Southwest Clay Township Annexation Master Drainage Plan

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City of Carmel
Engineering Department

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Table of Contents

Section 1: Introduction

- Purpose and Scope / Content.....1
- Evaluation Area.....2
- Analysis/ Evaluation Process.....1-2
- Evaluation Criteria.....2
  - Exhibit 1: Southwest Clay Township Annexation Map.....3

Section 2: Detailed Drainage Evaluation

- Individual Subdivisions.....4-17
- Thoroughfares.....17

Section 3: Current Priority Projects

- Bridlebourne.....18
- Larkspur.....18
- Walnut Creek Woods.....18-19
- Kings Mill.....19
- Windemere.....19
- Crooked Stick Estates.....19
- Crooked Stick West.....20

Section 4: Williams Creek Watershed Management Plan.....21

  - Exhibit 2: Williams Creek Watershed Master Plan Summary Letter.....22-23
  - Exhibit 3: Williams Creek Watershed Map.....24

Section 5: Conclusions and Proposed Project Priority / Timeline.....25

Appendix A: Hamilton County Highway Department – Drainage Information

- **Section and Street Maps.....A-1 – A-11**
- **Drainage Complaint Summary.....A-12 – A-25**

Appendix B: Subdivision Drainage Pictures

- **Annally Downs.....B-1**
- **Bentley Plat.....B-2**
- **Brandywine.....B-3 – B-6**
- **Cass Estates.....B-7**
- **Crooked Stick Estates.....B-8**
- **Crooked Stick West.....B-9 – B-10**
- **North American Park.....B-11**
- **North Augusta.....B-12 – B-21**
- **Queens Manor.....B-22 – B-24**
- **Reserve at Spring Mill.....B-25 – B-26**
- **Sutton Place.....B-27**
- **Town at Weston Pointe.....B-28 – B-29**
- **Wood Haven.....B-30 – B-31**
- **106th Street and Springmill Road.....B-32 – B-40**

Section 1: Introduction

Purpose and Scope / Content

The purpose of this master drainage plan is to indicate and investigate existing or potential drainage problems within the Southwest Clay Township Annexation Territory, and provide the City of Carmel with a recommended list of priority projects and a projected timeline. Throughout the following sections of this master plan the visual evaluation of each development within the annexation territory will be discussed, as well as the thoroughfares that extend throughout the territory. The Williams Creek Watershed Management Plan which is being completed concurrently will also be identified and discussed. And finally recommended project prioritization and projected scheduling will be discussed. It is important to note that the main focus of this drainage master plan will be concentrated on the residential subdivisions that constitute the majority of the annexation territory. Some commercial developments will be briefly discussed; however, proposed improvements and project prioritization was only evaluated for the residential or mixed use developments.

Evaluation Area

The limits of the drainage evaluation / study area are the entire limits of the Southwest Clay Township annexation territory. More specifically, this area is bordered by the Clay Township Line to the west, Springmill Road to the east, 116th Street to the north, and 96th Street (Hamilton County / Marion County Line) to the south. In addition, a small portion of the annexation territory is also located on the east side of Springmill Road to the north and south of 106th Street (see Exhibit 1: Southwest Clay Township Annexation Map). Within the limits of the drainage evaluation area there are numerous residential single-family subdivisions and a small amount of commercial subdivisions. The commercial subdivisions are predominately concentrated within the west side of the annexation territory in the vicinity of Michigan Road. Residential subdivisions make up the majority of the evaluation area and consist of a combination of both County regulated and private subdivisions. The residential subdivisions also include a combination of older developments that employ little or no storm sewer systems or detention facilities, and newer developments with storm sewer systems and detention facilities designed per Hamilton County ordinance.

Analysis / Evaluation Process

The existing drainage condition analysis and evaluation process was completed by a combination of methods. The process commenced with meetings and discussions with the Hamilton County Surveyor's Office to obtain background information on all regulated drains and subdivisions within the evaluation area. Next, the Hamilton County Surveyor's Office provided drainage complaints and work orders for corrective actions for seven subdivisions (Larkspur, Walnut Creek Woods, Kings Mill, Bridlebourne, Windemere, Crooked Stick Estates and Crooked Stick West) that have been designed as priority projects by the annexation ordinance. Due to the size of the drainage complaint and work order files, they have not been included within this report. However, they are available upon request. Also, a summary of drainage complaints and background information was gathered from the Hamilton County Highway Department for the thoroughfares and local streets within the annexation area. Refer to Appendix A for the summary information gathered from the Hamilton County Highway Department. And finally, visual inspections of most commercial and residential subdivisions within the evaluation area

were performed during or after rain events. The visual inspections employed a set of evaluation criteria and made efforts to verify the information received from the Surveyor's Office. General visual inspections were also performed on the thoroughfares within the evaluation area during and after rain events. Photos of drainage issues and concerns were taken during the visual investigations, and are included within Appendix B of this report.

Evaluation Criteria

As mentioned previously, a certain set of visual evaluation criteria were utilized to determine the condition of each inspected development's overall existing drainage system. The visual evaluation criteria consisted of the following:

- Streets and Curb Inlets:
    - Flooding / standing water within traffic lanes
    - Flooding of curb inlets (if applicable)
    - Standing water within curb and gutter (if applicable)
    - Pavement failures that may suggest pipe cover issues, pipe joint failures, or underdrain failures
    - Condition and capacity of existing inlet grates (if applicable)
    - Condition and materials of inlet structures (if applicable)

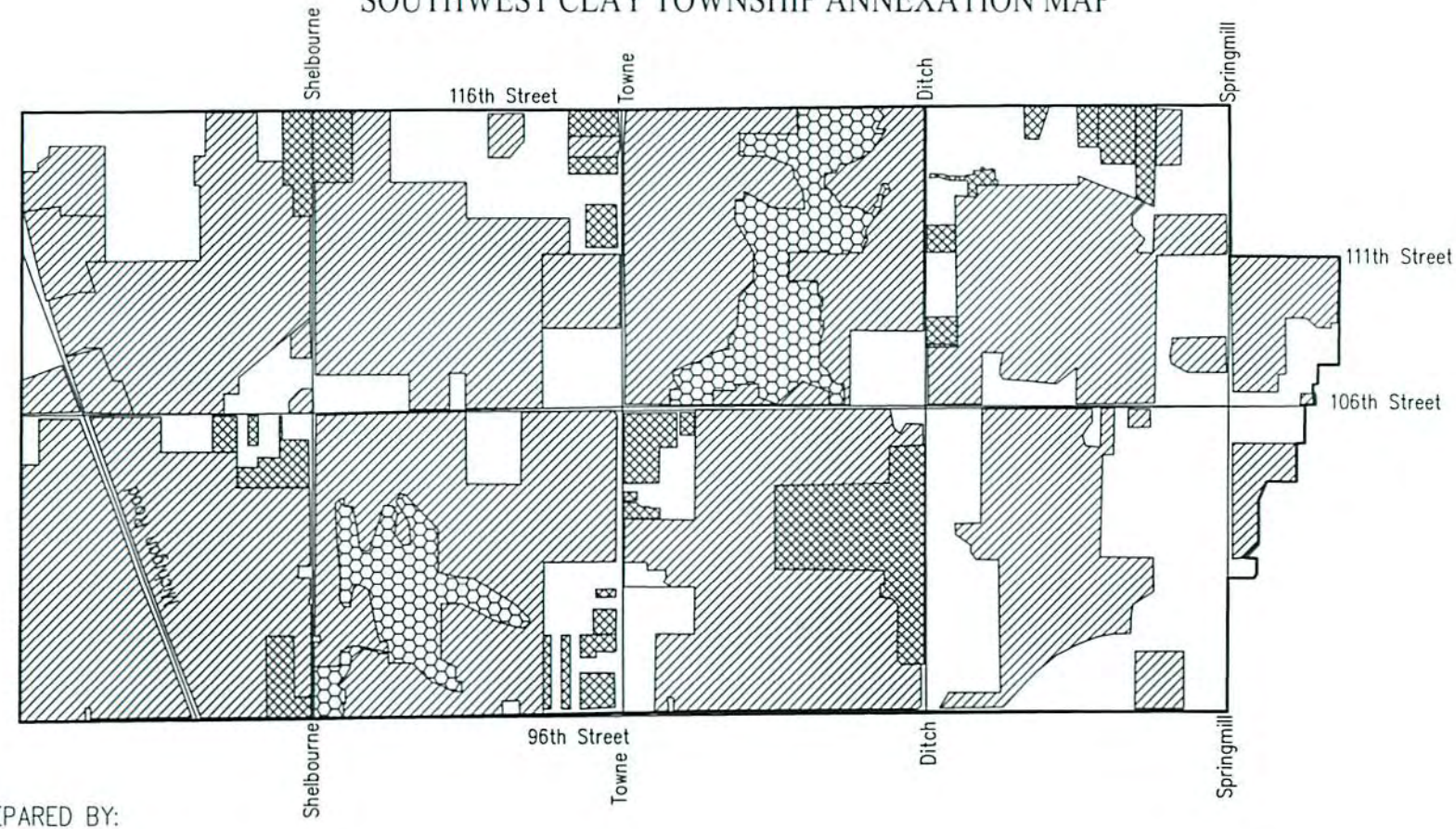
- Detention Ponds (if applicable):
    - Water surface elevation in comparison to outlet pipe (normal pool elevation)
    - Visible capacity concerns
    - Condition of outlet structures / pipes
    - Presence of debris at outlet structures / pipes
    - Presence of visible sedimentation

- Swales:
    - Flooding / standing water within swales
    - Longitudinal slope of swale (quality of ditch grading)
    - Type of swale vegetation and condition of vegetation maintenance
    - Type and condition of swale outlet (structure, end section, roadside ditch, etc.)
    - Presence of visible sedimentation
    - Presence of landscaping within conveyance limits of the swales
    - Possible areas of subsurface drainage damage (tree roots, etc.)

In addition to the above criteria, erosion control issues were also noted and evaluated for all inspected developments. Any other visual indications of existing or potential drainage issues were also noted for all developments.

EXHIBIT #1:

SOUTHWEST CLAY TOWNSHIP ANNEXATION MAP



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NORTH

SCALE : NTS

LAND USE LEGEND

- Commercial and Residential Developed Area
- Residential use 5 acres or less plus Simon Property
- Golf Courses

Section 2: Detailed Drainage Evaluation

- **Individual Subdivisions**

Annally Downs

Annally Downs is a single-family residential development on the south side of 106th Street between Shelbourne Road and Towne Road that employs sheet flow, open swales and drive culverts, and consists of no stormwater detention system. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition. Swales are generally clean and in good shape, and no standing water was present within drainage swales during visual inspection. A small amount of water ponds at the southwest corner of 106th Street and Fergus Avenue, due to the rim elevation of the existing structure (see Annally Downs pictures in Appendix B). Lowering of the structure would correct the problem, but would need further investigation to verify no utility conflicts. However, the problem is a small concentrated area and is considered minor. The Hamilton County Surveyor's Office reported only one drainage complaint on file, and it dealt with rear yard flooding. The reported area was investigated during visual inspection, and no evidence of flooding was seen. As stated, the overall drainage is in good working condition and no drainage remediation is currently recommended for this subdivision.

Ashbrook

Ashbrook is a single-family residential development on the west side of Shelbourne Road between 96th Street and 106th Street that employs a storm sewer system with an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate overall drainage system with a detention facility in good working condition. The Hamilton County Surveyor's Office reported that the subdivision gets drainage from the Weston developments to the north and periodically experiences flooding during extremely heavy rain events. Also, they reported that periodic standing water is experienced in an area where a subsurface drain outlets into an end section. However, neither of these problems was present during visual inspections and no drainage remediation is currently recommended for this subdivision.

Bella Terra

Bella Terra is a single-family residential development on the northeast corner of Towne Road and 106th Street that employs a storm sewer system with no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Bentley Plat

The Bentley Plat is a minor single-family residential development at the southwest corner of 116th Street and Towne Road that employs sheet flow, an open swale and small pipe culvert with no detention facility. A small amount of ponding was evident during visual investigation on the west side of Old Town Road between the two properties (see Bentley Plat pictures in Appendix B). It is expected that a small amount of grading work would alleviate this standing water. The Hamilton County Surveyor's Office reported that all known drainage complaints have been corrected and that they have received no new complaints. **This project should be considered a second level priority project.**

Bramblewood

Bramblewood is a single-family residential development on the north side of 96th Street between Towne Road and Ditch Road that employs a storm sewer system and on-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed no drainage issues, but the presence of hardscape obstructions within multiple drainage swales may ultimately impact drainage. The Hamilton County Surveyor's Office reports that beavers and debris block the detention pond outlet causing the pond to back up until the blockage is removed. Installation of trash screens at the outlet may help limit this problem, but regular monitoring and maintenance will still be required. Currently the overall drainage system is adequate and no drainage remediation is currently recommended for this subdivision.

Brandywine

Brandywine is a single-family residential development on the west side of Shelbourne Road between 116th Street and 106th Street that employs a combination of a storm sewer system and open swales, and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed multiple areas of water ponding within the streets' curb lines, and silting of culverts that outlet the stormwater from the development (see Brandywine pictures in Appendix B). The ponding appears to be a result of multiple overlays and the minimal curb reveal that remains. The Hamilton County Surveyor's Office stated that they have already designed drainage improvements for the subdivision, but have only completed Phase I of the designed improvements. The County is currently looking at completing Phase II of the improvements; however, they have only completed repairs on the subdivision outlets due to the cost of the overall improvements. **The planned improvements should be considered a second level priority.**

Bridlebourne

Bridlebourne is a single-family residential development on the east side of Shelbourne Road between 116th Street and 106th Street. Bridlebourne is a gated development that was unable to be accessed during rain events. The development should be visually evaluated during upcoming rain events. The Hamilton County Surveyor's Office noted that they have already been investigating this development, and a proposed improvement plan has been created. The proposed plan includes lowering the normal pool of the northern detention pond and creating additional storage volume, as well as completing outlet work on the southern pond. It is the anticipation of the County that these improvements will also correct the drainage issues within Larkspur Phase I north of this subdivision. Continued monitoring after the proposed improvements are completed should be done to analyze the impacts on drainage issues for both Bridlebourne and Larkspur Phase I. **The planned improvements should be considered a first level priority.**

Camden Walk

Camden Walk is a single-family residential development on the west side of Towne Road between 106th Street and 96th Street that employs and storm sewer system and on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Cass Estates

Cass Estates is a single-family residential development on the south side of 116th Street between the Township Line and Shelbourne Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed water ponding at inlets on Montoya Drive (see Cass Estates pictures in Appendix B); however, it is thought that the ponding is due to the inlet grates being clogged with straw and debris, and not an issue with grate capacity. The Hamilton County Surveyor's Office stated that the only complaints received are issues concerning cover over pipes, and no drainage complaints. Overall, it appears that the recently installed drainage system is adequate and in good working order. No drainage remediation is currently recommended for the subdivision.

Cedar Point

Cedar Point is single-family residential development on the north side of Interstate 465 between Ditch Road and Springmill Road that employs a storm sewer system with no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed only minor amounts of water standing along edge of pavement areas due to the pavement overlay of the roll curbs. The Hamilton County Surveyor's Office stated that drainage complaints were reported several years ago, but they were resolved and no complaints have been reported recently. Overall, it appears that the drainage system is adequate and in good working order. No drainage remediation is currently recommended for the subdivision.

Chateaux de Moulin

Chateaux de Moulin is a single-family residential development on the south side of 116th Street between Ditch Road and Springmill Road that employs a storm sewer system and on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Coppergate

Coppergate is a single-family residential development on the south side of 106th Street between Towne Road and Ditch Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed minor ponding within roadside ditches due to the presence of the landscaping in the drainage areas. Also, minor amounts of ponding in the curb and gutter eyebrow islands were reported; however, the amounts were minor and not believed to be a safety issue, and should not need to be resolved. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Crooked Stick Estates

Crooked Stick Estates is a single-family residential development on the west side of Ditch Road that extends from 116th Street to 106th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed several areas of concern. Ponding was noted within a roadside ditch north of Prestwick Lane along Ditch Road, likely due to being filled in with sedimentation. Next, water ponding on the north side of Crooked Stick Lane and Ditch Road was evident due to the presence of landscaping preventing stormwater conveyance from entering the swale behind the curb (see Crooked Stick

Estates pictures in Appendix B). Also, miscellaneous ponding in rear yard swales were reported. The Hamilton County Surveyor's Office reported drainage complaints of drainage structures failing on the west side of Ditch Road, south of Crooked Stick Lane, and near the maintenance facility. Also, several complaints due to erosion control issues were reported. Further in-depth investigation of the subdivision's drainage system is required to fully determine the corrective actions that will be required to resolve the drainage issues. **This project should be considered a first level priority.**

Crooked Stick West

Crooked Stick West is a single-family residential development of the east side of Towne Road between 116th Street and 106th Street that employs a storm sewer system, drainage ditch and an off-site detention pond. Visual evaluation on the subdivision's existing drainage system revealed several drainage issues. Ponding was noted on the approach to Towne Road across Firestone Lane which creates a safety issue. Next, the capacity of the culvert crossing Greenbrier Drive is reduced due to sedimentation and debris, and the inlet grate capacity is reduced due to the presence of a homemade casting (see Crooked Stick West pictures in the Appendix). Lastly, it was noted that the culverts crossing Tam-O-Shanter Court, Burning Tree Lane and Thunderbird Drive have no current issues, but they appear aged and should be monitored. The Hamilton County Surveyor's Office reported issues with a structure just east of Towne Road, and stated that the majority of complaints are due to erosion control issues. Further in-depth investigation of the subdivision's drainage system is required to fully determine the corrective actions that will be required to resolve the drainage issues. **This project should be considered a first level priority.**

Deerfield

Deerfield is a single-family residential development at the northwest corner of Ditch Road and 96th Street that employs a combination of a storm sewer system and open swales with drive culverts, and does not consist of a detention facility. Visual evaluation of the subdivision's existing drainage system revealed several drainage issues. Several areas with minor standing water were noted in edge of pavement areas due to asphalt overlays and minimal curb reveal. Next, erosion control issues were reported in a side yard swale of 9803 Deerfield Circle. Lastly, ponding was noted at the northwest corner of Culpepper Drive and Deerfield Circle in the roadway as sedimentation is preventing stormwater conveyance to a yard inlet. The Hamilton County Surveyor's Office stated that they completed improvements, but were not successful in resolving the drainage complaints. Further in-depth investigation of the subdivision's drainage system is required to fully determine the corrective actions that will be required to resolve the drainage issues. **This subdivision should be further investigated and considered a third level priority.**

English Oaks

English Oaks is a single-family residential development on the east side of Shelbourne Road between 116th Street and 106th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Estancia

Estancia is a private, single-family residential development south of 116th Street between Ditch Road and Springmill Road that employs sheet flow, open swales and drive culverts, and consists of no stormwater detention system. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Genung

Genung is a minor single-family residential development on the southwest corner of Ditch Road and 106th Street that employs sheet flow to an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office stated that all drainage issues were corrected by the adjacent development. No drainage remediation is currently recommended for this subdivision.

Green Tree Country Club Estates

Green Tree Country Club Estates is a single-family residential development on the north side of 96th Street between Shelbourne Road and Towne Road that employs a storm sewer system and an off-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed a minor drainage issue on Greentree Drive. Greentree Drive has very little longitudinal slope causing the water to flow very slowly to the existing inlets and pond into the travel lanes. This area did not cause a large safety concern during the visual inspection, but could create a larger concern during heavier rain events and cold weather. The Hamilton County Surveyor's Office stated that the design of proposed improvements have been placed on hold due to anticipated cost estimates. Coordination with the surveyor's office and further in-depth investigation of the subdivision's drainage system is required to fully determine the corrective actions that will be required to resolve the drainage issues. **This subdivision should be further investigated and considered a third level priority.**

Huntersfield

Huntersfield is a single-family residential development on the southeast corner of Shelbourne Road and 106th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office did state that homes were constructed in the emergency spillway for the development, but did not report any complaints related to this issue. No drainage remediation is currently recommended for this subdivision.

Huntington Chase

Huntington Chase is a single-family residential development on the southeast corner of 116th Street and Towne Road that employs a storm sewer system and an off-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office reported that sediment accumulation has been seen in the detention pond, and that the outlet from the pond was eroding. They stated that these issues have been fixed, with no further complaints. No drainage remediation is currently recommended for this subdivision.

Kings Mill

Kings Mill is a single-family residential development on the north side of 106th Street between Shelbourne Road and Towne Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing overall drainage revealed an adequate drainage system with a detention facility in good working condition. The Hamilton County Surveyor's Office reported that the end section at the west end of the subdivision becomes clogged with debris and causes yards to flood. Further investigation will be needed to determine the full extent of the proposed improvements required to correct the flooding issue. **This project should be considered a first level priority.**

Kosene

Kosene is a single-family residential development on the south side of 106th Street between Ditch Road and Springmill Road. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Lacoma Estates

Lacoma Estates is a single-family residential development between Interstate 465 and 96th Street and between Ditch Road and Springmill Road that employs a storm sewer system and no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition. Minor amounts of standing water at the edge of pavement due to asphalt overlays of roll curb on Copley Drive were noted, but amounts are minor and not a safety issue. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Larkspur Phase I

Larkspur Phase I is a single-family residential development on the south side of 116th Street between Shelbourne Road and Towne Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition; however, the Hamilton County Surveyor's Office reported drainage issues in heavy rain events due to not having a positive outlet into the northern Bridlebourne detention pond. The County believes that any issues within this development will be corrected by the lowering of the northern Bridlebourne detention pond. Additional visual inspection should be completed after the Bridlebourne improvements are completed to analysis the impacts and determine if any additional improvements are required within the development. **This project should be considered a first level priority.**

Laurel Ridge

Laurel Ridge is a newly constructed, single-family residential development southeast corner of 106th Street and Ditch Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Laurelwood

Laurelwood is a private, single-family residential development on the south side of 106th Street between Ditch Road and Springmill Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. They did state that the development's brick wall along the frontage of 106th Street was taken down by flooding in 2003, but has been rebuilt and has experienced no recent damage. No drainage remediation is currently recommended for this subdivision.

Mayflower Park

Mayflower Park is a commercial development on the north side of 96th Street between Michigan Road and the County Line that employs a combination of storm sewer systems, open swales, and drive culverts. Visual evaluations of the subdivision's existing drainage system were unable to be completed during significant rain events. The Hamilton County Surveyor's Office did note that the development consists of all private streets and a poorly designed storm sewer system that discharges to the south side of the development and flows south of 96th Street. This development should be evaluated after a significant rain event. Until that time, no drainage remediation is currently recommended for this development.

McCracken Bourdillon Estate

McCracken Bourdillon Estate is a single-family residential development on the south side of 106th Street between Ditch Road and Springmill Road that employs sheet flow with no storm sewer system or on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Meridian Suburban

Meridian Suburban is a single-family residential development on the south side of 111th Street between Springmill Road and Meridian Street (US 31) that employs a storm sewer system and no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition. Minor amounts of standing water at the edge of pavement due to asphalt overlays of roll curb were noted, but amounts are minor and not a safety issue. The Hamilton County Surveyor's Office stated that the County completed a sewer reconstruction due to tree root damage, and no additional drainage complaints have been reported since the correction. No drainage remediation is currently recommended for this subdivision.

North American Park

North American Park is a commercial development on the west side of Michigan Road north of 96th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the development's existing drainage system revealed an adequate overall drainage system in good working condition. Small areas of ponding water were visible due to pavement rutting and casting elevations (see North American Park pictures in the Appendix). These areas are considered minor and not a safety issue. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this development.

North Augusta

North Augusta is a mixed use development on the northeast corner of Michigan Road and 96th Street that employs sheet flow, open swales and drive culverts with no on-site detention facility. Visual evaluation of the development's existing drainage system revealed an aged, inadequate infrastructure system that is in poor condition. Some of the drainage issues noted includes silted pipe culverts, collapsed pipe culverts, CMP culverts that are rusted through, broken headwalls, minimal to no cover over pipes, poorly graded swales, and silted swales with overgrown vegetation. There are also areas where pavement subgrade is being washed out, causing pavement failures and safety issues (see North Augusta pictures in the Appendix). The Hamilton County Surveyor's Office also noted that the development's infrastructure is old and deteriorated, with undersized drive culverts. Further investigation and survey will be required to determine the extent of proposed improvements required to correct the numerous drainage issues. **This project should be considered a second level priority.**

Pine Lake Estates

Pine Lake Estates is a single-family residential development on the west side of Towne Road between 106th Street and 96th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office reported complaints of pipe joint separation and joint leaks, but during visual inspection there were no sinkholes or pavement deformation visible to indicate any joint separation. No drainage remediation is currently recommended for this subdivision.

Queens Manor

Queens Manor is a single-family residential development on the northeast corner of Ditch Road and 106th Street that employs sheet flow, open swales and drive culverts with no on-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed several large lengths of roadside swales holding water. It appears that the issues could be caused by a combination of damaged subsurface drainage and poor ditch grading (see Queens Manor pictures in the Appendix). The Hamilton County Surveyor's Office stated that they have had multiple maintenance issues with the subsurface drains within the development, and have previously completing dredging efforts and subsurface drain fixes. They also stated that areas of the subsurface drainage have been infiltrated by tree roots, and the County has work orders to repair the subsurface drainage when weather and site conditions permit. Additional investigation of the drainage should be performed after the work orders have been completed to determine the impact on the issues, and to determine the need for, and priority of, any additional development repairs. **This subdivision should be further investigated and considered a third level priority.**

Reserve at Spring Mill

Reserve at Spring Mill is a single-family residential development on the east side of Springmill Road between 106th Street and Interstate 465 that employs a storm sewer system and no on-site detention facility. Visual evaluation of the subdivision's existing drainage system revealed an adequate drainage system in good working condition with minimal issues to report. It was noted that there was a minimal amount of water standing in a swale between 10445 and 10455 Spring Highland Drive (see Reserve at Spring Mill pictures in the Appendix). The Hamilton County Surveyor's Office also noted this drainage swale issue, and stated that the underdrain and swale

remain wet for extended periods. They also noted that the subdivision experiences greater issues in extremely heavy rain events as the detention pond floods due to being overwhelmed by increased inflow of stormwater from the 106th Street and Springmill Road culvert to the north of the development. This issue will be further discussed in the Thoroughfares portion of this Section, as well as in the Williams Creek Watershed Management Plan Section. The County believes that the correction of the aforementioned culvert issue will rectify the detention pond flooding. Additional investigation of the pond issue should be monitored after the proposed 106th Street and Springmill Road drainage improvements are installed to determine the impact on the issues, and to determine the need for, and priority of, any additional development repairs. **This subdivision should be further investigated and considered a third level priority.**

Rosado Hill

Rosado Hill is a small, single-family residential development that is currently under construction on the southeast corner of Springmill Road and 106th Street that employs sheet flow and no on-site detention facility. Visual evaluation of the development's drainage system revealed no current drainage issues. The Hamilton County Surveyor's Office noted that as drainage bypasses the 106th Street and Springmill Road culvert and flows south in heavy rain events, the developments drive culvert becomes overwhelmed and drainage washes over the drive. As stated in the Reserve at Spring Mill section above, additional investigation of the drive overtopping issue should be monitored after the proposed 106th Street and Springmill Road drainage improvements are installed to determine the impact on the issues, and to determine the need for, and priority of, any additional development repairs. **This subdivision should be further investigated and considered a third level priority.**

Sanders Estates

Sanders Estates is a single lot, residential development on the west side of Towne Road between 106th Street and 96th Street that employs sheet flow with no storm sewer system of on-site detention facility. The development is gated and was unable to access during any rain events; however, it is anticipated that the subdivision's existing drainage is an adequate drainage system in good working condition. This should be verified during an upcoming rain event. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommeded for this subdivision.

Shelbourne Green

Shelbourne Green is a single-family residential development on the north side of 96th Street between Shelbourne Road and Towne Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. Street flooding was noted at the Troon Court and Inverness Boulevard, but it was determined that the cause were blocked inlet grates. Straw, grass clippings and debris were removed from the grate, and the water drained. The Hamilton County Surveyor's Office noted that there was a drainage complaint concerning a "low pocket" on the north side of the golf course. This area was investigated and no low pockets were visible during the rain event. No drainage remediation is currently recommended for this subdivision.

Spring Arbor

Spring Arbor is a single-family residential development on the west side of Shelbourne Road between 106th Street and 96th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office reported periodic backyard flooding due to floodplain elevations. The County removed obstructions found in pipe inverts, and that has helped correct the drainage issues. No drainage remediation is currently recommended for this subdivision.

Spring Mill Place

Spring Mill Place is a single-family residential development on the southeast corner of 111th Street and Springmill Road that employs a storm sewer system and open swales, and no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition. The Hamilton County Surveyor's Office stated that certain areas of subsurface drains periodically become plugged and causes water ponding; however, the County periodically jets these pipes and the issue is corrected. No drainage remediation is currently recommended for this subdivision.

Spring Run Estates

Spring Run Estates is a single-family residential development on the north side of 106th Street between Towne Road and Ditch Road that employs a storm sewer system and no on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed and adequate overall system with one drainage issue. Ponding was seen at the northeast corner of Crooked Stick Lane due to an existing structure taking the drainage slowly. Further investigation is required to determine the exact cause of the problem. The Hamilton County Surveyor's Office has no drainage complaints to report. **This project should be consider a second level priority.**

Springwood

Springwood is a single-family residential development on the west side of Springmill Road between 116th Street and 106th Street that employs a storm sewer system and no on-site detention facility. The development is gated and was unable to access during any rain events; however, it is anticipated that the subdivision's existing drainage is an adequate drainage system in good working condition. This should be verified during an upcoming rain event. The Hamilton County Surveyor's Office stated that there are complaints between neighbors, but had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Summer Lakes

Summer Lakes is a single-family residential development on the north side of 96th Street between Towne Road and Ditch Road that employs a storm sewer system and on-site detention facilities. The development is gated and was unable to access during any rain events; however, it is anticipated that the subdivision's existing drainage is an adequate drainage system in good working condition. The only issues noted were minor amounts of standing water within the curb line of the subdivisions acceleration and deceleration lanes. Also, there was some landscaping noticed within drainage areas that could possibly create drainage issues. The Hamilton County Surveyor's Office did note possible rear yard flooding issues in properties on the north side of Royalton Road due to drainage from the property to the north. This rear yard flooding was not

present during visual investigations, but the condition of the overall drainage system should be verified during an upcoming rain event. No drainage remediation is currently recommended for this subdivision.

Sun Mundy One Two Three

Sun Mundy One Two Three is a commercial development on the northeast corner of Michigan Road and 106th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with only minor miscellaneous parking lot and curb line ponding to report. The amounts of ponding are considered minor and not a safety issue. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Sutton Place

Sutton Place is a single-family residential development on the east side of Towne Road between 116th Street and 106th Street that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition. The only issue noted was water being trapped on the asphalt path along Towne Road due to the path falling away from the existing yard inlet (see Sutton Place pictures in the Appendix). The Hamilton County Surveyor's Office had no drainage complaints to report. Further investigation will be required to determine the exact fix for the issue of water ponding on the path. **This subdivision should be further investigated and considered a third level priority.**

The Park at Weston Place

The Park at Weston Place is a single-family residential development on the north side of 106th Street between Michigan Road and Shelbourne Road that employs a storm sewer system and an on-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office stated that there have been underdrain failures reported, but no complaints recently. No drainage remediation is currently recommended for this subdivision.

Town at Weston Place

Town at Weston Place is a multi-family residential development on the east side of Michigan Road between 116th Street and 106th Street that employs a storm sewer system and on-site detention facilities. Visual evaluation of the development's existing drainage reveals an inadequate system that is in poor condition. Several of the issues that were noted during visual inspections include: standing water at the intersection of Lemongrass Drive and Mulch Marcle Drive, standing water and flooding behind the condos facing both Lemongrass Drive and Mulch Marcle Drive, the ditch with subsurface drainage behind the condos is heavily silted limiting the capacity and conveyance of the ditch, and drainage cannot reach portions of the existing storm sewer. It also appeared that the development may be trapping water on an adjacent development. Residents claimed that during heavy rain events, water floods up to the decks behind the condos. The Hamilton County Surveyor's Office reported drainage complaints dealing with flooding behind condos, low areas behind condos that cannot drain to existing storm sewer structures, and swales and backyards that stay wet. Further investigation and survey will be required to determine the extent of proposed improvements required to correct the numerous drainage issues. **This project should be considered a second level priority.**

Treesdale

Treesdale is a single-family residential development on the east side of Towne Road between 106th Street and 96th Street that employs a storm sewer system and on-site detention facilities. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no drainage problems to report. The only issues that were noted during visual inspection were related to major erosion control issues and possible areas of sediment entering the detention pond. The Hamilton County Surveyor's Office also stated that the only complaint they have received is related to erosion control issues. No drainage remediation is currently recommended for this subdivision.

Village at Weston Place

Village at Weston Place is a single family residential development on the north side of 106th Street between Michigan Road and Shelbourne Road that employs a storm sewer system and an off-site detention facility. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Walnut Creek Woods

Walnut Creek Woods is a single family residential development on the north side of 106th Street between Shelbourne Road and Towne Road that employs a storm sewer system and on-site detention facilities. Visual evaluation of the subdivision's existing drainage revealed an aged drainage system in fair condition. The existing storm sewer appears to be old inlet block structures that may allow significant infiltration. The Hamilton County Surveyor's Office had reports of the outlet pipe for the development periodically becoming blocked by beavers and debris causing the flooding of the inlets and street north of 106th Street and in the cul-de-sac. The County has indicated this development to be a priority, but no proposed improvements have been designed yet. Further investigation and survey will be required to determine the extent of proposed improvements required to correct the flooding issues. **This project should be considered a first level priority.**

West Carmel Center

West Carmel Center is a commercial development on the southeast corner of Michigan Road and 106th Street that employs a storm sewer system and no on-site detention system. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

West Carmel Market Place

West Carmel Market Place is a commercial development on the east side of Michigan Road between 106th Street and 96th Street that employs a storm sewer system and on-site detention facilities. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with only minor amounts of standing water in the Target parking lot. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Weston Park

Weston Park is a commercial development on the south side of 106th Street between Michigan Road and the County Line that employs a storm sewer system and no on-site detention facility. Visual evaluations of the subdivision's existing drainage system were unable to be completed during significant rain events. The Hamilton County Surveyor's Office had no drainage complaints to report. This development should be evaluated after a significant rain event. Until that time, no drainage remediation is currently recommended for this development.

Weston Park Northwestern

Weston Park Northwestern is a commercial development on the west side of Michigan Road between 106th Street and 96th Street that employs a storm sewer system and no on-site detention facility. Visual evaluations of the subdivision's existing drainage system were unable to be completed during significant rain events. The Hamilton County Surveyor's Office had no drainage complaints to report. This development should be evaluated after a significant rain event. Until that time, no drainage remediation is currently recommended for this development.

Weston Ridge

Weston Ridge is a residential development on the west side of Shelbourne Road between 116th Street and 106th Street that employs a storm sewer system and on-site detention facilities. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office stated that there are numerous poor sump-pump connections to the existing storm sewer causing pavement failures. This is an issue that should continue to be monitored, but no drainage remediation is currently recommended for this subdivision.

Williams Mill

Williams Mill is a single family residential development on the west side of Springmill Road between 116th Street and 106th Street. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office had no drainage complaints to report. No drainage remediation is currently recommended for this subdivision.

Windemere

Windemere is a single family residential development on the south side of 106th Street between Towne Road and Ditch Road that employs a storm sewer system and on-site detention facilities. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in fair condition. In general, there are many landscape filled drainage swales that may create drainage issues and sedimentation evident in the 106th Street roadside ditches. It was also noted that a minor amount of water ponds at the southwest corner of Windemere Boulevard and Bishop Circle due to a sunken curb. The Hamilton County Surveyor's Office noted multiple drainage complaints and larger issues than were noted during visual investigation. The County reported issues of the development's outlet structure on 106th Street, and with a brick wall being constructed within the detention pond's emergency spillway. Further investigation will be required to determine the extent of proposed improvements required to correct the drainage issues. **This project should be considered a first level priority.**

Windsor Grove

Windsor Grove is a single family residential development at the southwest corner of 106th Street and Towne Road that employs a storm sewer system and on-site detention facilities. The development is currently not completely constructed, with several lots to be developed. Visual evaluation of the subdivision's existing drainage revealed an adequate drainage system in good working condition with no problems to report. The Hamilton County Surveyor's Office reported an old drainage complaint concerning flooding, but the County corrected the issue and have received no additional complaints. No drainage remediation is currently recommended for this subdivision.

▪ Thoroughfares

Generally, the areas along the thoroughfares within the annexation territory are largely comprised of roadside swales and ditches with drive / road culverts. In many cases, the roadside swales and ditches contain a significant amount of sedimentation and debris which reduces the flow characteristics and capacity of the swales. It was also noted that in many cases the roadside swales and ditches have minimal longitudinal slope. Further, many of the drive culverts appear aged, in poor condition, undersized, partially silted in, or a combination thereof. Some of these thoroughfare areas flood into roadway travel lanes in heavy rain events, and due to volume and speed of vehicular traffic, is a greater concern than subdivision streets. Refer to Appendix A for a summary of thoroughfare drainage complaints received by the Hamilton County Highway Department.

The thoroughfare area of primary concern during visual evaluation is the east side of Springmill Road south of 106th Street. An existing creek on the east side of Springmill Road flows south from 106th Street and turns 90 degrees into existing twin CMP culverts crossing Springmill Road that are heavily silted (see 106th Street and Spring Mill Road pictures in the Appendix). The water conveyed by the creek is to flow through the existing culverts and empty into Williams Creek. However, in extremely heavy rain events the water currently overwhelms the existing culverts and floods the creek, causing a considerable amount of drainage to flow south along Springmill Road. This drainage overwhelms the drive culvert at the Rosado Hill development and overtops the development's drive. The drainage then continues south along the east side of Springmill Road until it reaches the detention pond for the Reserve at Spring Mill development. This amount of drainage inundates the detention pond and causes the entrance of the development and the entire width of Springmill Road to flood. The Hamilton County Surveyor's Office provided a video verify this flooding. Further investigation, including drainage and pipe capacity calculations, will be required to determine the exact cause of the problem and to assist in determining the appropriate solution for the problem. As this creek is within the Williams Creek Watershed, it will be further investigated in the Williams Creek Watershed Management Plan, which will be discussed in Section 4 of this master plan. Coordination with the Williams Creek Watershed Management Plan, the City of Carmel Engineering Department, Hamilton County Highway Department, and the Hamilton County Surveyor's Office will be required to determine the most effective solution for the problem, and an estimated timeline for the proposed improvements.

Section 3: Current Priority Projects

In accordance with the Southwest Clay Township Annexation agreement, The City of Carmel will implement drainage improvements on several subdivisions that have been indicated as first level priority by the City of Carmel Engineering Department and the Hamilton County Surveyor's Office. These subdivisions include Larkspur, Walnut Creek Woods, Kings Mill, Bridlebourne, Windemere, Crooked Stick Estates and Crooked Stick West. Each of these subdivisions have been discussed within Section 2 of this master plan, and will be summarized below.

- **Bridlebourne:**
  Proposed drainage improvement plans have already been created for the Bridlebourne subdivision by Structurepoint. A portion of the proposed improvements includes lowering the storm sewer that conveys drainage from the northern pond to the southern pond, and in turn, lowering the normal pool of the northern detention pond. The lowering of the normal pool will not only create additional storage volume in the northern pond, but will also help alleviate the surcharging of the existing inlet pipe from the Larkspur subdivision's detention pond in heavy rain events; thus, promoting positive drainage from the Larkspur detention pond to the north. In addition, the proposed improvements also deal with improving the outlet of the southern detention pond. It is the anticipation of the County and Structurepoint that these improvements will correct the drainage issues within Bridlebourne, as well as correct the drainage issues within Larkspur subdivision north of the development. Continued monitoring after the proposed improvements are completed should be done to analyze the impacts on drainage issues for both Bridlebourne and Larkspur Phase I. The completion schedule of these proposed improvements shall be as discussed in Section 5 of this master plan.

- **Larkspur:**
  Currently, there have been no construction plans completed for drainage improvements to the Larkspur development. It is believed that the drainage issues are caused by the existing surface water elevations of the northern Bridlebourne detention pond, in which the Larkspur detention pond outlets. In heavy rain events, the water level in the Bridlebourne pond reaches an elevation that will not allow a positive outlet from the Larkspur pond. Therefore, as discussed in the Bridlebourne section above, it is the anticipation of the Hamilton County Surveyor's Office that the lowering of the northern Bridlebourne pond will correct any drainage issues experienced within the Larkspur development. Therefore, it is recommended that the design of any proposed Larkspur improvements be completed after the Bridlebourne improvements are completed, monitored and analyzed. The completion schedule of the proposed improvements shall be as discussed in Section 5 of this master plan.

- **Walnut Creek Woods:**
  Currently, there have been no construction plans completed for drainage improvements to the Walnut Creek Woods development. The Hamilton County Surveyor's Office believes that drainage issues within the development are due to the outlet pipe for the development periodically becoming blocked by beavers and debris causing the flooding of the inlets and street north of 106th Street and in the cul-de-sac. It will be the objective of further investigations to verify that the development's detention facility has sufficient

capacity and determine if outlet blockage is the cause of the drainage issues. If it is determined that outlet blockage is the cause of the issues, many options will be investigated in order to achieve the goal of specifying an effective, maintenance free outlet protection measure to prevent future blockages. The completion schedule of the additional investigation and proposed improvements implementation shall be as discussed in Section 5 of this master plan.

- **Kings Mill:**
  Currently, there have been no construction plans completed for drainage improvements to the Kings Mill development. The Hamilton County Surveyor's Office believes that current rear yard flooding issues within the development are due to an end section at the west end of the subdivision becoming clogged with debris. This portion of the storm sewer conveys off-site flow through the subdivision, bypassing the development's detention system. As stated in Section 2 of this master plan, further investigations of the development will be required to determine the extent of the proposed improvements that will be required to correct this drainage issue. The additional investigation will analyze the condition and capacity of this portion of the existing storm sewer. A possible solution that will be analyzed while creating the proposed improvements will be the installation of a bypass or overflow system for this existing pipe. According to the surveyor's office it will be acceptable to route a bypass / overflow system into the existing detention ponds if necessary. However, analyzing the existing detention facility will be required to determine the feasibility of this option. The completion schedule of the additional investigation and proposed improvements implementation shall be as discussed in Section 5 of this master plan.

- **Windemere:**
  Currently, there have been no construction plans completed for drainage improvements to the Windemere development. The Hamilton County Surveyor's Office believes that the drainage issues within the development are due to an outlet structure on 106th Street. Further investigations will be required to determine if there is an issue with pipe capacity, grate capacity, outlet conditions, invert elevations, or another issue. Possible solutions that will be analyzed may range from outlet structure replacement to outlet pipe upsizing depending on the results of the additional investigations. The completion schedule of the additional investigation and proposed improvements implementation shall be as discussed in Section 5 of this master plan.

- **Crooked Stick Estates:**
  Currently, there have been no construction plans completed for drainage improvements to the Crooked Stick Estates development, as the full extent and cause of the drainage issues are not yet determined for the development. Further investigation will be required to first determine the cause of the drainage issues, and then to determine the appropriate resolution for the issues. The completion schedule of the additional investigation and proposed improvements implementation shall be as discussed in Section 5 of this master plan.

- **Crooked Stick West:**
  Currently, there have been no construction plans completed for drainage improvements to the Crooked Stick West development, as the full extent and cause of the drainage issues are not yet determined for the development. Further investigation will be required to first determine the cause of the drainage issues, and then to determine the appropriate resolution for the issues. The completion schedule of the additional investigation and proposed improvements implementation shall be as discussed in Section 5 of this master plan.

Section 4: Williams Creek Watershed Management Plan

Christopher B. Burke Engineering, LTD. (CBBEL) is completing a Williams Creek Watershed Management Plan for the Hamilton County Surveyor's Office. Currently, CBBEL is still is the early stages of research, investigation, delineation, etc. and expects to have the plan completed in at least draft form by September 2009. Per CBBEL (refer to Exhibit 2: Williams Creek Watershed Master Plan Summary Letter) the management plan will identify the Indiana Department of Natural Resources (IDNR) Construction in a Floodway limits for Williams Creek, note existing drainage problems within the Williams Creek Watershed, revise the Flood Insurance Study (FIS) model of Williams Creek and identify potential flood problems at stream crossings or buildings along the stream, investigate and propose a solution for the aforementioned flooding of 106th Street and Springmill Road, investigate water quality issues within the watershed, and to investigate existing stormwater release rate requirements. As the majority of the Southwest Clay Township Annexation Territory is located within the Williams Creek Watershed (refer to Exhibit 3: Williams Creek Watershed Map), coordination with the management plan will be required to ensure that this drainage master plan is thorough and comprehensive. As different sections of the management plan are completed and become available, they will need to be reviewed to determine if any revisions or additions to this drainage master plan should be completed.

EXHIBIT #2

WILLIAMS CREEK WATERSHED MASTER PLAN SUMMARY

CHRISTOPHER B. BURKE ENGINEERING, LTD.

National City Center Suite 1368 South 115 W. Washington St. Indianapolis Indiana 46204 TEL (317) 266-8000 FAX (317) 632-3306 TOLL FREE (888) 463-1974

June 23, 2009

Mr. Willie Hall
Crossroad Engineers, PC
3417 S. Sherman Drive
Beech Grove, IN 46107

RE: Williams Creek Watershed Master Plan – Hamilton County
(CBBEL Proj. No. 07-0760)

Dear Mr. Hall:

This letter is in response to your inquiry about the Williams Creek Watershed Master Plan that we are working on for the Hamilton County Surveyor's Office. You are completing a study of drainage issues for the City of Carmel for an area that is planned to be annexed. Per the map you provided, almost all of the proposed annexation area is within the Williams Creek watershed. Christopher B. Burke Engineering (CBBEL) is currently preparing a Master Plan for the watershed which is scheduled to be completed in at least draft form in September 2009. As part of the Master Plan, CBBEL has done or will do the following:

- Identify the one square mile drainage area location for showing the limits where Construction in the Floodway permits are required by the Indiana Department of Natural Resources

- Note existing problems based on discussions with the Hamilton County Surveyor's Office, City of Carmel, and a public meeting (which 5 residents attended)

- Revise and extend the Flood Insurance Study modeling of Williams Creek from the County line upstream to 156th Street based on the County one foot contour interval topographic mapping to reflect the revised Coordinated Discharges that IDNR determined. Use this model to identify the extent of potential flood problems at stream crossings or buildings along the stream.

- Investigate the reasons for and propose a conceptual solution to the regular flooding of Springmill Road just south of 106th Street.

- Investigate water quality in the watershed and make recommendations for improvements.

- Determine whether the existing default release rates for new development are appropriate for all of this watershed and then make recommendations for addressing the situation if not.

As portions of the report are completed and reviewed, they will be posted on the watershed web site http://www.cbbel-in.com/williamscreek/index.html .

Sincerely,

Siavash E. Beik, P.E., CFM
Head, Water Resources Department

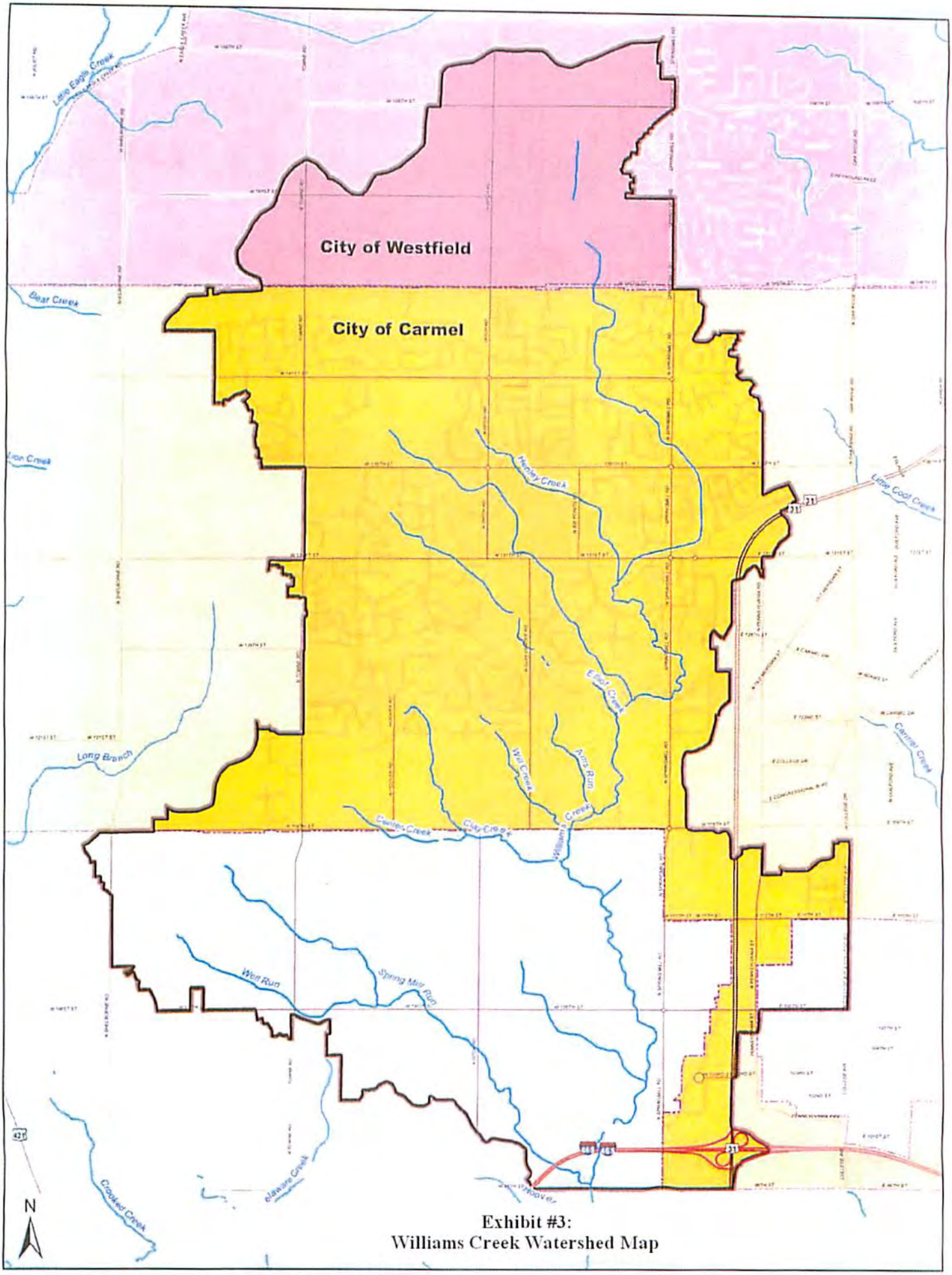


Exhibit #3:
Williams Creek Watershed Map

Section 5: Conclusions and Proposed Project Priority / Timeline

As discussed in Section 3 of this drainage master plan, the City of Carmel and the Hamilton County Surveyor's Office have previously selected seven subdivisions within the annexation territory to be first level priority projects. These subdivision include Larkspur, Walnut Creek Woods, Kings Mill, Bridlebourne, Windemere, Crooked Stick Estates and Crooked Stick West. However, visual evaluations and drainage complaint reviews have revealed that additional subdivisions have specific drainage issues as described in this report. For this master plan, these improvement projects were included in a second level priority list. These subdivisions include Bentley Plat, Brandywine, North Augusta, Spring Run Estates and Town at Weston Place. Lastly, it was determined that several subdivisions within the annexation territory will require further investigation to determine the extent of the problems and need for improvements. For this master plan, these were included in a third level priority list. These subdivisions include Deerfield, Greentree Country Club Estates, Queens Manor, Summer Lakes, Sutton Place, Reserve at Spring Mill and Rosado Hill.

The timeline for all proposed drainage improvements implementation shall be as dictated by the Southwest Clay Annexation ordinance. Proposed improvement implementation shall consist of both plan preparation and construction completion for each development. Per the ordinance, the seven predetermined first level priority projects shall have the proposed drainage improvements designed and constructed by July 27, 2012. The second and third level priority projects shall have the proposed drainage improvements designed and constructed by July 27, 2014.

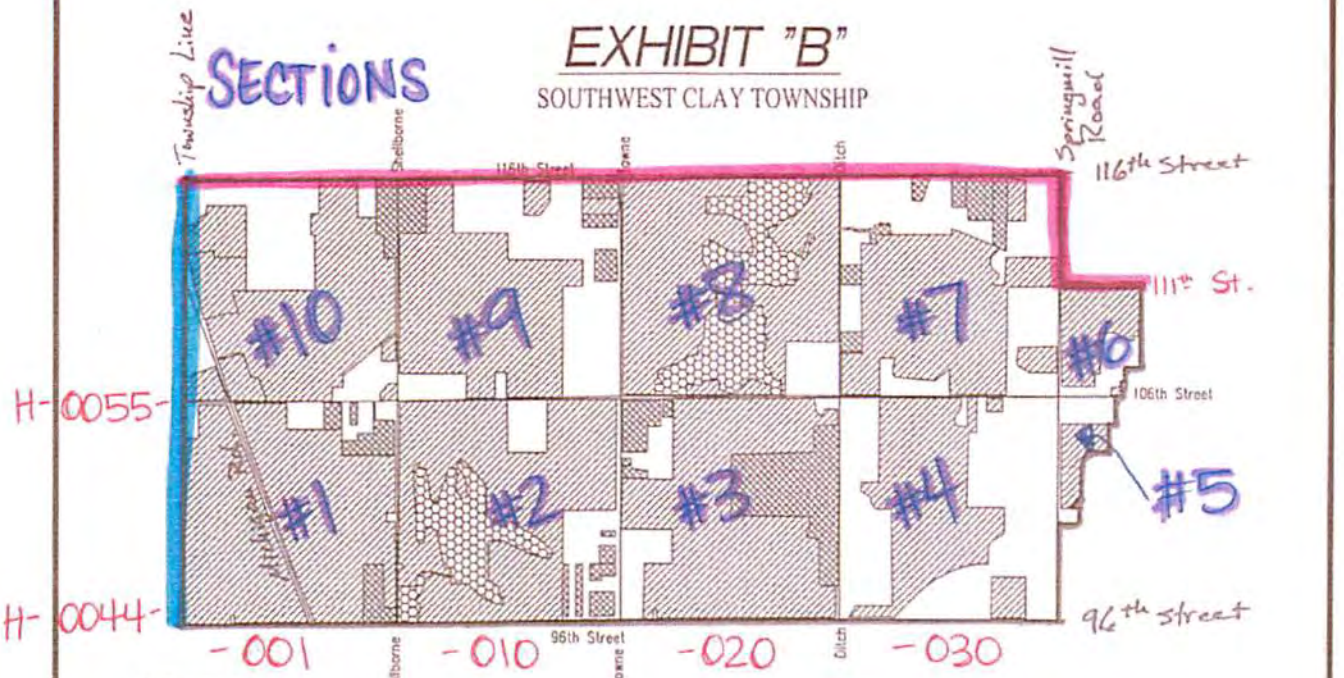
Appendix A: Hamilton County Highway Department – Drainage Information

- **Section and Street Maps.....A-1 – A-11**
- **Drainage Complaint Summary.....A-12 – A-25**

CARMEL ST. DEPT. 317-733-2001

EXHIBIT "B"

SOUTHWEST CLAY TOWNSHIP



PREPARED BY:

CROSSROAD ENGINEERS, PC

Transportation & Development Consultants

NORTH

SCALE : NTS

CORPORATE BOUNDARY	232352242.0810	
LEVEL 1 (has an area of	139966052.7600	60.24%
LEVEL 2a (residential use 5 acres or less)	14811180.0156	6.37%
LEVEL 2b (golf courses)	13411290.1717	5.77%
LEVEL 3 (N.S.P. excluding 116th St.)	3133555.1341	1.35%
TOTAL	171322078.0814	73.73%

BOONE CO. HWY. 765-482-4550

SECTION #1

Hamilton County Highway Department

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Map Contents

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  - hwy_centerline
  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
  - 2007 Voter Precincts
  - Subdivisions
  - Parcels
  - 2008 Orthos
  - 2007 Orthos
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  - Hydro
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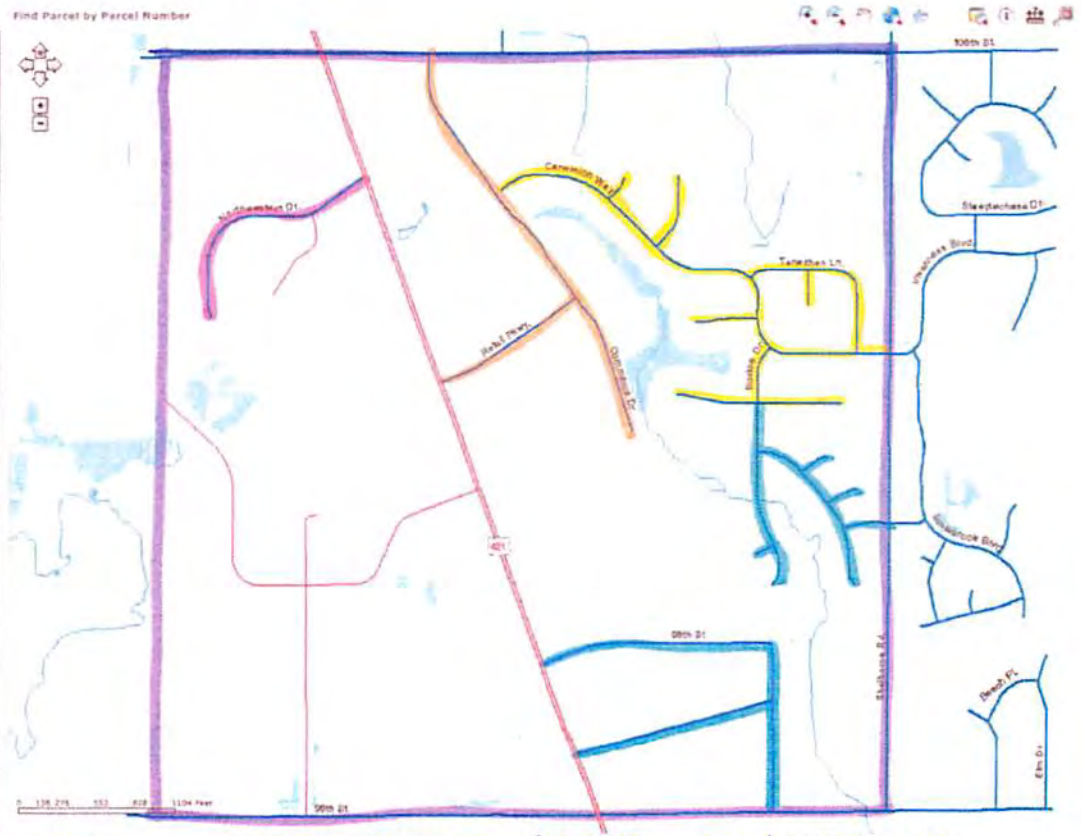

PARK NORTHWESTERN

WEST CARMEL CENTER

ASHBROOKE

SPRING ARBOR

NORTH AUGUSTA

SECTION #2

Hamilton County Highway Department

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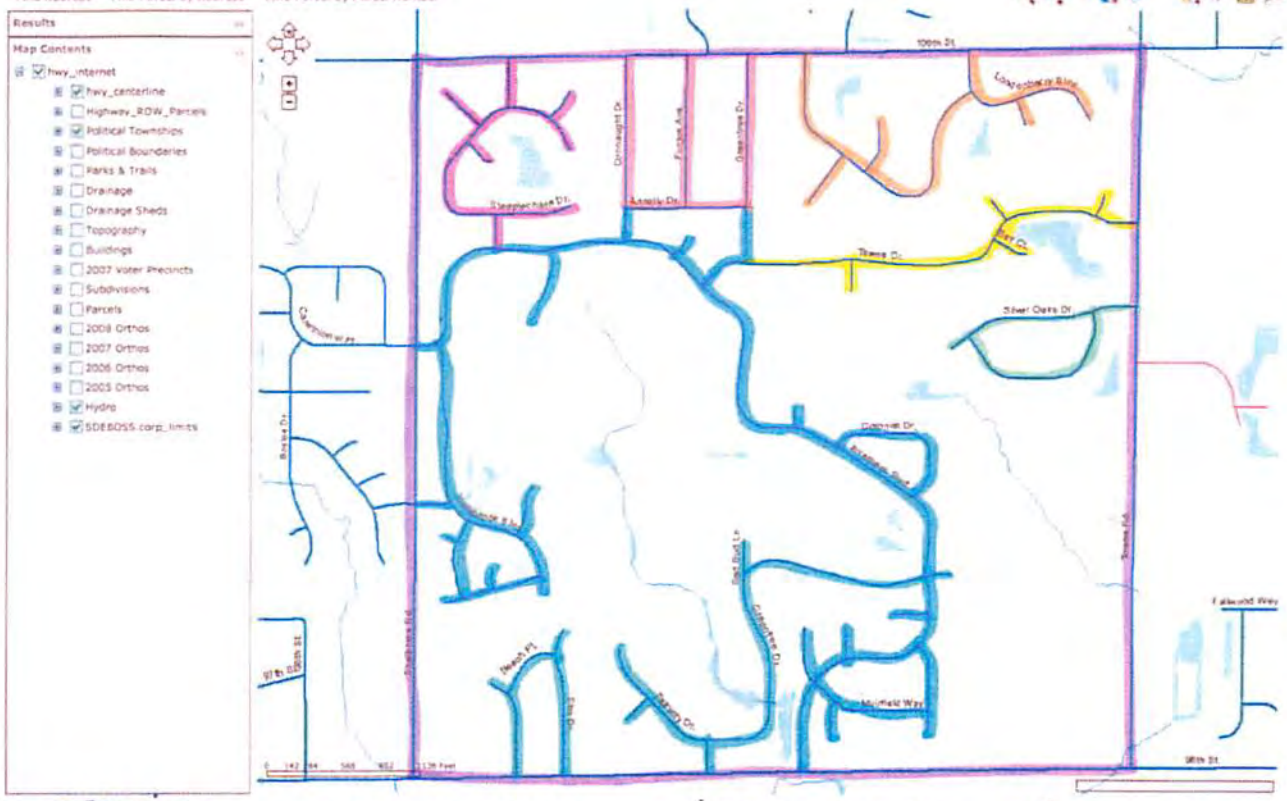

HUNTERS FIELD ANNALLY DOWNS WINDSOR GROVE PINE LAKE

CAMDEN WALK GREEN TREE SHELBORNE GREEN

SECTION #3

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Map Contents

- hwy_internet
  - hwy_centerline
  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
  - 2007 Voter Precincts
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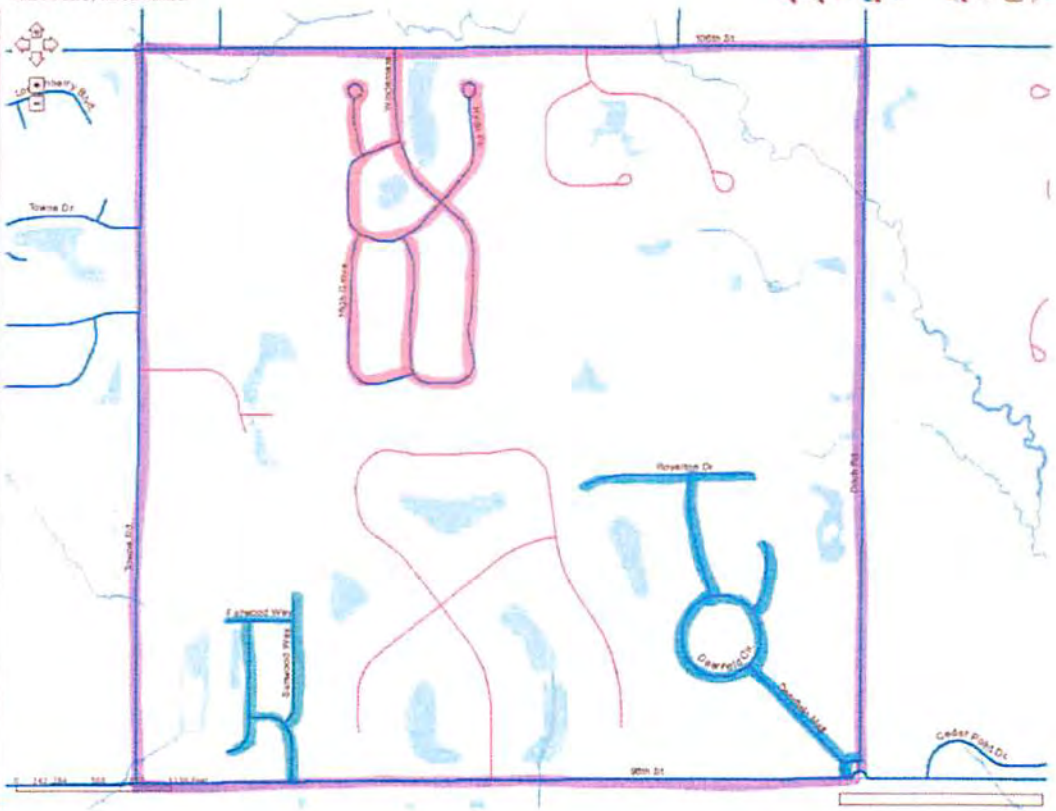

WINDEMERE BRAMBLEWOOD DEERFIELD

SECTION #4

Hamilton County Highway Department

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Map Contents

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  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
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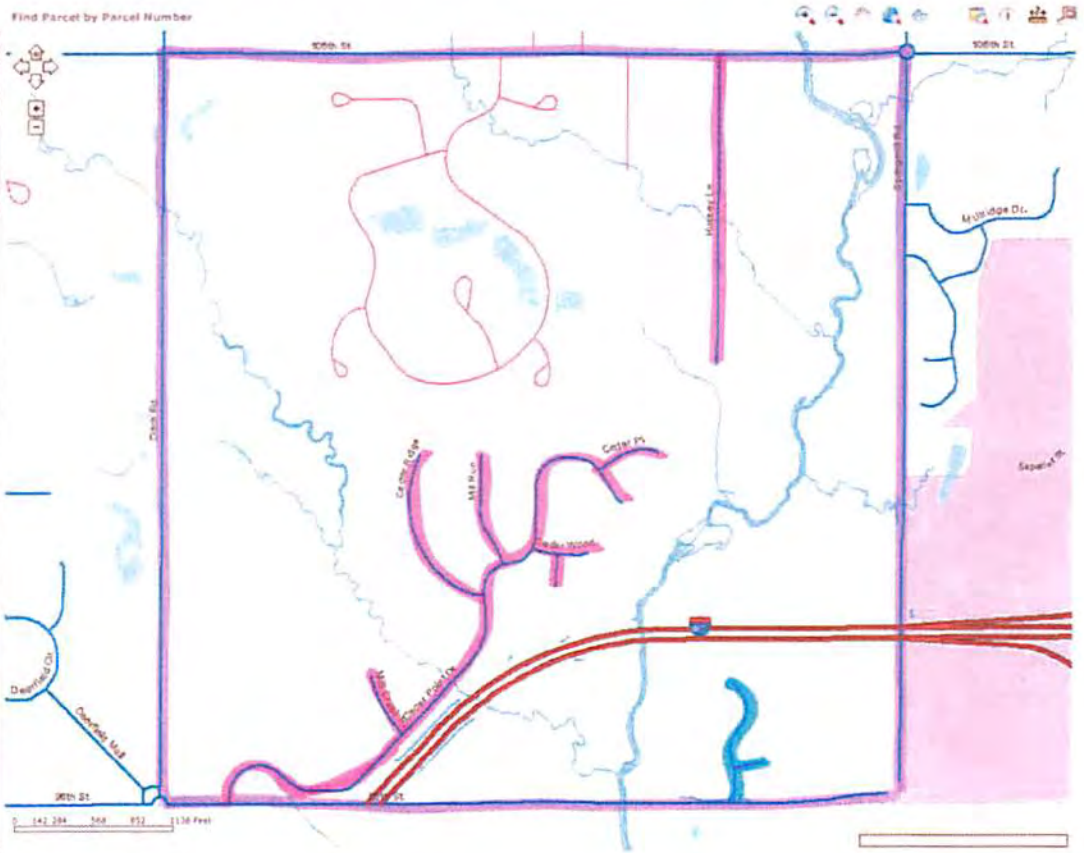

CEDAR POINT

LACOMA ESTATES

SECTION #5

Hamilton County Highway Department

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  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
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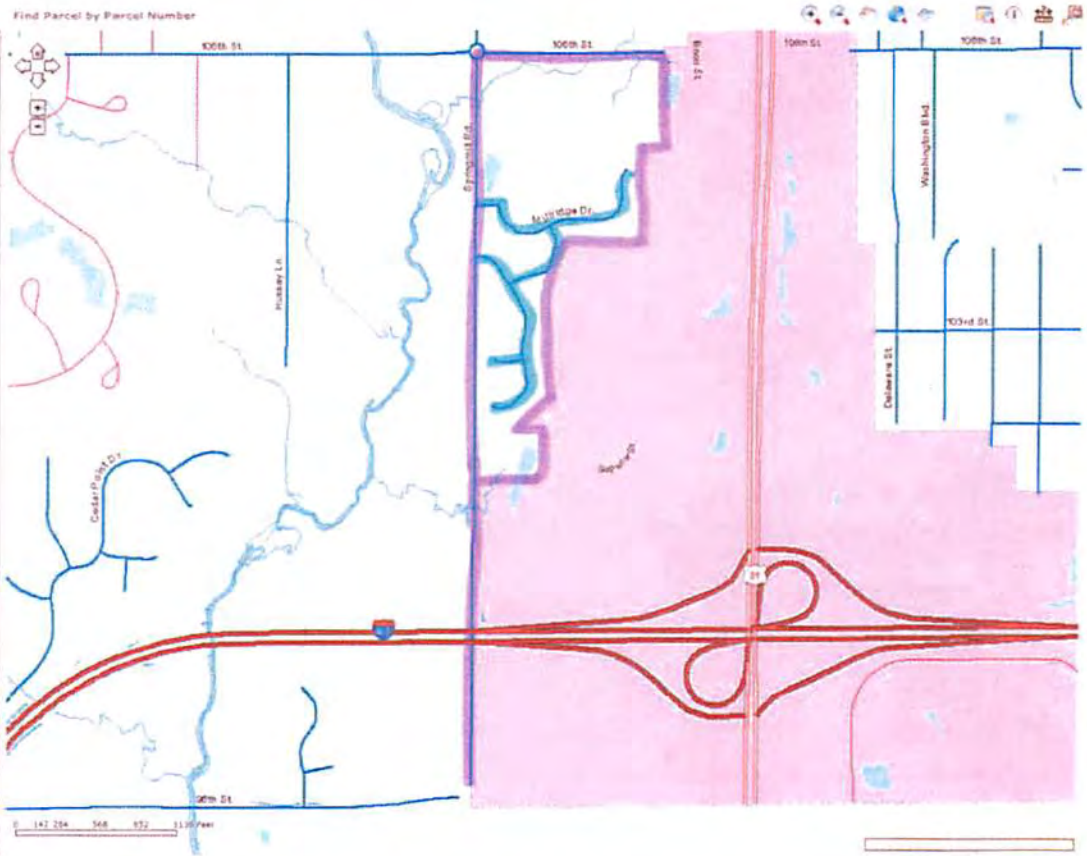

THE RESERVE at SPRING MILL

SECTION #6

Hamilton County Highway Department

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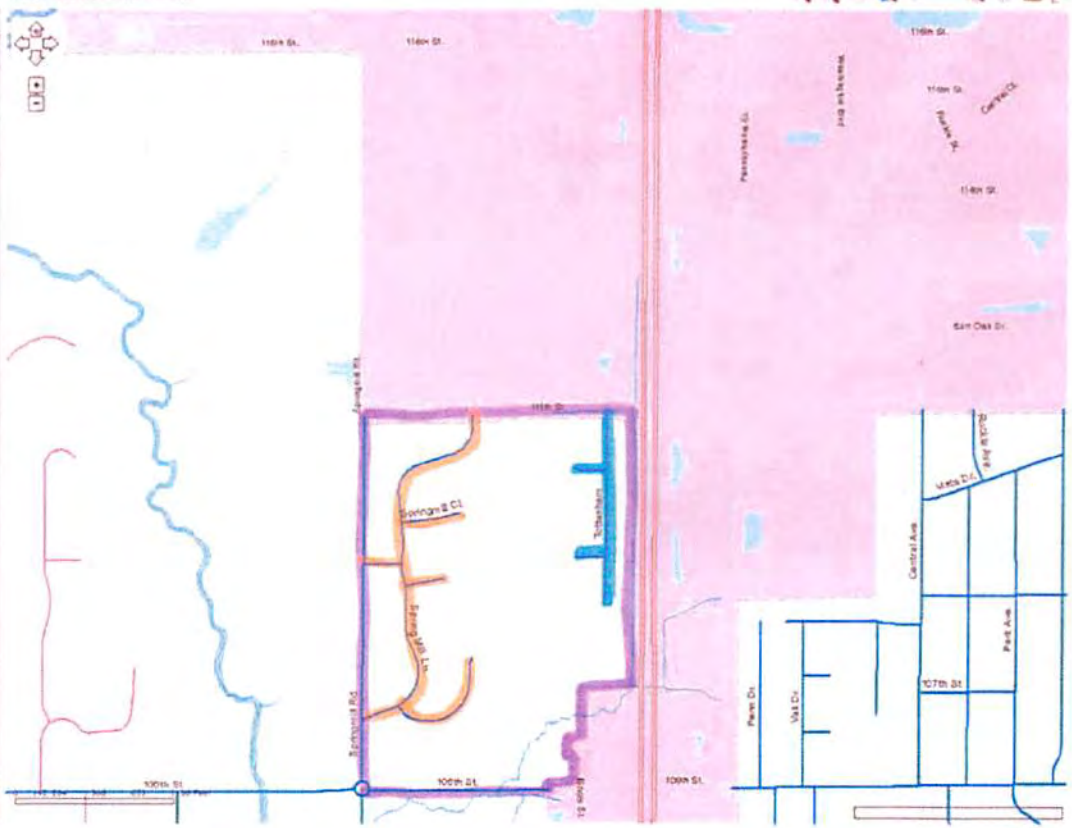

SPRING MILL PLACE

MERIDIAN SUBURBAN

SECTION #7

Hamilton County Highway Department

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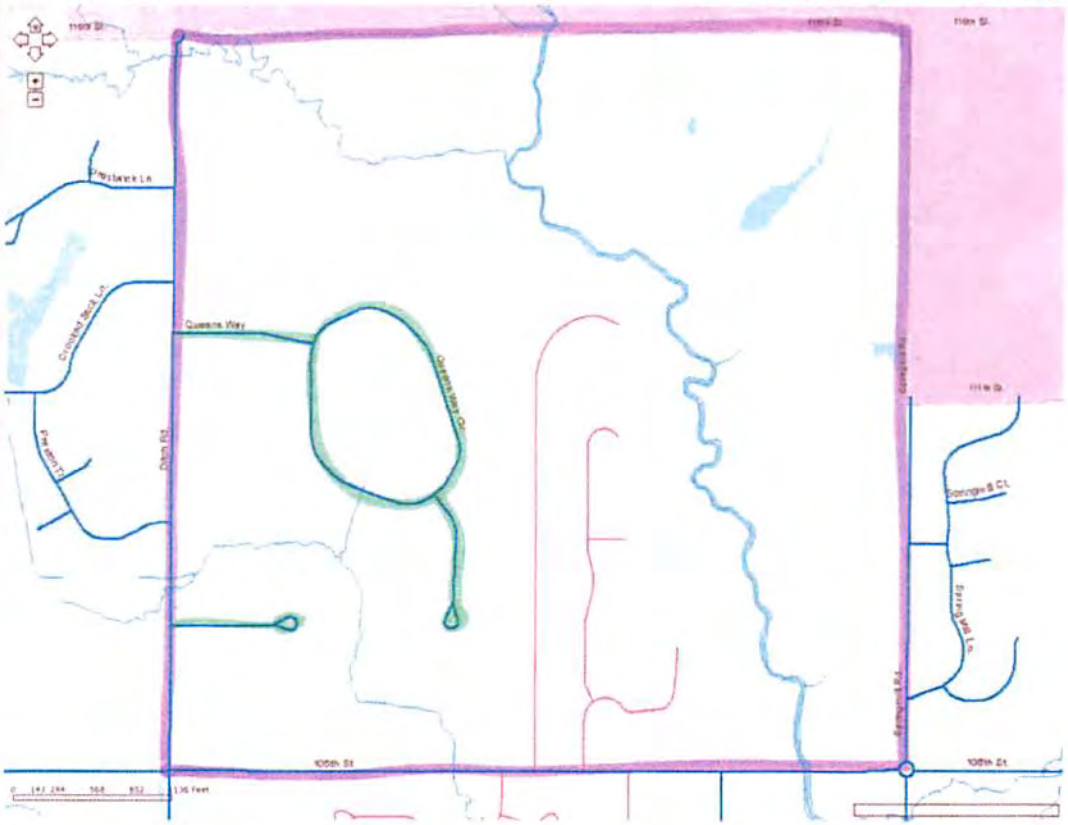


QUEENS MANOR

SECTION #8

Hamilton County Highway Department

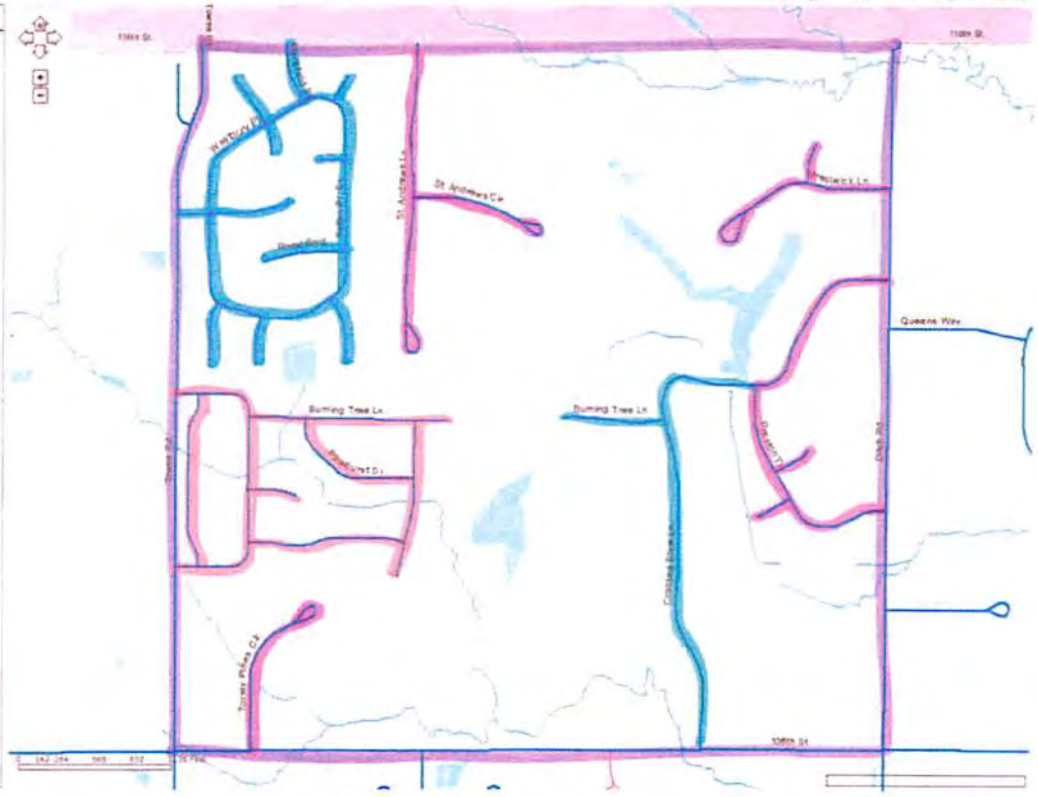
ESRI ESRI Support Center Help

Find Address Find Parcel by Address Find Parcel by Parcel Number

Results

Map Contents

- hwy_internet
  - hwy_centerline
  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
  - 2007 Voter Precincts
  - Subdivisions
  - Parcels
  - 2008 Orthos
  - 2007 Orthos
  - 2006 Orthos
  - 2005 Orthos
  - Hydro
  - SDEBOSS corp_limits



CROOKED STICK ESTATES SUTTON PLACE SPRING RUN ESTATES

CROOKED STICK ESTATES WEST

SECTION #9

Hamilton County Highway Department

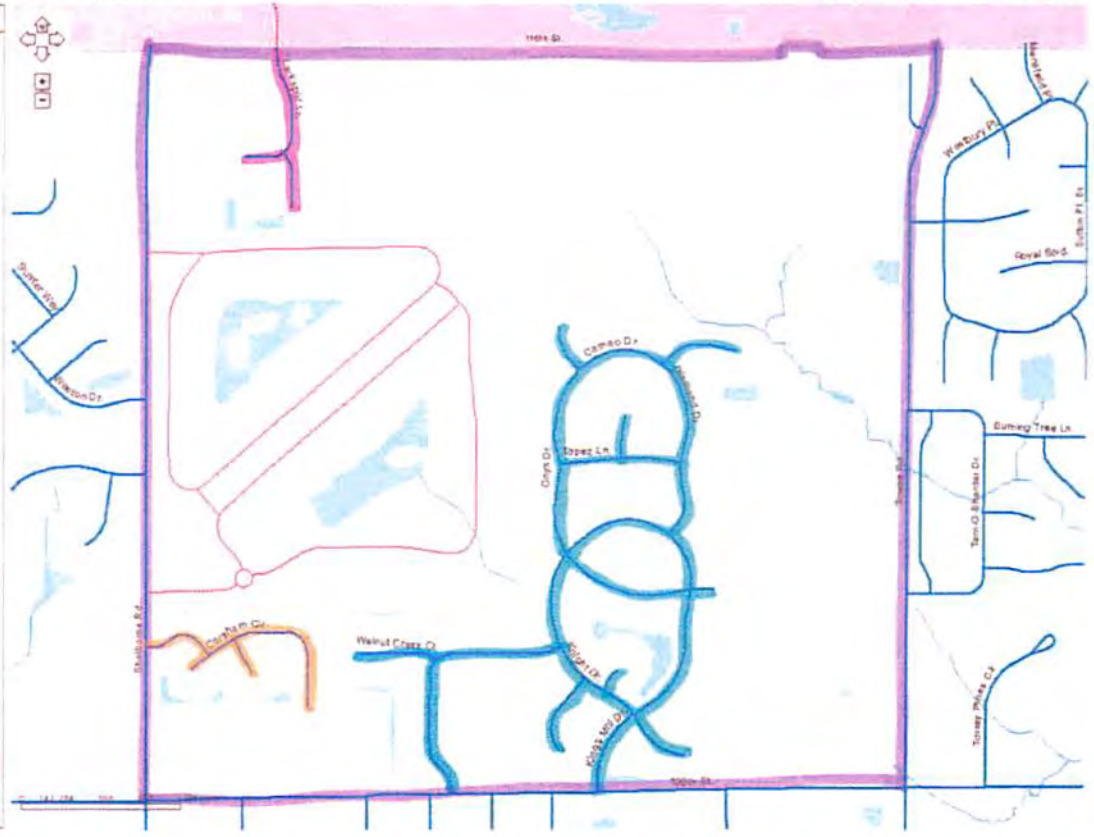
ESRI ESRI Support Center Help

Find Address Find Parcel by Address Find Parcel by Parcel Number

Results

Map Contents

- hwy_internet
  - hwy_centerline
  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
  - 2007 Voter Precincts
  - Subdivisions
  - Parcels
  - 2008 Orthos
  - 2007 Orthos
  - 2006 Orthos
  - 2005 Orthos
  - Hydro
  - SDEBOSS.corp_limits



LARKSPUR ENGLISH OAKS KINGS MILL WALNUT CREEK WOODS

SECTION #10

Hamilton County Highway Department

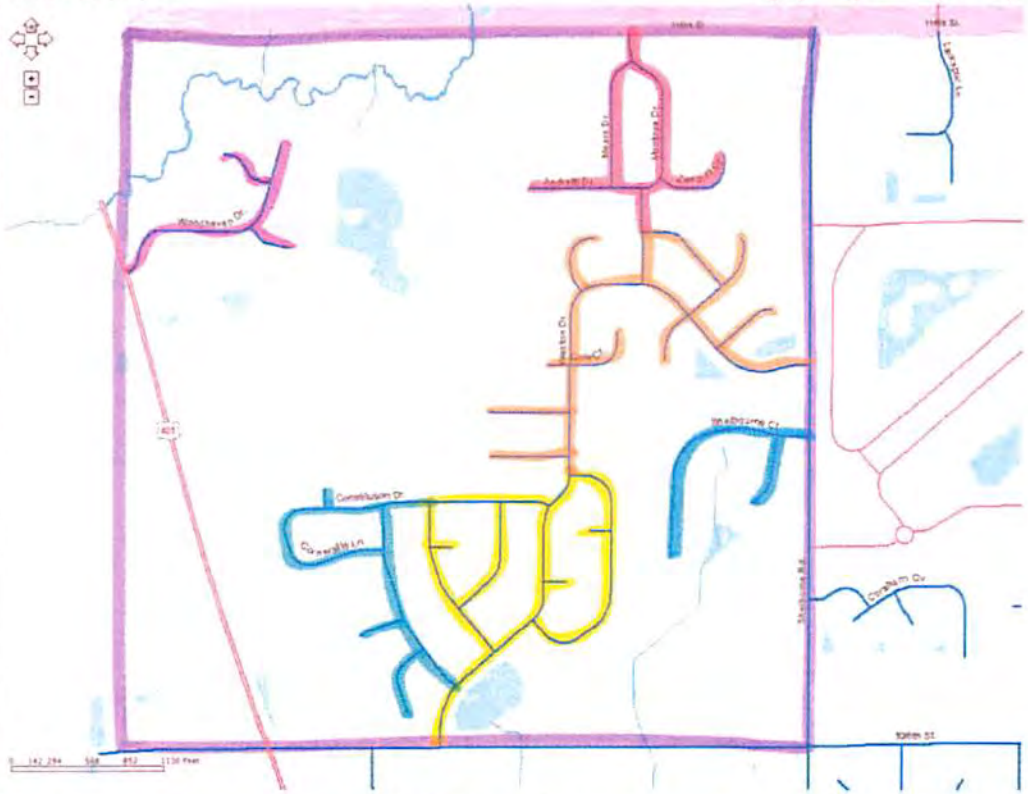
ESRI ESRI Support Center Help

Find Address Find Parcel by Address Find Parcel by Parcel Number

Results

Map Contents

- hwy_internet
  - hwy_centerline
  - Highway_ROW_Parcels
  - Political Townships
  - Political Boundaries
  - Parks & Trails
  - Drainage
  - Drainage Sheds
  - Topography
  - Buildings
  - 2007 Voter Precincts
  - Subdivisions
  - Parcels
  - 2008 Orthos
  - 2007 Orthos
  - 2006 Orthos
  - 2005 Orthos
  - Hydro
  - SDERROSS corp_limits



WOODHAVEN CASS ESTATES WESTON RIDGE WESTON PLACE

WESTON PLACE VILLAGES BRANDYWINE

DRAINAGE COMPLAINTS IN SOUTHWEST CLAY

LOCATION	SEG. ID#	CMPLTS
On 96th Street between Boone Co. Line and Shelborne	H-0044-001	0
On 96th Street between Shelborne and Towne	H-0044-010	1
On 96th Street between Towne and Ditch	H-0044-020	0
On 96th Street between Ditch and Springmill	H-0044-030	2
On 106th Street between Boone Co. Line and Shelborne	H-0055-001	4
On 106th Street between Shelborne and Towne	H-0055-010	1
On 106th Street between Towne and Ditch	H-0055-020	1
On 106th Street between Ditch and Springmill	H-0055-030	3
On Shelborne between 96th Street and 106th Street	H-1678-001	0
On Shelborne between 106th Street and 116th Street	H-1678-010	0
On Towne Road between 96th Street and 106th Street	H-1900-001	2
On Towne Road between 106th Street and 116th Street	H-1900-010	1
On Ditch Road between 96th Street and 106th Street	H-0682-001	1
On Ditch Road between 106th Street and 116th Street	H-0682-010	0
On Springmill Road between 96th Street and 106th Street	H-1754-001	0
On Springmill Road between 106th Street and 116th Street	H-1754-010	1

SECTION # 1

SUBDIVISION	STREET	SEG ID#	CMPLTS
Park Northwestern	Northwestern Drive	H-1385-001	0
West Carmel Center	Retail Parkway	H-2630-004	0
West Carmel Center	Commerce Drive	H-2629-004	1
West Carmel Center	Commerce Drive	H-2629-006	1
North Augusta	North Augusta Drive	H-2172-001	0
North Augusta	97th Street	H-0046-005	0
North Augusta	98th Street	H-0047-004	0
Ashbrooke	Carwinion Way	H-2231-001	0
Ashbrooke	Carwinion Way	H-2231-005	2
Ashbrooke	Terwithen Lane	H-2244-001	0
Ashbrooke	Bosahan Court	H-2265-005	0
Ashbrooke	Trebah Circle	H-2295-050	0
Ashbrooke	Trerice Way	H-2296-010	0
Ashbrooke	Caerhays Court	H-2230-001	0
Ashbrooke	Bosloe Drive	H-2228-005	0
Ashbrooke	Penzance Place	H-2254-007	0
Ashbrooke	Penjerrack Court	H-2253-008	0
Spring Arbor	Bosloe Drive	H-2228-003	1
Spring Arbor	Gomer Court	H-2423-008	0
Spring Arbor	Tammer Drive	H-2415-008	0
Spring Arbor	Zonda Blvd	H-2419-009	0
Spring Arbor	Zuker Court	H-2425-009	0
Spring Arbor	Monty Circle	H-2424-009	0

SECTION # 2

SUBDIVISION	STREET	SEG ID#	CMPLTS
Huntersfield	Huntersfield Drive	H-2376-009	0
Huntersfield	Steeplechase Drive	H-2380-012	0
Huntersfield	Deepwood Trail	H-2379-007	0
Huntersfield	Barnstable Road	H-2375-009	0
Huntersfield	Hounds Crossing	H-2377-009	0
Huntersfield	Windward Way	H-2378-008	0
Annally Downs	Connaught Drive	H-0556-007	1
Annally Downs	Furgus Avenue	H-0841-007	1
Annally Downs	Greentree Drive	H-0896-001	0
Annally Downs	Annally Drive	H-0189-013	0
Windsor Grove	Iron Horse Lane	H-2637-015	0
Windsor Grove	Titan Run	H-2634-008	0
Windsor Grove	Roxley Bend	H-2734-008	0
Windsor Grove	Noma Court	H-2735-008	0
Windsor Grove	Londonberry Blvd	H-2635-009	0
Windsor Grove	Elizabeth Court	H-2636-009	0
Pine Lake	Towne Drive	H-1898-050	0
Pine Lake	Fairwind Court	H-2314-010	0
Pine Lake	Circle Court	H-2313-010	0
Pine Lake	Bay Court	H-0261-050	0
Pine Lake	Towne Lane	H-1899-015	0
Camden Walk	Silver Oaks Drive	H-2532-018	0
Camden Walk	Turner Leaf Lane	H-2533-018	0
Green Tree	Sycamore Road	H-1836-001	2
Green Tree	Elm Drive	H-0747-001	1
Green Tree	Beech Place	H-0282-011	0

Green Tree	Fairway Drive	H-0771-001	0
Green Tree	Fairway Drive	H-0771-002	0
Green Tree	Greentree Drive	H-0896-010	0
Green Tree	Greentree Drive	H-0896-002	0
Green Tree	Red Bud Lane	H-1541-002	0
Green Tree	Dogwood Lane	H-0685-001	0

Shelborne Green	Inverness Blvd	H-2695-001	3
Shelborne Green	Turnberry Court	H-2696-002	0
Shelborne Green	Avenel Court	H-2699-002	0
Shelborne Green	Muirfield Way	H-2697-016	0
Shelborne Green	Cypress Way	H-2698-002	0
Shelborne Green	Troon Court	H-2700-002	0
Shelborne Green	Glen Abbe Court	H-2701-016	0
Shelborne Green	Colonial Drive	H-2703-004	0
Shelborne Green	Inverness Drive	H-2704-005	0
Shelborne Green	Towne Drive	H-1898-014	0
Shelborne Green	Fergus Ave	H-2706-007	0
Shelborne Green	Wentworth Court	H-2707-006	0
Shelborne Green	Innisbrook Blvd	H-2708-003	0
Shelborne Green	Innisbrook Way	H-2713-010	0
Shelborne Green	Sawgrass Court	H-2709-003	0
Shelborne Green	Jupiter Pass	H-2710-002	0
Shelborne Green	Linkside Court	H-2712-011	0
Shelborne Green	Seminole Drive	H-2702-011	1
Shelborne Green	Berry Court	H-2711-002	0

SECTION # 3

SUBDIVISION	STREET	SEG ID#	CMPLTS
Windemere	Windemere	H-2251-007	0
Windemere	Windemere	H-2251-004	0
Windemere	Charter Oaks	H-2312-006	0
Windemere	High Grove	H-2239-005	0
Windemere	Bishop Circle	H-2227-001	0
Windemere	Hyde Park	H-2243-001	0
Windemere	Chatham Court	H-2232-001	0
Bramblewood	Bramblewood Way	H-2497-001	0
Bramblewood	Prairiewood Way	H-2498-002	0
Bramblewood	Sunwood Way	H-2499-003	0
Bramblewood	Fallwood Way	H-2500-022	0
Deerfield	Deerfield Mall	H-0669-001	0
Deerfield	Deerfield Circle	H-0667-001	0
Deerfield	Brandon Court	H-0332-002	0
Deerfield	Culpepper Drive	H-0629-003	0
Deerfield	Royalton Drive	H-1618-002	0
Deerfield	Royalton Drive	H-1618-001	0

SECTION # 4

SUBDIVISION	STREET	SEG ID#	CMPLTS
Cedar Point	Cedar Point Drive	H-0461-004	1
Cedar Point	Cedar Point Drive	H-0461-002	0
Cedar Point	Cedar Point Drive	H-0461-001	0
Cedar Point	Mill Creek Place	H-1299-001	0
Cedar Point	Cedar Ridge	H-0462-003	0
Cedar Point	Mill Run	H-1301-005	0
Cedar Point	Cedar Wood	H-0464-035	0
Cedar Point	Cedar Place	H-0460-036	0
Cedar Point	Cedarwood Place	H-0465-003	0
Cedar Point	Hussey Lane	H-1041-001	0

Lacoma Estates	Copley Drive	H-0565-001	0
Lacoma Estates	Copley Place	H-0566-038	0

SECTION # 5

SUBDIVISION	STREET	SEG ID#	CMPLTS
The Reserve at Spring Mill	Millridge Drive	H-2483-040	0
The Reserve at Spring Mill	Colemery Drive	H-2406-041	0
The Reserve at Spring Mill	Spring Highland Drive	H-2408-040	0
The Reserve at Spring Mill	Ventana Court	H-2407-041	0

SECTION # 6

SUBDIVISION	STREET	SEG ID#	CMPLTS
Spring Mill Place	Spring Mill Lane	H-1743-001	0
Spring Mill Place	Spring Mill Lane	H-1743-002	0
Spring Mill Place	107th Street	H-0057-042	0
Spring Mill Place	Spring Ridge Court	H-1745-001	0
Spring Mill Place	Springmill Court	H-1751-001	0

Meridian Suburban	Tottenahm	H-1896-001	0
Meridian Suburban	Manchester Court	H-1247-042	0
Meridian Suburban	Mersey Court	H-1293-001	0

SECTION # 7

SUBDIVISION	STREET	SEG ID#	CMPLTS
Queens Manor	Regal Drive	H-1551-001	0
Queens Manor	Queens Way	H-1552-001	0
Queens Manor	Queens Way Circle	H-1523-002	0
Queens Manor	Queens Way Circle	H-1523-001	0

SECTION # 8

SUBDIVISION	STREET	SEG ID#	CMPLTS
Crooked Stick Estates	St. Andrews Lane	H-1762-001	0
Crooked Stick Estates	St. Andrews Lane	H-1762-002	0
Crooked Stick Estates	St. Andrews Circle	H-1761-001	0
Crooked Stick Estates	Prestwick Lane	H-1516-001	0
Crooked Stick Estates	Prestwick Court	H-1515-001	0
Crooked Stick Estates	Crooked Stick Lane	H-0623-016	0
Crooked Stick Estates	Preston Trail	H-1514-013	1
Crooked Stick Estates	Preston Court	H-1513-001	0
Crooked Stick Estates	Woodlake Court	H-2123-002	0
Crooked Stick Estates	Torrey Pines Circle	H-1895-001	0
Spring Run Estates	Crooked Stick Lane	H-0623-010	1
Spring Run Estates	Burning Tree Lane	H-0400-026	0
Crooked Stick Estates West	Greenbriar Drive	H-0891-013	1
Crooked Stick Estates West	Firestone Lane	H-0793-020	1
Crooked Stick Estates West	Augusta Lane	H-0236-020	0
Crooked Stick Estates West	Tam-O-Shanter Drive	H-1844-001	0
Crooked Stick Estates West	Tam-O-Shanter Court	H-1843-001	0
Crooked Stick Estates West	Burning Tree Lane	H-0400-022	2
Crooked Stick Estates West	Pinehurst Drive	H-1485-001	0
Crooked Stick Estates West	Pebble Beach Drive	H-1457-001	0
Crooked Stick Estates West	Thunderbird Drive	H-1871-001	0
Sutton Place	Sutton Avenue	H-1829-020	0
Sutton Place	Sutton Place Drive	H-2490-021	0
Sutton Place	Westbury Place	H-2496-021	0
Sutton Place	Royal Place	H-1617-016	0
Sutton Place	Royal Circle	H-2171-016	0
Sutton Place	Royal Court	H-1613-016	0
Sutton Place	Royal Blvd	H-1612-022	0

Sutton Place	Greystone Court	H-2491-023	0
Sutton Place	Newbridge Court	H-2493-019	0
Sutton Place	Mansfield Place	H-2492-019	0
Sutton Place	Braemar Court	H-2495-018	0
Sutton Place	Belmont Court	H-2494-017	0

SECTION # 9

SUBDIVISION	STREET	SEG ID#	CMPLTS
Larkspur	Larkspur Lane	H-1174-002	1
Larkspur	Nicole Court	H-1367-001	0
English Oaks	Callowell Court	H-2582-010	0
English Oaks	Corsham Circle	H-2583-011	0
English Oaks	Straton Circle	H-2585-013	0
English Oaks	English Oaks Drive	H-2574-012	0
Walnut Creek Woods	Walnut Creek Drive	H-2261-020	0
Walnut Creek Woods	Walnut Creek Court	H-1966-001	0
Walnut Creek Woods	Walnut Creek Drive North	H-1967-010	1
Kings Mill	Kings Mill Drive	H-2418-010	0
Kings Mill	Knight Drive	H-2409-015	0
Kings Mill	Palace Court	H-2410-016	0
Kings Mill	Jewel Lane	H-2411-011	0
Kings Mill	Crown Circle	H-2412-011	0
Kings Mill	Winterset Drive	H-2413-014	0
Kings Mill	Onyx Drive	H-2414-014	0
Kings Mill	Cameo Drive	H-2504-016	0
Kings Mill	Diamond Drive	H-2416-014	0
Kings Mill	Topaz Lane	H-2417-014	0
Kings Mill	Topaz Lane	H-2417-015	0
Kings Mill	Ruby Court	H-2502-014	0
Kings Mill	Kings Court	H-2501-017	0
Kings Mill	Jasmine Drive	H-2503-016	0

SECTION # 10

SUBDIVISION	STREET	SEG ID#	CMPLTS
Woodhaven	Woodhaven Drive	H-2122-001	1
Woodhaven	Windledge Circle	H-2081-001	0
Woodhaven	Haven Court	H-0949-001	0
Cass Estates	Montoya Drive	H-2729-018	0
Cass Estates	Mears Drive	H-2730-018	0
Cass Estates	Andretti Drive	H-2732-006	0
Cass Estates	Zanardi Court	H-2731-008	0
Cass Estates	Yorktown Crossing	H-2452-019	0
Weston Ridge	Yorktown Crossing	H-2452-019	0
Weston Ridge	Sumter Way	H-2455-007	0
Weston Ridge	Valley Forge Circle	H-2451-018	0
Weston Ridge	Pickens Court	H-2450-018	0
Weston Ridge	Trumball Circle	H-2453-019	0
Weston Ridge	Patriot Court	H-2449-017	0
Weston Ridge	Weston Drive	H-2429-014	1
Weston Ridge	Cole Court	H-2454-004	0
Weston Ridge	Brigade Circle	H-2456-005	0
Weston Ridge	Vanguard Circle	H-2457-005	
			0
Weston Place	Independence Way	H-2430-012	0
Weston Place	Richmond Court	H-2434-007	0
Weston Place	Marion Court	H-2433-006	0
Weston Place	Weston Drive	H-2429-010	0
Weston Place	Constitution Drive	H-2432-005	0
Weston Place	Constitution Drive	H-2432-003	0
Weston Place	Putnam Place	H-2444-005	0
Weston Place	Gettysburg Place	H-2431-013	1
Weston Place	Freeman Court	H-2445-005	0

Weston Place Villages	Constitution Drive	H-2432-002	0
Weston Place Villages	Cornwallis Lane	H-2438-002	0
Weston Place Villages	Monitor Lane	H-2439-013	0
Weston Place Villages	Bunker Hill Drive	H-2435-011	0
Weston Place Villages	Minuteman Circle	H-2437-004	0
Weston Place Villages	Morristown Court	H-2436-011	0

Brandywine	Shelborne Court	H-1679-001	0
Brandywine	Brandywine Circle	H-0333-014	0

Appendix B: Subdivision Drainage Pictures

- **Annally Downs**.....B-1
- **Bentley Plat**.....B-2
- **Brandywine**.....B-3 – B-6
- **Cass Estates**.....B-7
- **Crooked Stick Estates**.....B-8
- **Crooked Stick West**.....B-9 – B-10
- **North American Park**.....B-11
- **North Augusta**.....B-12 – B-21
- **Queens Manor**.....B-22 – B-24
- **Reserve at Spring Mill**.....B-25 – B-26
- **Sutton Place**.....B-27
- **Town at Weston Pointe**.....B-28 – B-29
- **Wood Haven**.....B-30 – B-31
- **106th Street and Springmill Road**.....B-32 – B-40

Annally Downs

Bentley Plat

Brandywine

Cass Estates

Crooked Stick Estates

Crooked Stick West

North American Park

North Augusta

Queens Manor

STOP

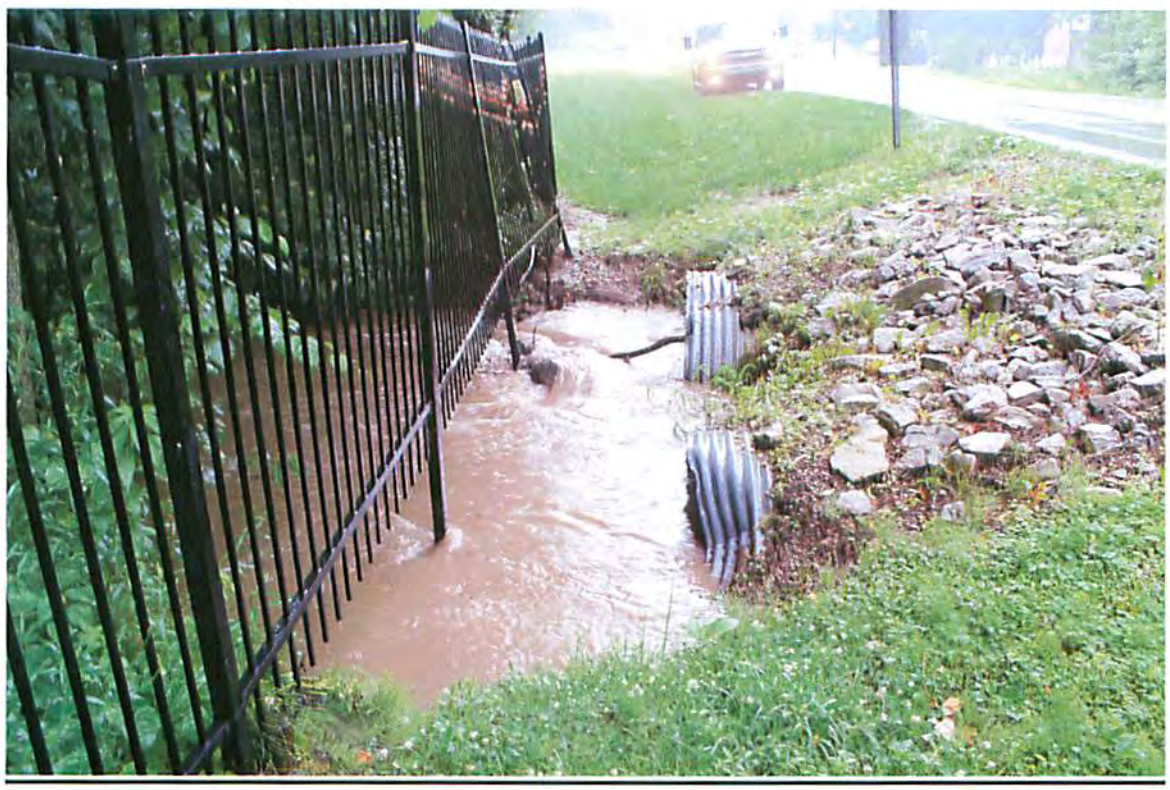
Reserve at Spring Mill

Sutton Place

Town at Weston Pointe

Wood Haven

106th Street and Springmill Road



YIELD
AHEAD

FIELD
AHEAD

15
M.P.H.