TOWN OF WINFIELD
STORMWATER MASTER PLAN
(June 2021 Update)

Prepared for:

Town of Winfield Town Council

By:

DLZ Indiana, LLC
900 Ridge Road. Suite L
Munster, Indiana 46321
(219) 836-5884

DLZ
Engineers • Architects • Scientists
Planners • Surveyors

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Glossary

cfs	cubic feet per second
CMP	Corrugated Metal Pipe
County	Lake County, Indiana
ERU	Equivalent Residential Unit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
HDPE	High Density Polyethylene Pipe
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
INDOT	Indiana Department of Natural Resources
LID	Low Impact Design
MS4	Municipally Separated Storm Sewer System
NRCS	Natural Resource Conservation Service (formerly SCS)
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
SCS	Soil Conservation Service (now NRCS)
Town	Town of Winfield, Indiana
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VCP	Vitrified Clay Pipe

SECTION 1
EXECUTIVE SUMMARY

Since its incorporation in 1993, the Town of Winfield (the Town) has experienced continued growth. In 2000 the population was 2,298 citizens, 4,383 citizens in 2010 and 5,987 citizens in 2019. The growth in population has continued to increase demand on the infrastructure serving the citizens of the Town, sometimes exceeding its capacity. In addition, continually increasing regulatory requirements with respect to stormwater management have been enacted impacting development within the Town.

In response to the changing demand and regulatory requirement, the Town commissioned the creation of a Stormwater Masterplan which was completed in 2009. The 2009 masterplan identified and characterized known stormwater issues; developed, identified and estimated construction costs for feasible alternatives to deal with the known flooding issues; identified current and future stormwater collection system maintenance requirements; estimate annual maintenance costs; and develop the methodology that will be used to assess stakeholders in the Town of Winfield a stormwater user fee. The activities undertaken during the development of the 2009 masterplan included public meetings and surveys to identify flooding issues, watershed / subwatershed delineation and runoff estimates, infrastructure capacity analysis.

Twelve (12) years have passed since the original masterplan and the Town has requested an update to the masterplan. This 2021 update to the masterplan includes:

- New public survey (limitations on public gatherings due to the pandemic limited any opportunity for a large public meeting);
- Updated watershed delineation using 2013 elevation data;
- Updated runoff estimates;
- Updated GIS data (including 2018 aerials, new subdivisions, etc.)
- Review of previous masterplan projects, noting completed and updates on pending actions;
- Updated planning cost estimates;
- Updated ERUs;
- Updated preventive actions, and;
- MS4 regulatory discussion.

The update found many of the original projects identified in the 2009 masterplan have been implemented or are in the process of being implemented. The results of the survey indicate the current ordinance and design manual (updated and implemented in 2015) have been successful in reducing the causes of flooding through stronger requirements during design and review with better enforcement. Most of the new flooding problems identified during this update were "local" (rear-yard, etc.) located in older developments or subdivisions under construction.

The Town is an MS4 community and could become a ***regulated*** small MS4 community. The primary criteria is a population density of 10,000 people or 1,000 people / sq mi or by *being physically connected to an urbanized area and having the potential to contribute substantial pollutants*. Currently, the Town is shown on the mapped Chicago urbanized area and the northern part of the Town is included with Lakes of the Four Seasons / Crown Point urbanized area (UA) (2010 Census Map). With a population of 6,000 and an area of approximately 12 square miles, the Town does not meet the overall population requirements. The population will need to reach 12,000 to meet the density threshold but will meet the 10,000 overall population threshold first.

Being located in an urbanized area and bordered by two regulated MS4s (Crown Point and Lakes of the Four Seasons) and having a growing population increases the probability the Town will become a regulated MS4 in the future. If the Town minimizes the potential to contribute pollutants to the urbanized area, they may continue not to be regulated until population thresholds are exceeded. Minimizing the potential to contribute pollutants can be achieved by implementing the requirements of an MS4 program including education, inspection, maintenance and implementing water quality practices.

Since most major capital projects identified in 2009 have been or are being addressed and no new major flooding issues have been identified, the Town should consider addressing maintenance of storm infrastructure. Storm infrastructure not only includes constructed infrastructure (e.g. inlets, pipes and detention ponds), but the swales, ditches and streams that convey runoff from the Town. Maintaining the ditches and drains may minimize the potential for discharging pollutants to the urbanized areas as well as prevent flooding.

The Town GIS data includes the following mapped infrastructure (from 4 subdivisions):

Table 1.0-1 Mapped Infrastructure Summary	
Item	**Units**
Structures	486 (EA)
Pipes	57,468 (LF)
Culverts	2,264 (LF)
Ponds	64 (Approx, EA)

There are 10 current subdivisions that do not have the infrastructure mapped in GIS and additional subdivisions in the permit stage. Assuming the four mapped subdivisions are representative, there are estimated 1,060 additional structures and 81,500 ft of additional storm sewer in the unmapped infrastructure subdivisions.

In addition to the above infrastructure to be maintained, the Town includes approximately 104,500 linear feet of primary and secondary streams to be maintained. These drains exclude the County legal drains.

Section 2 of this Plan provides a review of the data collection process that was used to prepare the contents of this Plan. Section 3 provides a narrative to describe the makeup of the Town's stormwater management system. Section 4 summarizes all of the stormwater issues identified in the Town and further classifies them as either public or non-public issues. Section 5 summarizes the hydrologic methods used in the development of this plan and critical hydrologic factors for each public problem area. Section 6 provides summary and description of the alternatives that were reviewed to mitigate each public flooding issues identified in Section 4. In this section, opinions of probable budgetary costs from the 2009 masterplan were developed and summarized. In Table 1.0-2 below, the remaining projects are summarized with opinions of probable cost adjusted for inflation (3% per year). Two budgetary cost columns are provided since some problem areas had more than one alternative. The column furthest to the right includes the cost of the most expensive alternative for each particular area. The most expensive alternative will not necessarily be the alternative selected by the Town.

TABLE 1.0-2

SUMMARY OF OPINIONS OF PROBABLE BUDGETARY COSTS FOR CAPITAL IMPROVEMENTS REMAINING FROM 2009

Area ID (2009)	Area Description	Alternative	Alternative Name	Individual Alternative Opinion of Probable Budgetary Cost	Opinion of Probable Budgetary Cost (Includes Larger Cost of Alternatives)
2	Flooding of Hidden Creek and Trees Subdivision	Current Proposal	Culvert Replacements - 101st Avenue and Clay Street, New Pond Outfall	$500,000	$500,000
6	Grand Boulevard Flooding 1,600' North of 109th Avenue	6b	Upstream Detention	$4,000	$4,000
8	109th Avenue Flooding by Deer Creek	8a	Replace Existing Culvert	$0	$0
10	Washout of Culverts Along Access Drive to Town Garage and WWTP	10a	Replace Existing Culverts	$101,000	$101,000
11	Standing Water at 104th Place in DBL West Phase 1	11a	Construct New Inlet and Storm Sewer	$52,000	$52,000
14	Flooding on County Line Road	14a	Replace Culvert	$139,000	$139,000
16	117th Avenue between Benton Street and Graper Ditch	16a	Regrade Roadway Ditch	$185,000	$185,000
18	Gibson Street Flooding South of 117th Avenue	18a	Replace Culvert and Ditch Regrading	$128,000	$128,000
20	125th Avenue Roadside Drainage	20a	Reconstruct Roadside Ditch and Replace Culverts	$326,000	$326,000
21	Flooding on Winfield Tributary #2 to Stony Run	21	Reconstruct Waterway and Provide Farm Access	$242,000	$242,000
22*	Downtown Master Improvement Plan – Randolph / 109th Area	22	Roadside Ditch Enclosure for Pedestrian Safety	$319,000	$319,000
				Total All Capital Projects	**$887,000.00**

Notes

1) Unit prices are based on Year 2021 dollars.
2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.
3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.
* Item Added in 2021

Section 7 provides a discussion on the operation and maintenance of the Town's stormwater management program. Table 1.0-3 summarizes anticipated costs associated

with the operation and maintenance of the Town's stormwater management facility on an annual basis.

Table 1.0-3
Summary of Annual Maintenance Costs

Maintenance Item	**Annual Maintenance Cost (Year 2021 Dollars)**
Maintenance of Waterways	$102,700
Maintenance of Culverts	$17,000
Culvert Replacement Program	$30,000
Maintenance of Catch Basins	$61,800
Maintenance of Storm Sewers	$55,600
Pond Maintenance	$10,000
Sinkhole Repair Program	$28,000
Maintenance of the Town's GIS	$21,000
Equipment Needs (To Be Determined by the Town)	$0
Staffing Needs (To Be Determined by the Town)	$0
Total	**$326,100.00***

* Excludes staffing and equipment needs.

Section 8 provides a discussion on the future direction of stormwater management in the Town of Winfield and offers some suggestions in order to keep the Town's stormwater management ordinances and other practices current with the continuously changing regulations.

Section 9 provides a discussion on the Stormwater Utility aspect of stormwater management. It outlines a methodology to establish a stormwater user fee. Based on the methodology described in the Section, approximately 3,116 billing units (residential ERUs, commercial ERUs, agricultural parcels) exist in the Town. This value may be revised upon further debate and discussion with the Town Council and the Town's constituents. However, it could serve as a starting point in any financial analysis undertaken by the Town including revisions to capital needs and user fees.

Section 10 provides a discussion of the implementation of the program including initial starting points for the priority of the various capital and maintenance projects, regulatory and permitting aspects, coordination with other projects and potential roles of the street department with respect to the projects.

Finally, as noted in the original 2009 SWMP, the attached updated plan should continue to be considered a dynamic document and it should be revised from time to time as conditions warrant. Changes in population, regulatory changes and budgetary changes should be monitored and appropriate review of this document should be considered. This document should also be considered a planning tool and should be consulted prior to undertaking any project within the Town whether it is a developer initiative or a Town initiative.

SECTION 2
DATA COLLECTION

A significant amount of data related to stormwater management in the Town of Winfield was collected in 2009 and organized with the intent to provide a useful planning tool for future development projects, future capital improvement projects and future maintenance projects.

In order to update the original data collection and organization, the Town acquired Lake County's the 2020 parcel data, street centerline data and stream centerline data from the Lake County Surveyor's Office. The data is in the ArcMap format and serves as the basis for the updating the Town-wide Geographic Information System (GIS). 2018 Digital orthophotos with a 6-inch resolution for the Town were also obtained. Floodplain mapping information from the Federal Emergency Management Agency (FEMA) and soils information from the Natural Resources Conservation Service (NRCS) were checked and updated as necessary into the Town GIS databases.

Contour data from 2013 was generated to update the 1998 Lake County contour data. Other data obtained by the Town may also be included into the GIS database in the future (e.g. sanitary sewer information, roadway maintenance activities, tracking and logging of complaints and actions performed, etc.). It is recommended as each new development is added in the Town, a CAD export of all infrastructure be required to be submitted to the Town in a standardized format and added to the GIS database.

For planning and maintenance purposes, it was determined to be important for the Town to have an accurate storm sewer database and map. DLZ reviewed its files, the Town's files and the County's files in an effort to collect and consolidate copies of available recorded plats, as-built drawings and construction drawings for the Meadows, Country Meadow Estates, Hidden Creek, Trees and Doubletree Lake Estates West. Storm sewer data for Prairie Crossings, Deer Creek Phase I, Wynbrook Phase I, and Stonegate Phase I, were **not** input into the Town's GIS at this time as the data has not been provided by the developers. Future work tasks should provide for an allowance to input this data as it becomes available and / or collection of field data where needed.

Subdivisions added:

- Providence at Stonegate

- Stonegate
- Wyndance
- Stonegate Commons

Although the subdivision was completed in recent times (1990s), no records could be found for the Meadows Subdivision. Multiple attempts were made to obtain the drawings from the original engineer / developer for the subdivision. Future work tasks should continue to include field verification of the storm sewer system in the Meadows Subdivision.

Electronic as-built information was obtained in 2009 for the Country Meadows Estates Subdivision; however, the coordinate system was arbitrary. DLZ performed field survey to "best fit" the electronic as-built survey for Country Meadows Estates into the Town's ArcMap GIS.

Paper copy as-builts of Hidden Creek were obtained since 2009. Rim elevations were shot in the field by DLZ surveyors. Inverts have not verified except in critical locations required for the analysis of the flooding problems in Hidden Creek Subdivision. This information was input into the Town's ArcMap GIS.

A significant number of sinkholes in the subdivision warranted extensive field work in the Trees Subdivision were noted in 2009. Design drawings of the storm sewer system were obtained from the subdivision's original engineer. Many of these drawings were not as-built drawings. After exhaustive field investigations, it was determined that these drawings may not have been followed closely during construction. Many manholes are either buried or non-existent. Those storm structures that were found were surveyed in the field. Rim elevation, invert elevation, pipe diameter and pipe material were determined and input into the Town's ArcMap GIS.

Electronic as-built information was obtained for Doubletree Lake Estates West. This data was "best fit" into the Town's ArcMap GIS. Data for Doubletree Lake Estates East has been limited since that subdivision has been privately owned and operated. However, the Town has been undertaking remedial work on the infrastructure with this limited information and updating the Town records.

There are many culverts located in the Town that are not within platted subdivisions. The data collection and organization phase of this Plan included locating of these facilities, identifying their diameters, materials, condition and invert elevations. This information was also included in the Town's GIS map. However, this information may be incomplete in some areas of the Town and the additional information should be added as the opportunity presents itself from maintenance, complaints, developments or other activities occur.

Based on the 2013 one-foot contour data generated from the 2013 LiDAR Data, DLZ checked and revised the delineated watershed boundaries within the Town of Winfield. Boundaries were delineated based on major ditch systems and identified problem areas. The watersheds were included in the Town's GIS database.

Section 4 of this report summarizes data collection including stormwater questionnaires and other public input.

SECTION 3
EXISTING CONDITIONS

As noted in the 2009 Master Plan, the Town of Winfield is uniquely situated along a geographical ridge line that separates the Lake Michigan Watershed from the Kankakee River Watershed, both of which are considered major watersheds for the purposes of this report. This ridge line is also unofficially known as the north / south "continental" divide. The two primary watersheds can be subdivided within the Town of Winfield into nine (9) secondary watersheds based on primary drains: Deer Creek; Hidden Creek; Niles Ditch North and South; Tributary to Deep River East 1, East 2 and West; Graper Ditch; and Stony Run. Each of these secondary watersheds represents a discharge point at the Town corporate limits. The Deer Creek, Hidden Creek, Niles Ditch, Graper Ditch and Tributary to Deep River Watersheds ultimately drain to Lake Michigan while Stony Run Watershed drains to the Kankakee River Watershed. Note that Graper Ditch drains to the Niles Ditch. **Appendix III-A** depicts the boundaries of each watershed and the following subsections provide a brief description of the characteristics of each sub-watershed. Specific items of flooding concern are discussed in Section 6.

Within the secondary watersheds are numerous tributaries to some of the primary drains. These tributary conveyances include open ditches, swales, field tiles and storm sewer systems in developed areas. Some of these tributary conveyances may be natural or man-made and originally constructed for agricultural or private drainage. While they serve a large common area / multiple parcels ("common drain"), they may not meet current design standards. The reader should note drain tiles and in particular agricultural tiles are designed to lower groundwater levels over a period of 24 or more hours and will not convey short duration design storm events (e.g. the 10% Annual Exceedance Probability or "10-yr" storm event).

Some of these conveyances serve developing land and while these new developments are providing detention as required by current standards, their allowable release rate may exceed the capacity of existing conveyances or tiles. The current stormwater ordinance requires developers to perform a drain tile survey to identify existing drain tile. The Town prohibits connection of detention ponds to drain tiles and requires existing tile upstream of the site to be perpetuated in order to safeguard up- and downstream properties and structures.

Some common drains were identified from Lake County GIS Hydrology data. For this report, the common drains were hydrologic waterway lines within the Town boundary that are not County legal drains. **Appendix III-B** for a map of the common drains.

3.1 HIDDEN CREEK WATERSHED

The Hidden Creek watershed is of special concern. While a small watershed in comparison to the others that discharge from the Town, it experiences flooding that impacts both structures and creates a safety concern. In particular, the Hidden Creek Subdivision has experienced flooding and is discussed in detail in Section 6.2. The overall Hidden Creek watershed was farmland in the past but has become largely developed with subdivisions.

Hidden Creek flows through the northwest portion of the Town of Winfield. Its main channel begins north of 109th Avenue in the Trees Subdivision. A series of wet pools are located in-line of the Creek. It runs northward through the Trees Subdivision and into Hidden Creek Subdivision. Hidden Creek exits the Town of Winfield at 101st Street approximately 200 feet west of Clay Street. Hidden Creek continues to flow northward and eastward to a point where it confluences with Deer Creek. This point is located approximately 1,300 feet east of Clay Street and 1,300 feet north of 101st Avenue. Deer Creek then flows north to Deep River. Deep River continues northward to the Burns Ditch in Lake Station. The Burns Ditch discharges into Lake Michigan in Portage, Indiana.

Land Use

The Hidden Creek Watershed is almost entirely comprised of the Hidden Creek Subdivision, Trees Subdivision and Wyndance Subdivision. These subdivisions are generally zoned residential. Hidden Creek and Trees Subdivisions include lots having parcels greater than one-acre in size to accommodate septic systems. The Wyndance Subdivision parcels are smaller than one-acre and are serviced by sanitary sewer and include multi-family developmental units. The locations of these subdivisions are provided in **Appendix III C**. With the exception of the areas north of 101st Avenue, no other municipality or un-incorporated area drains into Hidden Creek.

Soils

Soils in the Hidden Creek Watershed are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a layer that impedes downward movement of water. These soils are generally characterized

by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas
Wetlands (reportedly wetlands created for mitigation requirements) exist in the watershed south of 109th Avenue in the parcel immediately west of the Wyndance Subdivision.

Mapped Floodplains
There are no mapped floodplains in the Hidden Creek watershed within the Town of Winfield.

Legal Drains
There are no legal drains in the Hidden Creek watershed within the Town of Winfield.

County Maintained Bridges
There are no known County maintained bridges in the Hidden Creek watershed within the Town of Winfield.

Other Stormwater Infrastructure
Hidden Creek, Trees and Wyndance Subdvisions all have storm sewer collection systems that serve the roadways for the purposes of drainage. Each subdivision also contains one or more detention basins for the purposes of attenuating stormwater peak flows. Several of these detention basins are in-line within Hidden Creek. Roadway culverts exist along Grand Boulevard and 109th Avenue for the purposes of conveying flow through the many tributaries of Deer Creek to Deer Creek main channel.

Agricultural or Other Field Tiles
It is suspected that numerous field tiles exist in the area as the area was predominantly agricultural before its development.

Appendix III-D shows potential locations of possible buried field tiles. The locations are based on the 2018 aerials and should not be considered complete. The map does not show tile in the Hidden Creek watershed, but existing agricultural land may still include drain tiles.

Common Drains

No common drains are shown for this watershed.

3.2 DEER CREEK WATERSHED

Deer Creek flows through the north central portion of the Town of Winfield. Its main channel begins south of 109th Avenue and is fed by several tributaries. It runs northward beneath the intersection of Grand Boulevard and 109th Avenue and into the Town of Merrillville east of Clay Street. Deer Creek drains into Deep River approximately 2,000 feet north of 97thAvenue and 1,000 feet east of Clay Street. Deep River continues northward to the Burns Ditch in Lake Station. The Burns Ditch discharges into Lake Michigan in Portage, Indiana.

Land Use

The Deer Creek Watershed contains portions of residential subdivisions, Trees, Country Meadow Estates, Deer Creek, Meadows, Stonegate Commons, Wynbrook, Latitude and Prairie Crossings as well as part of the Lakes of the Four Seasons. A significant portion of Winfield's commercial development corridor along 109th Avenue and Randolph Street is also contained within this watershed. A portion of the northwest corner of the Lakes of the Four Seasons and unincorporated Lake County also drains to Deer Creek. The locations of these subdivisions are provided in **Appendix III-A**.

Soils

Soils in the Deer Creek Watershed are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a layer that impedes downward movement of water. These soils are generally characterized by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas

Various wetlands and depressional areas exist adjacent to the Creek within the Town of Winfield as well as the Town of Merrillville. The wetlands and depressional areas include both forested and non-forested areas.

Mapped Floodplains

Deer Creek is a mapped floodplain from the Town limits to the north to a point south of 109th Avenue located in the Deer Creek Subdivision. The approximate location of the floodplain is shown in **Appendix III-A**.

Legal Drains

There are no legal drains within the Deer Creek Watershed within the Town of Winfield.

Common Drains

The Deer Creek watershed has one of the highest densities with respect to common drains (see **Appendix III-B**). Deer Creek includes many tributary drains within its boundaries. Some are small and have been incorporated into subdivision developments. Others lie within undeveloped agricultural areas and may include outlets from field tiles.

County Maintained Bridges

A County owned and maintained bridge is located approximately 2,500 feet north of 109th Avenue on Grand Boulevard to convey flows in Winfield Tributary #1 to Deer Creek. This bridge was replaced in 2004.

Other Stormwater Infrastructure

Trees, Country Meadow Estates, Deer Creek, Meadows, Stonegate Commons, Wynbrook, Latitude and Prairie Crossings Subdivisions all have storm sewer collection systems that serve the roadways for the purposes of drainage. Each subdivision also contains one or more detention basins for the purposes of attenuating stormwater peak flows. Roadway culverts exist along Grand Boulevard and 109th Avenue for the purposes of conveying flow through the many tributaries of Deer Creek.

Agricultural or Other Field Tiles

It is suspected that numerous field tiles exist in the area as the area was predominantly agricultural before its development.

3.3 TRIBUTARY TO DEEP RIVER WATERSHEDS

There are three (3) tributary watersheds to Deep River watersheds within the Town boundaries. Watersheds Deep River E1 and E2 are located in the northeast portion of the

Town (see **Appendix III-A**) and Deep River W watershed is located in the northwest corner of the Town. Deep River E1 and E2 join north of the Town boundary and flow to Deep River. Deep River W exits the Town to a different tributary to Deep River relative to Deep River E1 / E2.

Deep River E1 is the largest of the watersheds and its main channel begins east of County Line Road in Porter County. It flows through the man-made lake in Doubletree Lake Estates East and crosses Randolph Street. It runs parallel to Randolph Street along the east edge of Doubletree Lake Estates West until it reaches the northern Town limits. The tributary flows northwesterly toward the intersection of 97th and Grand Boulevard, jogs back due east for a little more than a half mile before it heads back northward where it joins Deep River approximately 2,000 feet north of 93rd Avenue and 1,500 feet east of Grand Boulevard. Deep River continues northward to the Burns Ditch in Lake Station. The Burns Ditch discharges into Lake Michigan in Portage, Indiana.

Deep River E2 is a small area that includes Doubletree Lakes Estates West. Runoff flows north from Doubletree West into a lake that outfalls into a waterway that exits the Town. There is an additional small area of agricultural field that sheet flows to a swale that exits at the Town border before joining with the pond runoff. This combined flow then joins the main tributary to Deep River approximately 360 feet north of the Town border.

Deep River W is another small watershed containing mostly agricultural land, wetlands and some large residential parcels. Runoff collects in field swales before exiting the watershed under Colorado Street to a tributary of Deep River.

Land Use

The Tributary to Deep River Watershed contains portions of residential subdivisions Doubletree Lake Estates East and Doubletree Lake Estates West. A portion of the commercial corridor along 109th Avenue east of Randolph Street drains to this tributary as well as the northern section of the Lakes of the Four Seasons and parts of unincorporated Porter County. Porter County's Falling Waters Development drains through this tributary and is located upstream of the Doubletree Lake Estates East lake.

Soils

Soils in the Tributary to Deep River Watershed are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a

layer that impedes downward movement of water. These soils are generally characterized by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas

Various suspected wetlands and depressional areas exist within the watershed south of the Doubletree Lake Estates East subdivision. The wetlands and depressional areas include both forested and non-forested areas.

Mapped Floodplains

There are no mapped floodplains in this watershed within the Town of Winfield.

Legal Drains

There are no legal drains within this watershed within the Town of Winfield.

Common Drains

There are multiple common drains serving the Deep River E1 area (see **Appendix III-B**). These drains are located primarily south of Doubletree Estates and also serve areas of Lakes of the Four Seasons. No common drains are show in Deep River E2 or W.

County Maintained Bridges

There are no known County maintained bridges in this watershed.

Other Stormwater Infrastructure

The Doubletree Lake Estates East and West Subdivisions all have storm sewer collection systems that serve the roadways for the purposes of drainage. Each subdivision also contains one or more detention basins for the purposes of attenuating stormwater peak flows. A large lake is located in Doubletree Lake Estates East. Its outlet is controlled by a dam and an outfall structure. Roadway culverts exist along Randolph Street, 109th Avenue and County Line Road for the purposes of conveying flow throughout the watershed.

Agricultural or Other Field Tiles

It is suspected that numerous field tiles exist in the area as the Deep River E1 and E2 watershed areas were predominantly agricultural before development. The Deep River W watershed is still largely agricultural and presence of wetlands increases the probability of field tiles.

3.4 NILES DITCH WATERSHED

The Niles Ditch flows through the southwest and western portions of the Town of Winfield. Its main channel flows northward and clips the southwest corner of Winfield before exiting into un-incorporated areas of Lake County. It continues northward where it meanders into the Town at a couple locations near 113th Avenue, 109th Avenue and Colorado Street. Just north of 109th Avenue, Niles Ditch turns eastward and northward for a distance approximately one mile where it discharges into Deep River. This discharge point is approximately 1,300 feet south of 101st Avenue and 4,500 feet west of Colorado Street. Deep River continues northward to the Burns Ditch in Lake Station. The Burns Ditch discharges into Lake Michigan in Portage, Indiana.

Appendix III-A depicts two watersheds that are identified as the Niles Ditch Watershed. One area is located in the southwest corner of the Town and the other area is located in the northwest corner of the Town. Graper Ditch, while described further in the following sections, is also part of the Niles Ditch Watershed. However, for the purposes of this report, it was separated into its own watershed.

Land Use

The Niles Ditch Watersheds are predominantly agricultural. There are no subdivisions of substantial concern in this watershed and it is considered largely undeveloped at this time. However, at the time of this update, the Crown Point School District is designing a new middle school at the southwest corner of Gibson Street and 121st Avenue.

Soils

Soils in the Niles Ditch Watersheds are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a layer that impedes downward movement of water. These soils are generally characterized by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas

Various suspected wetlands and depressional areas exist within the Niles Ditch Watershed. The wetlands and depressional areas include both forested and non-forested areas.

Mapped Floodplains

Mapped floodplain extends along the entire distance of Niles Ditch and many of its tributaries in the Town of Winfield. The Niles Ditch floodplain covers significant portions of the Niles Ditch watershed as shown in **Appendix III-A**.

Legal Drains

Niles Ditch is a County legal drain within the Town limits of Winfield. The limits of the legal drain are shown in **Appendix III-A**.

Common Drains

There are multiple common drains serving the Niles Ditch watershed. The majority of the drains appear to have been constructed as agricultural open ditches (see **Appendix III-B**).

County Maintained Bridges

Lake County maintains the bridge over Niles Ditch on 109th Avenue. The location of this bridge is approximately 600 feet east of Colorado Street. The bridge was replaced in Year 2008.

Other Stormwater Infrastructure

Roadway culverts exist along 109th Avenue and Arizona Street within this watershed. They generally serve the purpose of conveying overland flow from one portion of the watershed to the other.

Agricultural or Other Field Tiles

It is suspected that numerous field tiles exist in the area as the area is predominantly agricultural and is served by multiple open ditches.

3.5 GRAPER DITCH WATERSHED

The Graper Ditch Watershed is part of the Niles Ditch Watershed. However, for the purposes of this study, it was separated from the Niles Ditch Watershed as a portion of the Graper Ditch is a County regulated legal drain. The Graper Ditch drains the central and west central sections of the Town and flows from east to west. It begins as a field tile in the vicinity of 117th Avenue and Gibson Street. Immediately east of State Street it becomes and open channel and ultimately joins with Niles Ditch near 113th Avenue at the western Town limits. See Appendix A for its location.

Land Use

The Graper Ditch Watershed is predominantly agricultural. There are no subdivisions of substantial concern in this watershed except for a portion of Prairie Crossing and a portion of Wyndance. However, the majority of the watershed can be considered undeveloped agricultural and forested at this time. However, at the time of this update, a developer has initiated the approval process for a 500+ lot subdivision on 200+ acres between 117th Avenue and 109th Avenue. A portion of this development will include watershed area tributary to Graper regulated drain.

Soils

Soils in the Graper Ditch Watershed are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a layer that impedes downward movement of water. These soils are generally characterized by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas

Various depressional areas exist within the Niles Ditch Watershed. There are some suspected wetlands in the watershed.

Mapped Floodplains

Graper Ditch does not have a mapped floodplain.

Legal Drains

Graper Ditch is a legal drain from the Town limits of Winfield to a point east of State Street and south of the Wyndance Subdivision. The approximate limits of the legal drain are shown in **Appendix III-A**.

Common Drains

There are no common drains other than Graper Ditch (see **Appendix III-B**).

County Maintained Bridges

There are no known County maintained bridges in this watershed.

Other Stormwater Infrastructure

Roadway culverts exist along State Street and 117th Avenue for the purpose of conveying flows in Graper Ditch.

Agricultural or Other Field Tiles
It is suspected that numerous field tiles exist in the area as the area is predominantly agricultural.

3.6 STONY RUN DITCH WATERSHED

Stony Run drains a small portion of the Town of Winfield. The main branch of Stony Run drains Lake Holiday and Big Bass Lake of the Lakes of the Four Seasons and Stony Run Subdivision. Flow is toward the south. Two tributaries also flow southward as shown on **Appendix III-A**.

Land Use
The Stony Run Watershed and Winfield Tributary #2 to Stony Run are predominantly residential in nature. Winfield Tributary #1 to Stony Run is predominantly agricultural in nature. The Stony Run Subdivision, Stonegate Subdivision and Lakes of the Four Seasons drain into either Stony Run or Winfield Tributary #2 to Stony Run.

Soils
Soils in the Stony Run Watershed are predominantly Hydrologic Soil Group C, categorized by slow infiltration rates when thoroughly wetted and consist of soils with a layer that impedes downward movement of water. These soils are generally characterized by high clay and silt content and result in greater stormwater runoff amounts than more sandy soils.

Wetlands and Depression Areas
Few depressional areas exist within the Stony Run Watershed. There are some suspected wetlands in the watershed.

Mapped Floodplains
The Main Branch of Stony Run has a mapped floodplain from its outlet from Lake Holiday to 129th Avenue in the Town of Winfield.

Legal Drains

Stony Run is a legal drain within the Town limits. The limits of the legal drain are shown in **Appendix III-A** .

Common Drains

There are approximately three (3) common drains including Stony Run Tributary #1 and #2 which are not County legal drains.

County Maintained Bridges

The County maintains the bridge over Stony Run that is located approximately 1,400 feet east of Randolph Street. The County maintains several culverts along Randolph Street north of 125th Avenue.

Other Stormwater Infrastructure

Stonegate Subdivision has a storm sewer system and detention basin system for the purposes of serving its subdivision drainage. Roadway culverts exist along 129th Avenue for the purpose of conveying flows in Graper Ditch.

Agricultural or Other Field Tiles

It is suspected that numerous field tiles exist in the area as the area is and was predominantly agricultural before its development.

SECTION 4
STORMWATER ISSUES WITHIN THE TOWN

The 2009 SWMP identified 25 areas of concern with respect to stormwater issues. Section 4.1 discusses of the current status of those projects. New Areas of stormwater concern (after 2009) within the Town were identified through stormwater questionnaires, interviews with Town representatives and knowledge of the Town by DLZ. Due to the COVID 19 pandemic, no public meetings were conducted for citizens to provide their concerns in person. A survey was sent out with utility bills and by email for individuals to complete and return. The information was converted into digital format and included in the Town's GIS. The results of the questionnaires are discussed later in this section.

The stormwater questionnaire requested detailed information pertaining to known and historical stormwater problems including location, frequency and perceived remedies to the problems. These questionnaires were reviewed in an effort to identify all stormwater problems in the Town of Winfield. This information was also converted into digital format and included in the Town's GIS. Approximately 283 questionnaires were returned to the Town by its residents and included in the process. Follow up site visits and / or telephone phone calls will be made for all questionnaires returned that indicated a stormwater flooding problem as conditions permit.

4.1 2009 SWMP Areas of Concern

The following table provides a summary of the areas of concern identified in the 2009 masterplan and the current status. **Appendix IV A** provides copies of the original description of the concerns for each area.

TABLE 4.1-1 – Areas of Concern Identified in 2009

Item	*Description of Concern*	*Status*
1	Add sanitary sewer information, roadway maintenance activities, tracking and logging of complaints and actions performed since 2009 added to GIS	On-going
2	Add Prairie Crossings, Deer Creek Phase I, Wyndance Phase I, Wynbrook Phase I, Stonegate Commons, Stonegate Phase I to GIS	Parcel Data entered with this update
3	Field verification of Meadows Subdivision	Pending

TABLE 4.1-1 – Areas of Concern Identified in 2009		
Item	***Description of Concern***	***Status***
	info in GIS	
4	Verify inverts based on Rim Elevation in Hidden Creek shot by DLZ	As Needed
5	Input Data for Doubletree Lake estates East into GIS	Parcel Data entered with this update
6	Follow-up with property owners to any surveys / questionaires	On-going
7	Area #1 - 109th and Arizona	Completed 2012
8	Area #4 - 101st west of Arizona	Completed
9	Area #5 - Failing Storm Sewer North of East 107th Place	On-Going – Additional failures reported since 2009. Remediating as resources become available
10	Area #7 - Grand Boulevard Flooding Immediately North of 109th Avenue	Project Pending
11	Area #3 - Flooding of Clay Street (North of 101st Avenue)	Project Pending
12	Area #2 - Flooding of Hidden Creek and Trees Subdivision	Project Pending
13	Area #6 – Grand Boulevard Flooding 1,600' North of 109th Avenue	Performed field inspection. Flooding not verified. Continuing to monitor.
14	Area #9 - 109th Avenue Flooding 150' East of Deer Creek Drive	Performed field inspection. Flooding not verified. Continuing to monitor.
15	Area #10 - Culverts along Access Drive the Town Garage and WWTP	Culverts remediated.
16	Area #11 - Standing Water at 104th Place in DBL West Phase I	Verification pending. Continuing to monitor.
17	Area #12 - Standing Water at Intersection of Ontario Drive and Randolph Street	This section of Randolph was rehabilitated and drainage improved. Continuing to monitor.
18	Area #13 - Keystone Lane Rear Yard Sinkhole	Remediated 2020
19	Area #14 - County Line Road	Roadway rebuilt in 2019 with ditch cleaning. Continuing to monitor.
20	Area #15 - State Street Culvert on Graper	Culvert upgraded and County

TABLE 4.1-1 – Areas of Concern Identified in 2009		
Item	***Description of Concern***	***Status***
	Ditch	has pending ditch rehabilitation project downstream.
21	Area #16 - 117th Avenue between Benton Street and Graper Ditch	Project completed by Town on 117th to improve ditches, pipes etc. Continuing to monitor.
22	Area #17 - 117th Avenue Flooding East of Decatur Street	Town replaced and upsized the roadway culvert but the private field tile remains an issue
23	Area #18 - Gibson Street Flooding South of 117th Avenue	Structural repaving performed in 2021. Continuing to monitor,
24	Area #19 - 117th Avenue East of Christianland Village	Rebuilt road and shoulders in 2019.
25	Area #20: 125th Avenue Roadside Drainage	Identified undersized culvert in the middle of the ditch run to be replaced / upgraded as well as the pipe under the road to alleviate issues.

4.2 QUESTIONAIRE RESULTS

Based on a review of the questionnaires, site visits and interviews with Town officials, stormwater concerns were classified and defined as one of the following categories:

Non-Public Stormwater Issue: Flooding, ponding or other stormwater hazards related to lot grading, groundwater, landscaping and / or sump pump discharges that do not impact or serve facilities owned and / or maintained by the Town of Winfield.

Public Stormwater Issue: Flooding, ponding or other stormwater hazards that impact facilities owned and / or maintained by the Town of Winfield.

Appendix IV-B identifies the location of the above referenced issues identified by the 2021 surveys.

Table 4.2 -1 Overall Survey Returns

Total Surveys Sent	Surveys Returned	% Returned
2,368	283	12.0

The Table above shows a return rate of 12%.

Table 4.2 -2 Flooding Types

Response	# Reported	% Reported
No Response, Blank, No, N/A, None	165	58.3%
Basement	2	0.7%
Basement & Other	1	0.4%
Front Street	1	0.4%
Front Yard	1	0.4%
Rear Yard	47	16.6%
Rear Yard & Basement	2	0.7%
Side Yard	9	3.2%
Side Yard & Front Yard	1	0.4%
Side Yard & Rear Yard	15	5.3%
Side Yard, Rear Yard & Basement	2	0.7%
Street	5	1.8%
Street & Rear Yard	7	2.5%
Street & Side Yard	2	0.7%
Street, Rear Yard & Basement	1	0.4%
Street, Rear Yard & Other	1	0.4%
Street, Side Yard & Rear Yard	12	4.2%
Street, Side Yard, Rear Yard & Basement	2	0.7%
Street, Side Yard, Rear Yard & Other	2	0.7%
Other	5	1.8%
Total	**283**	

The above reported incident numbers reflect the response based each unique category. As the table shows, the majority (165 of 283, or 58%) of respondents had no complaint. The next largest reported response category was rear yard flooding with 47 response (17%). There were 55 (19%) responses not listed with a specific subdivision leaving 81% (228) of

flooding complaints inside subdivisions. The counts of response involving street flooding were 33 (12%) with 6 (2%) outside of subdivisions.

Overall, the results show most reported problems are inside subdivisions and in the rear yards.

The following identified the flooding issues by subdivision.

Table 4.2 -3 Flooding Types By Subdivision

Country Meadow		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	37	68.6%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	9	16.7%
Rear Yard & Basement	1	1.9%
Side Yard	1	1.9%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	1.9%
Side Yard, Rear Yard & Basement		0.0%
Street	2	3.7%
Street & Rear Yard	3	5.6%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	**54**	
Deer Creek Estates		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	3	50%
Basement		16.7%
Basement & Other		0.0%

Front Street		16.7%
Front Yard		0.0%
Rear Yard	1	16.7%
Rear Yard & Basement		0.0%
Side Yard	1	0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	0.0%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		16.7%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		16.7%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	**6**	
Deer Creek Trails		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	1	33.3%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard		0.0%
Rear Yard & Basement		0.0%
Side Yard	1	33.3%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard		0.0%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard	1	33.3%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%

Other		
Total	3	
Doubletree Lake		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	26	72.2%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	5	13.9%
Rear Yard & Basement		0.0%
Side Yard	1	2.8%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	2.8%
Side Yard, Rear Yard & Basement		0.0%
Street	2	5.6%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other	1	2.8%
Total	36	
Doubletree West		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	16	57.2%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	6	21.4%
Rear Yard & Basement	1	3.6%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	3	10.7%
Side Yard, Rear Yard & Basement	1	3.6%

Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard	1	3.6%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	28	
Hidden Creek Estates		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	4	28.6%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	1	7.1%
Rear Yard & Basement		0.0%
Side Yard	2	14.3%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	7.1%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard	1	7.1%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	4	28.6%
Street, Side Yard, Rear Yard & Basement	1	7.1%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0
Total	14	99.90%
Latitude		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	2	50%
Basement		0.0%
Basement & Other		0.0%

Front Street		0.0%
Front Yard		0.0%
Rear Yard		0.0%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard		0.0%
Side Yard, Rear Yard & Basement	1	25.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement	1	25.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	4	
Prairie Crossing		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None		0.0%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	2	100.0%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard		0.0%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%

Other		0.0%
Total	2	
Providence at Stonegate		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	3	21.4%
Basement		0.0%
Basement & Other	1	7.1%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	5	35.7%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	2	14.3%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard	1	7.1%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	2	14.3%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	14	
Stonegate		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	9	47.4%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	7	36.8%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	5.3%
Side Yard, Rear Yard & Basement		0.0%

Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	1	5.3%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other	1	5.3%
Total	19	
Stonegate Commons		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	14	77.8%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard		0.0%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard		0.0%
Side Yard, Rear Yard & Basement		0.0%
Street	1	5.6%
Street & Rear Yard	1	5.6%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other	1	5.6%
Street, Side Yard & Rear Yard		0.0%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other	1	5.6%
Total	18	
The Meadows		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	4	36.4%
Basement		0.0%
Basement & Other		0.0%

Front Street		0.0%
Front Yard		0.0%
Rear Yard	5	45.5%
Rear Yard & Basement		0.0%
Side Yard		0.0%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard		0.0%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	2	18.2%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other		0.0%
Other		0.0%
Total	11	
Trees		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	10	52.6%
Basement		0.0%
Basement & Other		0.0%
Front Street		0.0%
Front Yard		0.0%
Rear Yard	1	5.3%
Rear Yard & Basement		0.0%
Side Yard	1	5.3%
Side Yard & Front Yard	1	5.3%
Side Yard & Rear Yard	4	21.1%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard		0.0%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	1	5.3%
Street, Side Yard, Rear Yard & Basement	1	5.3%
Street, Side Yard, Rear Yard & Other		0.0%

Other		0.0%
Total	19	
Non-Subdivision Areas		
Response	# Reported	% Reported
No Response, Blank, No, N/A, None	36	65.5%
Basement	2	3.6%
Basement & Other		0.0%
Front Street	1	1.8%
Front Yard	1	1.8%
Rear Yard	5	9.1%
Rear Yard & Basement		0.0%
Side Yard	2	3.6%
Side Yard & Front Yard		0.0%
Side Yard & Rear Yard	1	1.8%
Side Yard, Rear Yard & Basement		0.0%
Street		0.0%
Street & Rear Yard	1	1.8%
Street & Side Yard		0.0%
Street, Rear Yard & Basement		0.0%
Street, Rear Yard & Other		0.0%
Street, Side Yard & Rear Yard	2	3.6%
Street, Side Yard, Rear Yard & Basement		0.0%
Street, Side Yard, Rear Yard & Other	2	3.6%
Other	2	3.6%
Total	55	99.80%

As noted previously the largest category after No Response was rear yard flooding. Table 4.2-4 provides a summary by subdivision of the number of reports of rear yard flooding.

Table 4.2 -4 Subdivision Flooding Summary

Subdivision	# Reported
Country Meadow	9
Deer Creek Estates	1
Doubletree Lake	5
Doubletree West	6
Hidden Creek Estates	1
Prairie Crossing	2
Providence at Stonegate	5
Stonegate	7
The Meadows	5
Trees	1

The table shows the highest number of reports is in Country Meadow with 9 followed by Stonegate with 7 and Doubletree West with 6.

4.3 PUBLIC STORMWATER ISSUES

No new large public stormwater issues were identified. The primary public stormwater issue is street flooding in subdivisions. Based on recent experience, street flooding is temporary and frequently a result of inlet blockage. Investigations into such complaints have found yard debris and inlet protection from construction activities left in place. The Town should continue to expect these types of reports.

4.4 NON-PUBLIC STORMWATER ISSUES

The map in **Appendix IV-B** includes the locations of the reported non-public concerns, entries that do not include "front street" or "street" in the description. The Town staff should continue to investigate these concerns.

SECTION 5
SUMMARY OF HYDROLOGIC AND HYDRAULIC ANALYSES

This section provides a brief overview of the hydrologic and hydraulic methods utilized in the original 2009 study and the 2021 update study to evaluate alternatives for the mitigation, reduction and elimination of flooding in the Town and provide recommendations for future analyses.

Major and minor watersheds and waterways were delineated and identified within the Town and are shown in **Appendix III-1**. A combination of field observations and use of existing 1998 one-foot contour data were used to prepare the 2009 delineations. The 2021 update incorporated contours generated from 2013 digital elevation maps (DEMs). These DEMs were based on 12-inch resolution and provided more accurate contours. In addition, the contours reflected land alterations made since 1998. Future watershed analyses should incorporate updated elevation data as it becomes available.

As new stormwater issues are identified in the Town, the delineations above can be broken down further so that the drainage area tributary to the point of analysis could be obtained.

The Soil Conservation Service (SCS) hydrograph methods were used to generate stormwater hydrographs (e.g. curves defining stormwater flow rate versus time). Hydrologic parameters such as time of concentration and runoff curve number were generated for each watershed to be analyzed. Soils data, aerial photography and current contour information in the Town's GIS can aid the development of these parameters. Huff rainfall distributions and critical duration storm events should be used throughout any analysis.

Rainfall data used in the 2009 analyses were based on Bulletin 71, Rainfall Frequency Atlas of the Midwest, by Huff and Angel, 1992. These values were generally conservative rainfall values. However, the rainfall depths have been changing with some increasing of total depth on average for some storm events. Updated rainfall information should be used such as NOAA Atlas 14 for all future analyses to ensure stormwater management facilities are not undersized.

Design storm criteria were originally selected in accordance with Winfield Standards and are summarized as follows:

- Roadway culverts: Pass the 50 year design storm without overtopping the roadway (except in the case of 109th Avenue at Deer Creek and 125th Avenue at Stony Run Lateral #2 where a 100 year design storm was used);
- Residential flooding: 100 year design storm event.

The above criteria should continue to be used as a minimum with more stringent criteria applied as may be required based on field conditions

Several hydrologic and hydraulic (H&H) computer models were previously utilized for the masterplan. Complex analyses required the use of the computer program entitled XP-SWMM. XP-SWMM allows for the dynamic routing of stormwater through complex systems including creeks, ditches, ponds, storm sewers and overland flow paths. For example, XP-SWMM was used for the analysis of Hidden Creek through the Hidden Creek Subdivision and Trees Subdivision. Another program developed by the Federal Highway Administration (FHA) entitled, HY-8 was used for other problem areas involving the replacement of a single culvert.

Future H&H models should continue to incorporate the SCS hydrologic parameters, the Huff Rainfall distributions and be capable of complex analyses when tailwater may impact performance of current and future stormwater management systems.

SECTION 6
CAPITAL ALTERNATIVES

This section summarizes the various capital alternatives that were reviewed as part of the 2009 master plan and provides a summary of any new ones. A capital alternative is a constructed alternative that mitigates or eliminates flooding. A constructed alternative may include: a new storm sewer; new detention facility or expanded detention facilities; channel improvements; culvert replacement; or a pump station. Alternatives were developed for many of the areas identified in Section 4. In some case, multiple alternatives were developed for a particular area. In some cases, only one alternative was developed for a particular area.

This 2021 update provides the descriptions of each alternative and addresses the current status of the alternatives. Updated opinions of probable budgetary cost for the remaining alternatives are provided in Section 6.24 as well as the new capital alternatives.

6.1 AREA #1: FLOODING OF ARIZONA STREET (INTERSECTION WITH 109TH AVENUE)

Alternative 1a – New Culvert Beneath Arizona Street
The conveyance alternative involves the construction of a 30 inch culvert under Arizona Street approximately 160 feet north of the intersection of 109th Avenue and Arizona Street. The opinion of probable budgetary cost for this alternative is provided in Table 6.22-1 at the end of this section.

Status - **Completed**.

Alternative 1b – Provide Upstream Detention
A storage alternative was considered for the purposes of attenuating stormwater flows to the area and preventing the overtopping of Arizona Street. This alternative would be significantly more costly than Alternative 1a as construction and land costs would be significantly higher. Also, considering a significant portion of the upstream watershed is undeveloped farmland, crop debris would present continued maintenance problems for the facility. If the area upstream is ever developed, detention meeting the requirements in the Town's ordinance will be required, reducing the volume of detention that would be required if upstream detention were constructed for the current conditions.

Recommended Alternative

The recommended alternative for this area in 2009 was Alternative 1a and has been completed. However, Alternative 1a reduces roadway flooding but does not reduce the upstream runoff rate and its impact on private parcels (Alternative 1b). The Town should continue to look for opportunities to reduce the upstream runoff rate(s) such as reducing the allowable release rates for new development based on downstream limitations.

6.2 AREA #2: FLOODING OF HIDDEN CREEK AND TREES SUBDIVISION

Conveyance, storage, maintenance and diversion alternatives were considered for this area in 2009. The alternatives were reviewed and their current status are summarized as follows.

Background

Reported flooding in the Hidden Creek subdivision has been primarily located in the area adjacent to the Hidden Creek channel. The original approved design of the subdivision included storage of runoff in the creek channel. Flooding has been reported around the homes and in the streets upstream of the in-line detention pond. Entry of flood water into homes has been reported upstream of and adjacent to the detention pond as well in the home on the west side of the channel downstream between the detention pond and 101st Avenue. Both homeowner and emergency access on the 104th Avenue cul-de-sac have been prevented by flooding. Floodwaters have also entered a home on 104th Avenue.

The original alternatives from 2009 are summarized in the table below:

Table 6.2-1
2009 Alternative Costs Summary

Alternative #	Description	Opinion of Probable Cost (2009)
2a	Channel Clearing Through Hidden Creek Subdivision	$308,000
2b	Culvert Replacement – 101st Avenue	$59,000
2c	Enlarge Detention (4X), Outlet Pipe, 101st Ave Culvert and Upsize 103rd Culvert	$2,520,000
2d	Enlarge Pond, Construct New Diversion Through Proposed Hidden Creek Phase 2 and Upsize 103rd Culvert	$2,964,000

Since 2009, the Town has reviewed these alternatives, performed preliminary engineering, updated opinions of probable cost and requested funding.

Channel clearing (Alternative 1a) has been performed with financial assistance from the Little Calumet River Basin Commission (LCRBC). Continued maintenance will be required to maintain and maximize the conveyance through the channel

Increasing the culvert under 101st Avenue was discussed with the Town of Merrillville (101st Avenue is in Merrillville's jurisdiction). Concerns about the ability of the downstream channel to convey the increased runoff and increased flooding downstream at the Clay Street crossing were discussed. The Lake County Surveyor's Office (LCSO) was contacted and a Mutual Drain Application was submitted. This allowed the LCSO to contact the landowner and discuss clearing of the mutual drain. The Town understands the property owner agreed to clear obstructions. However, increased flooding of the Clay Street Crossing remained a concern.

Alternatives 2c and 2d were investigated and preliminary engineering completed. Alternative 2c would have required enlargement of the pond by a factor of 4 and property acquisition from Hidden Creek Phase 2 and enlargement of the 101st Avenue culvert. Both the cost of property acquisition and downstream impacts at Clay Street were not desirable.

Alternative 2d would include an enlarged pond and a new outlet directly to the Deer Creek wetlands to the east, eliminating negative impacts at Clay Street. Additional property acquisition for the new outfall required a larger investment relative to Alternative 2C. Funding was requested from the LCRBC to reduce the cost to the Town but was denied since the flooding was considered a design oversight in the initial plans.

A new approach was devised based on the experiences of the previous alternatives. The project was divided into a two (2) phased approach. Phase 1 would include upsizing both the culverts under 101st Avenue and Clay Street and constructing a new, separate enclosed outfall from the pond under 101st Avenue (see Figure 6.2 - Phase I). Phase 2 would include regrading the Hidden Creek channel inside the subdivision, installing an underdrain under the channel and upgrading the 103rd Avenue culvert.

With the support of the Town of Merrillville and Lake County, Phase 1 was submitted to the LCRBC for funding in 2021. The LCRBC agreed to fund part of Phase 1. Phase 2 is to be performed by the Town at a later date.

All alternatives were evaluated using the criteria the 100-yr storm event would not reach the residential structures.

6.3 AREA #3: FLOODING OF CLAY STREET (NORTH OF 101ST AVENUE)

This area is located outside of the Town of Winfield in the Town of Merrillville. Flooding of Clay Street cannot be eliminated with any of the alternatives reviewed for Area #2. Elimination of flooding on Clay Street would involve the raising of the roadway and the enlargement of the culvert beneath Clay Street at this location.

Status – **This alternative will be addressed with Area #2 above (Flooding of Hidden Creek and Trees Subdivision).**

6.4 AREA #4: FLOODING OF 101ST AVENUE (WEST OF ARIZONA STREET)

This area is located within the jurisdiction of the Town of Merrillville. The Town of Merrillville is presently considering a solution to relieve the flooding of 101st Avenue at this location by reconstructing a field tile to drain the water to the southwest toward Colorado Street. Their proposal is to construct the inlet of this tile at an elevation of 681.1 located at the southern end of the pond system owned by the resident on 101st Avenue. The elevation of 101st Avenue at the location of flooding is 682.93 feet. Approximately 1,000 feet of drain tile would be constructed to the southeast through existing farm ground and discharge to an open waterway and pass beneath Colorado Street approximately 1,600 feet south of 101st Avenue.

Status – **This has been addressed by the Town of Merrillville.**

6.5 AREA #5: FAILING STORM SEWER NORTH OF EAST 107TH PLACE

Alternative 5a – Replace Existing Storm Sewer

The recommended plan for this area is to repair approximately 800 feet of the existing 12-inch diameter storm sewer between the pond located at 6152 East 107th Place and its outlet to Deer Creek (see Figure 6.5a).

Status - **Completed**.

6.6 AREA #6: GRAND BOULEVARD FLOODING 1,600' NORTH OF 109TH AVENUE

Background
Roadway flooding along Grand Boulevard approximately 1,600 feet north of 109th Avenue has been reported. Using the Lake County GIS information, the watershed was delineated and runoff for the 50-year storm event was estimated using the SCS (NRCS) curve number methodology and hydrologic modeling software. The following table summarizes the inputs and results.

Table 6.6-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
4	74	39	3.61

Next the Federal Highway Association (FHA) software HY-8 was used to evaluate the existing culvert. The results indicate that the existing 1 foot (12inch) CMP pipe at 0.014 ft/ft (1.4%) slope would accommodate the 3.61 cfs from the 50-year storm without overtopping the roadway. Therefore, it is determined that Alternative 6a should be implemented as described below.

Status – **To Be Addressed**.

Alternative 6a – Culvert Cleaning and Regrading Around the Inlet and Outlet
The existing culvert should be cleaned and regrading should occur around the inlet and outlet of the culvert.

Advantages: The frequency of flooding / overtopping will be reduced.

Disadvantages: None.

Budgetary Cost: The Updated Opinion of Probable Budgetary Cost for this alternative is provided in Table 6.24-6.

6.7 AREA #7: GRAND BOULEVARD FLOODING IMMEDIATELY NORTH OF 109TH AVENUE

Background

Roadway flooding / overtopping along Grand Boulevard immediately north of 109th Avenue has been reported. Using the Lake County GIS information, the watershed draining to this area was delineated and runoff for the 50-year storm event was estimated using the SCS (NRCS) curve number methodology and hydrologic modeling software. The following table summarizes the inputs and results.

Table 6.7-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
10	77	36	11.3

Status – **To be Addressed with Area #8**.

6.8 AREA #8: 109TH AVENUE FLOODING BY DEER CREEK

Background

Roadway flooding / overtopping of 109th Avenue over Deer Creek has been reported under extreme conditions. Using the Lake County GIS information, the watershed served by the existing culvert was delineated and runoff for the 100-year storm event was estimated using the SCS (NRCS) curve number methodology. The following table summarizes the inputs and results.

Table 6.8-1 100-year Watershed Runoff Input and Results			
Area (ac)	**Curve Number**	**Time-of-Concentration (min)**	**Peak Runoff (cfs)**
776	78	233	433

Status – **Project Pending 2021**.

A project has been designed and contracted for 2021 that includes improvements to the intersection, upgraded culvert and relocation of the Deer Creek channel on the east side of Grand Avenue.

6.9 AREA #9: 109TH AVENUE FLOODING 150' EAST OF DEER CREEK DRIVE

Background
Roadway flooding / overtopping along 109th Avenue 150 feet east of Deer Creek Drive has been reported. Using the Lake County GIS information, the watershed served by the culvert at this location was delineated and runoff for the 50-year storm event was estimated using the SCS (NRCS) curve number methodology. The following table summarizes the inputs and results.

Table 6.9-1 50-year Watershed Runoff Input and Results			
Area (ac)	**Curve Number**	**Time-of-Concentration (min)**	**Peak Runoff (cfs)**
27	76	38	28

Next the Federal Highway Association (FHA) software HY-8 was used to evaluate culvert sizes. The results indicate three 1.5 foot (18 inch) CMP pipes at 3-percent slope would need to be installed accommodate the 28 cfs of the 50-year storm without overtopping the roadway. However, there have been discussions about improvements for 109th Avenue including a new storm system. With this new system, a single inlet could be installed and connected to the new storm system.

Status – **Continue Monitoring**.

6.10 AREA #10: WASHOUT OF CULVERTS ALONG ACCESS DRIVE TO TOWN GARAGE AND WWTP

Background

Flooding / overtopping of the access drive to the town garage and WWTP has washed out the roadway once in the past couple years. Currently, the drive is built over three different size culverts spaced widely apart. These added together still appear unable to convey runoff from the upstream watershed frequently. Using the Lake County GIS information, the watershed to the access drive was delineated and runoff for the 50-year storm event was estimated using the SCS (NRCS) curve number methodology and StormShed software. The following table summarizes the inputs and results.

Table 6.10-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
156	84	80	169

Status – **Temporary culvert installed. Permanent culvert replacement anticipated in 2022**.

Alternative 10a – Replace Existing Culverts

The Federal Highway Association (FHA) software HY-8 was used to evaluate culverts. The results indicate a 4 foot wide, 2 foot tall box culvert at a 0.0014 (0.14%) slope would accommodate the 169 cfs of the 50-year storm without overtopping the drive. For comparison, the cross-sectional area of all the existing culverts is 5.6 square feet and the new box culvert would have a cross-sectional area of 8 square feet. See Figure 6.10a for an aerial picture of the area.

Advantages: This alternative would prevent the frequent overtopping and washing out of the roadway as well as reduce the backwater caused by the undersized culverts.

Disadvantages: Access to the Town Garage and WWTP will need to be coordinated as this culvert would be constructed through the only access to these facilities.

Budgetary Cost: The Opinion of Probable Budgetary Cost for this alternative is provided in Table 6.24-10.

6.11 AREA #11: STANDING WATER AT 104TH PLACE IN DBL WEST PHASE I

Background

This problem area is not considered a severe flooding problem. Other than ice buildup and being a possible personal safety concern, it is considered to be a minor public nuisance and can over time lead to premature pavement failure on the roadway. On April 17, 2008, DLZ offered alternatives to this problem area in a memorandum to the Town. They are as follows:

Status – **Continue Monitoring**.

Alternative 11a – Construct New Inlet and Storm Sewer

This alternative would involve the construction of an inlet at the ponding location along with a storm sewer to convey the runoff to the nearest inlet in the cul-de-sac. As incidental work to this, minor curb replacement and asphalt re-grading would be required. See Figure 6.11a for an aerial picture of the area.

Advantages: Implementation of this alternative would allow for the complete elimination of the standing water and the protection of the existing pavement structure.

Disadvantages: Implementation of this alternative will incur cost.

Budgetary Cost: The Opinion of Probable Budgetary Cost for this alternative is provided in Table 6.24-11.

Alternative 11b – Refinement of Operations and Pavement Maintenance

This alternative includes a refinement in snow plowing practices in this vicinity to prevent the "damming" up of snowmelt at the low areas. When the snowmelt is "dammed" up, more of it will likely migrate into the cracks in the asphalt to the sub-base where the freeze / thaw cycle will cause pavement deterioration.

Advantages: Coupled with the Town's annual or bi-annual crack sealing program, this alternative should provide a low cost means to protect the pavement in the area for a period close to its life of 20 years. Implementation of this alternative also prevents tearing up of a recently constructed roadway.

Implementation of this alternative is lower in cost than the previous alternative.

Disadvantages: This alternative is not a permanent alternative and will require the cooperation and understanding of current and future snow plow operators.

Budgetary Cost: Crack sealing the area for this alternative would be expected to be less than $1,000 per year.

Recommended Alternative

Until such time that the street is repaved at the end of its lifecycle, Alternative 11b is recommended. When the streets in the subdivision are repaved, the Town should consider implementation of Alternative 11a.

6.12 AREA #12: STANDING WATER AT INTERSECTION OF ONTARIO DRIVE AND RANDOLPH STREET

Background

Ontario Drive is reported to be a private driveway. However, of special consideration is that the Town Hall and Fire Department use this roadway as access to their facilities. During all rain events, the intersection of Ontario Drive and Randolph Street has flooded. While the flooding is minor in nature, it presents a hazard in the wintertime due to ice formation and buildup.

Status – **Completed**.

6.13 AREA #13: KEYSTONE LANE REAR YARD SINKHOLE

Background
During an investigation into rear yard flooding on Keystone Lane in Country Meadow Estates, a sinkhole was discovered over a 24-inch diameter storm sewer that runs north and south behind Aurelio's Pizza Restaurant. This sinkhole is not only a public hazard, but it also has the potential to carry sediment and debris into the sewer system and cause backups and flooding.

Status – **Repair Completed 2020**.

6.14 AREA #14: FLOODING OF COUNTY LINE ROAD

Background
County Line Road has historically flooded just east of Doubletree Lake Estates East. An existing 12-inch culvert carries 184 acres of runoff from Porter County into the Town of Winfield at this location.

Using the USGS Quadrangle information, the watershed to County Line Road was delineated. Runoff for the 50- and 10-year storm events were estimated using the SCS (NRCS) curve number methodology with the StormShed software and using the allowable release rate for the Fallings Waters Subdivision sub-watershed. The following table summarizes the inputs and results.

Table 6.14-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
107	74	60	85
77 (Falling Waters)	N/D	N/D	27*
		Total	113

Table 6.14-2 10-year Watershed Runoff Input and Results			
Area (ac)	**Curve Number**	**Time-of-Concentration (min)**	**Peak Runoff (cfs)**
107	74	60	38
77 (Falling Waters)	N/D	N/D	27*
		Total	65

N/D – Not Determined
*- Sum of Allowable Release Rates for Sub-Watersheds from Falling Waters Engineering Report

Status – **Continue Monitoring**. Repaving and ditch cleaning were performed to reduce flooding frequency.

Alternative 14a – Replace Culvert
The Federal Highway Association (FHA) software HY-8 was used to evaluate culverts. The results indicate a 8 foot wide, 2 foot tall box culvert at a 0.0021 (0.21%) slope would accommodate the 113 cfs of the 50-year storm without overtopping the drive. HY-8 results for the 10-year storm indicated a 5 foot wide, 2 foot tall box culvert at a 0.0021 (0.21%) slope would accommodate the 65 cfs of the 10-year storm without overtopping the drive For comparison, the cross-sectional area of all the existing culvert is 0.785 square feet and the new box culvert would have a cross-sectional area of 16 square feet (approximately equivalent to a 60" pipe) for the 50-year storm and 10 square feet (approximately equivalent to a 48" pipe) for the 10-year storm. See Figure 6.14a for an aerial picture of the area.

The recommended plan is to install the 5 foot x 2 foot box or equivalent number of smaller structures. Long short box culverts are generally custom structures and more costly the longer they are required to be. This is recommendation is based on economic considerations and the existing geometry of the roadway. More frequent overtopping may be acceptable since traffic could easily take alternate routes and no property would be isolated. However, if replacement of the culvert were done with road reconstruction and raising the elevation of the roadway were possible, a narrower but taller culvert should be considered. Such a culvert should be less costly. (See Figure 6.14a for aerial of the area.)

Advantages: This alternative would reduce the frequency of roadway overtopping.

Disadvantages: Overtopping would occur more frequently than culverts sized for the 50-year storm event.

Budgetary Cost: The Opinion of Probable Budgetary Cost for this alternative is provided in Table 6.24-14.

6.15 AREA #15: FLOODING OF STATE STREET CULVERT ON GRAPER DITCH

Background

Roadway flooding / overtopping along State Street where it crosses Graper Ditch has been reported. Using the Lake County GIS information, the watershed served by this culvert was delineated and runoff for the 50-year storm event was estimated using the SCS (NRCS) curve number methodology. The following table summarizes the inputs and results.

Table 6.15-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
879	81	243	420

Status – **County upgraded culvert and has downstream improvement project for 2021**.

6.16 AREA #16: 117TH AVENUE BETWEEN BENTON STREET AND GRAPER DITCH

Alternative 16a – Regrade Roadway Ditch

Portions of the existing roadway along 117th Avenue from Benton Street to Graper Ditch has been recently milled a resurfaced. However, roadside drainage in this area is insufficient to achieve the maximum life of the pavement. The GIS contour information indicates a culvert under the abandoned railroad bed approximately 2,100 feet west of Benton Street. The contour information also indicates this culvert could drain the roadway from Benton Street to a point approximately 3,000 feet west of Benton Street.

The GIS contour information also indicates an abandoned railroad bridge 3,500 feet west of Benton Street that could drain the area west of the area that could be served by the culvert. This alternative proposes to clear and regrade the roadway ditches to fully utilize the two "natural" outlets for this area. See Figure 6.16a for an aerial layout of this alternative.

Status – **Continue Monitoring**. Interim improvements made to culverts and ditches along 117th Avenue provided some relief. Town should continue to look for opportunities to improve flow under abandoned railroad bed.

6.17 AREA #17: 117TH AVENUE FLOODING EAST OF DECATUR

Background

Roadway flooding / overtopping along 117th Avenue 125 feet east of Decatur Street has been reported. Using the Lake County GIS information, the watershed draining to this point was delineated and runoff for the 50- and 10-year storm events were estimated using the SCS (NRCS) curve number methodology. In addition, the two existing depressional storage areas in the farm fields were incorporated into the model. The following table summarizes the inputs and results.

Table 6.17-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
79 (Upper Shed)	74	117	68
244 (Lower Shed)	81	157	205

Table 6.17-2
10-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
79 (Upper Shed)	74	117	19
244 (Lower Shed)	81	157	91

Next the Federal Highway Association (FHA) software HY-8 was used to evaluate culvert sizes. The results indicate a culvert with 41 square feet of opening area is required at a 0.28% slope to accommodate the 50-year storm without overtopping the roadway and a 15 square foot culvert at a 0.28% slope would be required to accommodate the 10-year storm without overtopping the roadway.

It should be noted this analysis while accurate with respect to the GIS contour data does not appear to corroborate local property owner reports. The local property owners have indicated there is an existing drain tile that is non-functioning in the field to the southeast of the intersection of 117th and Decatur. DLZ verified this in the field. The property owners indicate when this tile was functioning, no roadway overtopping occurred.

Status – **Continue Monitoring**. Pipe under 117th Avenue was upgraded reducing roadway flooding but flooding in the private field upstream continues.

Recommended Alternative

According to the analysis, a pipe with an area equivalent to 15 square feet would be required beneath 117th Avenue to stop it from flooding during the 10 year storm event. However, due the discrepancy between the runoff estimates and local property owner reports, re-evaluation of the contributing drainage area to this point should be reconsidered when or after the crops have been cultivated and the leaves have fallen from the trees.

Instead, the project for this area should be broken up into two phases. Phase a (Alternative 7a) includes the consideration of extending the existing storm west of Decatur on 117th Avenue to the east side of Decatur with a manhole structure to provide a new connection for the reported field tile. This work would constitute Alternative 17a and should be the first phase of any work in this location. ***It is also imperative that the landowner repair the tile in the field to the southeast of the intersection of Decatur and 117th Avenue.*** The repaired field tile could be tied into this manhole.

As a follow up, a field reconnaissance of the watershed in late winter of early spring prior to planting should also be done to verify watershed boundaries and conditions. Re-evaluation of the culvert size after these steps is recommended and a 15 square foot culvert may not be warranted. For the purposes of this report and in order to provide the

programming for anticipated costs for a culvert replacement, Alternative 17b was added which includes culvert replacement beneath 117th Avenue east of Decatur Street.

6.18 AREA #18: GIBSON STREET FLOODING SOUTH OF 117TH AVENUE

Background

Roadway flooding / overtopping along Gibson Street 870 feet south of 117th Avenue has been reported. This is a natural depressional area. The Lake County GIS information indicates the landowner of the depressional area on the west side of the street has created an overland channel on the west side of the depressional area that turns and drains south to the abandoned railroad bed. Using the GIS contour data, the watershed to the east side of the road was delineated and runoff for the 50- and 10-year storm events were estimated using the SCS (NRCS) curve number methodology and StormShed software. The following table summarizes the inputs and results.

Table 6.18-1
50-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
79	82	65	89

Table 6.18-2
10-year Watershed Runoff Input and Results

Area (ac)	Curve Number	Time-of-Concentration (min)	Peak Runoff (cfs)
79	82	65	45

Next the Federal Highway Association (FHA) software HY-8 was used to evaluate culvert sizes under Gibson Street. The results indicate a 9 foot wide by 2 foot high box culvert at 0.0025 (0.25%) slope would accommodate the 89 cfs of the 50-year storm without overtopping the roadway and a 5 foot by 2 foot box culvert would accommodate the 10-year storm event without overtopping the roadway. It should be noted, this scenario assumes the overland drainage channel is sized to accommodate the flow out of the west

pond. According to the GIS contour information, the existing ditch should accommodate the 50-year flow. See Figure 6.18a for an aerial layout of this alternative.

Status – **To be Addressed with repaving in 2021**

Recommended Alternative
The 5 foot by 2 foot box culvert is recommended for economic reasons.

Advantages:	The frequency of roadway overtopping would be reduced
Disadvantages:	The smaller size, accommodating the 10-year storm, will allow overtopping more often than would occur during a 50-year design culvert.
Budgetary Cost:	The updated Opinion of Probable Budgetary Cost for this alternative is provided in Table 6.24-18.

6.19 AREA #19: 117TH AVENUE PAVEMENT DETERIORATION EAST OF CHRISTIANLAND VILLAGE

Background
According to landowners adjacent to this location, fiber optic lines were installed over two decades ago along this stretch of roadway. During the installation, the existing ditch was filled in. Now, runoff from the street and adjacent land is washing away at the existing shoulder on the south side of the road.

Status – **Completed 2019**

6.20 AREA #20: 125TH AVENUE ROADSIDE DRAINAGE

Background
Reconstruction / rehabilitation of 125th Avenue has been under discussion for the past several years. Pavement condition is deteriorating rapidly in part to the inability of stormwater to drain away from the pavement. Furthermore, it is reported that 125th Avenue has overtopped the roadway at its intersection of Winfield Tributary #2 to Stony Run.

Status – **Continue Monitoring.** Full **r**econstruction / rehabilitation to be scheduled, interim repairs have been performed.

Recommended Alternative
In order to prevent degradation of the pavement along 125th Avenue in this section, it is recommended that a roadside swale be constructed along the portion shown in Figure 6.20 and the Stony Run Lateral culvert under 125th Avenue be replaced. The estimated runoff for the 100-yr storm event for the existing conditions is 246 cfs. This will require the equivalent of an 11 foot x 3 foot box culvert be installed in place of the existing 36 inch CMP.

Advantages: Prevention of further pavement degradation.

Disadvantages: None.

Budgetary Cost: The updated Opinion of Probable Budgetary Cost for this is provided in Table 6.24-20.

6.21 AREA #21: FLOODING ON WINFIELD TRIBUTARY #2 TO STONY RUN

Background
Property owners between 125th Avenue and 129th Avenue along Tributary #2 to Stony Run have reported flooding. Tributary #2 is and open ditch approximately 15 to 20 feet wide and 2 feet deep from 125th Avenue to about 1,700 feet south. At this point it is reported to enter into an 18 inch tile and flow overland when the pipe is flowing at its capacity to 129th Avenue. See Figure 6.21a for an aerial of this area.

Using the GIS contour data, the watershed to the east side of the road was delineated and runoff for the 100-, 50-, 25- and 10-year storm events were estimated using the SCS (NRCS) curve number methodology, StormShed software and information from the proposed development. The following table summarizes the results.

Table 6.21-1
Watershed Runoff Estimates

100-year (cfs)	50-year (cfs)	25-year (cfs)	10-year(cfs)
354	275	210	142

The existing ditch was evaluated using a constant slope, flow depth and assuming it is grassed. Due to the topography, the flow depth was held at 2 and the ditch sizes needed to accommodate the various storm events was estimated. The following table summarizes the results.

Table 6.21-2
Ditch Bottom Widths (assuming a 2 foot flow depth and 3:1 side slopes)

100-year (ft)	50-year (ft)	25-year (ft)	10-year(ft)
38	29	22	14

The existing ditch has a bottom width of approximately 17 ft. This width will accommodate the 10-year storm and more. However, it will not accommodate a 25-year storm or greater.

Status – **Continue Monitoring.**

Recommended Alternative
Reconstruction the ditch through the section that has been enclosed to match the existing ditch upstream is recommended. While a larger ditch would contain lesser frequency events, the width would increase significantly and reduce usable land for the property owners. An 18 inch tile at a slope of 0.002086 ft/ft can only accommodate approximately 5 cfs, far less than the 10-year storm. Access across the proposed ditch for the property owners should also be provided and easements for the ditch should be required prior to any construction activities.

Advantages: The frequency of overland flow would be reduced

Disadvantages: The smaller size, accommodating the 10-year storm, will allow overland more often than would occur during a less frequent return period.

Budgetary Cost: The updated Opinion of Probable Budgetary Cost for this is provided in Table 6.24-21.

6.22 Area #22: Downtown Master Improvement Plan – Randolph / 109th Area

Background

The intersection of 109th Avenue and Randolph Street has developed as part of the central Downtown Winfield commercial district. The Town desires to make the areas more pedestrian friendly but the intersection does not include crosswalks and roadway drainage is provided by open ditches. As part of intersection improvements including crosswalks, sections of the open ditches will require enclosing and installation of catch basins, allowing construction of walkways. See Figure 6.22a for an aerial picture of this area.

Advantages: Allow safe pedestrian traffic to patronize the commercial establishments.

Disadvantages: None.

Budgetary Cost: The updated Opinion of Probable Budgetary Cost for this is provided in Table 6.24-22.

6.23 Area #23 - Culvert Between 10762 and 10705 Randolph Street (Aurelio's Pizza and Strip Mall)

Background

The businesses at 10762 and 10705 Randolph Street have reported flooding in the parking areas on both sides of the roadway. There is an existing roadside ditch on the east side of Randolph Street flowing north into an existing pipe. Based on construction plans and preliminary field investigation, this pipe flows north then turns east along the north side of the building structures. The original construction plans indicate the pipe connects to an inlet in the rear entrance drive where flow turns north to an outfall. Since construction of the strip mall, the adjoining property has been developed and the outfall has been enclosed. The topographic maps suggest the outfall may have been moved to the east of the access roadway (Ontario).

On the west side of Randolph Street, there is a shallower roadside ditch. There are inlets on the bottom of this ditch accepting the runoff, but the layout of this storm sewer is yet to be determined.

A culvert has been installed between the east and west roadside ditches under Randolph Street and its inverts have not been field verified. Previous video investigation of the culvert indicated the west end has been extended with a smaller diameter pipe than the

original culvert that was blind tapped into the existing storm sewer under the roadside ditch. The contour data indicates the natural watershed break lies behind the strip mall, suggesting the strip mall are originally drained west before development.

The potential dual outlet direction of the Randolph culvert and unknown downstream receiving storm sewers will require additional investigation to determine potential remedies and a plan of action. The capacity of the ditch, capacity of the existing storm sewer and downstream conveyance / detention systems will need to be examined to determine potential remedies.

Recommended Alternative
Additional field investigation and review of existing construction plans / as-built plans should be conducted to characterize the downstream conveyance / detention systems both east and west. Field survey may also be required to evaluate the hydraulic characteristics of the existing storm systems and determine if any restrictions exist.

Advantages:	A solution minimizing impact to downstream structures and properties can be determined.
Disadvantages:	Additional field investigation and hydraulic study will require additional time.
Budgetary Cost:	An Opinion of Probable Budgetary Cost for this project is not provided since additional investigation will be required.

6.24 OPINIONS OF PROBABLE BUDGETARY COST

This section provides opinions of probable budgetary cost for most of the alternatives described in the preceding sections. Note that costs are provided in Year 2021 dollars. Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

Costs are provided for easement acquisition and land acquisition; however, they are not purported to be accurate for all areas. Detailed appraisals are required for more accuracy and should be performed by the Town prior and during the programming of the projects.

TABLE 6.24-6

OPINION OF PROBABLE BUDGETARY COST

TO MITIGATE:

AREA #6: GRAND BOULEVARD FLOODING 1,600' NORTH OF 109th AVENUE

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	0	LS	$ 4,000	$ -
2	Erosion Control	0	LS	$ 2,500	$ -
3	Maintenance of Traffic	0	LS	$ 2,500	$ -
4	Restoration	0	LS	$ 25,000	$ -
5	Clean Culvert	40	LFT	$ 69	$ 2,768
Alternative Total (No Contingency)					$ 2,768
Construction Contingency @				25%	$ 692
Alternative Total (w/ Construction Contingency)					$ 3,461
Administrative, Legal, Engineering, Inspection				25%	$ 865
Easement Acquisition		0 SFT @		$ 1	$ -
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 4,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-10

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 10a - REPLACE EXISTING CULVERTS

TO MITIGATE:

AREA #10: WASHOUT OF CULVERTS ALONG ACCESS DRIVE TO TOWN GARAGE AND WWTP

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 2,500	$ 2,500
2	Erosion Control	1	LS	$ 1,000	$ 1,000
3	Maintenance of Traffic	1	LS	$ -	$ -
4	Restoration	1	LS	$ 5,000	$ 5,000
5	4' x 2' Box Culvert	60	LFT	$ 415	$ 24,916
6	Wingwalls	4	EA	$ 6,921	$ 27,685
7	Pavement Patching, Gravel	50	SYS	$ 69	$ 3,461
Alternative Total (No Contingency)					$ 64,561
Construction Contingency @				25%	$ 16,140
Alternative Total (w/ Construction Contingency)					$ 80,702
Administrative, Legal, Engineering, Inspection				25%	$ 20,175
Easement Acquisition		0 SFT @		$ 1	$ -
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 101,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-11

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 11a - CONSTRUCT NEW INLET AND STORM SEWER

TO MITIGATE:

AREA #11: STANDING WATER AT 104th PLACE in DBL WEST PHASE I

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 2,500	$ 2,500
2	Erosion Control	1	LS	$ 1,000	$ 1,000
3	Maintenance of Traffic	1	LS	$ 2,500	$ 2,500
4	Restoration	1	LS	$ 5,000	$ 5,000
5	Storm Sewer, 12-inch	50	LFT	$ 62	$ 3,115
6	Inlet	1	EA	$ 2,492	$ 2,492
7	Pavement Patching, Asphalt	75	SYS	$ 208	$ 15,573
8	Curb and Gutter	50	LFT	$ 28	$ 1,384
Alternative Total (No Contingency)					$ 33,563
Construction Contingency @				25%	$ 8,391
Alternative Total (w/ Construction Contingency)					$ 41,954
Administrative, Legal, Engineering, Inspection				25%	$ 10,488
Easement Acquisition		0 SFT @		$ 1	$ -
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 52,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-14

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 14a - REPLACE CULVERT

TO MITIGATE:

AREA #14: FLOODING ON COUNTY LINE ROAD

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 2,500	$ 2,500
2	Erosion Control	1	LS	$ 1,000	$ 1,000
3	Maintenance of Traffic	1	LS	$ -	$ -
4	Restoration	1	LS	$ 5,000	$ 5,000
5	5' x 2' Box Culvert	60	LFT	$ 484	$ 29,069
6	Wingwalls	4	EA	$ 6,921	$ 27,685
7	Pavement Patching, Asphalt	100	SYS	$ 208	$ 20,764
Alternative Total (No Contingency)					$ 86,017
Construction Contingency @				25%	$ 21,504
Alternative Total (w/ Construction Contingency)					$ 107,521
Administrative, Legal, Engineering, Inspection				25%	$ 26,880
Easement Acquisition		5000 SFT @		$ 1	$ 5,000
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 139,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-16

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 16a - REGRADE ROADWAY DITCH

TO MITIGATE:

AREA #16: 117th AVENUE BETWEEN BENTON STREET AND GRAPER DITCH

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 5,000	$ 5,000
2	Erosion Control	1	LS	$ 5,000	$ 5,000
3	Maintenance of Traffic	1	LS	$ 5,000	$ 5,000
4	Restoration	1	LS	$ 10,000	$ 10,000
5	Ditch Regrading	4,000	LFT	$ 14	$ 55,369
6	Storm Sewer, 42-inch	100	LFT	$ 235	$ 23,532
7	End Section, 42-inch	2	EA	$ 4,153	$ 8,305
Alternative Total (No Contingency)					$ 112,207
Construction Contingency @				25%	$ 28,052
Alternative Total (w/ Construction Contingency)					$ 140,258
Administrative, Legal, Engineering, Inspection				25%	$ 35,065
Easement Acquisition		10000	SFT @	$ 1	$ 10,000
Land Acquisition		0	SFT @	$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 185,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-18

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 18a - REPLACE CULVERT AND DITCH REGRADING

TO MITIGATE:

AREA #18: GIBSON STREET FLOODING SOUTH OF 117th AVENUE

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 5,000	$ 5,000
2	Erosion Control	1	LS	$ 2,500	$ 2,500
3	Maintenance of Traffic	1	LS	$ 2,500	$ 2,500
4	Restoration	1	LS	$ 5,000	$ 5,000
5	5' x 2' Box Culvert	60	LFT	$ 484	$ 29,069
6	Ditch Regrading	600	LFT	$ 14	$ 8,305
7	Pavement Patching, Asphalt	50	SYS	$ 208	$ 10,382
Alternative Total (No Contingency)					$ 62,756
Construction Contingency @				25%	$ 15,689
Alternative Total (w/ Construction Contingency)					$ 78,445
Administrative, Legal, Engineering, Inspection				25%	$ 19,611
Easement Acquisition		30000	SFT @	$ 1	$ 30,000
Land Acquisition		0	SFT @	$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 128,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-20

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 20a - RECONSTRUCT ROADSIDE DITCH AND REPLACE CULVERTS

TO MITIGATE:

AREA #20: 125th AVENUE ROADSIDE DRAINAGE

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 10,000	$ 10,000
2	Erosion Control	1	LS	$ 5,000	$ 5,000
3	Maintenance of Traffic	1	LS	$ 5,000	$ 5,000
4	Restoration	1	LS	$ 20,000	$ 20,000
5	12-inch Culvert	400	LFT	$ 62	$ 24,916
6	Replace Culvert Beneath 125th Ave @ Winfield Trib. #2 to Stoney Run	60	LFT	$ 500	$ 30,000
7	Ditch Regrading	8,000	LFT	$ 14	$ 110,739
Alternative Total (No Contingency)					$ 205,655
Construction Contingency @				25%	$ 51,414
Alternative Total (w/ Construction Contingency)					$ 257,069
Administrative, Legal, Engineering, Inspection				25%	$ 64,267
Easement Acquisition		5000 SFT @		$ 1	$ 5,000
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 326,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-21

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 21a - RECONSTRUCT WATERWAY AND PROVIDE FARM ACCESS

TO MITIGATE:

AREA #21: FLOODING ON WINFIELD TRIBUTARY #2 TO STONEY RUN

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 5,000	$ 5,000
2	Erosion Control	1	LS	$ 5,000	$ 5,000
3	Maintenance of Traffic	1	LS	$ -	$ -
4	Restoration	1	LS	$ 10,000	$ 10,000
5	Earthwork, Excavation	2,000	CYD	$ 28	$ 55,369
6	Field Bridge for Farm Access	100	LFT	$ 250	$ 25,000
Alternative Total (No Contingency)					$ 100,369
Construction Contingency @				25%	$ 25,092
Alternative Total (w/ Construction Contingency)					$ 125,462
Administrative, Legal, Engineering, Inspection				25%	$ 31,365
Easement Acquisition		85000 SFT @		$ 1	$ 85,000
Land Acquisition		0 SFT @		$ 2	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 242,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

TABLE 6.24-22

OPINION OF PROBABLE BUDGETARY COST

ALTERNATIVE 22a - Enclose Roadside Ditches

TO MITIGATE:

AREA #22: Intersection of Randolph and 109th Pendestrian Safety

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization / Demobilization	1	LS	$ 9,000	$ 9,000
2	Erosion Control	1	LS	$ 15,000	$ 15,000
3	24" HDPE	1,378	LFT	$ 30	$ 41,340
4	Catch Basin	29	EA	$ 3,000	$ 87,000
5	24" End Section	2	EA	$ 1,000	$ 2,000
6	Restoration	1	LS	$ 20,000	$ 20,000
7	Grading / Excavation	2,000	CY	$ 15	$ 30,000
Alternative Total (No Contingency)					$ 204,340
Construction Contingency @				25%	$ 51,085
Alternative Total (w/ Construction Contingency)					$ 255,425
Administrative, Legal, Engineering, Inspection				25%	$ 63,856
Easement Acquisition		5000 SFT @		$ -	$ -
Land Acquisition		0 SFT @		$ -	$ -
Alternative Project Total (Rounded to Nearest $1,000)					**$ 319,000**

Notes

1) Unit prices are based on Year 2021 dollars.

2) Land acquisition and easement costs are assumed and are not purported to be accurate. Detailed appraisals are required for more accuracy.

3) Project costs do not include costs for any unusual soil, environmental, utility relocation or dewatering conditions.

SECTION 7
OPERATION AND MAINTENANCE

A stormwater management plan is not complete without a discussion of operation and maintenance of stormwater facilities. Stormwater facilities include inlets, pipes, swales and detention ponds (i.e. constructed facilities). In addition, stormwater facilities should include the ditches and waterways that accept runoff from the constructed facilities and convey that runoff to the borders of the Town.

Operation and maintenance can include elements ranging from manpower and equipment to cleaning and inspection of stormwater facilities.

When developing a stormwater utility and fee, it is important to plan for and consider the costs of operation and maintenance in addition to capital cost of projects. In some cases, operation and maintenance costs could exceed capital project costs. This section identifies operation and maintenance recommendations for the Town of Winfield's stormwater management system.

7.1 MAINTENANCE OF WATERWAYS

For the purpose of this plan, a waterway is defined as any natural or manmade drainage way, drain, river, stream, creek, ditch, ravine having that conveys runoff in a definite direction. The waterways may include wetlands sections where the bank is not well defined but there is a waterway inlet and an outlet to a waterway. Waterways are important to the Town in that they serve as the primary means to convey stormwater through and out of the Town of Winfield. Without well maintained waterways, even storm sewer systems with excess capacity can fail.

Lake County generally follows a 10 to 15 year maintenance cycle on their regulated drains. Maintenance generally consists of logjam removal, channel bottom dipping (sediment removal), channel bank excavation (slope repair), restoration and erosion control. Legal drains typically have a 75-foot easement outward from the top of bank on each side of the ditch which provides access and ample room to work. While some waterways in the Town are legal drains maintained by the County (e.g. Niles Ditch, Stony Run and Graper Ditch), the majority of waterways in the Town are not legal drains.

This update continues to recommend the Town adopt a program to maintain primary and secondary waterways (common drains that are not County legal drains) similarly to the

way the County maintains their legal drains. For the purposes of this plan, primary waterways are waterways that serve the primary watersheds shown in **Appendix III-A** and the secondary waterways convey runoff to the primary waterways.

Town roadway infrastructure crosses primary and secondary waterways that without proper maintenance could pose an impact to public welfare and safety. Table 7.1-1 summarizes the primary waterways within the Town and **Appendix III-A** provides the locations of the primary waterways and the secondary waterways.

Secondary waterways may not always directly impact roadway infrastructure but are important to providing conveyance from property and structures. Some secondary waterways are located in agricultural land but convey runoff from developed areas. These drains may include field tiles. As the Town continues to develop, the secondary drain may be incorporated into development and through the plan review process be redesigned to current standards. Other secondary drains or sections of secondary drains will be downstream of a proposed development and may be hydraulically impacted by the development runoff, e.g. may be subject to reduced peak flows from upstream detention. Impacts may include erosion from continuous low flow surface discharged or tile failure from surcharging.

In order for the Town to adopt a program to maintain waterways, its first step would be to acquire easements for access to the waterway. This process could be time consuming and costly, or the Town may find that the residents are willing to donate the necessary easements. In either event, the Town could consider sending letters to residents and / or meeting them on site to discuss their intentions. Due to the coordination involved, the Town may wish to consider prioritizing acquisition of easement rights for the critical waterways. Table 7.1-1 provides a recommendation for this prioritization. The recommendation is based on areas of known or potential problems, access and relation to projects identified in the Capital Improvements Section of this Plan. Table 7.1-1 further identifies maintenance costs. Please note that the costs for obtaining easements are not included.

Table 7.1-1
Summary of Primary Waterways

Waterway	Location	Length (feet)	Easement Area Required (acres)*	Priority Level	Maintenance Cost (15 Year Cycle)*
Hidden Creek	Town Limits to North Border of Trees Subdivision	3,200	8	1	$137,000
Hidden Creek	Town Limits North to Deer Creek (in Merrillville)	3,000	7	1	$128,000
Deer Creek	Town Limits to 109th Avenue	8,000	19	2	$342,000
Tributary to Deer Creek South of Meadows Subdivision	Deer Creek to Randolph Street (through WWTP property)	5,400	13	3	$231,000
Winfield Trib. #2 to Stony Run	Randolph Street to 129th	4,200	10	4	$180,000
Winfield Trib. #1 to Deer Creek	Deer Creek to Randolph Street (excluding lake in Country Meadows Estates)	6,200	15	5	$265,000
Deer Creek	109th Avenue to 117th Avenue	6,000	14	5	$257,000
				Total	**$$1,540,000.00**

* Costs are in Year 2021 dollars and do not include costs for easements.

Assuming the Town adopts a 15 year cycle to clean all of its critical waterways, the Town can expect to spend approximately $102,700 annually (Year 2021 dollars) for this measure ($1,540,000 / 15 years = $102,700).

7.2 MAINTENANCE OF CULVERTS

Culverts are required to convey waterways beneath the Town's roadways. Over time, sediment is deposited upstream, within and downstream of these culverts. Periodic cleaning of these culverts is required. Culverts within the Town should be cleaned on a 5 to 10 year cycle or as needed. There are over 50 known culverts within the Town of Winfield with diameters ranging from 8-inches in to 72-inches. The culvert material is generally

corrugated metal pipe (CMP). **Table 7.2-1** summarizes the locations and sizes of these culverts.

Table 7.2-1
Summary of Culverts

Street	GIS Identifier	Diameter	Upstream Elevation (feet)	Downstream Elevation (feet)
109th Avenue	C-109-2	72 IN	683.1	683.0
109th Avenue	C-109-3	60 IN	721.0	720.2
109th Avenue	C-109-5	36 IN	733.1	732.5
109th Avenue	C-109-6	48 IN	726.1	725.8
113th Avenue	C-113-1	12 IN	682.3	681.9
117th Avenue	C-117-1	12 IN	687.9	687.8
117th Avenue	C-117-2	12 IN	686.2	685.3
117th Avenue	C-117-3	12 IN	686.5	686.2
117th Avenue	C-117-4	10 IN	710.8	710.2
117th Avenue	C-117-5	15 IN	713.0	712.7
117th Avenue	C-117-6	12 IN	726.4	726.2
117th Avenue	C-117-7	60 IN	712.2	711.7
117th Avenue	C-117-8	18 IN	757.5	757.3
121st Avenue	C-121-1	12 IN	707.1	706.8
121st Avenue	C-121-2	24 IN	708.8	708.7
125th Avenue	C-125-1	12 IN	727.5	726.9
125th Avenue	C-125-1A	12 IN	715.1	714.4
125th Avenue	C-125-2	12 IN	731.4	730.5
125th Avenue	C-125-4	24 IN	725.2	724.2
125th Avenue	C-125-5	12 IN	738.6	737.2
125th Avenue	C-125-6	36 IN	718.8	718.6
126th Avenue	C-126-1	8 IN	728.5	728.3
129th Avenue	C-129-1	36 IN	675.4	674.7
129th Avenue	C-129-2	12 IN	688.7	687.5
129th Avenue	C-129-3	12 IN	730.4	730.3
129th Avenue	C-129-4	15 IN	729.1	728.2
129th Avenue	C-129-5	48 IN	712.0	711.7
129th Avenue	C-129-6	24 IN	715.5	714.9
129th Avenue	C-129-7	12 IN	742.8	741.9
129th Avenue	C-129-8	18 IN	756.6	755.8
Arizona Street	C-AZ-2	18 IN	688.6	688.4
County Line Road	C-CLR-2	30 IN	754.4	731.0

County Line Road	C-CLR-3	24 IN	753.8	753.5
Decatur Avenue	C-DEC-2	12 IN	703.7	703.2
Decatur Street	C-DEC-1	24 IN	702.2	701.7
Gibson Street	C-GIB-1	30 IN	703.8	701.5
Gibson Street	C-GIB-3	30 IN	705.4	704.7
Gibson Street	C-GIB-4	12 IN	711.4	710.6
Gibson Street	C-GIB-5	18 IN	709.5	708.8
Gibson Street	C-GIB-6	24 IN	711.7	711.4
Randolph Street	C-RAN-1	15 IN	727.7	727.1
Randolph Street	C-RAN-10	60 IN	706.8	706.0
Randolph Street	C-RAN-2	60 IN	720.4	720.4
Randolph Street	C-RAN-3	24 IN	740.2	739.7
Randolph Street	C-RAN-4	12 IN	752.7	752.3
Randolph Street	C-RAN-5	18 IN	757.6	755.9
Randolph Street	C-RAN-6	18 IN	755.1	755.0
Randolph Street	C-RAN-8	36 IN	742.7	742.0
Randolph Street	C-RAN-9	12 IN	732.7	731.4
State Street	C-STA-1	12 IN	694.3	693.6
State Street	C-STA-2	48 IN	690.4	690.3

The cost to clean all of the culverts is estimated to be $85,000 (in Year 2021 dollars). The Town may wish to consider the staggering of the cleaning of the culverts over 5 to 10 year period. Assuming a 5 year period, the Town could clean 20-percent of their culverts each year at an annual cost of $17,000 (in Year 2021 dollars).

7.3 CULVERT REPLACEMENT PROGRAM

The majority of the culverts in the Town are corrugated metal pipe (CMP). They were installed well over several decades ago which puts them toward the end of their typical life expectancy of 20 to 40 years. Therefore, a culvert replacement program should be considered. Setting aside $30,000 per year (2021 dollars) could allow the Town to repair / replace several smaller (12-inch diameter to 24-inch diameter) culverts per year (either with in-house staff or contracted out). Reinforced concrete pipe is recommended for longer service life and durability. Where possible, the culvert replacement should be coordinated with paving projects. This could reduce overall cost by preventing cutting of good pavement and eliminating equipment mobilization costs.

7.4 MAINTENANCE OF CATCH BASINS

Regular maintenance and inspection of the storm sewer collection systems is required. Regular maintenance includes cleaning of debris from catch basins, jetting storm sewer pipes and video inspection of storm sewer pipes. Of the maintenance and inspection items listed, removal of debris from catch basins is the most critical. Removal of debris from the catch basin helps prevent migration of sediment and debris into the pipes and receiving streams. There are an estimated 486 mapped storm structures (manholes, catch basins and inlets) in the Town of Winfield Subdivisions (Hidden Creek, Trees, Country Meadow Estates, Doubletree West, Meadows) and approximately 300 outside of the subdivision that are mapped. There are currently approximately 10 subdivisions with unmapped infrastructure that should be updated in the GIS system as well as new subdivisions being proposed.

If we assume the mapped subdivisions are representative, we estimate on average there is 1.3 structures per acre and the unmapped subdivisions may an additional 1,060 structures for total of approximately 1,545 structures

Of these 1,545 storm structures, it is assumed that 50% of them are catch basins. Ideally these catch basins should be cleaned out on an annual basis at an estimated cost of $61,800 per year (Year 2021 dollars). As more subdivisions are accepted by the Town, more catch basins will require cleaning. If rear-yard swales are replaced with pipe, the amount of storm sewer to maintain will increase.

For the size of Winfield, this work would normally be subcontracted out; however, if Winfield continues to grow, the Town may wish to consider the purchase of a sewer jet truck. This truck can also serve a dual purpose and provide service to the sanitary collection system. Although outside the scope of this study, annual maintenance of the sanitary sewer lines should be considered.

7.5 MAINTENANCE OF STORM SEWERS

The Town's collection system is relatively new and it is not expected that there are many clogged or collapsed pipes (with the exception of the Trees Subdivision). In the Hidden Creek, Trees, Country Meadows, Doubletree West and Meadows there is estimated to be approximately 57,468, linear feet of storm sewer.

Once again assuming the subdivisions are representative, we can estimate a value from the unmapped 10 subdivisions. The mapped subdivisions indicate an approximate average length of pipe of 100 ft/ ac. Using the area of the unmapped subdivisions, approximately 81,500 linear feet of additional storm sewer is added to the 57,468 linear feet for a total of approximately 139,000 linear feet.

As with catch basin cleaning, the Town should consider that in the next couple years, the Town will increase the lineal footage of storm sewer in the Town with additional development. A reasonable maintenance and inspection schedule for the storm sewer is to perform maintenance (cleaning) and inspection of 10% of the system each year. Based on the lineal footage of storm sewer the Town contains today, the estimated annual cost (year 2021 dollars) is $55, 600.

In older subdivisions, the Town has noted seals not installed between storm sewer castings and the concrete structure has resulted in the formation of sinkholes around the structures. While the cost to repair these sinkholes cost up to a couple of thousand dollars each to repair, the installation of the sealant would prevent the occurrence. The Town should consider revisions to the standards to require the sealant.

7.6 Pond Maintenance

Ponds require periodic maintenance in the form of dredging to remove accumulated sediment and possibly plant removal. Newer ponds with a pre-treatment system such as a forebay require yearly or biannual inspections and more frequent maintenance of the forebay. However, the incorporation of pre-treatment with regular maintenance greatly reduces the dredging frequency of the pond from an estimated 10 to 20 years to 20 to 40 years.

The Town currently has an estimated 64 ponds with different ages and designs. Assuming no maintenance is performed on the ponds and one (1) pond may need to be dredged every five (5) years at a cost of $50,000, a budgetary yearly maintenance cost for dredging would be $10,000. This cost would be increased if more ponds were to be maintained by the Town

7.7 SINKHOLE REPAIR PROGRAM

The Town has experienced several sinkholes on their storm sewer system in the past. Sinkholes were a result of either piping pulled out of joint or crushed piping. As the Town's infrastructure ages, there will be a higher frequency of sinkholes. Whether the work is contracted out or performed by the Town's Street Department, the Town should consider an annual budget for the repair of sinkholes throughout the Town. Based on the Town's history with sinkholes, an annual amount of at least $28,000 (2021 dollars) is recommended to be set aside for the repair of sinkholes or other types of emergency repairs.

7.8 MAINTENANCE OF THE TOWN'S GEOGRAPHIC INFORMATION SYSTEMS

The Town's Geographic Information Systems (GIS) mapping developed as part of this study will require annual maintenance. Annual maintenance should include:

- Addition of stormwater management data from new subdivisions (e.g. storm sewers, detention basins, inverts, catch basins, manholes, inlets, etc.;
- Tracking of repairs to the existing system;
- Field verification and mapping of missing subdivision stormwater management systems;
- Updates of parcel and centerline information;
- Identification of depressional areas and new wetland information.

Continued maintenance of the system will also prove beneficial at a point when stormwater quality regulations encompass Towns the size of Winfield. The recommended annual maintenance cost for the Town's GIS related to stormwater management is $21,000 (Year 2021dollars).

7.9 EQUIPMENT NEEDS

THIS SECTION SHOULD BE COMPLETED WITH INPUT FROM THE TOWN AND ITS MAINTENANCE STAFF.

7.10 STAFFING NEEDS

THIS SECTION SHOULD BE COMPLETED WITH INPUT FROM THE TOWN AND ITS MAINTENANCE STAFF.

SECTION 8
FUTURE CONSIDERATIONS

Stormwater management is an evolving field and the Storm Water Management Board will continue to face new challenges as development continues and stormwater regulations become more stringent. Ordinances will require frequent updating not only for quantity regulations, but for water quality regulations.

8.1 STORMWATER MANAGEMENT ORDINANCE

As recommended in 2009, the Town has reviewed and updated its stormwater management ordinance in 2015. Previous revisions to the Town's stormwater management ordinance occurred in 2007 and 2000. Periodic reviews should continue be conducted to make sure the Town's ordinance follows current and acceptable materials, construction and engineering practices and to address new concerns of the citizens. The recommended minimum review cycle is 5 years mimicking the NPDES MS4 permit cycle. Items to be reviewed include, but should not be limited to:

- Allowable pipe materials and specifications;
- Floodplain regulations;
- Compensatory storage regulations;
- Allowable release rates and acceptable discharge locations;
- Allowable erosion control practices;
- Post construction stormwater management practices;
- Data collection needs.

8.2 COMPLIANCE WITH MS4 REGULATIONS

The Town of Winfield is considered a small municipally separated storm sewer system (MS4) community by the USEPA under the Stormwater Phase II Final Rule. However, it is **not** considered a *regulated* MS4 at this time. Based on the 2010 census, part of the Town is shown as an Urbanized Area (see **Appendix VIII-A** for the map of urbanized areas) and is adjacent to the town of Merrillville and Crown Point urbanized areas.

There are three ways a small MS4 may be designated as a regulated MS4:

- **Automatic Nationwide Designation** – A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority), and on a case-by-case basis those small MS4s located outside of UAs that the NPDES permitting authority designates. An urbanized area (UA) is a densely settled core of census tracts and/or census blocks that have population of at least 50,000, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas. At this time, the Town is mapped with the Chicago UA.
- **Potential Designation by the NPDES Permitting Authority** - An operator of small MS4 located outside of a UA have been designated as a regulated small MS4 if the NPDES permitting authority determined that its discharges cause, or have the potential to cause, an adverse impact on water quality. The Phase II Final Rule required the NPDES permitting authority to develop a set of designation criteria and apply them, at a minimum, to all small MS4s located outside of a UA serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000 people/square mile. Recommended evaluation criteria include: Discharge to sensitive waters;
  - High population density;
  - High growth or growth potential;
  - Contiguity to a UA;
  - Significant contributor of pollutants to waters of the United States; and
  - Ineffective protection of water quality concerns by other programs.
- **Potentially Designation by the NPDES Permitting Authority – Physically Interconnected** - the NPDES permitting authority was required to designate any small MS4 located outside of a UA that contributes substantially to the pollutant loadings of a physically interconnected MS4 regulated by the NPDES stormwater program. Physically interconnected means that one MS4 is connected to a second MS4 in such a way that it allows for direct discharges into the second system

While the UA map indicates the part of the Town of Winfield is an urbanized area, the Town by itself does not meet the population requirements and the Permitting Authority (IDEM) has not designated the Town of Winfield a Regulated MS4 at this time. However, as

population increases, new censuses are performed and Winfield is surrounded by other Regulated MS4's, the chances the Town may become a regulated MS4 increases.

Small MS4s can request a waiver from the Phase II Permit / Program requirements. There are two (2) options:

The first applies to jurisdictions serving less than 1,000 people within the UA (with additional conditions) and the second applies where:

(1) the jurisdiction served by the system is less than 10,000 people (with additional conditions);

(2) an evaluation of all waters of the U.S. that receive a discharge from the system shows that stormwater controls are not needed based on wasteload allocations that are part of an EPA approved or established TMDL that addresses the pollutant(s) of concern or an equivalent analysis; and

(3) it is determined that future discharges from the small MS4 do not have the potential to result in exceedances of water quality standards.

The Town of Winfield may qualify for the second waiver option if the streams the Town discharges to do not currently have a TMDL and the discharges from the Town do not have the potential to result in an exceedance in the receiving waters. It should be noted, however, if a receiving stream received a TMDL, the waiver status could change.

While the Town is not a regulated MS4, the steps required for compliance could be implemented to reduce the Town's impact on the stormwater receiving streams now and in the future. As part of compliance, a stormwater quality master plan for the community is required along with implementation of elements contained within the stormwater quality master plan. Compliance with the MS4 program usually entails the following elements:

- Public Education and Outreach – Includes education of and outreach toward the public on stormwater quality issues;
- Public Involvement / Participation – Includes the involvement and participation by the public on stormwater quality issues;
- Illicit Discharge Detection and Elimination – Involves the identification of and removal of illicit discharge sources (e.g. oil, anti-freeze, sewage, etc.) in the stormwater collection system;

- Construction Site Runoff Control – Involves taking over the responsibility of reviewing, inspecting and enforcing erosion control practices in developing areas;
- Post Construction Stormwater Management – Involves the management of stormwater quality with structural practices that are built into each new development and the retrofitting of existing stormwater systems with stormwater quality practices;
- Pollution Prevention / Good House Keeping for Municipal Operations – Involves the documentation of and the practice of good housekeeping measures designed to reduce stormwater pollution (e.g. street sweeping, disposal of maintenance liquids, etc.).

As of this update, IDEM is in the process of updating the MS4 general permits and may combine Public Outreach and Education and Public Involvement / Participation.

The Town should consider implementing a stormwater management program that could comply with the above requirements. It is possible the Town could become a regulated MS4. A program meeting the requirements would reduce potential impact on the receiving streams, document the actual impacts and may provide data to support a waiver.

8.3 DATA REQUIREMENTS COLLECTION FROM DEVELOPMENTS

As the Town continues to develop and watersheds are changed, the Town will confront new drainage problems that are more complex. Detailed information will be required to determine or confirm drainage and flooding issues as well as to evaluate alternatives. This information will include geospatial location, conveyance details (pipe lengths, materials, slopes, etc.) and detention specifics.

This information is costly to collect as field work. However, this cost can be reduced by collection and storage of information at the plan review and approval stage. Requiring all plans be submitted in state plane coordinated and NAVD88 datum in conjunction with electronic copies, developments can be entered into a GIS system at a minimal cost (discussed in Section 7.8). Requiring summary tables of storm conveyance and storage systems that include pipes sizes, lengths, materials, inverts and manhole locations in state plane coordinates, conveyance and storage information may also be managed by a GIS system, saving the Town costs of data collection later.

It is therefore recommended the Town consider revising the requirements for submittal and of approval of new construction permits. In addition, the Town should consider a

continuing effort to collect and store data for existing conveyance and storage systems in a GIS system.

8.4 PROMOTE STORMWATER QUALITY PRACTICES

Although the Town of Winfield is not a regulated MS-4 community, many of the stormwater practices used to improve water quality in MS-4 communities can be implemented in new developments or re-developments projects. They provide an aesthetic benefit as well as a real benefit for stormwater quality and conveyance systems.

Low impact development (LID) practices such as buffers and rain gardens can reduce the total amount of runoff from sites and reduce the impact on the down-stream conveyance and / or storage systems. This may be a more economical alternative to construction or reconstruction of systems where flooding has been identified as a concern.

In addition, LID practices may be used to comply with zoning green space requirements.
The Town should consider revising the ordinance to provide a manual of approved LID practices developers and engineers could voluntarily implement on new and reconstruction projects.

SECTION 9
STORMWATER UTILITY

Since 2009, the Town of Winfield has created a stormwater management board pursuant to Indiana Code 8-1.5-5. Indiana Code 8-1.5-5-7 provides for a number of methods to finance the acquisition, construction, installation, operation and maintenance of stormwater facilities. Financing of the utility comes through establishment of stormwater fees. These stormwater fees can be established by one or more of the following methods:

- A flat charge for each lot, parcel of property or building;
- The amount of impervious surface on the property;
- The number and size of storm water outlets on the property;
- The amount, strength, or character of stormwater discharged;
- The existence of improvements on the property that address storm water quality and quantity issues;
- The degree to which storm water discharged from the property affects water quality in the stormwater district;
- Any other factors the board considers necessary.

In a Special Council Meeting on September 1, 2009, the Town Council approved methodology consisting of the following elements:

- An equivalent residential unit (ERU) will be calculated based on an estimated average impervious surface of a typical residential parcel in the Town of Winfield;
- Each subdivided single family residential parcel (vacant and non-vacant) will be assessed one ERU;
- Each subdivided multi-family residential parcel, both vacant and non-vacant will be assessed one ERU. This includes duplexes, condos, triplexes and town homes;
- Each non-platted residential parcel will be assessed one ERU;
- Each commercial, industrial and exempt facility (apartment complexes, religious, school, government buildings, etc.) will be assessed a number of ERUs based on their total impervious surface divided by the value of the ERU in square feet;
- Impervious surface will consist of rooftop, asphalt and concrete;
- Each agricultural and non-platted vacant residential parcel will be assessed one billing unit per parcel.

The above criteria were used in the original 2009 masterplan to analyze data obtained from the Lake County GIS Department. Updated data (2020) was obtained from Lake County for this update and comparisons made to the 2009 data.

9.1 PARCEL STATISTICS

Parcel data provided by Lake County served as a basis for the analysis in the Section. According to the 2009 data (as of Spring 2009), Winfield contained 2,629 parcels. As of the 2020 County dataset, the Town contained 3,478 parcels and increase of 32% from 2009. The County classifies each parcel by a Property Classification Code. The table below summarizes the number of parcels and the total area by Property Classification Code. A detailed table with all current Property Classification Code descriptions is provided in **Appendix IX-A.**

Table 9.1-1
Parcel Statistics for the Town of Winfield (Property Classification, Number of Parcels, Area)

Property Description	Property Classification Code	Number of Parcels	2020 Total Area per Property Classification Code (acres)	2009 Total Area per Property Classification Code (acres)	% Change - Acres
AG-Vacant Agriculture	100	132	2705	278.0	90%
AG-Cash Grain Or General Farm	101	51	1348	3823.8	-184%
AG-Livestock	102	3	34	44.1	-30%
AG -SE	105	1	19	0	100%
AG-Nurseries	108	0	0	4.1	100%
AG-Other Agriculture Use	199	1	28	15.4	-82%
IND-Vacant Land	300	0	0	14.5	100%
COM-Vacant Land	400	11	11	53.9	-390%
COM-Apt 4-19 Units	401	2	1	49.2	-4820%
COM-Nursing Homes And Hospitals	412	0	0	14.7	100%

Table 9.1-1
Parcel Statistics for the Town of Winfield (Property Classification, Number of Parcels, Area)

Property Description	Property Classification Code	Number of Parcels	2020 Total Area per Property Classification Code (acres)	2009 Total Area per Property Classification Code (acres)	% Change - Acres
AG-B(SE)-Commerical Other Housing Agri-Business With Special Exception	419	1	2	0	100%
COM-Small Det. Retail (-10,000)	420	5	4	2.4	40%
COMM(3)-Commercial Neighborhood Shopping Center	425	6	9	0	100%
COM-Community Shopping Center	426	3	11	11.2	-2%
COM-Convenience Market	428	1	2	1.5	25%
COM-Otr Retail Structure	429	15	12	9.6	20%
COM-Rest, Cafe And/Or Bar	430	4	8	17.6	-120%
COM-Franchise Restaurant	431	2	2	0.9	55%
COMM(3)-Commercial Funeral Home	441	2	2	0	100%
COM-Medical Clinic Or Offices	442	7	35	3.5	90%
COM-Full Service Banks	444	2	2	1.0	50%
COM-Savings And Loans	445	1	1	0.9	10%
COM-Office Bldg 1 Or 2 Story	447	5	4	0.8	80%
COM-Convenience Market/Gas	450	2	2	1.5	25%

Table 9.1-1
Parcel Statistics for the Town of Winfield (Property Classification, Number of Parcels, Area)

Property Description	Property Classification Code	Number of Parcels	2020 Total Area per Property Classification Code (acres)	2009 Total Area per Property Classification Code (acres)	% Change - Acres
PDC-Commercial Convenience Market Or Franchise-Type Restaurant With Gasoline Sales	451	1	2	0	100%
COM-Auto Service Station	452	0	0	1.1	100%
COM-Car Washes	453	1	1	1.5	-50%
PDC-Commercial Garage	455	1	1	0	100%
COMM(3)-Commercial Parking Lot Or Structure	456	1	3	0	100%
COM-Health Club	467	1	1	0.7	30%
COM-Other Commercial Structures	499	1	1	115.1	-11410 %
RES-Vacant Lot	500	554	408	390.2	4%
RES-Vacant 0-9.99ac Unplatted	501	45	163	122.9	25%
RES-Vacant 10-19.99ac Unplatted	502	4	47	8.5	82%
RES-Vacant 20-29.99ac Unplatted	503	4	77	28.9	62%
PDR-Residentail (Vacant Unplatted Land Of 30-39.99 Acres)	504	2	51	0	100%
RES-Vacant 40ac + Unplatted	505	2	122	98.0	20%
RES-One Family Plt Lot	510	2,397	1,255	629.3	50%

Table 9.1-1
Parcel Statistics for the Town of Winfield (Property Classification, Number of Parcels, Area)

Property Description	Property Classification Code	Number of Parcels	2020 Total Area per Property Classification Code (acres)	2009 Total Area per Property Classification Code (acres)	% Change - Acres
RES-One Dwelling Unplated 0-9.99ac	511	112	369	356.4	3%
RES-One Dwelling Unplated 10-19.99ac	512	23	245	263.8	-8%
RES-One Dwelling Unplated 20-29.99ac	513	5	84	111.1	-32%
AG-Agriculture With Residential (One Family Dwelling On Unplatted Land Of 30-39.99 Acres)	514	1	34	0	100%
RES-One Dwelling Unplatted +40ac	515	1	41	114.9	-180%
RES-Two Family Dwelling	520	8	2	20.0	-900%
RES-Two Dwelling Unplatted 0-9.99ac	521	1	2	2.2	-10%
RES-Three Family Dwelling	530	4	2	6.0	-200%
AG-Agriculture With Residential (Mobile Or Manufactured Home Family Dwelling On Unplatted Land)	541	1	8	0	100%
RES-Other Residential Structure	599	13	69	30.8	55%

Table 9.1-1
Parcel Statistics for the Town of Winfield (Property Classification, Number of Parcels, Area)

Property Description	Property Classification Code	Number of Parcels	2020 Total Area per Property Classification Code (acres)	2009 Total Area per Property Classification Code (acres)	% Change - Acres
RES(1)-Residential And Exempt Property (Owned By The United States Of America)	600	1	7	0	100%
EXMP-County Owned	620	1	1	2.1	-110%
EXMP-Township	630	3	11	0.9	92%
EXMP-Municipality	640	9	33	25.2	24%
EXMP – Owned by Board of Education	650	7	137	0	100%
EXMP-Charitable/Granted	680	3	105	11.6	89%
EXMP-Religious Org	685	8	142	78.6	45%
EXMP-Church/ Mosque/Temple	686	2	22	21.7	1%
AG-Agriculture And State Accessed Operating Property (Owned By A Railroad Company)	841	2	3	0	100%
COMM(3)(SE)-Commercial With Locally Assessed Property With Special Exception (Owned By A Sewage Company - Commercial)	850	1	0.4	0	100%
UTIL-Local Assessed Phone	860	1	8	8.2	-2%
No data*	ND	0	0	704.7	-100%
TOTAL:		**3,478**	**7,697**	**7502.9**	**3%**

Notes:

1. A value of 0 means no parcels were classified under the Code for the respective year's data.

Note that there is a property description entitled, "No data" at the bottom of Table 9.1-1 with an assigned property classification code equal to "ND". This entry was from the 2009 analysis and did not occur in the 2020 analysis. The County appears to have cleaned and updated the "No Data parcels", essentially eliminating them in the 2020 database with respect to the Town of Winfield.

While the table frequently shows changes in acreages of near or above 100% in individual Property Classification Codes (PCC), a review of the actual acreage changes shows the high change is frequently from a small numerical change (e.g. 0 to 1 or 2).

Some of the noteworthy table changes include:

- PCC 100 and 101 (Agricultural) – The change from 2009 to 2020 for PCC 100 was an increase form 278 acres to 2,705 acres (2,427 acres). The change for 101 from 2009 to 2020 was 3824 to 1348 (-2,476), an amount approximately equivalent to the change in PCC 100. This may be attributable to more refined assignment of property codes.
- PCC 401 (Apartments of 4-19 units) – The table documents a reduction in acreage from 49.2 acres to 1.
- PCC 442 (Medical Clinic or Offices) – The table documents an increase from 3.5 acres to 35 acres.
- PCC 499 (Other Commercial) – There is a reduction from 115 to 1 acres in the table while there are increases in many of the other PCC 400 categories.
- PCC 510 (One Family Platted Lots) – The table shows almost doubling of acreage from 629 acres to 1,255 acres.
- PCC 650 (Exempt – Owned by Board of Education) – The table shows an increase in acreage from 0 to 137 acres.

Table 9.1-3 below provides a simplified summary of the parcel data by selected PCC categories.

Table 9.1-2 **Simplified Summary of Parcel Data**				
Parcel Classification (Code)	**No. of Parcels**	**2020 Total Area (acres)**	**2009 Total Area (acres)**	**% Change - Acres**
Agricultural (100s)	188	4,135	4,165	-1%
Industrial / Commercial Vacant Land (300, 400)	11	11	69	-527%
Commercial (400s, not including 400)	64	103	233	-126%
Utility (800s)	4	12	8	33%
Exempt (600s)	34	457	140	69%
Residential – Vacant Lot (500)	554	408	390	4%
Residential – Vacant & Unplatted (501, 502, 503, 504, 505)	57	460	258	44%
Residential - One or Two Dwelling or Other Residential Structure – Unplatted (511, 512, 513, 514, 515, 521, 541, 599)	157	851	879	-3%
Residential – One or Multi-Family Dwelling – Platted (510, 520, 530)	2409	1259	649	48%
Total:	**3478**	**7,696**	**6,791**	12%

Table 9.1-2 documents a large % change in PCC 400 but the actual acreage change is only 58 acres. The largest noteworthy changes in this table are the increase in exempt properties and again the increase in residential platted parcels.

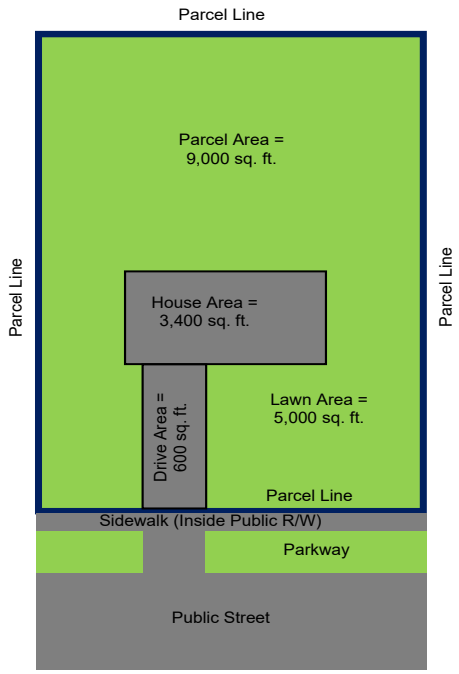
Table 9.1-3 below provides a summary of parcel data for subdivisions larger than 5 acres.

Table 9.1-3 **Summary of Subdivision Parcels (Subdivisions > 5 Acres)**			
Location / Category	**No. of Parcels**	**Avg Parcel Size (Acres)**	**% of Total Parcels**
Country Commons Subdivision	24	1.19	0.83%
Country Meadow Estates Subdivision	353	0.41	12.24%
Deer Creek Subdivision	118	0.50	4.09%
Deer Creek Trails Subdivision	15	2.37	0.52%
Doubletree Lake Estates Subdivision	574	0.43	19.90%
Doubletree Lake Estates West Subdivision	329	0.26	11.40%
Greentree Estates Subdivision	7	2.03	0.24%
Hidden Creek Estates Subdivision	152	1.54	5.27%
Latitude Subdivision	82	0.36	2.84%
Milos Meadows Subdivision	12	0.84	0.42%
Palmer Subdivision (Original Town)	28	0.60	0.97%
Prairie Crossings Of Winfield Subdivision	44	1.64	1.53%
Providence At Stonegate Subdivision	187	0.40	6.48%
Stonegate Commons Subdivision	256	0.19	8.87%
Stonegate Subdivision	150	0.49	5.20%
The Meadows Subdivision	81	0.85	2.81%
The Meadows Subdivision - Villages Of Four Seasons	26	0.11	0.90%
The Pointe Subdivision	60	0.15	2.08%
Trees Unit 2 Subdivision	119	1.83	4.12%
Trees Unit Subdivision	55	2.00	1.91%
Wynbrook Subdivision	22	0.50	0.76%
Wyndance Subdivision	191	0.40	6.62%
TOTAL:	2885		

Table 9.1-3 documents the majority of the 2,885 parcels in the larger subdivisions appear to be less than 0.5 acres.

9.2 EQUIVALENT RESIDENTIAL UNIT

The Equivalent Residential Unit (ERU) is defined as the average amount of impervious surface on an average residential lot (both single family and multi-family units) in the Town of Winfield. Impervious surface is defined as rooftop, asphalt or concrete and can be in form of buildings, driveways, sidewalks and patios. Figure 9-1 provides an example of the calculation.



Impervious surface = 3,400 + 600 = 4,000 square feet

Figure 9.2-1: Sample Impervious Area Calculation

Since the amount of typical impervious surface for residential lots in the Town of Winfield vary by location (e.g. specific subdivision and un-platted residential lots), a weighted average impervious area was calculated to account for the variations that occur from subdivision to subdivision. Impervious areas for twenty residences were computed. The locations of these residences were geographically selected proportionate to the number of residences in each of the major subdivisions. The number of residences from each area was broken down in accordance with Table 9.2-1.

Impervious data was calculated using GIS geodatabases from Lake County. Both the impervious surface shapefile and the building area shapefiles were originally created from 2013 data and updated in 2020 by the County.

Residences in Providence at Stonegate Subdivisions were not included in this analysis since they had not been updated in the impervious database from the County.

A summary of the subdivision lot sizes is provided in Table 9.2-1

Table 9.2-1 Breakdown of Subdivision Lot Size		
Subdivision / Location	**No. of Lots**	**%**
Lots <, = 0.5 Acres	2235	74%
Lots >0.5 and <1.5	268	9%
Lots >, = 1.5 and <, = 5 acres	475	16%
Lots > 5 acres	36	1%
Total	3014	

Using the results in Table 9.2-1, a sampling plan was created based on the lot size percentage. A total of 20 samples were taken from various subdivisions as shown in Table 9.2-2

Table 9.2-2 Breakdown of Sample Locations to Determine the ERU for the Town of Winfield	
Subdivision / Location	**No. of Samples**
Doubletree Lake Estates Subdivision (<0.5 acres)	3
Country Meadow Estates Subdivision (<0.5 acres)	3
Doubletree Lake Estates West Subdivision (<0.5 acres)	3
Stonegate Commons Subdivision (<0.5 acres)	2
Wyndance Subdivision (<0.5 acres)	2
Stonegate Subdivision (<0.5 acres)	2
Deer Creek Subdivision (>0.5 and <1.5 acres)	1
The Meadows Subdivision (>0.5 and <1.5 acres)	1
Hidden Creek Estates Subdivision (>, = 1.5 and <, = 5 acres)	1
Trees Unit 2 Subdivision (>, = 1.5 and <, = 5 acres)	1
Sapper's Addition Subdivision (> 5 acres)	1
	20

Random lots were chosen and the results indicated the average impervious area for the lots sampled was 4,580 sq ft (1 ERU). The 2009 Masterplan provided an estimate of 4,146 sq ft impervious area average per parcel for an ERU.

9.3 COMMERCIAL AND EXEMPT PROPERTIES – IMPERVIOUS AREA CALCULATIONS

Impervious areas were computed for each commercial and exempt properties with the GIS data. The following table summarizes the impervious area by parcel identification number and calculates the corresponding number of ERUs per parcel based on one (1) ERU equaling 4,580 square feet. In summary, the commercial and exempt properties contain approximately 2,345,779 square feet of impervious surface resulting in 512 ERUs (2,345,779/ 4,580 =512).

Table 9.3-1 Summary of Impervious Area

Parcel Classification (Code)	Impervious Area (sq ft)
Commercial, Utility, Exempt (400s, not including 400, 860, 600s)	2,345,779
Residential – Vacant Lot (500)	1,149,636
Residential – Vacant & Unplatted (501, 502, 503, 505)	330,471
Residential - One or Two Dwelling or Other Residential Structure – Unplatted (511, 512, 513, 515, 599)	2,075,099
Residential – One or Multi-Family Dwelling – Platted (510, 520, 530,*)	7,795,262
Exempt (600s, 800s)	1,985,657
TOTAL:	15,681,904

9.4 SUMMARY OF CALCULATED BILLING UNITS

Based on the methodology described in the preceding subsections and the methodology the Town Council approved on September 1, 2009, the following table was developed to identify the breakdown of billing units by parcel classification.

Table 9.4-1
Summary of Calculated Billing Units

Parcel Classification (Code)	Billing Unit Type	2020 Billing Units	2009 Total Billing Units per Classification	% Change
Agricultural (100s)	Parcel	181	185	-2%
Industrial / Commercial Vacant Land	Parcel	11	16	-31%

Table 9.4-1 Summary of Calculated Billing Units				
Parcel Classification (Code)	**Billing Unit Type**	**2020 Billing Units**	**2009 Total Billing Units per Classification**	**% Change**
(300, 400)				
Commercial, Utility, Exempt (400s, not including 400, 860, 600s)	ERU	512	751	-32%
Residential – Vacant Lot (500)	ERU	250	435	-43%
Residential – Vacant & Unplatted (501, 502, 503, 505)	ERU	72	59	22%
Residential - One or Two Dwelling or Other Residential Structure – Unplatted (511, 512, 513, 515, 599)	ERU	453	136	233%
Residential – One or Multi-Family Dwelling – Platted (510, 520, 530,*)	ERU	1,701	1,534	11%
Exempt – (600s, 800s)	ERU	433	N/A	N/A
	TOTAL:	**3,613**	**3,116**	**16%**

Again, the above table was developed based on the following assumptions:

- An equivalent residential unit (ERU) will be calculated based on an estimated average impervious surface of a typical residential parcel in the Town of Winfield;
- Each subdivided single family residential parcel (vacant and non-vacant) will be assessed one ERU;
- Each subdivided multi-family residential parcel, both vacant and non-vacant will be assessed one ERU. This includes duplexes, condos, triplexes and town homes;
- Each non-platted residential parcel will be assessed one ERU;
- Each commercial, industrial and exempt facility (apartment complexes, religious, school, government buildings, etc.) will be assessed a number of ERUs based on their total impervious surface divided by the value of the ERU in square feet;
- Impervious surface will consist of rooftop, asphalt and concrete;
- Each agricultural and non-platted vacant residential parcel will be assessed one billing unit per parcel.

9.5 FUTURE BILLING UNITS

The Town is continuing to grow. Over the course the 12 years between the original 2009 masterplan and this 2021 update, the number of billing units has increased by approximately 500 units. Developments under consideration may increase the equivalent residential units by another 1,000 units in the next five (5) years.

SECTION 10
PRIORITIZATION AND IMPLEMENTATION PLAN

This section provides guidance on regulatory coordination and permitting, prioritization and implementation of the revised stormwater master plan.

10.1 PRIORITIZATION

How a community will prioritize their capital projects will depend upon a number of factors including:

- Impacts of Flooding on Public Infrastructure (e.g. deterioration of roadway pavements, damages to culverts, etc.);
- Potential of Flooding that to Limit Access to Critical Facilities (e.g. Town garage, wastewater treatment plant, Town Hall, etc.);
- Impacts of Flooding on Access to Residences and Businesses (e.g. inconveniences, emergency services, etc.);
- Severity of Residential and / or Commercial Structure Flooding;
- Frequency of Flooding;
- Opportunity to Coordinate Projects with Other Town Projects (e.g. 109th Avenue Project, 125th Avenue Project, County Line Road Project, etc.);
- Opportunity to Coordinate with Future Land Developers to Address Localized Issues;
- Relative Project Cost.

The table below summarizes each of the stormwater problem areas, the relative probability of flooding impacts and an initial priority level ranking of each area. The lower the level, the higher the priority. The initial priority should only be considered as a beginning point and should be reviewed by the Town officials and adjusted as necessary.

Table 10.1-1
Capital Alternatives – Priorities and Summary of Factors Considered

Area	Area Description	Probability to Impact Roadway Pavement Condition	Probability to Impact Critical Facilities	Probability of Structure Flooding	Probability to Impact Public Safety	Probability to Cause Public Inconvenience	Flooding Frequency	Opportunity to Coordinate with Other Projects	Relative Project Cost	Priority Level
6	Grand Boulevard Flooding 1,600' North of 109th Avenue	Low	None	None	Low	Low	Every few years	N/A	Low	2
10	Washout of Culverts along Access Drive to Town Garage and WWTP	None	High (WWTP and Town Garage)	None	Low	Low	Infrequent	N/A	Med.	1
11	Standing Water at 104th Place in DBL West Phase 1	Med.	None	None	Low	Med.	> 1 time per year	N/A	Med.	5
14	Flooding on County Line Road	Med.	None	None	Med.	Med.	Every few years	County Line Roadway Work	High	3
16	117th Avenue Flooding Between Benton Street and Graper Ditch	High	None	None	Low	High	Every few years	N/A	Med.	1
18	Gibson Street Flooding South of 117th Avenue	Low	None	None	Low	Low	Every few years	N/A	Low	3
20	125th Avenue Roadside Drainage	High	None	None	Low	Low	N/A	125th Avenue Roadway Work	High	5
21	Flooding on Winfield Tributary #2 to Stoney Run	Low	None	None	Low	Low	Every few years	125th Avenue Roadway Work	High	6
22	Downtown Master Improvement Plan – Randolph / 109th Area	Low	None	None	Med	High	N/A	Intersection Improvements	High	5

Table 7.1-1 in Section 7 provides a preliminary priority level for each of the critical waterway maintenance activities.

10.2 REGULATORY COORDINATION AND PERMITTING

In order to implement the Plan, a review of regulatory coordination and permitting is required. This sub-section addresses such items.

The majority of the capital projects outlined in this report will not require any significant regulatory coordination or permitting since they mostly involve replacement of roadway culverts. However, the Hidden Creek improvements (Area #2) will require significant coordination with the Indiana Department of Environmental Management (IDEM) and the United States Army Corps of Engineers (ACOE) since they involve the removal of material from below the ordinary water mark of Hidden Creek. Since the drainage area to the point of work is less than one square mile, the Indiana Department of Natural Resources (IDNR) will likely not have any involvement. The creek is not a County regulated drain; therefore, coordination with Lake County is not required.

Area #16 may require excavation of new roadside ditches in and / or adjacent to wetlands. Therefore, until the details are defined further, it is anticipated that coordination with IDEM and the ACOE is required.

The following table summarizes permitting requirements for each of the alternatives developed in this plan.

Table 10.2-1
Capital and Maintenance Alternatives Regulatory Coordination and Permitting Summary

Capital Alternative	**Regulatory Agency**				
	IDNR	**IDEM**	**ACOE**	**LCSO**	**MVLL**
Area #1, Alternative 1b					
Area #2, Current Alternative		√	√		√
Area #16, Alternative 16a		√	√		
Maintenance of Waterways: Hidden Creek		√	√		√
Maintenance of Waterways: Deer Creek	√	√	√		
Maintenance of Waterways: Tributary to Deer Creek South of Meadows Subdivision		√	√		
Winfield Trib. #2 to Stoney Run		√	√		
Deer Creek: 109th Avenue to 117th Avenue		√	√		
Culvert Replacement Program	*	*	*	*	*

√ - Coordination and / or Permit Required
* – To be Evaluated on a Case by Case Basis
Blank cell – Coordination and / or Permit Not Anticipated

10.3 COORDINATION WITH OTHER PROJECTS

The Town is considering projects in the future and inclusion of the projects discussed above should be considered as part of those projects wherever possible. Additionally, as new capital projects unrelated to stormwater are proposed in the Town, a review should be

made to see if the implementation of replacement, upgrading or installation of new storm infrastructure should be considered and added to the capital project. However, each area should continue to be monitored on an annual basis and after each major storm event.

10.4 POTENTIAL ROLE OF THE STREET DEPARTMENT

The Town also needs to consider their own resources when prioritizing and implementing projects. Based on personnel and staffing available to the Town at the writing of this report, non-complex capital and maintenance projects could be completed either fully by the Street Department staff or in conjunction with contractors saving engineering and construction dollars. This would have to be reviewed on a case by case basis since the staffing resources of the Town are limited. Future review of staffing needs may be necessary as the feasibility of this approach is assessed.

APPENDICES

APPENDIX I

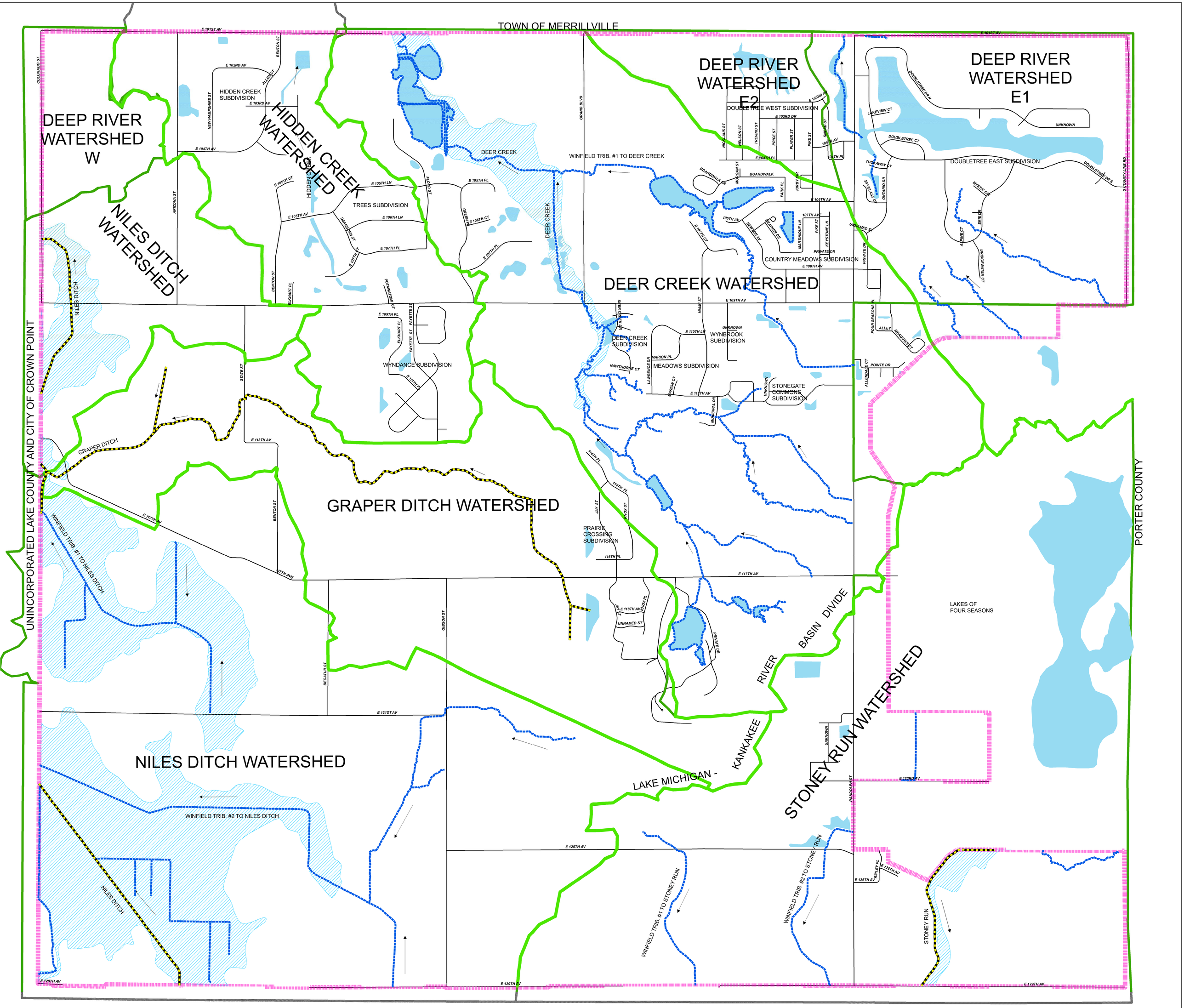
(NOT USED)

APPENDIX II

(NOT USED)

APPENDIX III

EXISTING CONDITIONS MAP, SUBDIVISION MAP, POTENTIAL TILE MAP



UNINCORPORATED LAKE COUNTY

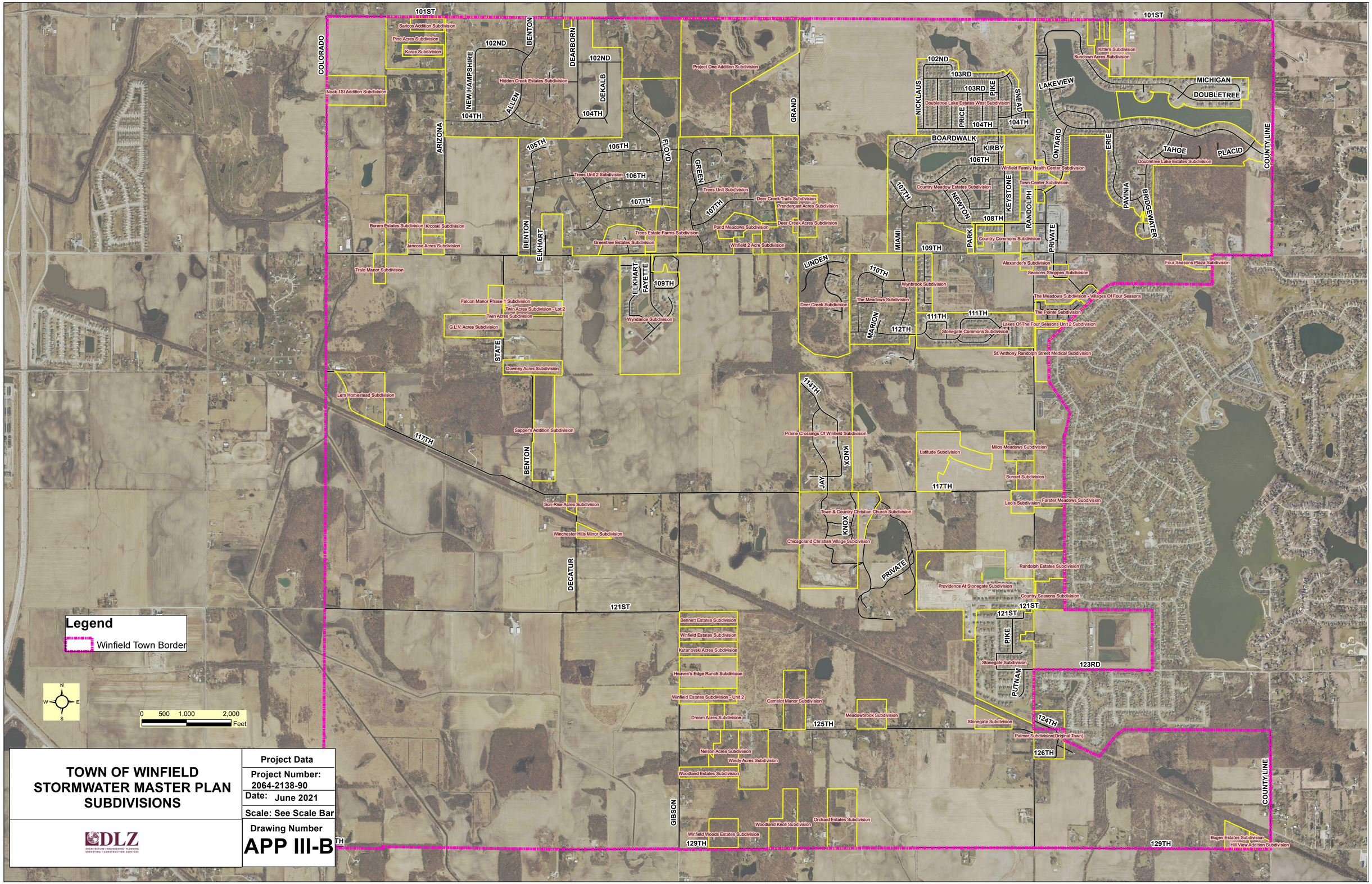
NORTH

0 1,500 3,000 6,000 Feet

Legend

- Common Drain
- Legal Drain
- Winfield Town Boundary
- Primary Watershed
- Flow_Arrows
- Ponds
- Floodplain_Crosshatch

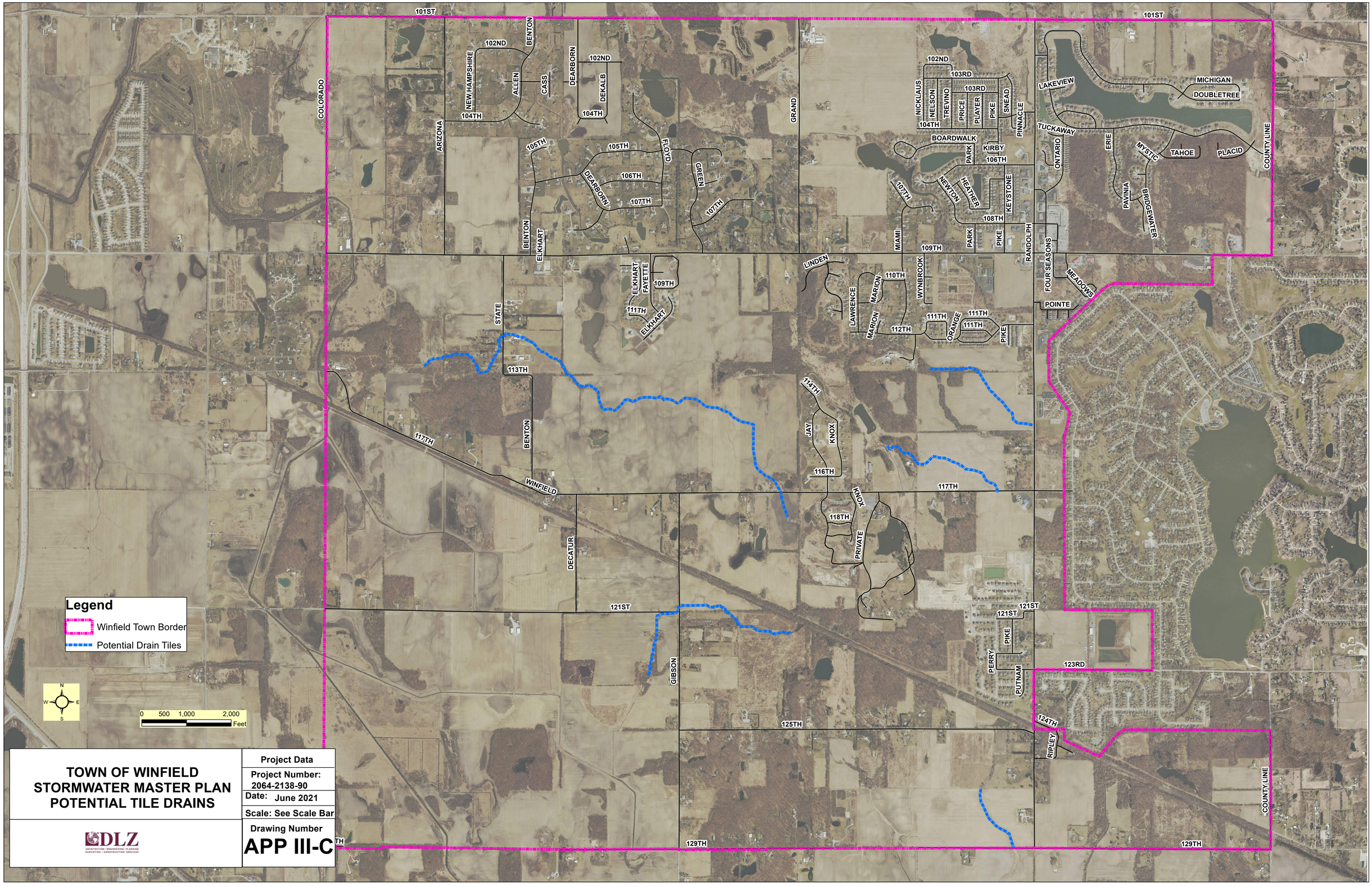
TOWN OF WINFIELD STORMWATER MASTER PLAN PRIMARY WATERSHEDS	Project Data
	Project Number: 2064-2183-90
	Date: June, 2021
	Scale: See Bar
DLZ ARCHITECTURE · ENGINEERING · PLANNING SURVEYING · CONSTRUCTION SERVICES	Drawing Number APP III-A



TOWN OF WINFIELD STORMWATER MASTER PLAN SUBDIVISIONS

DLZ
ARCHITECTURE · ENGINEERING · PLANNING
SURVEYING · CONSTRUCTION SERVICES

Project Data
Project Number: 2064-2138-90
Date: June 2021
Scale: See Scale Bar
Drawing Number
APP III-B



TOWN OF WINFIELD
STORMWATER MASTER PLAN
POTENTIAL TILE DRAINS

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES

Project Data
Project Number: 2064-2138-90
Date: June 2021
Scale: See Scale Bar
Drawing Number
APP III-C

APPENDIX IV

2009 AREAS OF CONCERN, 2021 IDENTIFIED PROBLEM LOCATIONS

APPENDIX IV-A
STORMWATER ISSUES WITHIN THE TOWN - 2009

IV-A.1 PUBLIC STORMWATER ISSUES

This section provides a summary of all of the public stormwater issues that have been logged as a result of this master plan process.

Area #1: Flooding of Arizona Street (Intersection with 109th Avenue)
Arizona Street at its intersection with 109th Avenue floods multiple times throughout the year. Runoff from the field to the northeast of the intersection of 109th Avenue and Arizona Street flows southwesterly toward the intersection. During more frequent, lesser intense storm events, runoff is conveyed to the inlet located at the northeast corner of the intersection of 109th Avenue and Arizona Street. This inlet is connected to a pipe that passes this flow to the west beneath Arizona Street. During heavier rain events and / or saturated field conditions, the inlet and culvert cannot handle the stormwater flows from the field. When this occurs, the roadway is overtopped. This roadway is one of only three routes into and out of the Hidden Creek Subdivision. All three routes experience road overtopping (Area #3 and Area #4 below) and many times the flooding of all three areas coincide with one another. The flooding can impede emergency services to the subdivision and those residents located along Arizona Street. Numerous questionnaires identified the intersection as an area of concern. While there are no photographs available for this report that show the roadway overtopping, the photograph below depicts an inundated area near this intersection.

Looking Northeast from Intersection of Arizona Street and 109th Avenue

Area #2: Flooding of Hidden Creek and Trees Subdivision

The Hidden Creek Subdivision and the Trees Subdivision flood frequently between 101st Avenue and 109th Avenue. The 104th Avenue cul-de-sac has been known to flood to a depth of mailboxes. The rear and side yards of the homes located along 104th Avenue, Cass Street, 103rd Street, Benton Street and 101st Avenue flood in the Hidden Creek Subdivision flood. The detention basin located in-line with Hidden Creek immediately east of Benton Street and south of 101st Avenue overtops its banks frequently. The house located to the southwest of the intersection of the creek and 101st Avenue has frequently flooded and has been reported to have multiple owners in the past several years. Recently, one of the homeowners of this house constructed a berm around the lower walkout level in an attempt to prevent flooding within the house. Reports of partially submerged electrical transformers have been made along this corridor and verified with photographs. Stormwater also overtops 101st Street at its intersection with Hidden Creek.

Flooding Around Homes at 4630 104th Avenue (courtesy of the resident)

Photographs of Flooding at 4630 104th Avenue (Transformer submerged on left; Living area flooded on right – Courtesy of Resident)

Within the Trees Subdivision, flooding of 105th Avenue and 107th Court has been reported. It has been reported that even 109th Avenue has overtopped once during the past couple years. Numerous complaints were received about the problems in the Trees and Hidden Creek Subdivision. There have also been reports that residents of the Trees Subdivision have removed a portion of the embankment of the Trees northernmost detention pond in an attempt to prevent flooding of their homes. Likewise, it has been reported that residents of Hidden Creek have tried to fill in the embankment that was removed. The photographs below depicts the severity of this flooding.

101st Avenue at Hidden Creek (Looking West)

House Flooding North of 101st Avenue by Hidden Creek

Hidden Creek (Looking North Toward Hidden Creek Subdivision from Trees Detention Basin)

Area #3: Flooding of Clay Street (North of 101st Avenue)

Although this location is within the Town of Merrillville, it affects residents in the Town of Winfield. Clay Street is one of the three access routes to the Hidden Creek Subdivision referred to previously that repeatedly flood. The location of flooding is approximately 1,200 feet north of the intersection of 101st Avenue and Clay Street. The source of flooding is Hidden Creek which is also the source of flooding in Area #2. The photograph below depicts the severity of this flooding.

Clay Street at Hidden Creek Crossing (Looking North)

Area #4: Flooding of 101st Avenue (West of Arizona Street)

As with Area #3, Area #4 is under the jurisdiction of Merrillville. 101st Street is one of the three access routes to Hidden Creek Subdivision that floods. The area that floods is part of a linear low lying area that extends from the southwest to the northeast through both Winfield and Merrillville. Topography indicates that the overflow for this area is toward the northeast into Merrillville, while an existing field tile is reported to exist at the southwest corner of this low area. The photograph below depicts the flooding of the roadway. Although not shown in the photograph below, the roadway has been completely submerged at times.

101st Avenue West of Arizona Street (Looking East)

Area #5: Failing Storm Sewer North of East 107th Place

In early 2008 a resident from East 107th Place notified the Town of a sinkhole that was located over a pipe near the outflow structure of the detention basin. Upon further field investigation, additional sinkholes were identified along the pipe to its outlet at Deer Creek. Bids were received from contractors to replace the line and in 2008, the Town did not have the funding available to perform the work. In the Summer of 2009, the Town repaired the sinkhole at the outlet structure with their own personnel. However, several hundred feet remain to be repaired. The pipe is a 12-inch pipe. While the problem is not a critical problem, it ultimately services Town roadways within the Trees Subdivision.

Area #6: Grand Boulevard Flooding 1,600' North of 109th Avenue

Grand Boulevard overtops at a location approximately 1,600 feet north of 109th Avenue. Only one person reported this flooding. This particular flooding event appeared to be during the occurrence of a snowmelt / rainfall combination.

Area #7: Grand Boulevard Flooding Immediately North of 109th Avenue
Grand Boulevard floods north of its intersection with 109th Avenue during extreme storm events. Runoff from the ground to the northeast of the intersection flows over the roadway. The photograph below depicts the severity of this flooding.

Grand Boulevard (Looking North Toward 109th Avenue Intersection)

Area #8: 109th Avenue Flooding by Deer Creek
Although no photographic documentation has been provided and no written testimony has been provided with respect to this flooding, 109th Avenue was verbally reported to have been overtopped by Deer Creek during the September 2008 storm event. Although this was an extreme storm event, this area will be studied since 109th Avenue is an important thoroughfare in the Town and with the new I-65 interchange at 109th Avenue, 109th Avenue will become even more important.

Area #9: 109th Avenue Flooding 150' East of Deer Creek Drive
An existing culvert is located approximately 150 feet east of Deer Creek Drive. At this location, runoff from the north side of 109th Avenue apparently flows over the top of 109th Avenue during extreme storm events.

Area #10: Culverts along Access Drive the Town Garage and WWTP
In January 2008, the access drive to the Town's WWTP and Garage washed out due to heavy rains and snowmelt. While it is likely that the washout occurred due to previous construction of a sanitary sewer force main to the WWTP from the Meadows Pump Station,

this crossing with a Tributary to Deer Creek is a very critical part of the Town's infrastructure. This is the only access into and out of the Town's property.

Area #11: Standing Water at 104th Place in DBL West Phase I

In early 2008, this problem was identified by a resident in Doubletree West Phase I. Stormwater and snowmelt is trapped along the edges of the cul-de-sac bubble at the east end of 104th Place. The standing water is slowly taking a toll on the condition of the pavement in the cul-de-sac. Due to lack of funding in 2008, this problem has not been addressed as of yet.

Area #12: Standing Water at Intersection of Ontario Drive and Randolph Street

The intersection of Ontario Drive and Randolph Street has always trapped stormwater. There are no inlets at this intersection to take the water away. While this water does not extend into Randolph Street, it still remains a nuisance and has the potential to degrade Ontario Street. Based on conversations with the Town, Ontario Street is not a public street. It is private.

Area #13: Keystone Lane Rear Yard Sinkhole

During investigations of rear yard flooding issues as part of this master plan, DLZ identified a sinkhole over the top of the storm sewer that serves the Country Meadow Estates Subdivision (west of the liquor store and Aurelios Pizza). The sinkhole at the time of observation was several feet in diameter by several feet. The photograph below depicts the sinkhole.

Photograph of Sinkhole Behind Aurelios Pizza (Photo Taken Looking North)

Area #14: County Line Road

County Line Road has historically flooded. The Town of Winfield is responsible for the operation and maintenance of this roadway. Runoff from Porter County drains into the Town of Winfield via a culvert located on County Line Road. The flow continues into an inlet structure located on the east side of the embankment constructed for Doubletree Lake Estates East. In the past, the roadway has been reported to overtop. The roadway condition in this area has also significantly deteriorated. This roadway is not a significantly traveled roadway which may be one reason it was not reported on any questionnaire returned to the Town.

Photograph Looking North on County Line Road at Low Point

Area #15: State Street Culvert on Graper Ditch

Graper Ditch is a County legal drain. It crosses State Street just south of 109th Avenue. Flooding has been reported to occur in the farm fields to the east of State Street as a result of an access driveway that was constructed across Graper Ditch just east of State Street. The true cause of this flooding has not been investigated as part of this study and cannot be verified. However, it is also reported that flooding occurs on the west side of State Street along Graper Ditch. This flooding is to be considered natural flooding and the area is meant to flood. However, there have been reported cases where State Street has overtopped at Graper Ditch.

Graper Ditch Looking West from State Street

Area #16: 117th Avenue between Benton Street and Graper Ditch

Topography along 117th Avenue is flat. Roadside ditches exist in some locations but there are no well defined outlets for these ditches. In other areas, there are not any defined roadside ditches. The 117th Avenue pavement in this area is deteriorating as a result of the poor drainage. In the past few years, the Town resurfaced, crack sealed and patched areas of 117th Avenue in this vicinity. An improved drainage system is required for this stretch of roadway if the Town is to protect their past investments in the roadway. A photograph of typical flooding along this roadway is provided below.

Typical Flooding on 117th Avenue West of Benton Street

Area #17: 117th Avenue Flooding East of Decatur Street

117th Avenue overtops at a location east of Decatur Street. 117th Avenue is a main east west route through the Town and overtopping of the roadway with stormwater can present hazards to the public. According to a local farmer and lifelong resident, the roadway has never overtopped until recent years (within the past 3-5 years). While a 12-inch culvert takes water from the south side to the north side of 117th Avenue at this location, there is also a field tile that takes water from the low lying area of the field southeast of the intersection of Decatur Street and 117th Avenue westward along 117th Avenue to an open ditch at the intersection of Benton Street and 117th Avenue. In 2002, the field tile broke in the vicinity of "Old Winfield" near the intersection of 117th Avenue and Benton Street. The Town hired a contractor to pipe burst the old tile (6-inch or 8-inch) and replace it with a new 12-inch outside diameter high density poly-ethylene pipe. The east end of this project was located just west of the intersection of Decatur Street and 117th Avenue. Presently, there is a confirmed break of the old field tile in field just southeast of the intersection of 117th Avenue and Decatur Street. It is suspected that this broken field tile may be contributing to the flooding of 117th Avenue east of Decatur. Below are photographs of the flooding at this location.

Flooding of 117th Avenue East of Decatur Street

Area #18: Gibson Street Flooding South of 117th Avenue

Contained within the same watershed as Area #17, Gibson Street floods approximately 900 feet south of 117th Avenue. No photographic documentation of this flooding was obtained for this report and frequency of flooding has not been identified. However, the street department personnel and several residents that returned questionnaires have identified it as a flooding problem. It should be noted that the areas to the east and west of Gibson at

this location are low lying and wet areas. Gibson Street is one of two main north / south roads south of 117th Avenue.

Area #19: 117th Avenue East of Christianland Village

According to residents, the telephone company installed ductwork along the south side of 117th Avenue in the vicinity over 20 years ago. As they did the work they eliminated the ditch that once used to exist and they also broke field drainage tiles. Although this has not been proven and will likely be difficult to prove, there is evidence of sinkholes along the route. The concern at this location is not necessarily with flooding, but erosion of the roadway shoulder and edge. The runoff from the properties to the south of the roadway and the south travel lane are directed to the very edge of the roadway since there is no roadside ditch. The shoulder is being eroded and the edge of the roadway is being undermined. Photographs of the eroded shoulder are provided below.

South Side of 117th Avenue Depicting Lack of Ditch and Shoulder Deterioration

Area #20: 125th Avenue Roadside Drainage

The pavement of 125th Avenue is in poor condition. This problem is enhanced by the lack of adequate roadside drainage along 125th. The Town is considering a project on 125th Avenue; however, in doing so, they need to consider provisions for improved drainage in order to protect their investment.

Area #21: Flooding on Winfield Tributary #2 to Stony Run

Farmers adjacent to this waterway have complained about flooding from upstream sources such as Stonegate and Lakes of the Four Seasons. The Winfield Tributary #2 to Stony Run is an open ditch to a point south of 125th Avenue where it enters and flows through a small tile until 129th Avenue. Between 125th and 129th Avenues, small rainfall event flows are conveyed through the tile and overland flow during larger events. Approximately 600 acres of runoff drain to 125th Avenue on this tributary.

IV-A.2 NON-PUBLIC STORMWATER ISSUES

This section provides a summary of those complaints that have been received with respect to non-public stormwater issues. The tables below identify the questionnaire identification number, the address of the complaint and the nature of the complaint. The nature of the complaint is identified as either "natural condition" or "lot grading, sump pump, or landscaping issue".

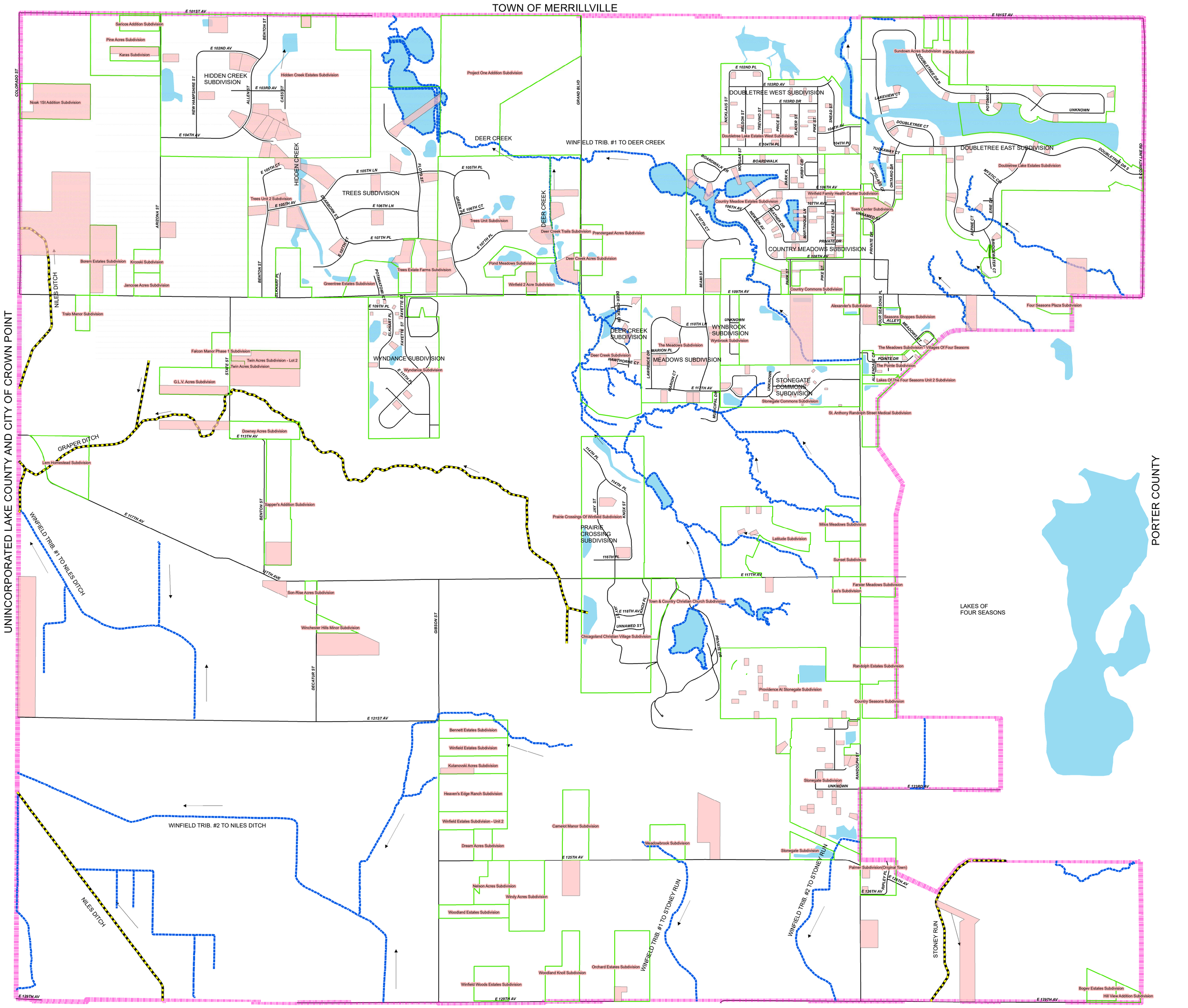
Table 4.3-1
Non-Public Stormwater Issues Summary
(Lot Grading, Groundwater, Landscaping or Sump Pump Issues)

Questionnaire ID	Address of the Complaint
8	7738 107th Avenue
14	10123 Arizona Street
15	7575 103rd Avenue
16	10759 Keystone Lane
18	11091 Miami Street
22	7221 107th Court
25	10728 Green Place
26	10491 Pike Street
27	10692 Green Place
29	11085 Marion Place
30	4303 104th Avenue
35	10495 Pike Street
37	10345 New Hampshire Street
42	4890 107th Court
44	7460 Mary Kay Court
47	10308 Nelson Street
49	5239 105th Lane
51	10348 Snead
72	7571 108th Avenue
73	5791 107th Place
74	4436 102nd Avenue

Table 4.3-1 Non-Public Stormwater Issues Summary (Lot Grading, Groundwater, Landscaping or Sump Pump Issues)	
Questionnaire ID	**Address of the Complaint**
76	5898 105th Place
79	8110 126th Place
84	4041 104th Avenue
95	7645 Amandas Way
96	10416 Trevino Street
98	10433 Snead Street
102	7600 Boardwalk
108	10851 Miami Street
109	5836 105th Place
111	12408 Gibson Street
122	11071 Marion Place
128	10290 Floyd Street
129	10337 Floyd Street
134	10316 Floyd Street
146	10735 Keystone Lane
149	7685 103rd Avenue
154	7628 103rd Drive
155	7680 Kirby Circle
158	10708 Heather Drive
159	10690 Newton Avenue
160	5246 107th Place
161	5758 106th Court
162	6320 129th Avenue
163	5955 125th Avenue
166	11107 Miami Street
170	10462 Player Street
171	7627 104th Place

Table 4.3-2 Non-Public Stormwater Issues Summary (Natural Condition Flooding)	
Questionnaire ID	**Address of the Complaint**
7	10844 Arizona Street
24	8908 109th Avenue
28	3222 121st Avenue

Table 4.3-2 Non-Public Stormwater Issues Summary (Natural Condition Flooding)	
Questionnaire ID	**Address of the Complaint**
33	11230 State Street
60	10810 Arizona Street
81	7043 112th Avenue
168	6234 109th Avenue
172	10854 Grand Boulevard



Legend

- Questionnaire_Parcels
- Subdivisions_Merged
- <all other values>

HYDRO_TYPE

- Common Drain
- Legal Drain
- Winfield Town Boundary
- Flow_Arrows
- Ponds

TOWN OF WINFIELD STORMWATER MASTER PLAN STORMWATER ISSUE PARCELS	Project Data
	Project Number: 2064-2183-90
	Date: June, 2021
	Scale: See Bar
DLZ ARCHITECTURE • ENGINEERING • PLANNING SURVEYING • CONSTRUCTION SERVICES	Drawing Number APP IV-B

APPENDIX V

(NOT USED)

APPENDIX VI

LIST OF FIGURES FOR SECTION 6

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SURVEYING · CONSTRUCTION SERVICES

Town of Winfield Stormwater Master Plan
Flooding of Hidden Creek and Trees Subdivision
2021 Alternative -Phase I: New Culverts

2064-2183-90 **Figure: 6.2 Phase I** **June 2021**

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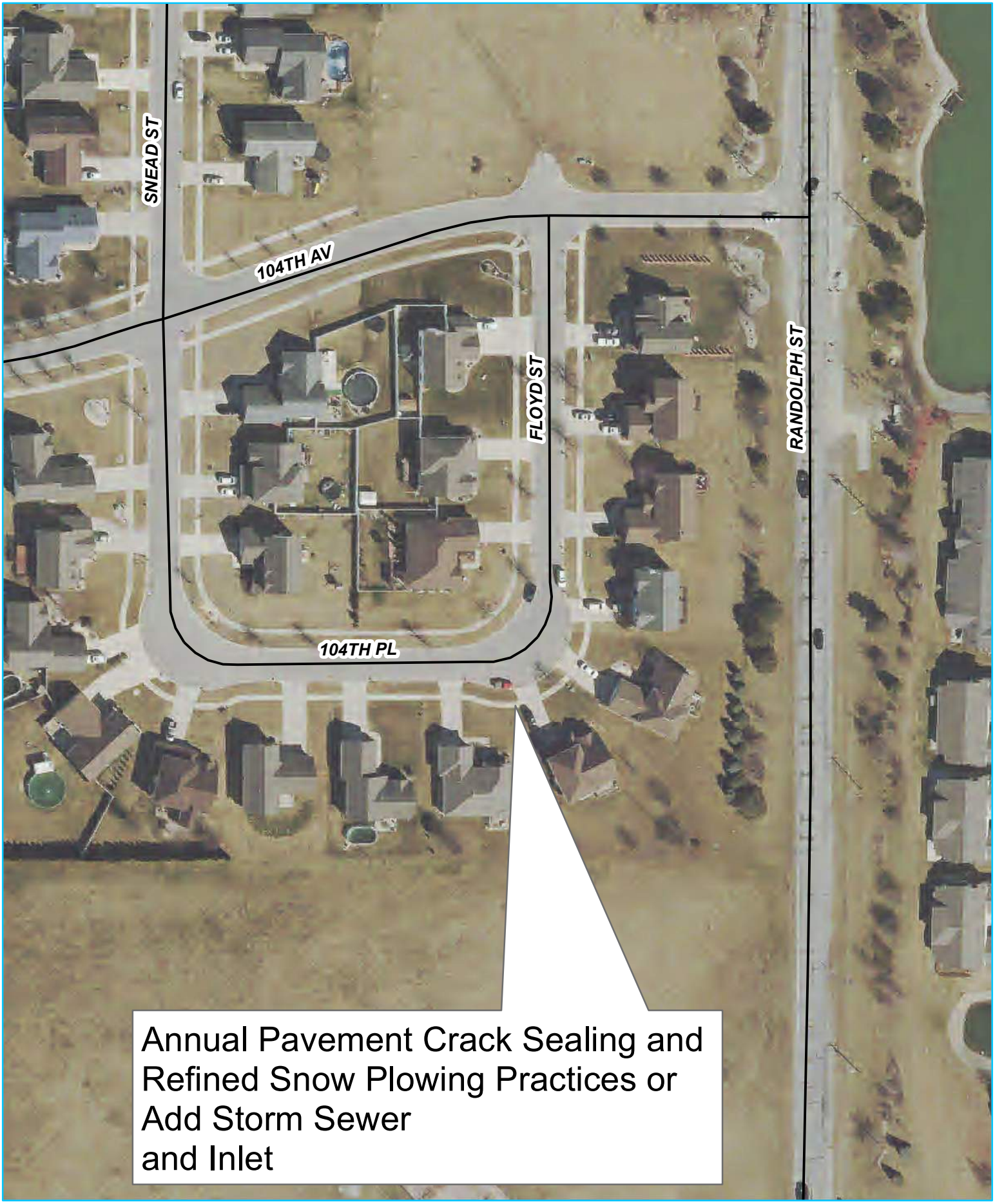
Town of Winfield Stormwater Master Plan
Culverts Under Access Drive to Town Garage & WWTP
Alternative 10 - New Culvert

2064-2183-90 **Figure: 6.10** **June 2021**



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Town of Winfield Stormwater Master Plan
Standing Water at 104th Place in DBL West Phase 1
Alternative 11- New Storm Sewer

2064-2183-90 **Figure: 6.11** **June 2021**

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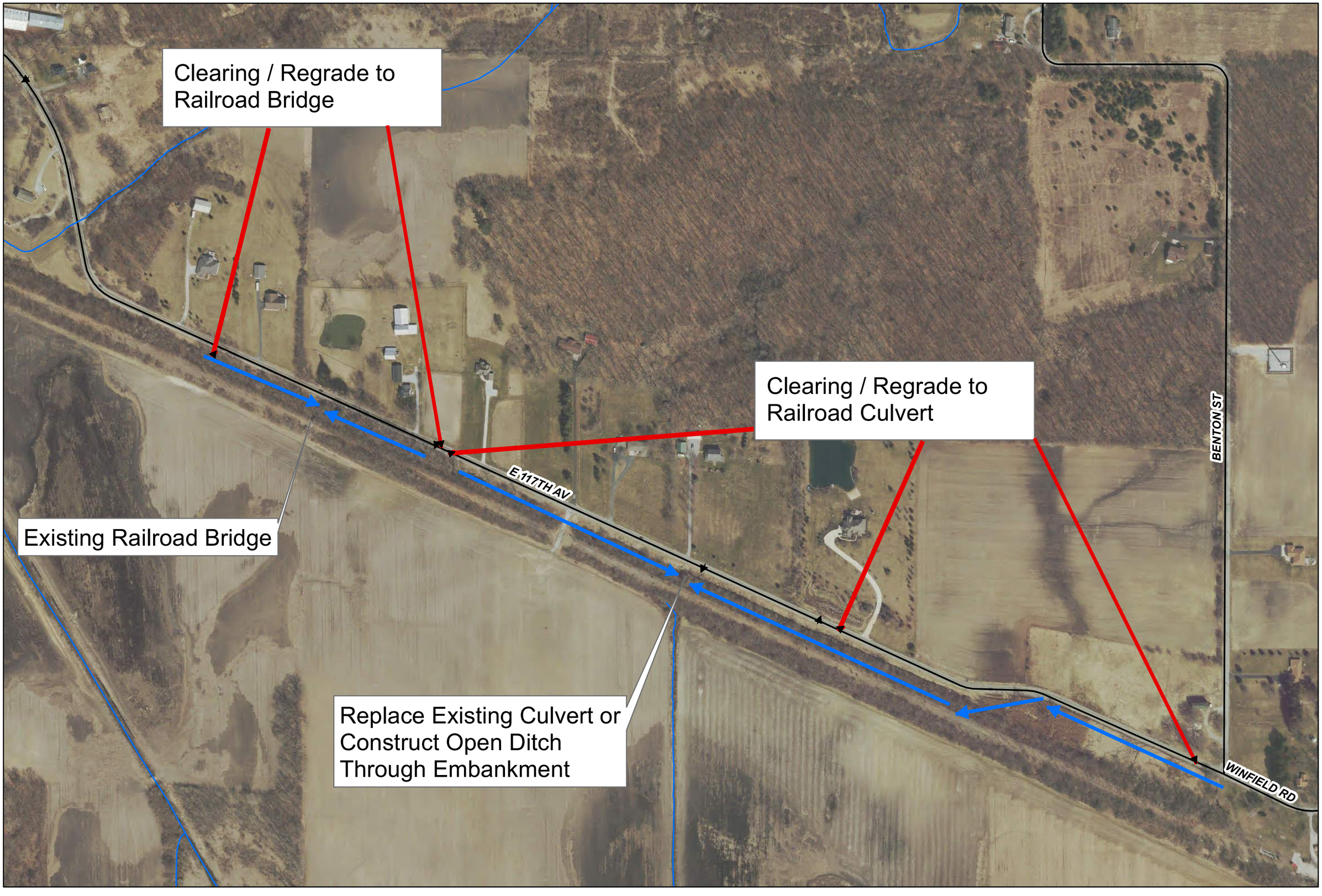
Town of Winfield Stormwater Master Plan
County Line Road Near DBL East Entrance
Alternative 14

2064-2183-90 **Figure: 6.14** **June 2021**



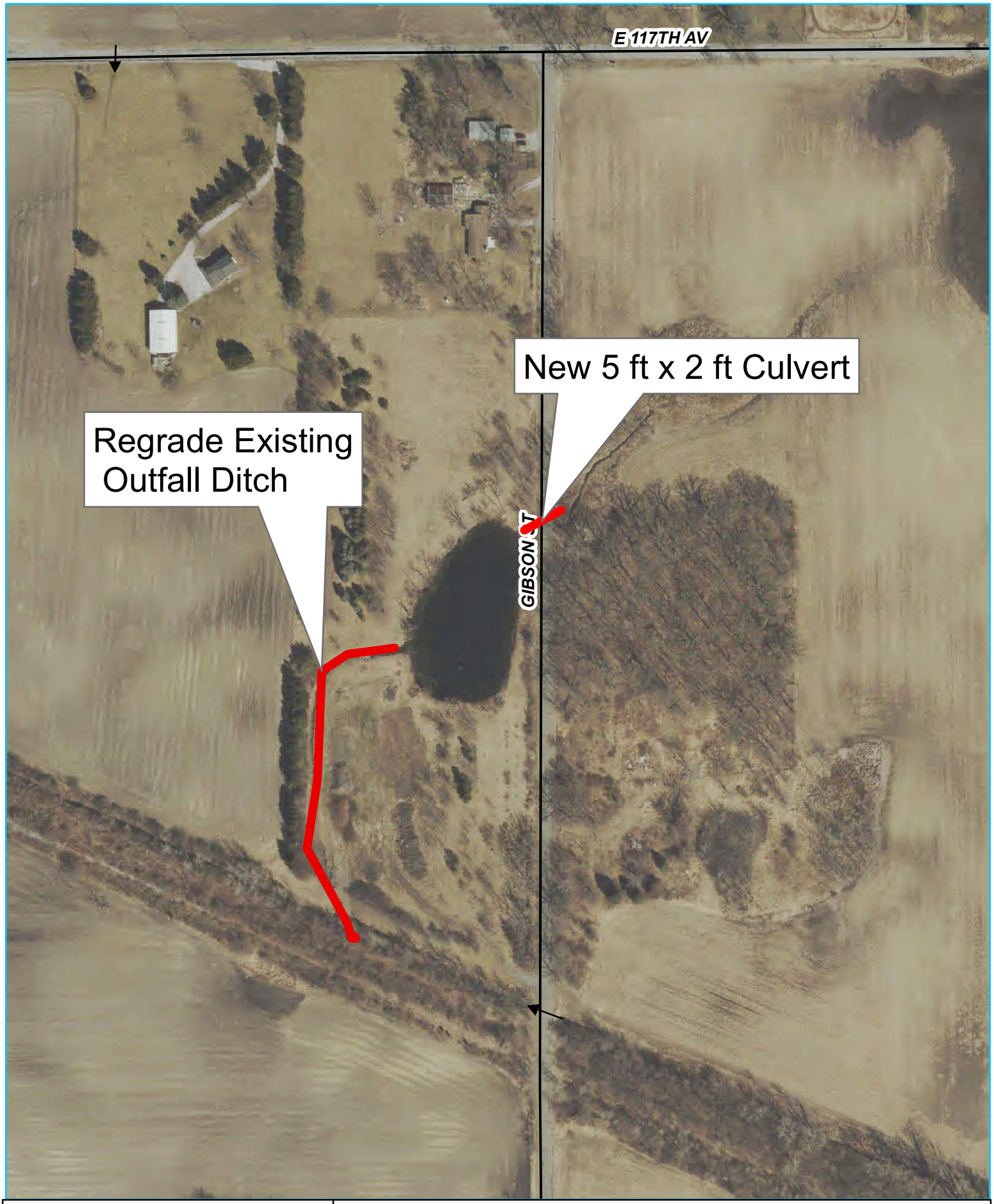
Town of Winfield Stormwater Master Plan
117th Avenue Between Benton Street and Graper Ditch
Proposed Ditch Clearing / Reconstruction

Figure: 6.16

June 2021

2064-2183-90

DLZ



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Town of Winfield Stormwater Master Plan
Gibson Street Flooding South of 117th Avenue
Alternative 18- New Culvert

2064-2183-90 **Figure: 6.18** **June 2021**

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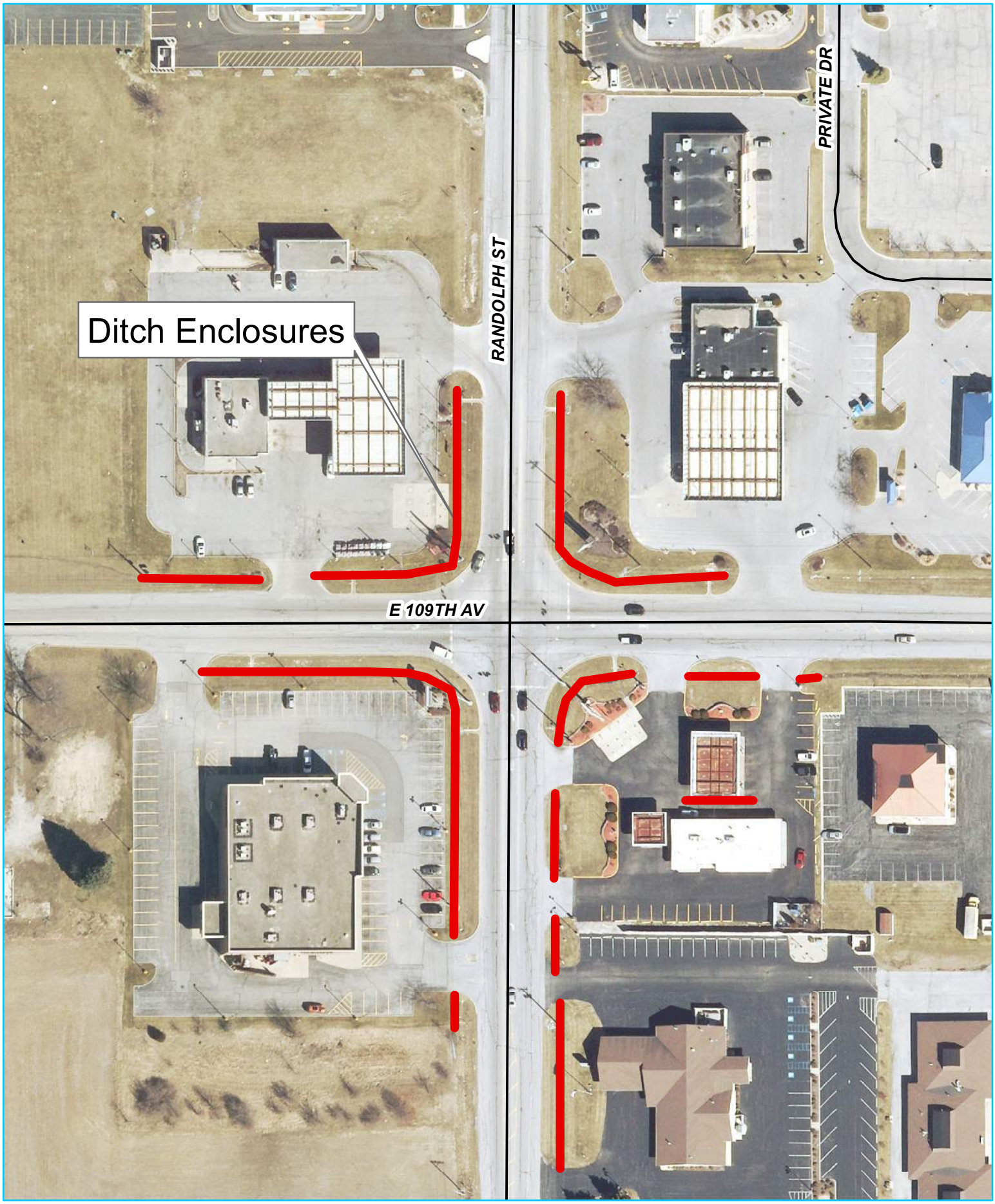
Town of Winfield Stormwater Master Plan
Flooding on Winfield Tributary #2 to Stoney Run
Alternative 21 - Reconstruct Waterway and Provide Farm Access

2064-2183-90	Figure: 6.21	June 2021



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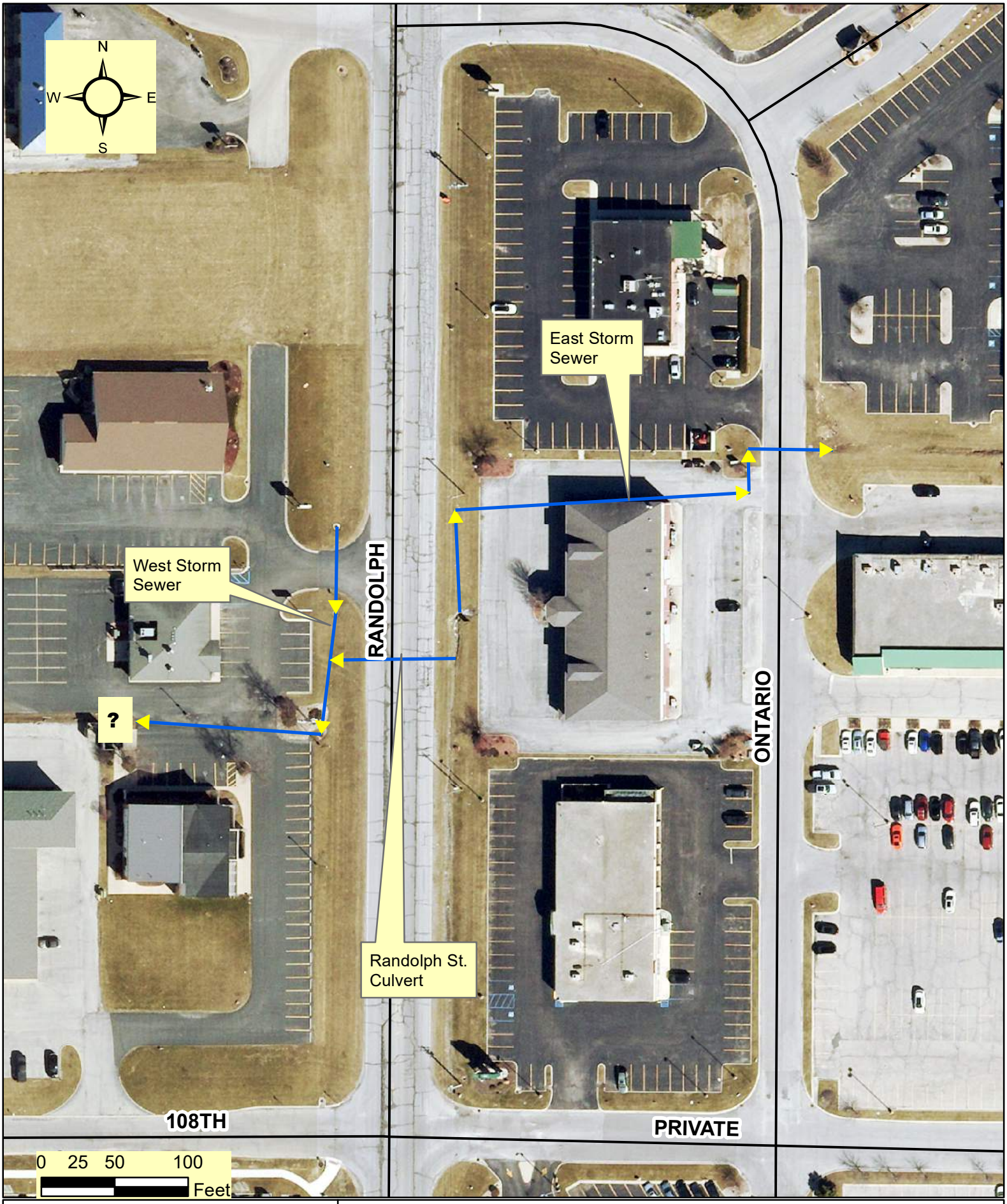
Town of Winfield Stormwater Master Plan
109th and Randolph Pedestrian Safety
Alternative 22 - Ditch Enclosures

2064-2183-90 **Figure: 6.22** **June 2021**



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Town of Winfield Stormwater Master Plan
Culvert - 10762 and 10705 Randolph Street
Area #23

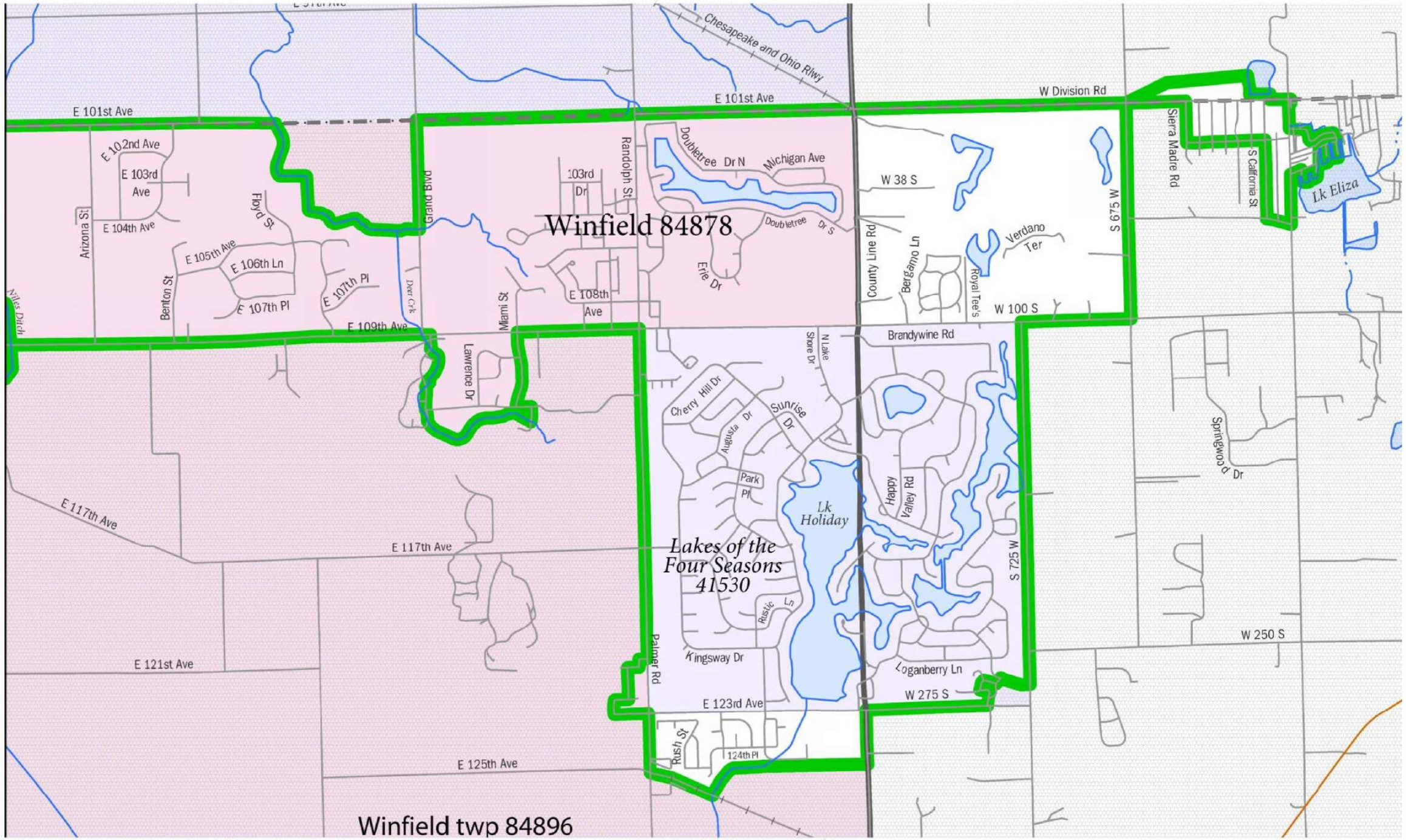
2064-2183-90 **Figure: 6.23** **June 2021**

APPENDIX VII

(NOT USED)

APPENDIX VIII

URBANIZED AREA MAP



Town of Winfield Stormwater Master Plan
Appendix VIII-A
Urbanized Area Map 2010
APP VIII-A

June 2021

2064-2183-90

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APPENDIX IX

DETAILED PROPERTY CLASSIFICATION CODES

100	AG(SE)-Vacant Agriculture Land With Special Exception AG-B(SE)-Vacant Agri-Business Land With Special Exception AG-Vacant Agriculture Land PDR-Residential With Vacant Agriculture Land RES(1)-Residential With Vacant Agriculture Land RES(2)-Residential With Vacant Agriculture Land RES(3)-Residential With Vacant Agriculture Land
101	AG(SE)-Cash Grain Or General Farm With Special Exception AG-B(SE)-Cash Grain Or General Farm Agri-Business With Special Exception AG-Cash Grain Or General Farm PDR-Residential With Cash Grain Or General Farm Agriculture RES(1)-Residential With Cash Grain Or General Farm Agriculture RES(3)(SE)-Residential With Cash Grain Or General Farm Agriculture With Special Exception RES(3)-Residential With Cash Grain Or General Farm Agriculture
102	AG(SE)-Livestock Other Than Dairy Or Poultry With Special Exception AG-Livestock Other Than Dairy Or Poultry
105	AG-Fruit And Nut Farm
199	AG-Other Agriculture Use
400	PDC-Commercial Vacant Land PDM-Mixed Use Vacant Land PDR-Residential Vacant Land
401	RES(3)-Residential With 4-19 Family Apartments RES(4)-Residential With 4-19 Family Apartments
419	AG-B(SE)-Commerical Other Housing Agri-Business With Special Exception
420	COMM(2)-Commercial Small Retail PDC-Commercial Small Retail
425	COMM(3)-Commercial Neighborhood Shopping Center PDC-Commercial Neighborhood Shopping Center
426	PDC-Commercial Community Shopping Center
428	COMM(2)-Commercial Convenience Market
429	COMM(3)(SE)-Commercial Other Retail Structures With Special Exception COMM(3)-Commercial Other Retail Structures PDC-Commercial Other Retail Structures PDM-Mixed Use Other Retail Structures
430	COMM(3)-Commercial Restaurant, Cafe, Or Bar PDC-Commercial Restaurant, Cafe, Or Bar PDM-Mixed Use Restaurant, Cafe, Or Bar
431	PDC-Commercial Franchise-Type Restaurant
441	COMM(3)-Commercial Funeral Home
442	COMM(2)-Commercial Medical Clinic Or Offices COMM(3)-Commercial Medical Clinic Or Offices PDC-Commercial Medical Clinic Or Offices PDR-Residential Medical Clinic Or Offices
444	PDC-Commercial Full Service Banks
445	PDC-Commercial Savings And Loans
447	COMM(2)-Commercial Office Building 1 or 2 Story

447	COMM(3)-Commercial Office Building 1 Or 2 Story PDC-Commercial Office Building 1 Or 2 Story RES(1)-Commercial Office Building 1 Or 2 Story
450	COMM(3)-Commercial Convenience Market With Gasoline Sales PDC-Commercial Convenience Market With Gasoline Sales
451	PDC-Commercial Convenience Market Or Franchise-Type Restaurant With Gasoline Sales
453	PDC-Commercial Car Washes
455	PDC-Commercial Garage
456	COMM(3)-Commercial Parking Lot Or Structure
467	COMM(3)-Commercial Health Club
499	COMM(3)-Commercial Other Structure
500	AG(UV)-Agriculture With Residential And Use Variance (Vacant Platted Lot) AG-Agriculture With Residential (Vacant Platted Lot) COMM(2)-Commercial With Residential (Vacant Platted Lot) PDM-Mixed Use With Residential (Vacant Platted Lot) PDR-Residential (Vacant Platted Lot) RES(1)-Residential (Vacant Platted Lot) RES(2)-Residential (Vacant Platted Lot) RES(3)-Residential (Vacant Platted Lot) RES(4)-Residential (Vacant Platted Lot)
501	AG-Agriculture With Residentail (Vacant Unplatted Land Of 0-9.99 Acres) COMM(2)-Commercial With Residentail (Vacant Unplatted Land Of 0-9.99 Acres) COMM(3)(SE)-Commercial With Residentail With Special Exception (Vacant Unplatted Land Of 0-9.99 Acres) COMM(3)-Commercial With Residentail (Vacant Unplatted Land Of 0-9.99 Acres) PDM-Mixed Use With Residentail (Vacant Unplatted Land Of 0-9.99 Acres) PDR-Residentail (Vacant Unplatted Land Of 0-9.99 Acres) RES(1)(SE)-Residentail With Special Exception (Vacant Unplatted Land Of 0-9.99 Acres) RES(1)-Residentail (Vacant Unplatted Land Of 0-9.99 Acres) RES(3)-Residentail (Vacant Unplatted Land Of 0-9.99 Acres)
502	AG-Agriculture With Residential (Vacant Unplatted Land Of 10-19.99 Acres) COMM(3)-Commercial With Residentail (Vacant Unplatted Land Of 10-19.99 Acres) PDR-Residentail (Vacant Unplatted Land Of 10-19.99 Acres)
503	AG(UV)-Agriculture With Residential And Use Variance (Vacant Unplatted Land Of 20-29.99 Acres) PDR-Residentail (Vacant Unplatted Land Of 20-29.99 Acres)
504	PDR-Residentail (Vacant Unplatted Land Of 30-39.99 Acres) RES(2)-Residentail (Vacant Unplatted Land Of 30-39.99 Acres)
505	COMM(3)(UV)-Commercial With Residential And Use Variance (Vacant Unplatted 40 Or More Acres) PDM-Mixed Use With Residential And Use Variance (Vacant Unplatted 40 Or More Acres)
510	AG-Agriculture With Residential (One Family Dwelling On Platted Lot) COMM(3)-Commercial With Residential (One Family Dwelling On Platted Lot) PDM-Mixed Use With Residential (One Family Dwelling On Platted Lot) PDR-Residential (One Family Dwelling On Platted Lot) RES(1)-Residential (One Family Dwelling On Platted Lot) RES(2)-Residential (One Family Dwelling On Platted Lot) RES(3)-Residential (One Family Dwelling On Platted Lot) RES(4)-Residential (One Family Dwelling On Platted Lot)

511	AG(SE)-Agriculture With Residential With Special Exception (One Family Dwelling On Unplatted Land Of 0-9.99 Acres) AG-Agriculture With Residential (One Family Dwelling On Unplatted Land Of 0-9.99 Acres) COMM(3)-Commercial With Residential (One Family Dwelling On Unplatted Land Of 0-9.99 Acres) RES(1)(SE)-Residential With Special Exception (One Family Dwelling On Unplatted Land Of 0-9.99 Acres) RES(1)-Residential (One Family Dwelling On Unplatted Land Of 0-9.99 Acres) RES(3)-Residential (One Family Dwelling On Unplatted Land Of 0-9.99 Acres)
512	AG-Agriculture With Residential (One Family Dwelling On Unplatted Land Of 10-19.99 Acres) RES(3)-Residential (One Family Dwelling On Unplatted Land Of 10-19.99 Acres)
513	AG-Agriculture With Residential (One Family Dwelling On Unplatted Land Of 20-29.99 Acres)
514	AG-Agriculture With Residential (One Family Dwelling On Unplatted Land Of 30-39.99 Acres)
515	AG-Agriculture With Residential (One Family Dwelling On Unplatted Land of 40 Or More Acres)
520	RES(4)-Residential (Two Family Dwelling On Platted Lot)
521	RES(3)-Residential (Two Family Dwelling On Unplatted Land Of 0-9.99 Acres)
530	AG-Agriculture With Residential (Three Family Dwelling On Platted Lot) RES(4)-Residential (Three Family Dwelling On Platted Lot)
541	AG-Agriculture With Residential (Mobiile Or Manufactured Home Family Dwelling On Unplatted Land)
599	AG(UV)-Agriculture With Residential And Use Variance (Other Structures) AG-Agriculture With Residential (Other Structures) COMM(2)-Commercial With Residential (Other Structures) COMM(3)(UV)-Commercial With Residential And Use Variance (Other Structures) RES(1)-Residential Other Retail Structures RES(3)-Residential Other Retail Structures
600	RES(1)-Residential And Exempt Property (Owned By The United States Of America)
620	AG-Agriculture And Exempt Property (Owned By County)
630	CIVIL-Civil And Exempt Property (Owned By A Township) RES(1)-Residential And Exempt Property (Owned By A Township)
640	CIVIL-Civil And Exempt Property (Owned By A Municipality) PDR(SE)-Residential And Exempt Property WIth Special Exception (Owned By A Municipality) PDR-Residential And Exempt Property (Owned By A Municipality)
650	AG-Agriculture And Exempt Property (Owned By A Board Of Education) COMM(3)(SE)-Commercial And Exempt Property With Special Exception (Owned By A Board Of Education) RES(1)-Residential And Exempt Property (Owned By A Board Of Education) RES(2)-Residential And Exempt Property (Owned By A Board Of Education)
680	AG-Agriculture And Exempt Property (Owned By A Charitable Organization That Is Granted An Exemption) PDR-Residential And Exempt Property (Owned By A Charitable Organization That Is Granted An Exemption)
685	AG(SE)-Agriculture And Exempt Property With Special Exception (Owned By A Religious Organtization That Is Granted An Exemption) RES(1)(SE)-Residential And Exempt Property With Special Exception (Owned By A Religious Organtization That Is Granted An Exemption) RES(2)(SE)-Residential And Exempt Property With Special Exception (Owned By A Religious Organtization That Is Granted An Exemption)
686	AG(SE)-Agriculture And Church, Chapel, Mosque, Synagogue, Tabernacle or Temple With Special Exception (That Is Granted An Exemption) RES(2)(SE)-Residential And Church, Chapel, Mosque, Synagogue, Tabernacle or Temple With Special Exception (That Is Granted An Exemption)
841	AG-Agriculture And State Accessed Operating Property (Owned By A Railroad Company)
850	COMM(3)(SE)-Commercial With Locally Assessed Property With Special Exception (Owned By A Sewage Company - Commercial)
860	AG(SE)-Agriculture With Locally Assessed Property With Special Exception (Owned By A Telephone, Telegraph, Or Cable Company - Commercial)

APPENDIX X

(NOT USED)