Town of Mooresville Drainage Study

Morgan County, Indiana

July 2016

Prepared By:
Joseph L. Miller, P.E., CFM

Prepared For:
Town of Mooresville

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Scope of Services

1. Develop a stormwater runoff model (100-Year and 10-Year Critical Duration Series) to simulate existing runoff and flooding potential along 2.9 mile study reach. Estimate possible increases in runoff that may be caused by future development.

2. Define existing and potential future flooding problems in the watershed.

3. Develop a set of solutions to the existing and potential future flooding problems under the existing and future development conditions. These solutions may include underground detention, two stage ditching, cutoff channels and / or rerouting runoff to other drainage sheds.

4. Walk study reach with Town of Mooresville staff. Banning Engineering will interview staff to determine areas where significant problems have been documented.

5. Topographic survey along study reach. Includes pipe crossing details and (1) cross-section between pipe crossings.

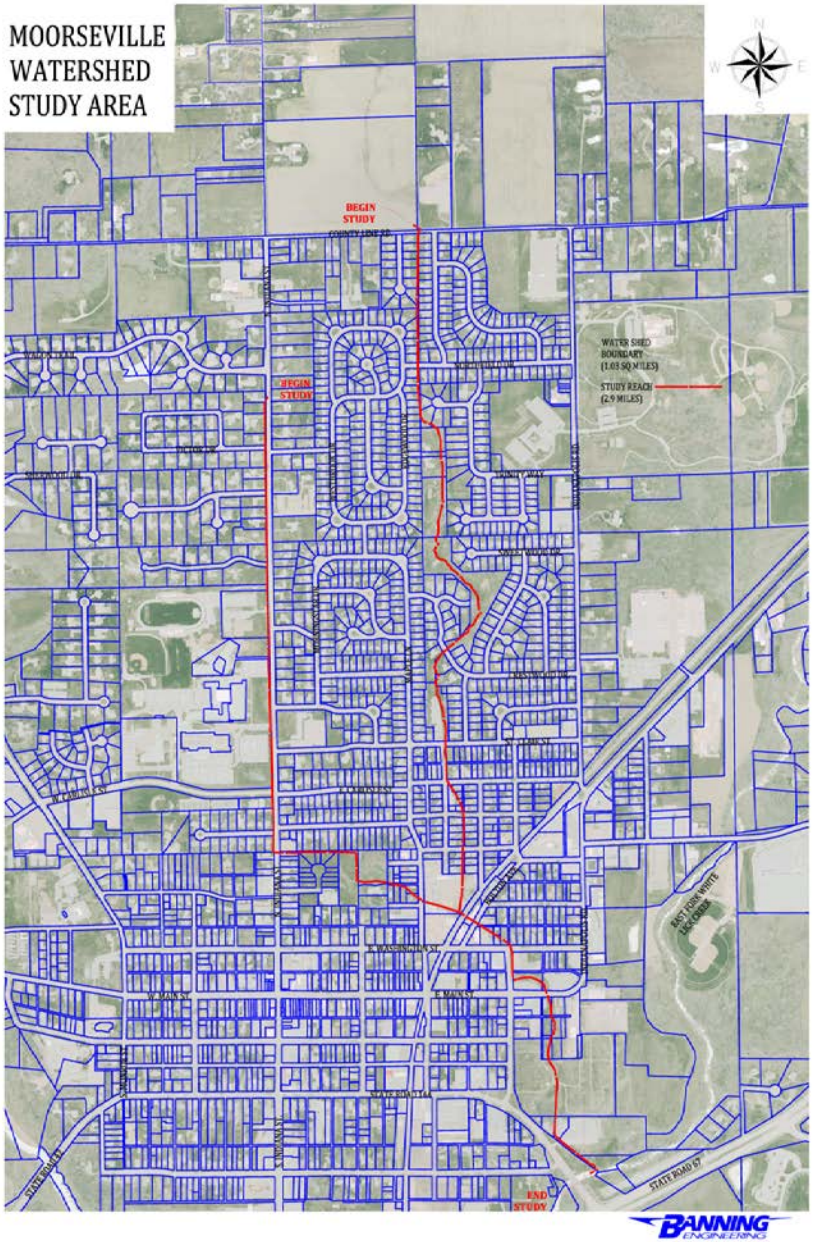
6. Develop preliminary flood plain (100-year) along study reach for planning purposes only.

7. Identify potential financing mechanisms for implementation of needed improvements.

Executive Summary

Introduction

The following report describes the findings of Banning Engineering, P.C., for the Drainage Study of the Town of Mooresville watershed along Goose Creek to East Fork of White Lick Creek. The watershed covers roughly 1 square mile (626 acres), with 86 acres in Hendricks County and 540 acres in Morgan County. The study reach is shown below.



The project was broken into five areas. Each area was analyzed in detail. Potential projects to alleviate flooding issues as discovered through the course of the study were advanced.

Data Collection

Overall topographic information was downloaded from the State of Indiana. The 1 foot contours from 2011 were used to delineate drainage basins and fill in elevation data as appropriate. In areas of specific focus, Banning Engineering surveyors gathered cross-sections, structure finished floor elevations, culvert and bridge details, and roadway profiles. Field Reconnaissance was completed throughout the entire reach. Condition of the existing infrastructure was noted as needed. The field reconnaissance was used to provide assumptions for the hydraulic modeling and confirm watershed delineations.

Additional information was compiled from the July 2015 flood event within the Town. Information from this storm event was used to calibrate the hydraulic modeling and confirm focus areas within the study reach.

Public Input

Public input was obtained using three primary methods. First, information from news coverage of the July 2015 flood event was reviewed for applicable data. Second, Town of Mooresville staff gave Banning Engineering staff a tour of the watershed and highlighted problem areas. Lastly, property owners adjacent to the study reach were sent a letter alerting them of the drainage study and to contact Banning Engineering staff with any questions or comments.

This method provided a definitive area of predominant public input for four of the five areas of study. Area A had a focus area north of Washington Street, west to Maple Land and North to Bridge Street. Area B had a public input focus along Circle Drive. Area C had primary public input along the northern part of the open ditch along Indiana Street. Area D had no focus area for public input. Area E had a focus area at the intersection of Northfield and Edgewood Drives.

Reviewing the public and staff comments found that Areas A and E appear to experience the most significant flooding issues. Area B has some flooding issues as well, but they do not appear to be as severe. Areas C and D do not appear to have significant flooding issues involving residents at this time.

Hydrologic and Hydraulic Analysis

A base hydrologic and hydraulic model was made using all the data collected. A critical storm duration series was used to evaluate both the 10-year and 100-year events. Huff rainfall distributions were used as described within the 2004 Mooresville Stormwater Design Manual. The model was calibrated using estimated rainfall depths from the July 2015 event.

The model was then used to delineate a 100-year and 10-year floodplain. The analysis showed flooding of 29 structures in a 100-year event and 5 structures in a 10-year event. Area A showed flooding of 16 structures in a 100-year event. Area B showed 2 structures being

flooded. Areas C and D showed no structures flooded in a 100-year event. Area E showed 10 structures flooded in a 100-year event. The modeling appears to collaborate the public input from the study.

Flooding within Area A appears to be from lack of capacity due to siltation or the small size of the ditch as well as the close proximity of structures to the ditch. Flooding within Area B is primarily due to the proximity of structures to the ditch. Area E experiences flooding for two primary reasons. First, the pipe under Northfield Drive is undersized requiring water to overflow from the ditch to the intersection of Northfield and Edgewood Drives. Second, the pipes at the intersection of Northfield and Edgewood Drives do not have capacity to discharge the local watershed.

Potential Solution Set

Six different potential solution sets were advanced. The overall watershed was reviewed first, and then the five areas within the watershed were all looked at for potential projects. Several additional projects were reviewed, but not included in the report. The primary reason for not including the projects was lack of benefit or significant damages downstream.

The overall watershed projects were programmatic in nature. There was no project found that could solve all the flooding issues along the study reach. The projects forwarded for the overall watershed include: using the 100-year floodplain mapping for future planning and building requirements, a property acquisition plan, and ordinance updates.

Area A had four projects advanced. The beneficial projects forwarded are A-1 and A-2. These projects include cleaning and dipping the ditch as well as removing unused private crossings. These two projects appear to have a significant benefit in the more frequent 10-year storm events. There is some benefit noted during a 100-year storm as well.

Area B had two projects advanced, but only project B-1 provided benefit. Project B-1 is the construction of a potential offline detention basin along the ditch downstream of Indiana Street. The benefit for this project occurs downstream of its location into Area A. There is no benefit upstream of Indiana Street

Area C had two projects advanced. Both project C-1 and project C-2 appear to have benefit if designed and constructed correctly. Project C-1 includes piping of the Indiana Street ditch and installation of offline dry detention. This project has benefit downstream through Indiana Street. Project C-2 has potentially significant benefit. Project C-2 includes working with Mooresville School Corporation to increase inlet capacity and detention on school property in an effort to eliminate a watershed jump along Carlisle Street.

Area D had one project advanced. The two-staged ditch (Project B-1) did not appear to provide benefit.

Area E had eight projects advanced. Of the eight projects three included some variation of purchasing homes (Projects E-5, E-6 & E-7). Project E-8 (Drainage Impact Area) has already begun implementation. Project E-1 was reviewed, but it was determined that increasing capacity through Northfield Drive had damages downstream that could not be offset. Projects E-2 and E-3 are smaller projects will smaller benefit (10-year storm or less). The projects include cleaning out of the ditch just downstream of Northfield Drive and providing additional inlets to help discharge localized flow from the Northfield and Edgewood Drive intersection.

The only project that fully addresses the flooding issues within Area E is Project E-4. This project includes construction of a regional detention basin upstream of County Line Road in Hendricks County, and additional pipes to help discharge the intersection of Northfield and Edgewood Drives. Benefits for Project E-4 can be documented downstream to Washington Street.

Potentially beneficial Non-Programmatic Project Summaries:

- Project A-1
    - Clean and Dip Ditch within Area A
        - Phase 1 Clean and dip ditch from Washington Street to Bridge Street and Maple Lane
        - Phase 2 Clean and dip ditch from Washington Street downstream to East Fork of White Lick Creek
    - Land Acquisition (multiple property easements or right of entries required)
    - Project Cost Opinion
        - Phase 1 $63,800
        - Phase 2 $52,500
    - Primary Benefit – Area A
        - 100-year elevations reduced on 16 structures
    - Secondary Benefit – Downstream portions of Area B
        - 100-year elevations reduced on 2 structures
- Project A-2
    - Remove unused private crossings
    - Land Acquisition (one easement or right of entry required)
    - Project Cost Opinion $5,000
    - Primary Benefit – Area A
        - 10-Year elevations reduced on 2 structures

- Project B-1
  - Green Space / Offline Detention within open space in Area B
  - Land Acquisition 3.75 Acres +/-
  - Project Cost Opinion $440,000
  - Primary Benefit – Downstream portions of Area B
    - 1 structure removed from 100-year floodplain
    - 100-year elevation reduced on 1 structure
  - Secondary Benefit – Upstream portion of Area A
    - 100-year elevations reduced on 2 structures
- Project C-1
  - Piping of Indiana Street Ditch with Offline Detention
  - Land Acquisition 3 Acres +/-
  - Project Cost Opinion $750,000
  - Primary Benefit – Downstream portions of Area C
  - Secondary Benefit – Upstream portions of Area B
    - 100-year elevation reduced on 1 structure
- Project C-2
  - Work with School Corporation to increase detention and inlet capacity on school property
  - Land Acquisition – none
  - Project Cost Opinion – Not determined
  - Primary Benefit – School Corporation property and Carlisle Street
  - Secondary Benefit – Circle Drive within Area B
- Project E-2
  - Additional inlets at Edgewood and Northfield Drives
  - Land Acquisition – none
  - Project Cost Opinion - $35,000
  - Primary Benefit – Intersection of Northfield and Edgewood Drives
    - 10-Year elevations reduced for 6 structures
- Project E-3
  - Clean ditch downstream of Northfield Drive
  - Land Acquisition – right of entry or easement required (not platted)
  - Project Cost Opinion - $5,000
  - Primary Benefit – Area E, but only in lower frequency events (not 100-year)
- Project E-4
  - Regional detention upstream of Hendricks County Line Road and increase pipe capacity at Northfield and Edgewood Drives
  - Land Acquisition – 12 Acres +/-
  - Project Cost Opinion - $1,000,000
  - Primary Benefit – Area E
    - 9 structures removed from 100-year floodplain
  - Secondary Benefit – Area D & Area A
    - 100-year elevations reduced on 13 structures

- Project E-5
    - Purchase 3 properties in overflow area from open ditch
    - Land Acquisition – 3 properties
    - Project Cost Opinion - $270,000
    - Primary Benefit – No reduction in flood elevations
        - 3 structures removed from 100-year floodplain
- Project E-6
    - Purchase 9 properties in 100-year flood area at Northfield and Edgewood Drives
    - Land Acquisition – 9 properties
    - Project Cost Opinion - $900,000
    - Primary Benefit – No reduction in flood elevations
        - 9 structures removed from 100-year floodplain
- Project E-7
    - Purchase 2 properties at Northfield and Edgewood Drives and install emergency overflows
    - Land Acquisition – 2 properties
    - Project Cost Opinion - $288,000
    - Primary Benefit – No reduction in flood elevations
        - 2 structures removed from 100-year floodplain

Potential Funding Mechanisms

Eight potential funding mechanisms for municipalities were noted from the study. The potential funding sources range from grants with a local match to loans with 40-year payback to utilizing drainage assessments. The most promising funding mechanisms are listed below:

- Flood Control Revolving Loan Fund (IDNR)
    - Maximum $300,000
- State Revolving Fund Loan Program (SRF)
    - 20-Year Loan
    - Must have environmental benefit
- Community Focus Fund Stormwater Improvement Grants (OCRA)
    - $500,000 Grant w/ in kind match required
- Community Facilities Loan (USDA)
    - 40-Year loan bonded against stormwater fees

Town of Mooresville Drainage Study
Narrative

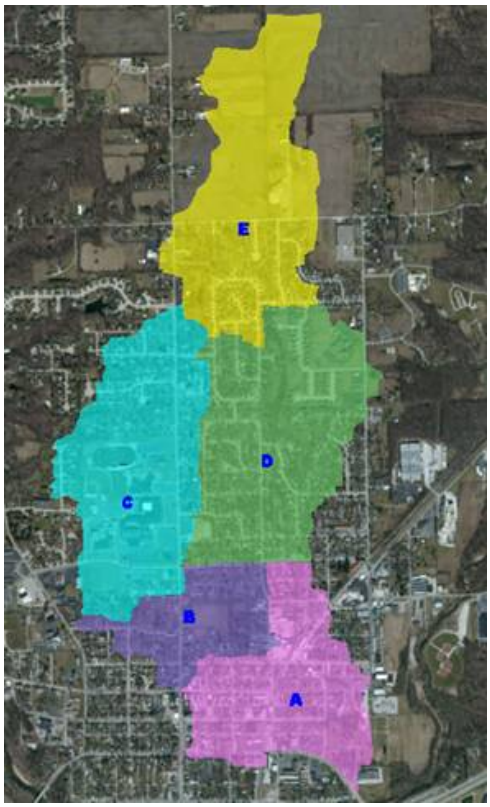


Figure 1: Watershed Boundary

1) Introduction

A. Overall Watershed

The hydrologic and hydraulic study of Mooresville encompassed 626 acres, just under one square mile. A small portion of the watershed, 86 acres, is within Hendricks County. The remaining 540 acres of the watershed is located within the Town of Mooresville and Morgan County. The watershed eventually drains into the East Fork of White Lick Creek, southeast of Mooresville, near the intersection of State Roads 67 and 144.

The study area has been split into five separate areas, based on watershed boundaries and issues observed. These areas and overall watershed boundary are shown in Figure 1.

2) Data Collection

A. Topographic Information

Topographic information was pulled from two sources: *Indiana University's ISDP Download Tool*[1] and a survey by Banning Engineering. 2011 LIDAR from the IU GIS website was used to create 1 ft contours of the entire watershed. In addition, the 2015 survey by Banning Engineering gathered approximately 25 cross sections, 41 culverts and bridge crossings, 19 finished floor elevations, and 4 roadway profiles.

B. Geographic Information Systems Data

The available GIS data included parcels, roadway locations and names, aerial photography, municipal boundaries, and parcel reports from *39 Degrees North*[2]. Other online GIS resources included the *USDA Soil Survey*[11]. Fortuitously, the Google Street View images available appear to be taken just hours after the July 2015 storm. It is obvious the water has receded in these images, but the general impacts of the

flooding are still apparent.

C. Field Reconnaissance

Field reconnaissance took place throughout the course of the study to support assumptions for the hydraulic study and to obtain valuable data for project development. Several days were spent by professional staff within the Town of Mooresville studying the lay of the land and confirming watershed boundaries.

Storm sewer locations were observed within the watershed to develop accurate internal basin boundaries. During the course of the site visits, it was discovered that the condition of several manholes were deteriorating. For example, the masonry manhole located on Northfield Drive, shown in Photo 1, appears to have a water line running through it. Some of the bricks have fallen into the manhole along with other debris. This manhole connects the Westwood Drive ditch, from the north, to Edgewood Drive, to the West, and outlets into the ditch just West of Canaan Street. It is the primary outlet for Area E.

Photo 1: Northfield Drive Manhole

In Area A, there were several industrial structures built across the ditch. These buildings, such as the one shown in Photo 2, restrict flow during larger storm events.

Photo 2: Building South of Railroad

D. July 2015 Event

The July 2015 flood event negatively affected many residences and businesses within the town. The event that occurred in was well covered by the local media outlets. As such, there were several sources of useful information used to calibrate the flood model created as part of this study. These sources included news reports, shared photos, resident accounts from field visits, and accounts from Town

personnel. Further information on the model calibration can be found in later sections of the report.

According to *8 WISH TV's* July 12th, 2015 publication[3], the Mooresville Fire Department rescued several families from their homes, by boat, during the night. The report indicated that the problematic areas included Areas A and E predominately with the more intense flooding near Edgewood Drive, Bridge Street, and Taylor Street. Several that were rescued stayed the night at the Middle School, with the assistance of the Red Cross. Several accounts of the event are included below. Additional information from the news coverage was used within portions of the public input sections of the report.

> *"I watched the water come in from the wall and just roll right to the center of the room in the carpet. It was fast." – Timothy Long*
>
> *"It was waist deep in my yard. This house has been in our family for 30 years and it's the first time this has happened." – Paul Uhls (Bishop Street, Area A)*

According to Fox 59's July 12th, 2015 publication[4], there were approximately a dozen water rescues. Accounts of the event were included, as follows:

> *"I think I lost everything. It's one of those things where you have no control over it and right now there's really nothing I can do." – Timothy Long*
>
> *"It was like a river." – Judy Ransome Moone (W. Washington St., Outside study watershed)*

Photo 3: Submerged Car

A photo also surfaced on *8 WISH TV's* website[3], at an unidentified location in Mooresville Indiana, showing a car partially submerged at night. The photo, shown in *Photo 3*, was a courtesy of a Cassie Jo White. It is unknown where, in Mooresville, this photo was taken.

3) Public Input

A. Public Input

Public input for the study was obtained using several methods. First, information from the July 2015 news coverage of the flooding event was used to note areas of concern and extent of flooding. Second, Town of Mooresville staff took Banning Engineering staff on a tour of the watershed and highlighted what they observe during flood events. Lastly, property owners adjacent to the study reach were sent a letter alerting them of the drainage study and notify them that surveyors will be in the area to collect elevation data. Many residents took the time to call Banning Engineering staff to pass along their flooding experiences.

Each of the accounts described below were incorporated into this study, as applicable, by mapping out each of the descriptions by origin location. The origin locations of these accounts were determined using *Google Earth*[5], *Google Earth Street View*[6], and *39 Degrees North*[2], Morgan County's GIS platform, after conducting simple searches for each parcel owner. These accounts were invaluable in calibrating the hydraulic model used in this report, as a means to create a more accurate floodplain map for other storm events.

i. Area A

A video from the *8 WISH TV*[3] account shows flooding damages at Big John's Auto Repair Shop at 162 Taylor Street, shown in Photo 4. A house, also located on Taylor Street, appears to have flooding damage. Photo 5 was viewed from a Google Street photo taken not long after the storm event. A pile of carpet & debris is seen next to the street for trash pickup.

Photo 4: Big John's Auto Repair Shop

Photo 5: Residence along Taylor Street

Town Staff provided a tour of Area A. During this tour they indicated the Railroad Trestle, near Bolton Avenue and Taylor Street, had become blocked at some point prior to the major flood on July 12th. The pile of

pallets was verified in a photo taken from the video on *8 WISH TV's* July 12th, 2015 publication[3]. See Photo 6. It is believed the majority of these pallets floated into and blocked the railroad trestle leading up to the July 12th, 2015 storm event.

Photo 6: Railroad Trestle Blockage

Discussions with property owners within Area A indicated the flooding issues were magnified significantly by the blockage of the railroad trestle. Many reported water much higher than they ever experience before.

Owners downstream of the railroad trestle stated they have noticed the ditch has begun to sediment in. This was specifically noted in the area of the railroad trestle and the area just downstream. There appears to be old concrete, sediment, or just general debris accumulated in the ditch. The cross-section of the ditch at this location is noticeably smaller than it is upstream and downstream. One private crossing was noted just downstream of Bolton Avenue that does not appear to be used.

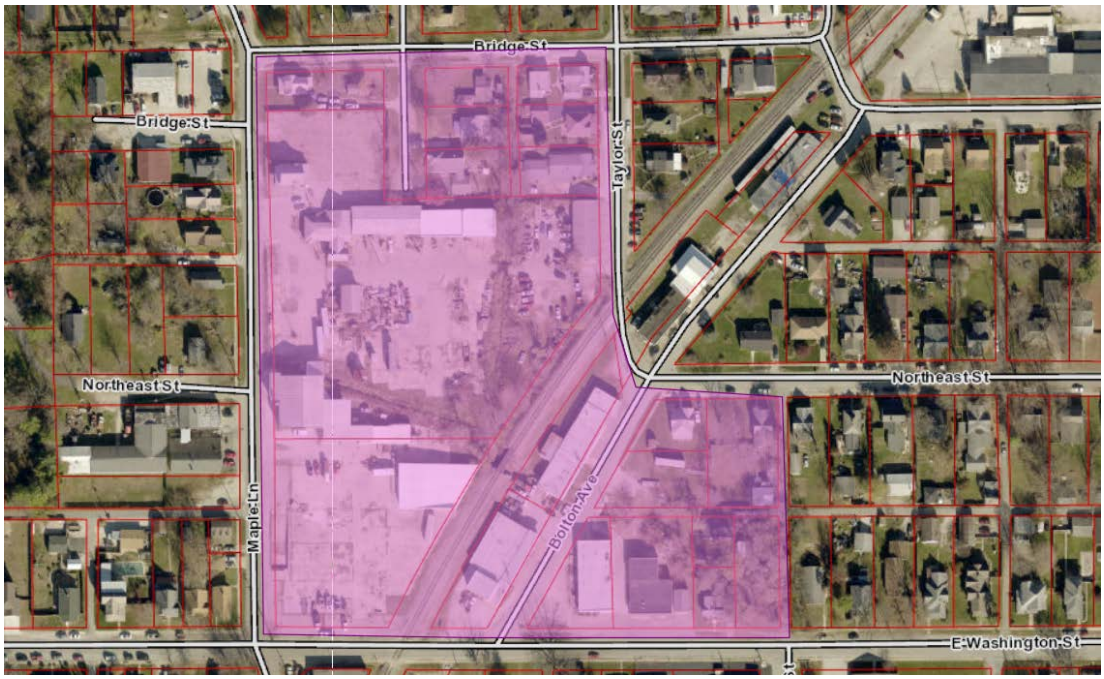


Figure 2: Area of Public Input within Area A

Property owner input for Area A was received predominately within the area bordered by Washington Street to the South, Maple Lane to the East and Bridge

Street to the North. This area was observed to have several structures over the ditch. Additionally, structures located next to the ditch have very little freeboard. Freeboard is elevation above the adjacent ground or flooding source. Figure 2 shows this location within Area A. One owner outside this area, 328 East High Street, expressed reoccurring impacts from flood waters.

ii. Area B

Town staff noted that issues have been expressed to them along Circle Drive just west of Indiana Street. Figure 3 shows this location. The reports state water from the west ponds and cannot go through a pipe west of Circle Drive. The water then proceeds over land as sheet flow across all of Circle Drive. Some vehicles parked on or near the road have reportedly been impacted. This claim is supported by Google Street photos showing vehicles drying out shortly after the floods on July 12, 2016. Photo 7 shows flowing storm water. It was taken standing on Circle Drive looking northeast to Indiana Street and the ditch being studied.

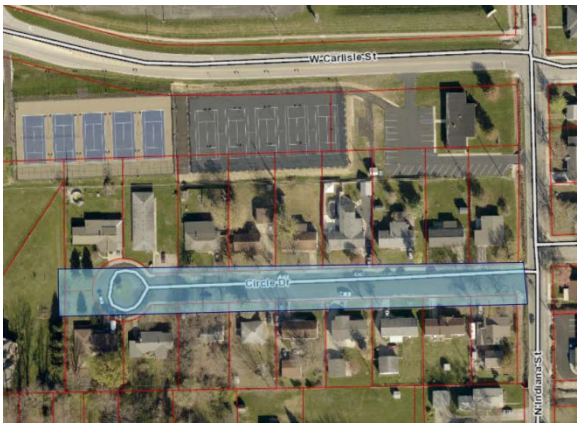


Figure 3: Area of Public Input within Area B

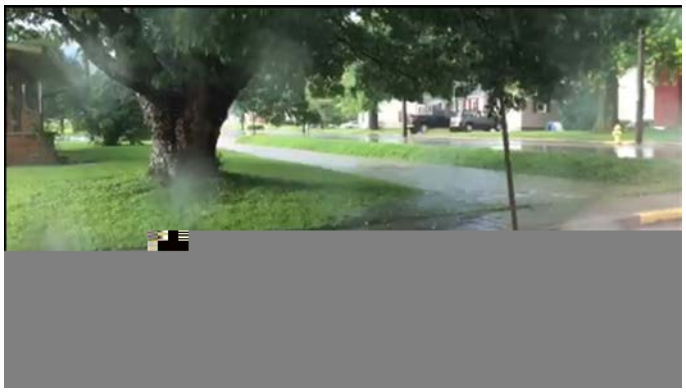


Photo 7: Storm Water at Circle Drive and Indiana Street

iii. Area C

Area C had primary public input north of Mooresville High School along Indiana Street. Residents within this area expressed they had trouble mowing the ditch along Indiana Street. Others expressed they filled there portion of the ditch many years ago. There were no reports of structure or vehicle flooding within this area. Figure 4 shows the area where the most residents expressed opinions about the ditch being studied.

Figure 17 Project E-4 New Pipe

Figure 18 Project E-4 Benefits

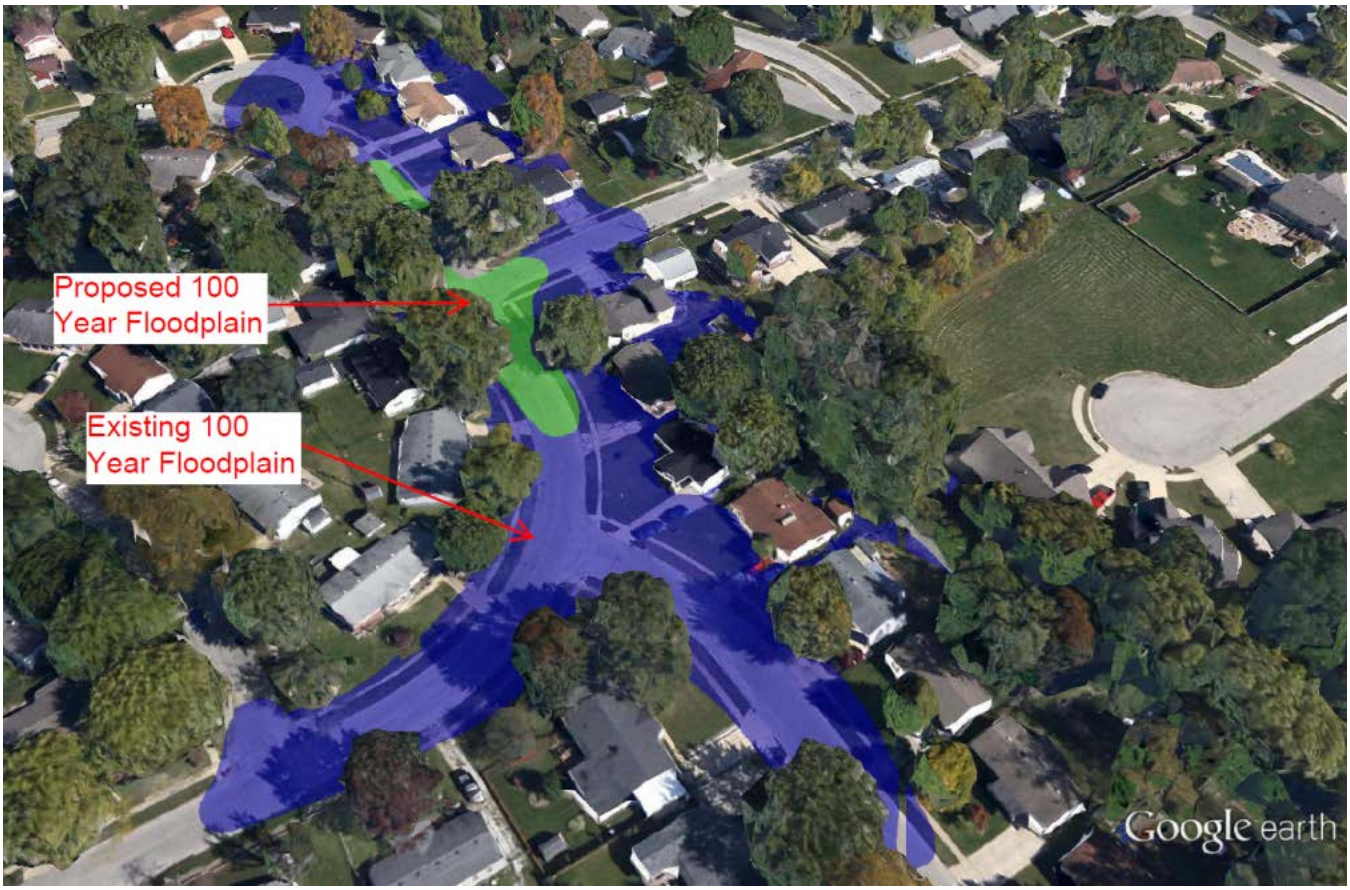
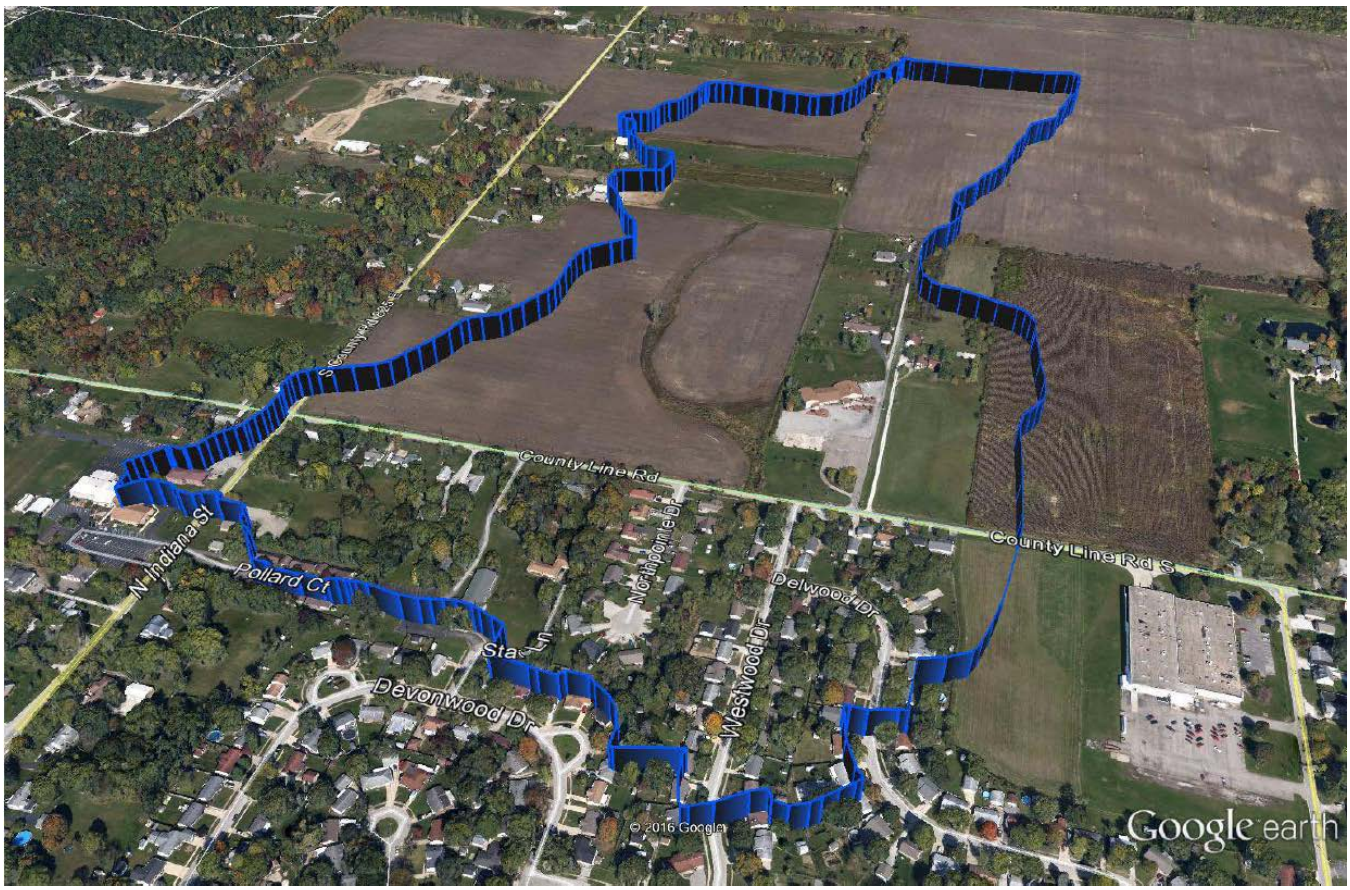


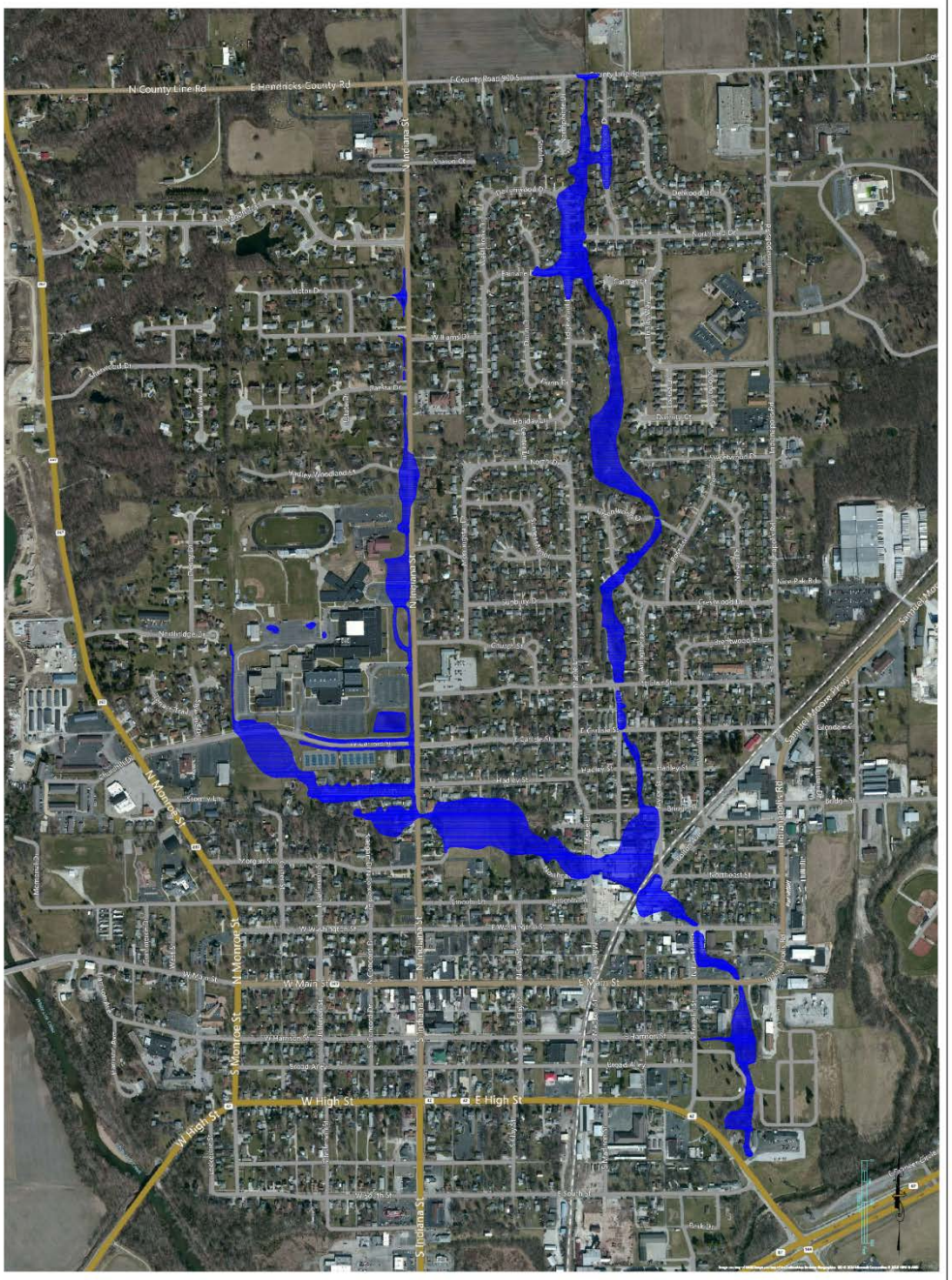
Figure 19 Project E-5 Location

Figure 20 Project E-6 Location

Figure 21 Drainage Impact Area



Appendix B – 100-Year Floodplain



BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

100 YEAR FLOODPLAIN (PRELIMINARY)

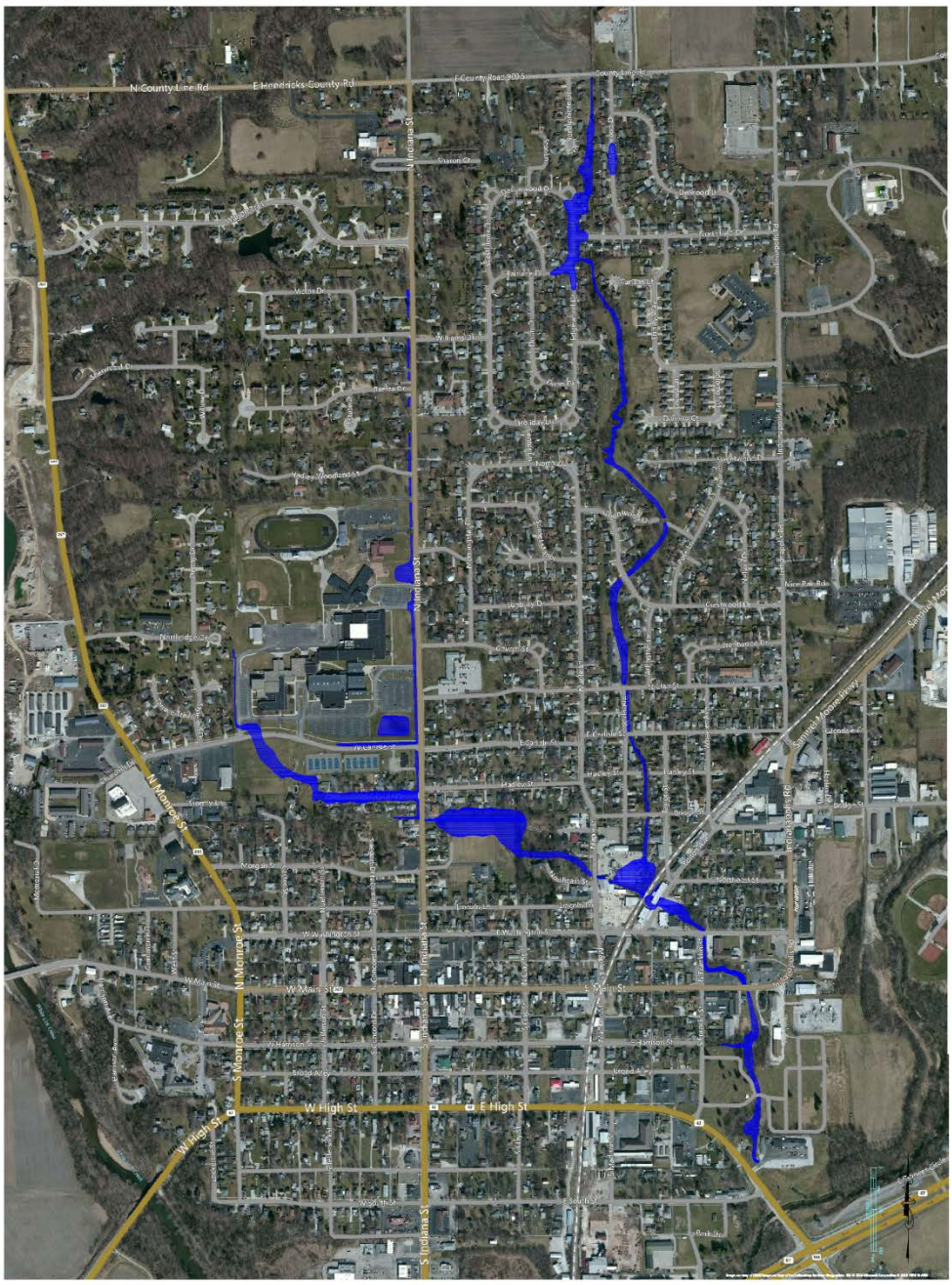
TOWN OF MOORESVILLE, INDIANA

Designed:
Drawn: JV
Checked:
Date: 2.16.2016

Sym.	Revisions	Date

Sheet No. 3
Project No. 133137

Appendix C – 10-Year Floodplain



BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

10 YEAR FLOODPLAIN (PRELIMINARY)

TOWN OF MOORESVILLE, INDIANA

Appendix D – Overall Watershed

Appendix E – Wetlands Opinion for Project E-4

AquaTerra

AquaTerra Consulting, Inc.
Randy Jones
151 North Home Avenue
Franklin, IN 46131

317/502-7897
866/827-5608 (facsimile)

Randy@aquaterracons.net

Mr. Joe Miller
Banning Engineering, PC
853 Columbia Road Suite 101
Plainfield, IN 46168

January 22, 2016

Re: *Mooresville Drainage Flood Study*
Section 404/401 Permitting
Hendricks County

Dear Mr. Miller:

In regards to our conversation concerning the potential permit ramifications resulting from the construction of a floodwater detention facility at property located near CR 825 East and Countyline Road, in Mooresville, please consider the following:

The US Army Corps of Engineers exercises regulatory authority of all "waters of the United States", including rivers, lakes, streams, and their adjacent wetlands. Based on site observations, I believe that there are jurisdictional waters present in the proposed detention site, including approximately 1-2 acres of emergent/scrub-shrub wetlands, and as much as 600-800 linear feet of ephemeral/intermittent stream channel. To authorize placement of fill material into jurisdictional "waters of the United States", a Section 404 permit from the Corps, and a Section 401 Water Quality Certification, from IDEM, are required. As a condition of permit issuance, the regulatory agencies require that impacts to jurisdictional waters be avoided and minimized, as much as possible, and remaining impacts be compensated for, through mitigation.

We discussed two scenarios for development of a floodwater detention facility at the site.

The first scenario centered on excavation of the area, combined with placement of a water control structure, to create a retention facility, or "wet pond". This method will result in fairly significant impacts to wetlands and stream channels, and the proposal would likely be denied by the agencies because other alternatives, resulting in less impacts to aquatic resources, are available.

Wetland impacts exceeding 1 acre will require issuance of Corps *Individual Permit* (IP), the most stringent permit mechanism. IP issuance requires a comprehensive *alternatives analysis* and *cumulative effects assessment*. For this type of activity, alternatives are presumed to exist. Permit denial is probable for this proposal.

Compensatory mitigation costs could run $30k - $60k per acre of wetland impact, and stream mitigation costs could run $30 - $50 per linear foot. Consulting costs for wetland delineation, IP permitting, and mitigation planning would run approximately $20k - $30k.

Figure 1 **Example of "Wet Pond" scenario**

The second scenario we discussed centered on excavation of areas adjacent to the existing wetlands/streams; to create something functionally similar to floodplain storage areas. This concept involves excavating areas outside of the wetland boundary, and limiting the fill material discharge/impact to jurisdictional waters, to just a control structure. This scenario demonstrates a comprehensive avoidance and minimization of wetland/stream impacts, and would likely result in permit issuance. Although permit applications to Corps and IDEM would still be required, since the fill material discharge could be limited to less than 0.1 acre, mitigation is unlikely to be required.

Figure 2 **Example of "Floodplain Storage" scenario**

Permit applications would need to demonstrate that the installation of a water control structure would not cause permanent impacts or degradation to the existing wetlands and/or stream channel functions. This concern can be ameliorated by appropriate water control pipe sizing, which allows for normal stream pass through, and only temporary inundation in existing stream channels, existing wetlands, and excavated floodplain areas, following storm events. Excavation of adjacent "floodplain areas" would serve similar function as existing wetlands, and the project would likely be "self-mitigating".

Consulting costs for this scenario's permit application submittal, including a required wetland delineation of the area, would run approximately $5k-$10k. Mitigation costs would not apply, however, some minimal on-site mitigation measures, such as seeding/planting of the excavated areas, may be required by the agencies.

Please let me know if you have any questions or need additional information at this time.

Sincerely,

Randy Jones
AquaTerra Consulting, Inc.

Figure 3 **Existing wetland areas**

Figure 4 **Existing ephemeral stream channel and adjacent wetlands**

Appendix F – Hendricks / Morgan County Joint Drainage Board Minutes (2012)

HENDRICKS COUNTY / MORGAN COUNTY
JOINT DRAINAGE BOARD

April 20, 2012
11:00 A.M.

Drainage Board members present were: Eric Wathen (Hendricks County), Stan Ryland (Hendricks County), Brian Goss (Morgan County), Don Adams (Morgan County), and Bill Hahn (Park County). Also present were: David Gaston (Hendricks County Surveyor), Terry Brock (Morgan County Surveyor), Deb Verley (Administrative Assistant), and Pete Foley (Morgan County Attorney).

Determination of a Quorum
Pledge of Allegiance
Prayer
Introductions

Election of Officers
Don Adams nominated Eric Wathen for President. Motion seconded by Stan Ryland. There were no other nominations. Motion carried 5-0.

Brian Goss made a motion to appoint Don Adams as Vice President. Motion seconded by Stan Ryland. There were no other nominations. Motion carried 5-0.

Eric Wathen made a motion to appoint Bill Hahn as Secretary. Motion seconded by Brian Goss. There were no other nominations. Motion carried 5-0.

Mudd Creek Drainage Discussion
Terry Brock stated that Mudd Creek goes through the northwest part of Morgan County and also flows through Hendricks County. At a previous meeting, it was discussed that the creek needed cleaning and maintenance. David Gaston stated that there are 10 regulated drains that dump into the creek and showed a map of the area. Mr. Brock stated that they will have to go through the permitting process before any work can begin. Stan Ryland stated that the creek is not wide enough to carry the volume of water and made a motion to have the two county surveyors start a study on the needs of Mudd Creek for the two counties and report back to the board in October. Motion seconded by Don Adams. Motion carried 5-0.

Drainage Issues along County Line Road
David Gaston stated that there are some homes in Mooresville that are getting flooded and the watershed is in Hendricks County. The water flows through a culvert on County Line Road and goes into a swale through the town of Mooresville and into a 36" pipe. Holloway Engineering, at the request of the Morgan County Surveyor, performed an engineering analysis. Ross Holloway, Holloway Engineering, stated that this is a very rudimentary study. There are approximately 141 acres in the watershed and 100 to 110 acres of this is in Hendricks County. There are two issues driving the flooding; there is a restriction above the section of the drainage system that goes through the 36" pipe and will barely handle a two-year flooding event, and the pipe will handle no more than a 10-year event. A viable economic solution would be to retain the water in Hendricks County. This would take a retention basin possibly as large as five acres. Mr. Holloway stated that it is not economical to increase the pipe size because there are houses that are right on the edge of the pipe and it would also be difficult to gain access to the ditch. The retention pond would retain the water upstream so it could be released at a slower rate. The next step would be to analyze the area north of the county line road and determine the size of the pond and where it should be located. The construction of a pond would take agricultural property out of production and would provide minimal benefit to property owners north of County Line Road.

Mr. Wathen asked if there were any public comments. George Watkins, Town of Mooresville Council President, thanked the board for looking at the issue and stated that there are families that have water in their homes because of the flooding and that the town is losing part of their park every season due to erosion. Mr. Watkins stated that it is costing them environmentally as well as financially.

Mr. Ryland asked if the property for the retention pond would be donated or if it would have to be purchased. Mr. Gaston stated that this has not been discussed. Don Adams stated that perhaps a small nature park could benefit the property owner for the retention pond and could be a win, win

solution for everyone. There could also be grant funds available for this purpose. The board discussed who would benefit from the drainage work and how to divide the cost. Stan Ryland made a motion to direct the Morgan County Surveyor to move forward in a study on the detention area and report back to the board in three months. Motion seconded by Brian Goss. David Gaston asked Mr. Holloway to proceed with the preliminary topography work. George Watkins stated that he appreciated the attention the board was giving to the issue. Motion carried 5-0.

Update on Lake Ditch
Terry Brock stated that they have completed the dipping on Lake Ditch, all the spoils have been knocked down, and most of the fields are already planted. It is now clear all the way to the county line and the project was under budget. The next step is to clean under the bridges and then spray for vegetation.

Update on Building One – West Point Business Park
David Gaston stated that it was agreed at a previous joint drainage meeting that the West Point Business Park projects that come in on the Hendricks County portion of property will be reviewed by that county's drainage board and will also send plans to the Morgan County Surveyor for review. There is a project just north of Love's Truck Stop that has received approval by the Hendricks County Drainage Board as well as the Hendricks County Planning Commission. This will be another large building similar to the Johnson & Johnson building.

Wishes to be Heard
There were none.

Next Meeting
The next meeting was set for 11:00 a.m. July 20, 2012 at the Mooresville Government Center, pending confirmation that this date is open.

Adjournment
Stan Ryland made a motion to adjourn the meeting. Motion seconded by Brian Goss. Motion carried 5-0.

HENDRICKS / MORGAN
JOINT DRAINAGE BOARD

Eric Wathen, President

Don Adams, Vice President

Bill Hahn, Secretary

Attest:

David Gaston, Hendricks Co Surveyor

Stan Ryland

Terry Brock, Morgan Co Surveyor

Brian Goss

HENDRICKS COUNTY / MORGAN COUNTY
JOINT DRAINAGE BOARD

October 26, 2012
9:00 A.M.

Drainage Board members present were: Eric Wathen (Hendricks County), Stan Ryland (Hendricks County), Brian Goss (Morgan County), Don Adams (Morgan County). Bill Hahn (Park County) was absent. Also present were: David Gaston (Hendricks County Surveyor), Terry Brock (Morgan County Surveyor), Pete Foley (Morgan County Attorney), and Deb Verley (Administrative Assistant).

Determination of a Quorum

Pledge of Allegiance

Prayer

Minutes
Eric Wathen noted that his name was misspelled in the April 20, 2012 minutes. Stan Ryland made a motion to approve the minutes with the correction. Motion seconded by Don Adams. Motion carried 4-0.

County Line Road Drainage Issue
Terry Brock stated that he received a letter from Russell Webb, Jr., attorney for the Rost Family Farm. The letter stated that Richard and Leo Rost do not believe it is in their best interest to participate in the study that the Joint Drainage Board is conducting. Ross Holloway, Holloway Engineering & Surveying stated that this poses some challenges in devising a solution to the drainage issue along County Line Road and providing relief for the residents whom are getting flooded in Mooresville. Mr. Holloway handed out an elevation map of the area showing an existing wetland in the field close to the church. Expanding the wetland with a 5.93 drainage basin could be a possible solution. The board then discussed legal drains, and urban drains. Pete Foley stated that in order to establish a legal drain there must be a petition filed in the Surveyor's Office with 10% of _____ or 25% of the assessed value. Eric Wathen asked if they would need to issue bonds for the construction and maintenance costs. Mr. Foley stated that the board would need to define the benefits, upstream as well as downstream, and determine if the cost/benefits meet standards. Mr. Holloway stated that the costs could be between $50,000 to $60,000 plus the cost of the land. Dave Gaston asked if the owners were willing to sell. Mr. Ryland suggested making an offer for 10 acres and that would be the starting point. Mr. Gaston stated that he would like to try a regional detention solution before going through the process of a legal drain. Mr. Gaston noted that the homeowners that receive the benefit would be the ones paying for it. Mr. Holloway stated that it could be an annual assessment of $75 to $100.

A discussion followed regarding jurisdiction. Mr. Foley stated that the board would need to purchase the land then petition for a legal drain. Don Adams suggested that there could be funding through the MPO (Metropolitan Planning Organization). Mr. Ryland stated that they should also obtain a commitment for the project from the Town of Mooresville. Mark Mathis (Town of Mooresville Council member) stated that he could not speak for the Council, but would inform them of the issue. The board asked that Mr. Gaston and Mr. Ryland approach Richard and Leo Rost regarding selling property for a retention pond.

Mudd Creek
Terry Brock stated that Mudd Creek will be a major project and he will report back at a future meeting.

Wishes to be Heard
There were none.

Next Meeting
The next meeting was set for 9:00 a.m. November 30, 2012 at the Mooresville Government Center.

Adjournment
Stan Ryland made a motion to adjourn the meeting. Motion seconded by Brian Goss. Motion carried 4-0.

HENDRICKS / MORGAN
JOINT DRAINAGE BOARD

Eric Wathen, President

Don Adams, Vice President

Bill Hahn, Secretary

Attest:

David Gaston, Hendricks Co Surveyor

Stan Ryland

Terry Brock, Morgan Co Surveyor

Brian Goss

Appendix G – Photo Log

Photo 1: Outlet Channel to East Fork of White Lick Creek
Station: 100

Photo 2: 9ft CMP outlet near Squealers BBQ
Station: 100

Photo 3: 9ft CMP near Squealers BBQ
Station: 102

Photo 4: 9ft CMP near Squealers BBQ
Station: 102

Photo 6: Culvert on Main Street
Station: 106

Photo 8: Bridge at Tackle Service Center
Station: 110

Photo 5: Culvert in cemetery
Station: 104

Photo 7: Culvert at E. Washington Street
Station: 107

Photo 9: Culvert at Bolton Avenue
Station: 111

Photo 10: Structure over ditch near Bolton Avenue
Station: 113

Photo 11: Structure over ditch near Bolton Avenue
Station: 114

Photo 12: Railroad trestle/bridge
Station: 115

Photo 13: Structure over ditch near Maple Lane
Station: 118

Photo 15: Culvert under Maple Lane
Station: 120

Photo 14: Industrial access bridge near Maple Lane
Station: 119A

Photo 16: Culvert under Orthodontics parking lot
Station: 121

Photo 17: Culvert under Orthodontics parking lot
Station: 122

Photo 18: Culvert under Indiana Street
Station: 123

Photo 19: Culvert under Indiana Street
Station: 124

Photo 20: Culvert under Circle Drive along Indiana Street
Station: 125

Photo 21: Circle Drive outlet to the Indiana Street roadway ditch
Station: 125

Photo 22: Circle Drive outlet to the Indiana Street roadway ditch
Station: 126

Photo 23: Culvert under Carlisle Street
Station: 129

Photo 24: Culvert under Carlisle Street ; Pedestrian bridge
Station: 130

Photo 25: Culvert at school entrance along Indiana Street
Station: 136

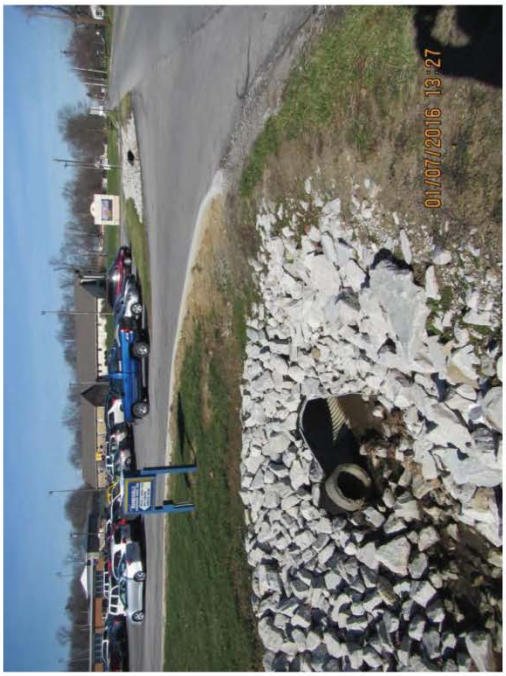


Photo 26: Culvert at school entrance along Indiana Street
Station: 137

Photo 27: Culvert at school along Indiana Street
Station: 140

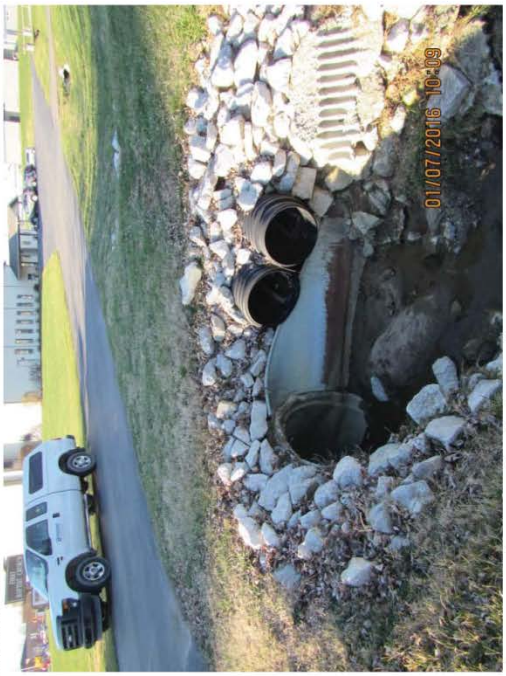


Photo 28: Culvert at school along Indiana Street
Station: 142

Photo 29: Culvert under access road to football field and parking lot
Station: 143

Photo 30: Culvert under Hadley Woodland St.
Station: 146

Photo 31: Culvert under private drive along Indiana Street
Station: 147

Photo 32: Storm sewer along Indiana Street
Station: 150

Photo 33: Culvert under Raesta Drive
Station: 153

Photo 34: Culvert under private drive along Indiana Street
Station: 157

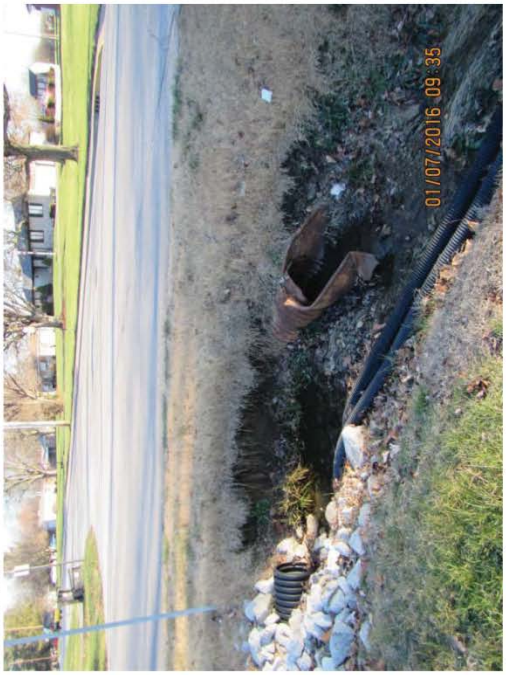


Photo 35: Culvert under Victor Drive
Station: 158

Photo 36: Storm sewer north of Victor Drive, along Indiana Street
Station: 160

Photo 37: Upstream end of study reach, along Indiana Street
Station: 164

Photo 38: Culvert under Bridge Street, near Bishop Street, looking South
Station: 201

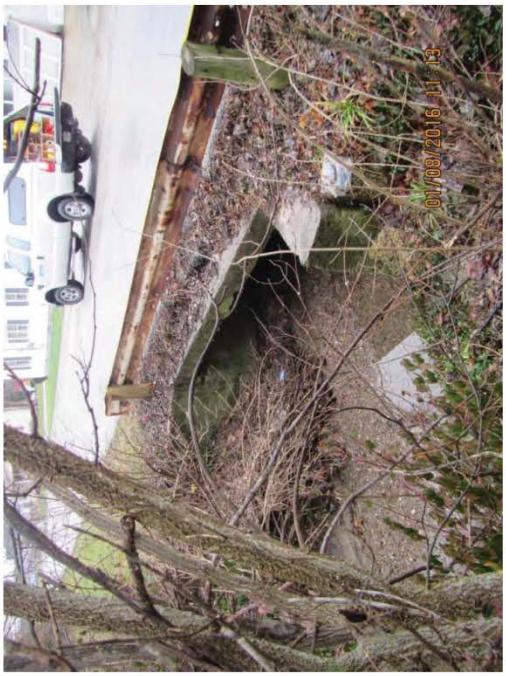


Photo 39: Culvert under Bridge Street, near Bishop Street
Station: 200

Photo 40: Culvert under E. Carlisle Street, looking South
Station: 202

Photo 41: Culvert under E. Carlisle Street, looking South
Station: 203

Photo 42: Culvert under St. Clair Street
Station: 204

Photo 43: Culvert under St. Clair Street
Station: 205

Photo 44: Culvert under Crestwood Drive
Station: 207

Photo 46: Pedestrian bridge in park, across from Greenwood Drive
Station: 208

Photo 48: Manhole connection on Northfield Drive
Station: 210A

Photo 45: Culvert under Crestwood Drive
Station: 206

Photo 47: Downstream outlet off of Northfield Drive
Station: 210

Photo 50: Low point on Edgewood Drive, looking North
Station: 210B

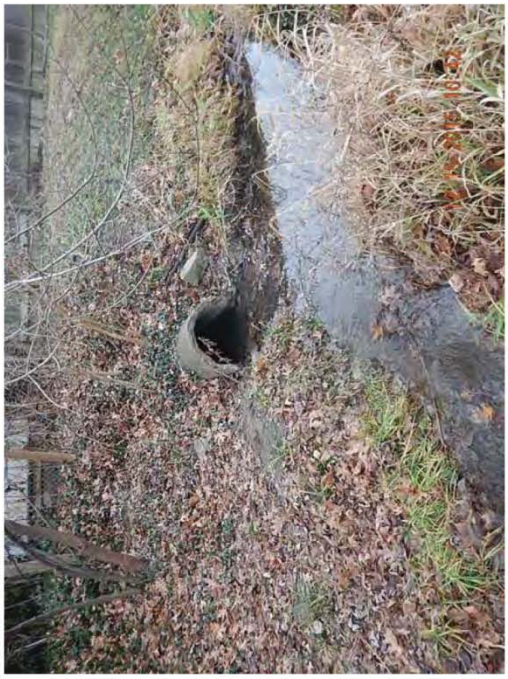


Photo 52: Outlet from Westwood drive into backyard ditch
Station: 212

Photo 49: Low point on Edgewood Drive, looking South
Station: 210B

Photo 51: Upstream end of 30"RCP, west of Westwood Drive
Station: 211

Photo 54: E. County Road 900 South, looking South
Station: 215

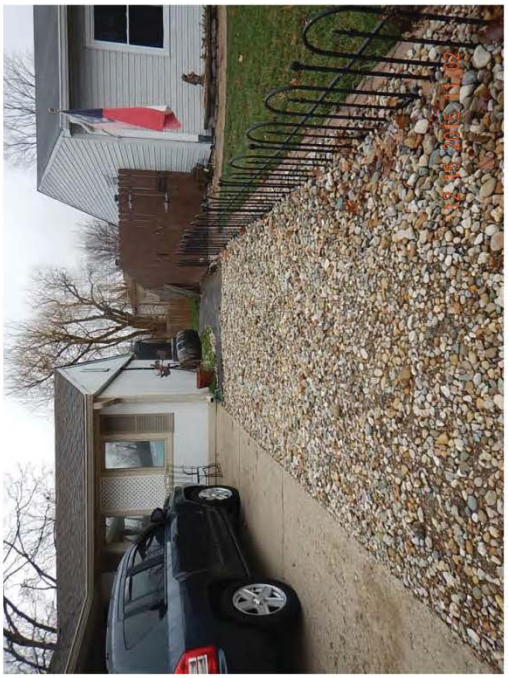


Photo 53: Unofficial overflow route from Westwood Drive between
Station: the houses.

Photo 55: Culvert under E. County Road 900 South
Station: 215

Photo 56:
Station:

Appendix H– Project Cost Estimates

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project A-1 (Clean and Dip Ditch)

Phase 1

line	item	quantity	unit	unit price	total cost
1	Tree Removal (1-side)	1,000	LF	$20.00	$20,000.00
2	Debris and Sediment Removal	1,430	LF	$10.00	$14,300.00
3	Haul Away	425	CYD	$15.00	$6,375.00
4	Under Buildings and Railroad	3	EA	$2,500.00	$7,500.00
5	Seeding	1	Acres	$5,000.00	$5,000.00

Subtotal	$53,175
20% Contingency	$10,635
Total	$63,810

Phase 2

line	item	quantity	unit	unit price	total cost
1	Tree Removal (1-side)	975	LF	$20.00	$19,500.00
2	Debris and Sediment Removal	1,850	LF	$7.50	$13,875.00
3	Haul Away	275	CYD	$15.00	$4,125.00
4	Seeding	1	Acres	$5,000.00	$6,250.00

Subtotal	$43,750
20% Contingency	$8,750
Total	$52,500

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project B-1 (Green Space Converted to Offline Detention)

line	item	quantity	unit	Median unit price	total cost
1	Mobilization / Demobilization	1	LS	$24,000.00	$24,000.00
2	Tree & Root Removal	0.5	ACRES	$5,250.00	$2,625.00
3	Strip Stockpile and Place Topsoil	2,420	CYD	$7.00	$16,940.00
4	Silt fence	1,600	LF	$3.00	$4,800.00
5	Erosion Control Blankets	5,000	SY	$3.00	$15,000.00
6	Excavation and Soil Removal	12,000	CYD	$15.00	$180,000.00
7	Seeding	3.3	ACRES	$5,000.00	$16,500.00
8	18" RCP	60	LF	$35.00	$2,100.00
9	Riprap	50	TONS	$60.00	$3,000.00
				Subtotal	$264,965
				W/ 15% Contingency	$304,710
10	Land Acquisition (Estimated)	3.75	ACRES	$20,000.00	$75,000.00
11	Professional Services	1	20%	$60,941.95	$60,942
				Subtotal	$135,942
				Total Project Cost	$440,652

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project C-1 (Piping Indiana Street with Offline Detention)

line	item	quantity	unit	Median unit price	total cost
1	Mobilization / Demobilization	1	LS	$40,000.00	$40,000.00
2	Strip & Stockpile Topsoil	1,100	CYD	$7.00	$7,700.00
3	Silt fence	3,000	LF	$3.00	$9,000.00
4	Excavation and Soil Removal	8,000	CYD	$15.00	$120,000.00
5	Topsoil Placement	1,100	CYD	$7.00	$7,700.00
6	Seeding	3	ACRES	$5,000.00	$15,000.00
7	Class I Riprap	60	TONS	$40.00	$2,400.00
8	Pipe Removal	6	EACH	$1,200.00	$7,200.00
9	30 Inch Pipe	2200	LF	$70.00	$154,000.00
10	Manholes / Inlets	15	EACH	$3,500.00	$52,500.00
11	Curb	2200	LF	$25.00	$55,000.00
12	Pavement Repair	2200	LF	$35.00	$77,000.00
				Subtotal	$547,500
				W/ 20% Contingency	$657,000
13	Professional Services	1	15%	$98,550.00	$98,550
				Subtotal	$98,550
				Total Project Cost	$755,550

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project D-1 (Two-Staged Ditch)

line	item	quantity	unit	Median unit price	total cost
1	Mobilization / Demobilization	1	LS	$5,660.00	$5,660.00
2	Silt fence	2,500	LF	$3.50	$8,750.00
3	Erosion Control Blankets	2,000	SY	$3.00	$6,000.00
4	Excavation	3,000	CYD	$8.00	$24,000.00
5	New Pipe	30	LF	$175.00	$5,250.00
6	Seeding	4	ACRES	$3,150.00	$12,600.00
				Subtotal	$62,260
				W/ 20% Contingency	$74,712
7	Professional Services	1	20%	$14,942.40	$14,942
				Subtotal	$14,942
				Total Project Cost	$89,654

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project E-2 (Additional Inlets to Drain Low Area at Northfield and Edgewood Drives)

line	item	quantity	unit	Median unit price	total cost
1	Mobilization / Demobilization	1	LS	$2,170.00	$2,170.00
2	24 Inch Pipe	110	LF	$70.00	$7,700.00
3	Pavement Repair	110	LF	$35.00	$3,850.00
4	Inlets	2	EA	$3,500.00	$7,000.00
5	Incidentals	1	LS	$3,150.00	$3,150.00
				Subtotal	$23,870
				W/ 20% Contingency	$28,644
6	Professional Services	1	20%	$5,728.80	$5,729
				Subtotal	$5,729
				Total Project Cost	$34,373

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project E-4 (County Line Storage and New Pipes at Edgwood / Northfield Drives)

line	item	quantity	unit	Median unit price	total cost
1	Mobilization / Demobilization	1	LS	$60,000.00	$60,000.00
2	Strip & Stockpile Topsoil	8,000	CYD	$7.00	$56,000.00
3	Silt fence	2,700	LF	$3.00	$8,100.00
4	Erosion Control Blankets	3,000	SY	$3.00	$9,000.00
5	Excavation & Removal	17,000	CYD	$15.00	$255,000.00
6	Compacted Earthfill	1,300	CYD	$12.00	$15,600.00
7	Topsoil Placement	8,000	CYD	$7.00	$56,000.00
8	Seeding	12	ACRES	$3,500.00	$42,000.00
9	Riprap	400	TONS	$60.00	$24,000.00
10	Structure Removal	3	EA	$3,000.00	$9,000.00
11	15 Inch Pipe	40	LF	$35.00	$1,400.00
12	18 Inch Pipe	280	LF	$55.00	$15,400.00
13	24 Inch Pipe	250	LF	$65.00	$16,250.00
14	30 Inch Pipe	140	LF	$80.00	$11,200.00
15	Manholes and Inlets	3	EA	$3,500.00	$10,500.00
16	Street Repair	1	LS	$30,000.00	$30,000.00
				Subtotal	$619,450
				W/ 20% Contingency	$743,340
17	Land Acquisition	12	ACRES	$9,000	$108,000
18	Professional Services	1	20%	$148,668	$148,668
				Subtotal	$256,668
				Total Project Cost	$1,000,008

Engineer's Estimate of Probable Costs
Town of Mooresville Drainage Study
Morgan County, Indiana
Project E-7 (Purchase 1 House at Each end of Edgewood, Install Overflow Paths)

line	item	quantity	unit	Median unit price	total cost
1	Purchase Residence	2	EA	$90,000.00	$180,000.00
2	Control Structure	2	EA	$5,000.00	$10,000.00
3	Berms	2	EA	$5,000.00	$10,000.00
				Subtotal	$200,000
				W/ 20% Contingency	$240,000
4	Professional Services	1	20%	$48,000.00	$48,000
				Subtotal	$48,000
				Total Project Cost	$288,000