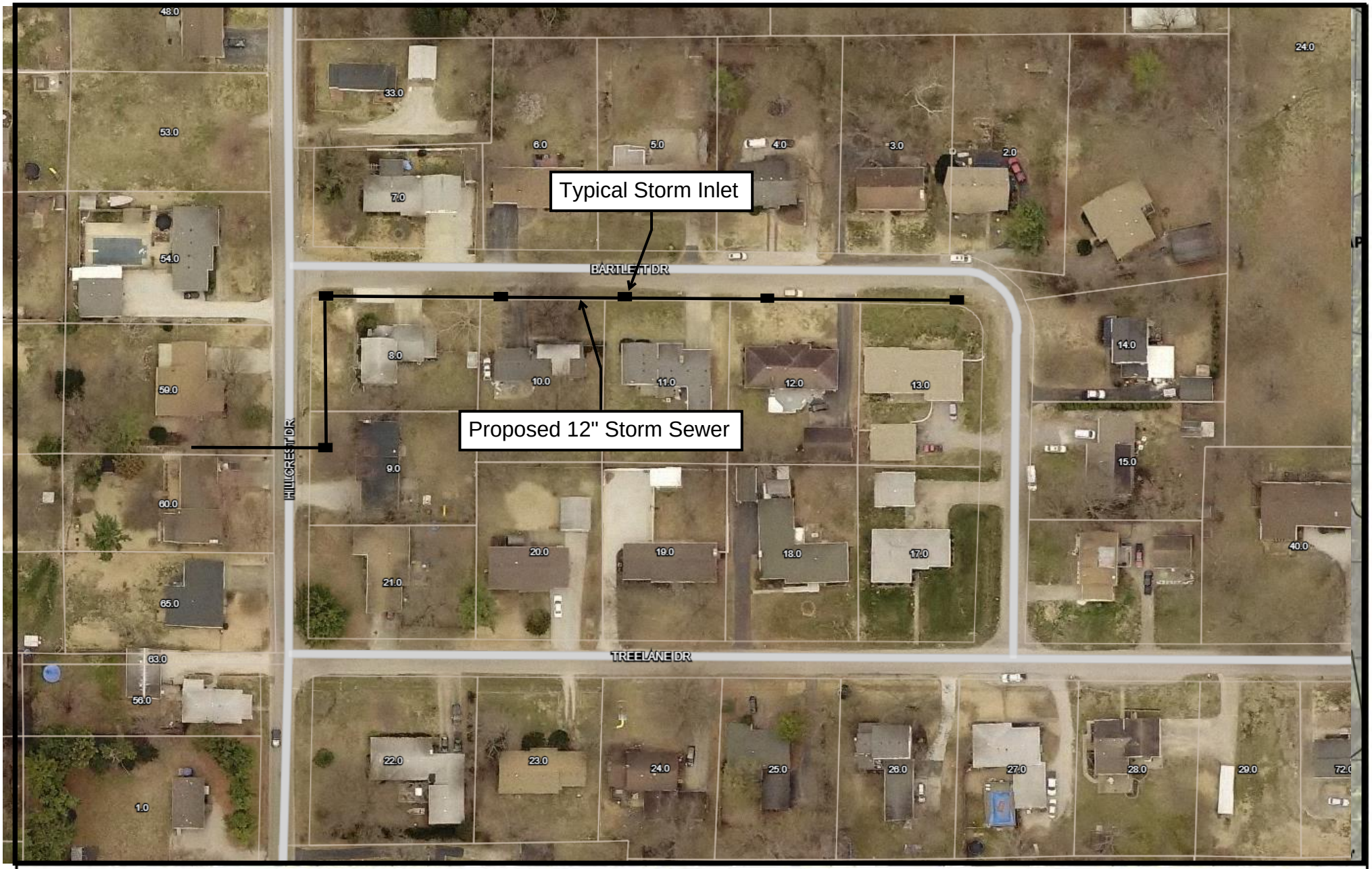
_____ _____

Chair Recorder

APPENDIX F – PUBLIC MEETING AND ADDITIONAL AREAS

ADDITIONAL AREA CONCEPTIONAL COST AND PLANS

BARTLETT DRIVE AREA



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TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

Additional Area - Bartlett Drive Area

— - 12" Storm Sewer

■ - Storm Inlet

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
ADDITIONAL PROJECT AREA - BARTLETT DRIVE AREA

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
12"Ø RCP, Depth 4'-8'	750	LF	$ 81	$ 61,000
Granular Backfill, 12" Pipe	100	LF	$ 36	$ 3,600
Manholes, Inlets, and End Sections				
12" Inlet/Junction Box	5	EA	$ 1,500	$ 7,500
12" End Section	1	EA	$ 1,100	$ 1,100
Misc.				
Private Drive Repair	1	LS	$ 6,500	$ 6,500
Asphalt Restoration	1	LS	$ 10,000	$ 10,000
Utility Relocation	3	%	$ 3,000	$ 3,000
Mobilization and Demobilization	6	%	$ 6,000	$ 6,000
Maintenance of Traffic	4	%	$ 4,000	$ 4,000
Dewatering	2	%	$ 2,000	$ 2,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 105,700**
			Contingency **15%**	$ 15,855
			Non-Construction Cost **30%**	$ 31,710
			TOTAL PROJECT COST[(1)]	**$ 153,265**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.

BUTLER PROPERTY – FOREST PARK AREA

Figure 1: Forest Park Drive Culvert looking Downstream

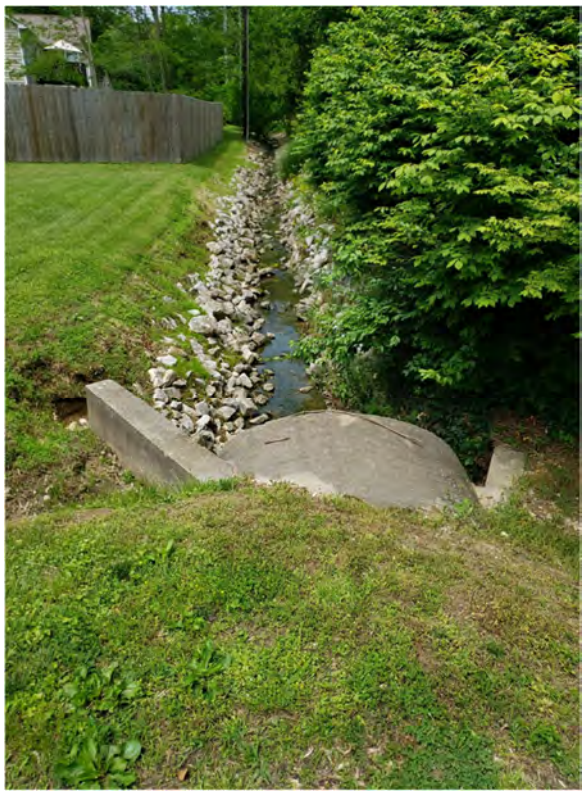

Figure 1: Forest Park Drive Culvert looking Upstream

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TOWN OF NEWBURGH
WARRICK COUNTY, INDIANA

NEWBURGH MASTER PLAN UPDATE

Additional Area - Butler Property-Forest Park Area

——— - 53"x34" Elliptical Storm Sewer

ENGINEER'S OPINION OF PROBABLE COST
TOWN OF NEWBURGH, INDIANA
FOREST PARK DRAINAGE IMPROVEMENTS & MASTER PLAN UPDATE
ADDITIONAL PROJECT AREA - BUTLER PROPERTY - FOREST PARK AREA

Item Description	Estimated Quantity	Units	Unit Price	Item Total Amount
Open-Cut Installation				
53"x34" Elliptical RCP, Depth 4'-8'	450	LF	$ 290	$ 131,000
Granular Backfill	50	LF	$ 150	$ 8,000
Manholes, Inlets, and End Sections				
53"x34" Pipe Connections	1	LS	$ 8,000	$ 8,000
Storm Inlets	6	EA	$ 1,000	$ 6,000
Misc.				
Ditch Backfill	350	LF	$ 50	$ 17,500
Remove and Replace Residential Fences	4	EA	$ 1,000	$ 4,000
Asphalt Restoration	1	LS	$ 10,000	$ 10,000
Utility Relocation	3	%	$ 6,000	$ 6,000
Mobilization and Demobilization	6	%	$ 12,000	$ 12,000
Maintenance of Traffic	3	%	$ 6,000	$ 6,000
Dewatering	2	%	$ 4,000	$ 4,000
Erosion Control	0.5	%	$ 1,000	$ 1,000
			SUB-TOTAL CONSTRUCTION COST	**$ 213,500**
			Contingency **15%**	$ 32,025
			Non-Construction Cost **30%**	$ 64,050
			TOTAL PROJECT COST[(1)]	**$ 309,575**

[1] Construction cost estimate is based on 2019 construction dollars and construction trends. For each year construction takes place after the year 2019, an inflation percentage of 5% should be added. Percentage based on Indiana Department of Transportation 2013 Design Manual Chapter 102 Project Development - Chapter 07 Environmental Procedures/Design Summary.