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Executive Summary

Introduction

The following report describes the findings of Banning Engineering, P.C. for the Hydraulic Study for the George Symons and William Krause Watershed. The watershed covers 7.4 square miles in the northwest corner of Hamilton County within Adams Township. A portion of the Town of Sheridan is within the watershed. The watershed generally drains from southwest to northeast.

The area of focus includes areas adjacent to the open George Symons drain ½ mile downstream of Eagletown Road upstream to the Town of Sheridan. Another area of focus includes the William Krause tile located mostly within the Town of Sheridan. Existing drainage infrastructure supporting the Marion Adams School Corporation facilities was also analyzed in detail.

Data Collection

The following information was reviewed and incorporated into the study, as appropriate: reconstruction petitions; history of maintenance; drainage board minutes; record drawings; watershed level 1 – foot topographic contours and other GIS data; site specific field data for areas of detailed study obtained by Banning Engineering, P.C. surveyors; Natural Resources Conservation Service Web Soil Survey; National Weather Service Historic Precipitation Data. Numerous existing studies were used and include: 2007 Watershed Management Plan for Little Cicero Creek; 2011 Total Maximum Daily Load Report; 2011 Morse Reservoir / Cicero Creek Watershed Management Plan; 2007 Hamilton County Thoroughfare Plan; 2008 to 2012 Hamilton County Highway Department Structure Improvement Plan; Indianapolis Metropolitan Planning Organization 2035 Long Range Transportation Plan.

Public input was a critical factor in the study. Public input was obtained during the field reconnaissance portion of the project and continued throughout the study. A formal public information gathering meeting was held on May 16, 2012 with sixteen residents participating.

Hydrologic Rainfall Data for the study was obtained from the National Oceanic and Atmospheric Administration National Weather Service Tipton 5 SW precipitation station. Observed rainfall depths from June 20, 2011, were utilized to calibrate the hydrologic and hydraulic model.

Existing Conditions

An existing conditions hydrologic and hydraulic model was compiled for the entire 7.4 square mile watershed and included 43 sub-basins, and 78 nodes of interest. Survey information and field observations were used to determine hydraulic characteristics of open channels and conduit systems.

A detailed flood analysis was completed for 2 miles of the George Symons ditch from the Sheridan WWTP to 0.70 miles downstream of Eagletown Road. Flowrates for both the 1% event (100-year) and 0.20% event (500-year) were used for the analysis. A floodway was determined using the 1% frequency event.

Flooding concerns occur throughout the watershed, but are most severe in six locations:

- Area 1 (American Legion Post 67)
  Area 1 is located within the overlapping watershed of the Thistlewaite and William and Krause Drains. The American Legion Post property is several feet lower than all of the surrounding topography, and appears to flood at least 5' in elevation before an overland flow route is established.
- Area 2 (East Side of Town of Sheridan)
  Area 2 is located along the Williams and Krause Drain Tile within the Town of Sheridan and west of SR 38. The existing 24 inch drain tile is not adequate to drain the upstream area as a stormwater outlet. Significant events exceed the 24 inch tile capacity and overtop SR 38. Aerial topography shows approximately 20 structures become inundated with flood waters when SR 38 overtops.
- Area 3 (Currey & Puzey Subdivision)
  Area 3 is the Curry and Puzey subdivision. The subdivion is bordered to the east and South by Marion – Adams High School. Two different flooding issues occur within Area 3. The first is flood waters raise within the detention basin for Marion – Adams High School. The second, is frequent overtopping of Hinesly Road and flooding of South Street through the subdivision. Several residences had flood waters within their houses on June 20, 2011.
- Area 4 (Moore Property)
  Area 4 is located at the confluence of the Benton Hinesley and George Symons Drain just east of Lamong Road (24695 Lamong Road). The Moore residence has experienced flooding on several occasions, with first floor flooding occurring on June 20, 2011. The residential structure is currently shown within an approximated Zone 'A' flood zone, but upon publication by FEMA, of the George Symons detailed flood study, it will be located within a detailed study Zone 'AE' and the regulatory floodway. Annually the Moore residence has a 10% chance of having flood waters against it. Additionally, Lamong Road has nearly a 50% chance of overtopping annually.
- Area 5 (Koepkey Property and Fox Field Estates)
  Area 5 is located further downstream along the George Symons drain where the drain crosses Eagletown Road. The Koepkey property has flooded several times with significant basement flooding occurring on June 20, 2011. The structure and property are currently shown within an approximated Zone 'A' flood zone. Upon publication of the detailed George Symons flood study the structure will be shown within a Zone 'AE' and the regulatory floodway. There is between a 4% and 10% chance of the Koepkey structure having flood waters against it annually. Additionally, there is between a 4% and 10% chance of Eagletown Road overtopping.
- Area 6 (Arm 3 of George Symons Drain)
  Area 6 is located at the intersection of Eagletown Road and 246th Street. The two culvert crossings at this intersection frequently overtop and produce a hazardous environment for local residents. During the course of this study it was noted that the Hamilton County Highway Department upsized and replaced these two structures.

A significant flood event occurred on June 20, 2011. This event was used to calibrate the hydrologic and hydraulic modeling. Reportedly 6 inches of rainfall occurred within a 3-hour period. This rainfall depth and duration is just below the 0.10% event (1000-year) depth of 6.07 inches. Observed high water marks were compared to modeled results throughout the watershed. In general, modeled results within

Areas (1, 2, 3, & 4) are very similar to observed data. Area 5 models slightly higher than the observed data, likely due to the inconsistency of the rainfall depth at this point further downstream in the watershed. Area 6 was observed to flood, but not enough information was available to calibrate with the modeling.

- Area 1 experienced flooding at American Legion Post 67. Several feet of flooding occurred on the Legion's parking lot and against the building. Several other structures in the area had water against them.
- Area 2 experienced flood waters for over 12 hours and SR 38 was overtopped. Numerous structures flooded.
- Area 3 experienced flood water along South Street and adjacent to the Marion – Adams High School detention basin. Several residential structures on the east side the Curry and Puzey Subdivision experienced first floor flooding.
- Area 4 experienced significant flooding on June 20, 2011. Flood waters inundated the Moore property and the first floor of the Moore residence was flooded.
- Area 5 experienced considerable flooding with the entire Koepkey property inundated with flood waters. The first floor of the Koepkey residence was spared flooding, but the garage reportedly had water within it and the basement filled with flood waters.
- The intersection at Area 6 was overtopped.

Marion – Adams school detention facilities were analyzed as part of this study. Both the new Elementary School, existing High School detention and outlet works were analyzed. Results of the study concluded:

- Both detention basins reduce peak flowrates downstream.
- The elementary school detention facility reduces flowrates downstream during a 1% event by nearly 90%. It is also estimated, the flowrate off the property during the June 20, 2011 event was reduced by 76% when compared to pre-existing conditions.
- The High School Detention basin functions adequately for onsite runoff (52.5 acres). It appears the 162 acres of offsite runoff does not pass through the facility without attenuation. This attenuation affects adjacent properties within Curry and Puzey Subdivision.
- During a 1% event, inflow to the basin is 190 cfs and discharge is 133 cfs. Modeling shows 0.1 foot inundation of at least one structure within Area 3.
- Curry and Puzey Subdivision was constructed before the detention basin. Without the detention basin or school facilities present, flooding within Curry and Puzey Subdivision would be expected to be 0.6 feet higher during a 1% event. In other words, the High School Detention Basin has a net positive impact on flood elevations upstream and downstream of 246th Street.
- Curry and Puzey Subdivision was built below 246th Street, and the overland flow route to the east. It is estimated 11 existing structures do not meet the current lowest adjacent grade requirement of overland overflow elevation plus 2 feet.

Flooding Solution Set

Ten projects and two programmatic initiatives were advanced for consideration during the study. A brief summary of the Project and probable benefits are shown below:

- Project 1
  - Placement of over 3,000 linear feet of storm drainage as a reconstruction of the William and Krause Drain located within Area 2. Outlet the new storm pipe into a 12 acre regional detention basin just upstream of the Sheridan WWTP.
  - Land Acquisition – 42 acres +/-
  - Project Cost Opinion – $3,000,000
  - Project Benefit
  - Primary – Area 2
  - Secondary – Areas 4 & 5
- Project 2
  - Two-stage ditch construction along 7,000 linear feet of George Symons Ditch from downstream of Eagletown Road to 246th Street.
  - Land Acquisition – N/A
  - Project Cost Opinion – $665,000
  - Project Benefit – Areas 4 & 5
- Project 3
  - Regional detention basin west of Curry and Puzey Subdivision. The detention basin would outlet through a storm pipe through the Marion – Adams High School detention basin.
  - Land Acquisition – 16 acres +/-
  - Cost Opinion – $1,030,000
  - Project Benefit – Area 3
- Project 4
  - Expand current Marion – Adams High School detention facility under the drive entrance to the east.
  - Land Acquisition – 8 acres +/-
  - Project Cost Opinion – $1,343,000
  - Project Benefit – Area 3
- Project 5
  - Regional detention basin on 46 acres at the northwest corner of Lamong Road and 246th Street.
  - Land Acquisition – 46 acres
  - Project Cost Opinion – $2,385,000
  - Project Benefit – Areas 4 & 5
- Project 6
  - Modify 246th Street outlet structure from existing Marion – Adams High School detention facility. Re-construct grassed waterway from 246th Street to Lamong Road.
  - Land Acquisition – 1 acre +/-
  - Project Cost Opinion – $98,000
  - Project Benefit – Area 3
  - Project Damages – Areas 4 & 5
- Project 7
  - Overbank storage construction within Area 5. Increasing capacity through Eagletown Road by adding six 48 inch culverts in the left overbank.
  - Land Acquisition – 4 acres +/-
  - Project Cost Opinion – $887,000

    - Project Benefit – Area 5
- Project 8
    - Relocate Moore residence out of the future floodplain.
    - Land Acquisition – one property
    - Project Cost Opinion – $218,000
    - Project Benefit – Area 4
    - Needs to be sponsored by another municipal entity (not drainage board) or private funds
- Project 9
    - Reconstruct Arm 3 of the George Symons Drain from 246th Street downstream to its confluence with the main George Symons Drain.
    - Land Acquisition – N/A
    - Project Cost Opinion – $75,000
    - Project Benefit – Area 6
- Project 10
    - Acquire four frequently flooded properties. (Moore Property, American Legion Post 67, Koepkey Property, and Swan Property)
    - Land Acquisition – four properties
    - Project Cost Opinion – $749,000
    - Project Benefit – Areas 1, 4 & 5
    - Needs to be sponsored by another municipal entity (not drainage board) or private funds

We recommend the following projects to the drainage board for implementation based on positive project impacts to Areas 2, 3, 4, 5, & 6.

1. Project 1
2. Project 2
3. Project 6
4. Project 7
5. Project 9

Programmatic Initiatives:

Utilize 0.20% Event (500-Year) as future floodplain, and regulate structure locations and elevations along open drains from this data instead of the 1% Storm (100-Year).
Review structures downstream of road crossings. Set lowest adjacent grade to the minimum roadway overtopping elevation plus 2 feet.

Wetlands Investigation

Cardno JFNew performed a field survey of potential wetlands that may occur along Symons Ditch, and at other potential project locations within the watershed. The survey found that Projects 2, 5 & 9 occur in areas where wetlands may be present. Additionally, other areas may contain wetlands depending on future land use practices at the time of the survey.

Numerous previous studies list the George Symons Drain (Teter Branch) as a highly impaired water resource. Impairment includes phosphorus, nitrates, E. Coli and erosion. Projects 1 through 7 have

varying degrees of water quality benefit for the watershed. These benefits have potential to assist in acquiring funding for the projects.

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 assessments. The most promising funding mechanisms are listed below:

- Regulated Drain Reconstruction
  - Funding by Landowners through Assessments
- Flood Control Revolving Loan Fund (IDNR)
  - Maximum of $300,000
- Property Acquisition Grants (IDHS)
  - 25% Local Match Required
- Lake and River Enhancement Grants (IDNR)
  - $100,000 per project limit / $300,000 lifetime grantee limit
- Community Facilities Loan (USDA)
  - 40-year loan bonded against drainage assessments
- The Nature Conservancy Two-Stage Ditch Program
  - $7.50 per Linear Foot towards Two-Stage Ditch Project

Several Natural Resource Conservation Service landowner funding mechanisms are available for project development. Two main concerns occur when attempting to fund a project in this manner. First, you have to have a landowner that is willing to participate in the project with limited influence by the municipality. Secondly, the amount of funds available is typically less than those listed above for municipalities and program eligibility is competitive with other applications across the state.

Potential Phasing

The Surveyor's staff suggested phasing the recommended projects to address the concerns for total cost noted by the Hamilton County Drainage Board, Town of Sheridan and the general public. Two Scenarios were evaluated for this phased approach.

The first scenario was developed considering the watershed in its present state. The first two phases of Scenario 1 includes construction of 50% of Project 1, Project 2, Project 6, land acquisition for Project 7, and a 42" pipe under State Road 38 to Area 2. The third Phase of Scenario 1 includes expanding Project 1 to 75% of its recommended size. Phase 4 of Scenario 1 is to be performed by others. The last phase, Phase 5, includes completing Project 1. All told, Scenario 1 is estimated to cost $4,094,278.

Scenario 2 differs from Scenario 1 by requiring a pre-project installation of a water quality and water quantity Best Management Practice (BMP) at Area 4. This BMP would include the purchase and demolition of the Moore residence. After completion of the BMP, Scenario 2 mimics Scenario 1, but the proposed projects are smaller in scope. The total detention volume for Project 1 is reduced by 50% as well as the length of Project 2. The benefits to Areas 2, 3, 4 and 5 are maintained, but the estimated cost of implementation is reduced by $800,000.

A public meeting was held on February 13, 2013 at the Town of Sheridan Community Center. Both the report and potential scenarios were unveiled to the residents within the watershed. Thirty-two members of the public attended the meeting. Additionally, nine Hamilton County and Banning Engineering, P.C. staff were present. Public comments and questions were insightful and positive in nature. Several constituents leant their support to Scenario 2 as outlined in the presentation. Detailed minutes of the meeting are available at the Hamilton County Surveyor's Office for review.

Summary

In summary, the flooding challenges noted within the Hydraulic Study for the George Symons and William Krause Watershed are significant and interconnected. Relieving flooding issues in one location may adversely affect an area downstream or upstream. A holistic approach to project implementation will be required to keep damages low and benefits high.

Scope of Study

1. Develop a stormwater runoff model to simulate existing runoff and flooding potential and estimate possible increases in runoff that may be caused by future development.

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

3. Evaluate regional detention basins and their effectiveness in controlling future flood peaks. Include an economic analysis of such basins for the whole basin, owners of tracts adjacent to the drain and those owners of tracts not adjacent to the drain. Also review possible multi-use application of regional detention sites.

4. Identify stormwater quality concerns and potential best management practices.

5. Evaluate the existing detention facilities for the Marion Adams Schools.

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

7. Identify wetland areas.

8. Develop a detailed flood study including base flood elevations for the area of the George Symons Drain from the Sheridan WWTP to a point 1,650 feet downstream of Eagletown Road.

9. Obtain public input for the study.

10. Obtain public input for engineering construction plans. (potential future)

11. Develop engineering construction plans for the George Symons Open Ditch based on the results of the hydraulic study. (potential future)

12. Develop engineering construction plans for the William Krause storm sewer system improvement based on the hydraulic study. (potential future)

13. Identify financing mechanisms for implementation of needed improvements.

1.0 Introduction

1.1 Overall Watershed

The Hydraulic Study for the George Symons and William Krause Watershed covers a 7.4 square mile area in Northwest Hamilton County (see Figure 1.1). The Town of Sheridan is the primary developed area in the watershed and is located at the highest portion of the watershed (Elevation 960 FT). The unincorporated Town of Boxley is located at the downstream end of the watershed (Elevation 900 FT). The main George Symons open drain has a length of 4.1 miles at its confluence (junction) with Little Cicero Creek. This study covers a significant portion of the 14-digit hydrologic unit code watershed (05120201080080) known as Little Cicero Creek – Teter Branch (20.8 square miles). Water from the George Symons open ditch discharges into Little Cicero Creek and eventually flows into Morse Reservoir in Cicero.

The total area of study includes a total of 9 regulated drains (See Appendix C). The drains can be classified into three distinct classes. The first two classifications are open agricultural drains and closed agricultural drains. The third classification is an urban closed drain. An area listing with classifications is shown in Table 1.1.The area delineated, as a combined watershed with the Thistlewaite Regulated Drain, is shown in Figure 1.3.

1.2 Area of Detailed Study

The area of detailed study is the William Krause Drain and the George Symons Drain extending to a point 1,650 LFT downstream of Eagletown Road (See Figure 1.2). The detailed analysis will assess hydraulic

Figure 1.1 Overall Watershed Boundary

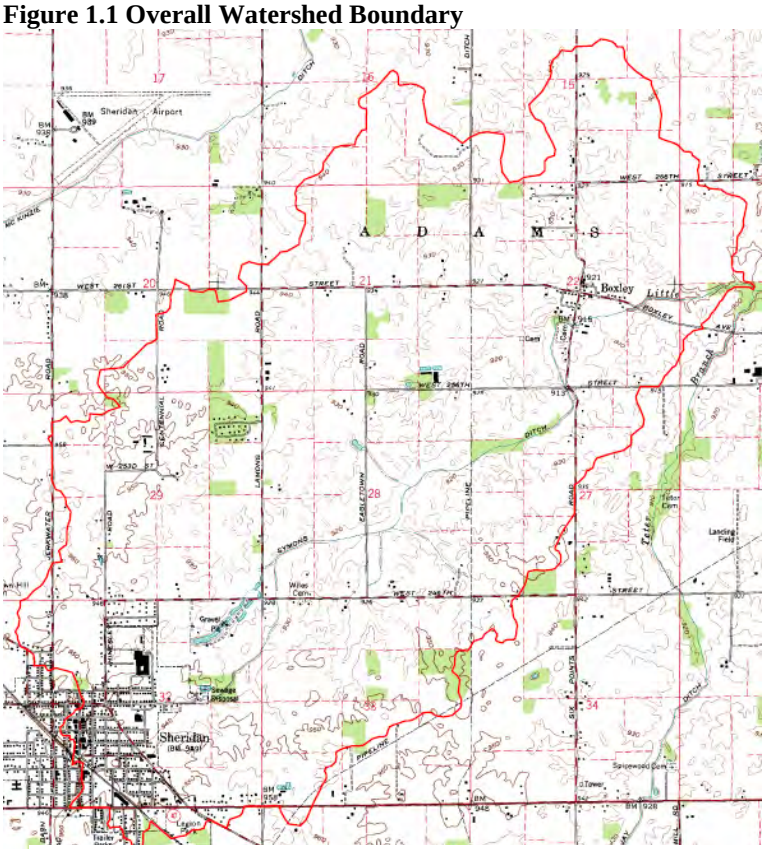
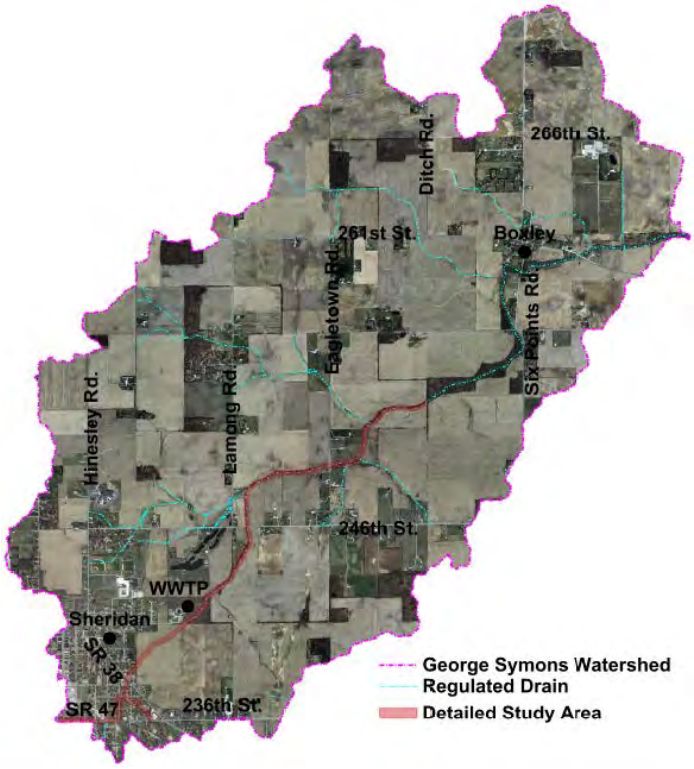


Figure 1.2 Detailed Study Area



capacity of the existing drainage infrastructure, and highlight potential improvements or modifications to this infrastructure. Additionally, a detailed regulatory flood study along George Symons Open Drain has been completed to assist in planning activities along the open drain.

Figure 1.3 Combined Watershed Area

1.3 Maintenance History of the Watershed

The watershed history for the George Symons and William Krause Drain is long and extensive. The original drain petition was completed in 1877, and was known as the West Cicero Ditch. In 1892, a new petition by George Symons provided the basis for what is known as the George Symons Open Drain. In 1919, a portion of the drain was tiled and was thence forth known as the William Krause Drain. Both drains were originally constructed as agricultural drains.

Table 1.1 Watershed Areas

Regulated Drain	Classification	Drainage Area (mi^2)
Benton Hinesley	Agricultural Closed	1.00
William Krause	Urban Closed	0.53*
George Symons Arm 3	Agricultural Open	0.48
George Beam	Agricultural Closed	0.24
William W. Thomas	Agricultural Closed	1.23
Ida Teter	Agricultural Closed	0.58
Abe Laudig	Agricultural Closed	0.56
Herr Haughley	Agricultural Closed	0.59
George Symons	Agricultural Open	7.40*

*Includes 0.028 mi^2 of combined watershed with Thistlewaite Regulated Drain

Maintenance on the George Symons Open Drain occurred regularly every few years from 1926 to 1941. Many years passed until the next maintenance was performed in 1965. The main purpose was to clean debris and blockage from the 1965 Palm Sunday Tornadoes. In 1995, the George Symons Open Drain was extended to its intersection with Teter Branch (Little Cicero Creek). At that time the drain was placed on regular maintenance which represents its current state.

From its conception in 1919, the William Krause Drain has been modified several times. In 1923, the Jacob Boyer Drain (to Biddle Memorial Park) was constructed and attached to the Krause drain. The first noted significant repair on the William Krause Drain occurred in 1945. Also in 1952, work was completed on the downstream headwall outlet. In 1952 the Town of Sheridan also petitioned for a reconstruction of the drain along SR 47 near Park Avenue and Malott Street. Both the Jacob Boyer Drain and the William Krause Drain were officially separated from the George Symons Drain in 1994 and known thence forth as the William Krause Drain. In 1994, the drain was also reclassified as an

Urban Drain and reassessed for maintenance. Since the reassessment in 1994, regular maintenance has occurred on the drain. The William Krause Drain was again reassessed for maintenance in 2012.

Figure 1.4 Benton Hinesley Drain

The other main component of this study is to evaluate the drains with respect to the current Marion-Adams School Corporation facilities. The Benton Hinesley Drain (See Figure 1.4) is the primary discharge point for the school corporation storm water. Originally part of the overall George Symons Drain as Arm #4, the Benton Hinesley Drain was constructed in 1892. In 1923, Benton Hinesley petitioned for a reconstruction of the drain. At that time, tile was installed to create the main Benton Hinesley Drain. An arm was added to the Benton Hinesley Drain to accommodate a small detention facility and physical education fields for Marion-Adams School Corporation in 1977. In 1993, the Marion-Adams School Board petitioned the Hamilton County Drainage Board to install a larger outlet to allow the detention facility to expand for the proposed Sheridan High School. Lastly, another branch of the Benton Hinesley Drain was constructed in 2008 as part of the new Sheridan Elementary School. Figure 1.4 shows the work progression on the Benton Hinesley Drain.

2.0 Data Collection

2.1 Hamilton County Records

An extensive list of records were used as part of this study. These include: Construction and Reconstruction petitions for the George Symons Drain; Benton Hinesley Drain; and William Krause Drain. Minutes from numerous drainage board meetings describing flooding issues within the noted watersheds were also reviewed. Record Drawings (As-Builts) of previously completed work, development plans for the Marion-Adams School Corporation sites, and related drainage reports were reviewed during the study development. Subsurface tile videos were also viewed as part of the analysis of the William Krause Drain.

2.2 Topographic Information

Topographic information was pulled from two sources. Watershed level 1 - foot contours were obtained from the Hamilton County GIS website. For the more detailed needs associated with the hydraulic study, Banning Engineering surveyors were dispatched to obtain current field data. Their activities

included cross-section development along the George Symons Open Ditch from the Sheridan WWTP downstream to the end point of the detailed study. Additional cross-sections were collected along Arm #3 of the George Symons Drain. Bridge details were collected to confirm hydraulic capacity of the openings. The site specific survey collection also included data through the Town of Sheridan at accessible manholes located along the William Krause and Benton Hinesley Drains.

2.3 Geographic Information Systems Data

The available Geographic Information System (GIS) data for the study area is extensive and was utilized as much as practical. Information downloaded or obtained from the Hamilton County GIS website includes but is not limited to: parcel lines; roadway locations and names; 2011 aerial photography; regulated drain alignments; historical aerial photography; municipal boundaries; and parcel reports. Other online GIS resources utilized included the National Resources Conservation Service (NRCS) Web Soil Survey, The Indiana Map, and National Weather Service Historic Precipitation Data (NOAA).

2.4 Previous Studies, Reports, or Work Plans

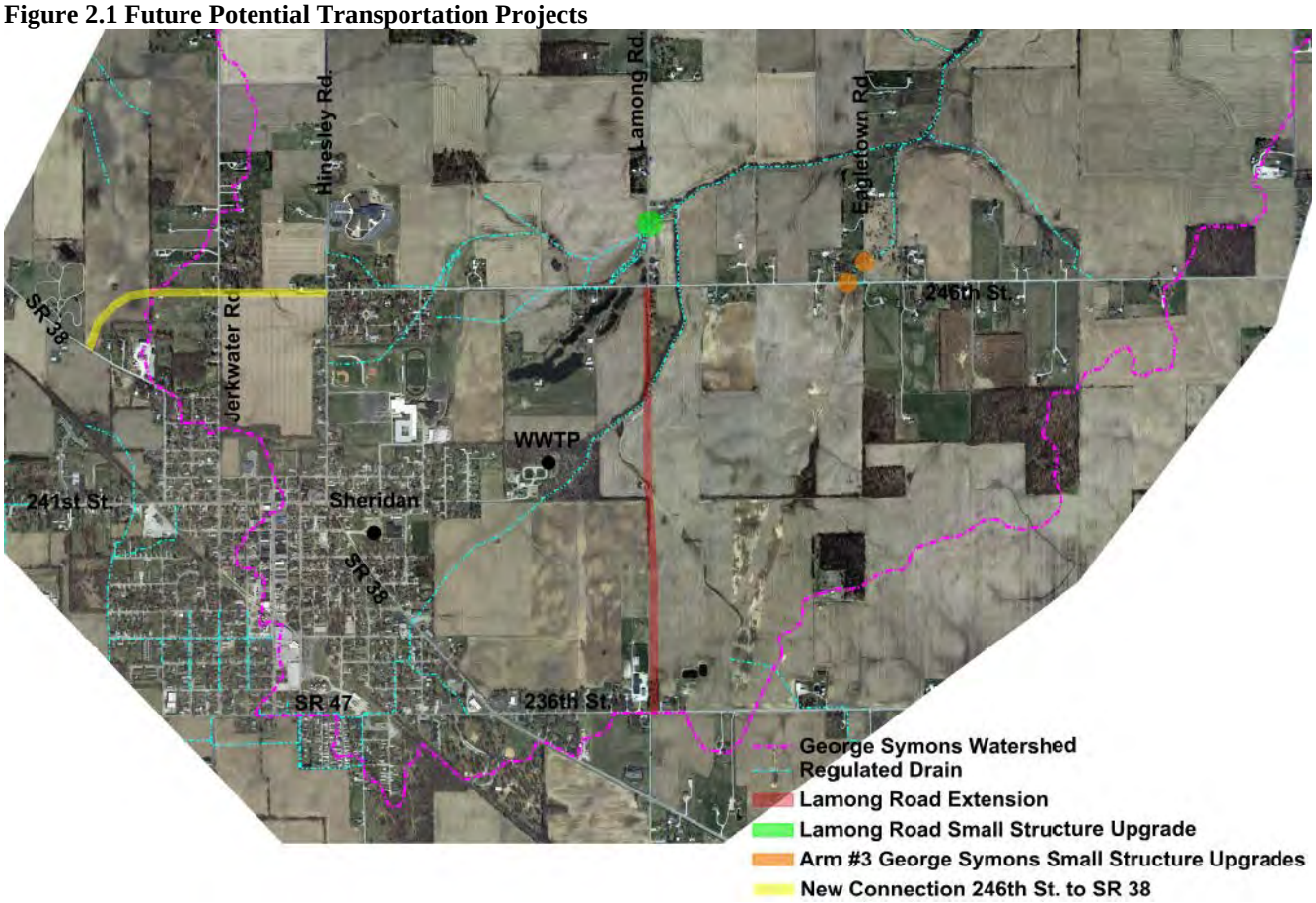
During the course of this study, the Town of Sheridan applied for and obtained a stormwater planning grant through the Indiana Office of Community and Rural Affairs (OCRA). The planning grant is being utilized by the Town of Sheridan to develop a community wide master plan to address flooding and stormwater issues within Sheridan. A significant portion of Sheridan falls within the William Krause and Benton Hinesley watersheds. Coordination was begun immediately with the Town of Sheridan and their consultant to combine resources in order to maximize the benefits to the landowners within George Symons Watershed. At the time of publication of this study, the Town of Sheridan stormwater master plan has not been finalized.

Three previous water quality reports were reviewed as part of this study. These include: a 2007 Watershed Management Plan for Little Cicero Creek prepared by JF New; a 2011 Total Maximum Daily Load report prepared by the Indiana Department of Environmental Management; and a 2011 Morse Reservoir / Cicero Creek Watershed Management Plan prepared by V3 Companies.

The 2007 Hamilton County Thoroughfare plan and 2008 to 2012 Hamilton County Highway Department Structure Improvement Plan were reviewed for potential impacts on the study. Additionally, the Indianapolis Metropolitan Planning Organization (IMPO) 2035 Long range Transportation Plan was reviewed. Also, the Crawfordsville District of the Indiana Department of Transportation (INDOT) was contacted for potential impacts to the watershed. Neither the IMPO nor INDOT have any projects currently planned within the watershed.

Four local transportation projects will have potential impact on the watershed. The proposed projects are: small structure upgrade over the Benton Hinesley Drain on Lamong Road; small structure replacement along Arm #3 of the George Symons Drain on 246th Street and Eagletown Road; Lamong Road extension from 246th Street to 236th Street; and the extension of 246th Street to SR 38. See Figure 2.1 for a location of these projects.

Figure 2.1 Future Potential Transportation Projects



2.5 Field Reconnaissance

Field reconnaissance to support assumptions for the hydraulic study and to obtain valuable data for project development took place throughout the course of this study. Several days were utilized to walk through the Town of Sheridan along the Benton Hinesley and William Krause Drains. Additionally, the open portions of the George Symons Drain were observed in detail from the Sheridan WWTP to the downstream end point of the study.

2.6 Public Input

Public input for the study has been obtained through various methods. During the course of field reconnaissance, several local residents took the opportunity to express to Banning personnel their local knowledge of stormwater challenges within the watershed. On January 27, 2012, Town of Sheridan and Hamilton County personnel provided a tour of the areas of concern and challenges within the Benton Hinesley and William Krause Drains. Lastly, a joint public meeting with the Town of Sheridan and Hamilton County was held on May 16, 2012, at the Sheridan Community Center. The primary purpose was to gain public information regarding flooding and stormwater challenges within the Town of Sheridan and the George Symons watershed. A summary of the May 16, 2012, public meeting can be found in Appendix A.

2.7 Hydrologic Data

Hydrologic input for the study was obtained from the NOAA, National Weather Service, Atlas 14 Point Precipitation Frequency Estimates. Specifically, First Quartile, 50% Risk of Exceedence, ordinates for temporal rainfall distributions were used for 0 – 6 hour storms, 12 hour storm, and 24 hour storm events (See Table 2.1). Rainfall depths were obtained from the closest NOAA precipitation station for the study area. The Tipton 5 SW (12-8784) was utilized for this data. Tabulated temporal distributions and rainfall depths are shown in Table 2.1 and 2.2.

Table 2.1 Temporal Rainfall Distributions

First Quartile 50% Risk of Exceedence Ordinates			
Percent of Storm	Percent of Rainfall Depth		
	0 - 6 Hour	12 - Hour	24 - Hour
0.0%	0.0%	0.0%	0.0%
8.3%	18.2%	18.0%	21.8%
16.7%	36.1%	40.3%	43.5%
25.0%	53.9%	59.6%	60.9%
33.3%	69.1%	72.2%	72.0%
41.7%	78.4%	80.4%	79.1%
50.0%	84.0%	86.4%	84.7%
58.3%	88.6%	91.2%	89.7%
66.7%	92.4%	94.8%	93.9%
75.0%	95.4%	97.4%	96.9%
83.3%	97.7%	99.0%	98.9%
91.7%	99.1%	99.8%	99.8%
100.0%	100.0%	100.0%	100.0%

The hydraulic model was calibrated using reported observations by residents and municipal employees of the June 20, 2011 storm which had a rainfall depth of 6 inches in 3 hours. No certified data verifying the rainfall depth or intensity of the June 20, 2011 event was available through local or national resources. High water observations compared favorably with the model results.

3.0 Hydrologic and Hydraulic Analyses

Table 2.2 Rainfall Depths

Precipitation Depths and Risk of Exceedence				
Duration	**50.00%**	**10.00%**	**1.00%**	**0.20%**
30-min:	1.18	1.64	2.33	2.84
60-min:	1.44	2.08	3.12	3.92
2-hr:	1.68	2.47	3.83	4.95
3-hr:	1.78	2.63	4.15	5.42
6-hr:	2.11	3.12	4.95	6.53
12-hr:	2.48	3.59	5.55	7.17
24-hr:	2.89	4.16	6.24	7.91

3.1 Existing Conditions

The existing conditions analysis was completed using a critical duration series as described in previous Section 2.7 Hydrologic Data. The overall George Symons watershed was broken up into 8 basins representing the different regulated drains and tributaries throughout the watershed. Those 8 basins were then broken down further into 43 sub-basins for a more in-depth analysis.

NRCS TR-55, runoff curve number methodologies were utilized to characterize sub-basins hydrologic properties. Soils data was obtained from the NRCS web based soil survey. Land use was estimated using 2011 aerial photography for the watershed. The 1-foot contour mapping and 2011 aerial photography was utilized to estimate time of concentrations for each sub-basin. For hydrologic and hydraulic model development, the sub-basin information was cataloged and coded into Interconnected Channel and Pond Routing software by Streamline Technologies ®. Elevations from the site specific surveys were utilized for various pipe networks within the watershed, and channel cross-sections of the detailed area of study along the George Symons open ditch were evaluated.

3.2 Floodplain Analysis and Regulatory Assessment (LOMR)

A detailed flood analysis was completed as part of the project. The area studied includes the open portion of the George Symons Ditch from the Sheridan WWTP to a point approximately 0.70 miles downstream of the Eagletown Road crossing. The overall length of the detailed study is nearly 3 miles, and has nearly 20 feet of drop in elevation.

Table 3.1 Flood Study Flows

River Mile	Drainage Area (mi^2)	1% Flow (cfs)
4.222	0.69	430
Sheridan Waste Water Treatment Plant		
3.892	0.91	570
246th Street		
3.434	1.03	580
3.288	2.03	965
3.078	2.15	990
Eagletown Road		
2.735	2.96	1205*
2.437	4.43	1655
2.144	4.74	1720
1.857	5.00	1805

Peak discharges were predicted by determining a runoff curve number (RCN) and time of concentration (Tc) for each of 43 contributing drainage basins. The RCN and Tc were inserted into ICPR for each basin. The rainfall frequency relationship detailing rainfall depths and distributions from NOAA Atlas 14 was coded into ICPR to determine the peak discharge for each contributing area as well as peak flows along the George Symons Open Drain. 1st Quartile storm distributions were used for all storm durations (30 minute through 24 hour) analyzed. The appropriate First Quartile ordinates, as specified from NOAA Atlas 14, were used for the specified storm duration. Peak flow data was generated within ICPR for various points along the George Symons open drain, and inserted into Hydraulic Engineering Center – River Analysis System (HEC-RAS) for further analysis. It was found that during the 1% frequency storm, the 120 minute (2-hour) event proved critical, generating the highest peak discharge. The 1% frequency, 120 minute rainfall depth is 3.83". Table 3.1shows a summary of the flow data within HEC-RAS.

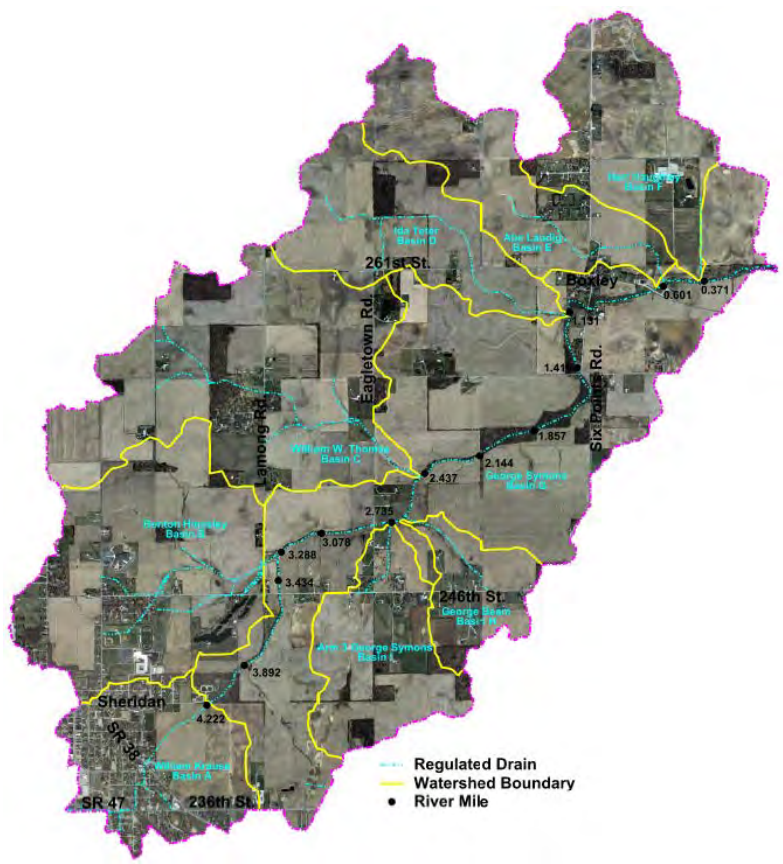


Figure 3.1 Watershed Basins and River Miles (see Appendix C-2)

HEC-RAS was used to predict the maximum flood

elevations for the peak discharge. Surveyed cross sections and aerial topography were used to develop the hydraulic routing sections and the floodplain and floodway mapping illustrated in the Appendix B. The General Guidelines for Hydrologic – Hydraulic Assessment of Floodplains in Indiana was followed to develop various models needed for the floodplain mapping.

The detailed hydraulic modeling will first be submitted to the Indiana Department of Natural Resources – Division of Water (IDNR-DOW) for review and approval. After concurrence is received from IDNR-DOW, a final approval of a Letter of Map Revision (LOMR) for Map Panel 18057C0015G will be sought from the Federal Emergency Management Agency (FEMA). River Mile flow data is available continuing along the George Symons Drain, and may be useful in extending the detailed hydraulic model through Boxley to the confluence with Teter Branch and Ross Ditch. Further detail of the hydraulic model can be found in supplemental information supplied to the Indiana Department of Natural Resources. To address floodplain concerns for years to come, a 0.20% annual risk of exceedence analysis was completed as part of this study. The 0.20% flood plain is estimated to most closely represent future conditions 1% percent annual chance rainfall depths based on recent climate trend data. This 0.20% risk of exceedence (future) flood plain is recommended to be used as the regulatory flood plain for planning and permitting purposes.

3.3 Noted Flooding Problems

Based on the hydraulic modeling, and public input, there appears to be six main areas of flooding concerns. Each area highlighted has significantly different characteristics than the other. More importantly, modeling has indicated that a “fix” in one area may adversely affect areas downstream.

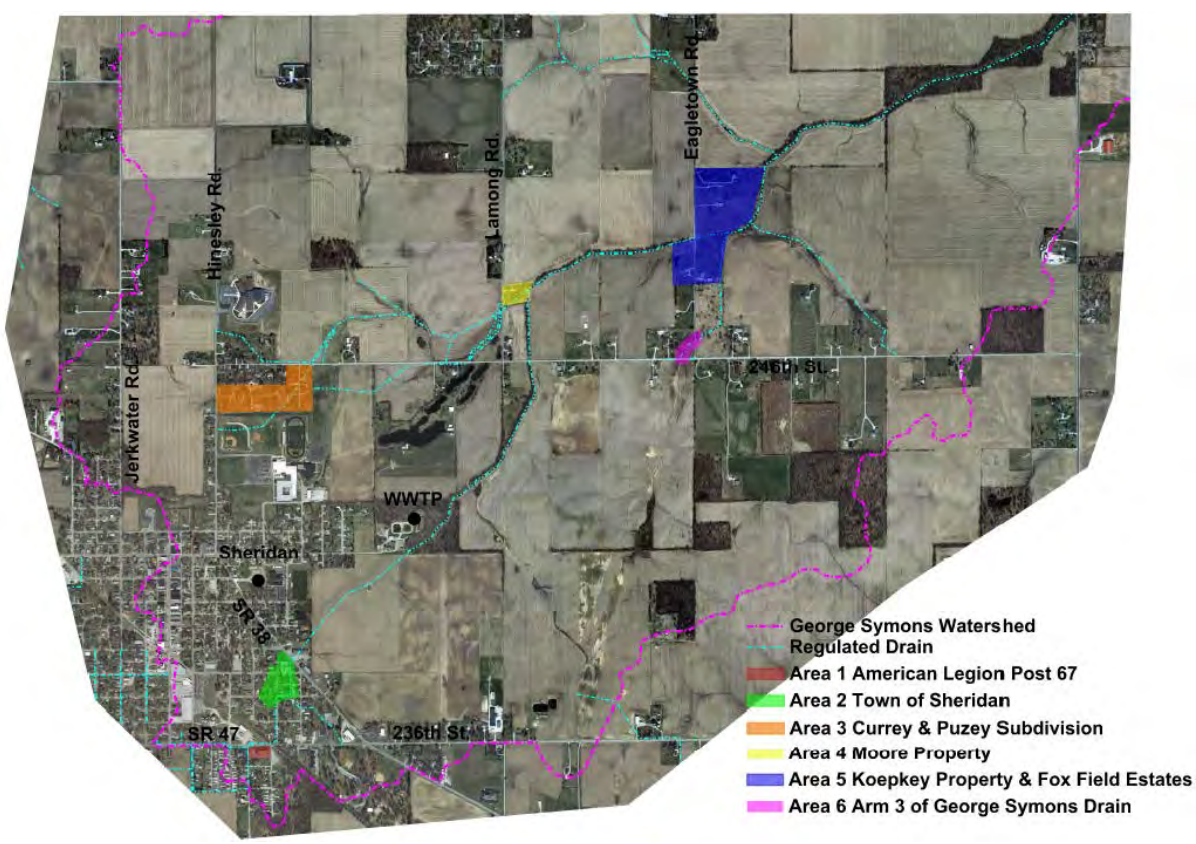


Figure 3.2 Areas of Concern

3.3.1 Area 1

Area 1 is at the point where the Thistlewaite drain and William & Krause Drain have overlapping watersheds. This is located at the American Legion Post 67 just south of SR 47 and drains approximately 18 acres. Information collected indicates the area of concern is primarily drained by the Thistlewaite drain with the William & Krause Drain serving as an overflow during large precipitation events. Survey information shows the top of bank of the open Thistlewaite drain to be approximately 1' higher than the 30" CMP outlet to the drain from the American Legion property. The property where the American Legion is located is low compared to surrounding ground, and tends to pond water. Topography shows water will need to pond over 5' in depth before an overland flow route is established from the property. A flood wall to help protect the American Legion property appears to have been recently installed. It estimated that waters would have to pond just less than 5' in depth to overtop the wall.

3.3.2 Area 2

Area 2 is located along the Williams & Krause drain within the main part of town near SR 38. SR 38 is elevated higher than many blocks of homes and businesses, and the hydraulic capacity of the existing William & Krause Drain is not sufficient to pass a 1% frequency storm event. Aerial topography shows approximately 20 structures with grades at or lower than the SR 38 overtopping elevation. The current full flowing capacity of the 24" William & Krause tile is estimated to be 10 cubic feet per second. This equates to roughly a 1-inch drainage coefficient for the area upstream of SR 38. A 1-inch drainage coefficient equals1-inch of water over the entire upstream area discharges in 24 hours. While the 1-inch drainage coefficient exceeds typical agricultural tile capacity requirements it is grossly undersized as a storm water runoff system. Without significant upsizing or diversion, flooding in Area 2 can be expected to continue.

3.3.3 Area 3

Area 3 is comprised of the Curry and Puzey subdivision. The subdivision is bordered to the east and south by the Marion – Adam High School detention Basin. To the north the subdivision is bordered by 246th Street, and to the west by Hinesley Road. Two separate flooding issues have been communicated during the course of the study. The first is a concern over the high school detention facility capacity. The second is the lack of adequate drainage from Hinesley Road along South Street continuing east to the high school detention facility. It appears that a private 10" tile has become plugged that normally drains water west of Hinesley Road underground to the Benton Hinesley Regulated Drain. With the private tile plugged, even normal frequent precipitation events flood South Drive from Hinesley Road to Hudson Street. During the winter the water along South Drive will freeze in place, sometimes several inches deep, making access along the road extremely treacherous. The Marion – Adams High School detention basin will be discussed further in later sections.

3.3.4 Area 4

Area 4 is located at the confluence of the Benton Hinesley drain and George Symons drain. The specific flooding issue is associated with the Moore family residential structure located at 24695 Lamong Road.

The property is bordered to the east by the George Symons open drain and to the south by the Benton Hinesley drain. The westerly property line is bordered by Lamong Road. The Moore residence lies 130' west of the George Symons drain and has a lowest adjacent grade approximately 5.5 feet higher than the ditch thalweg (flowline). The property is currently located within an approximated Zone 'A' flood zone. Preliminary calculations show the residential structure to be completely surrounded by the 1% Zone 'AE' flood zone and within the regulatory floodway. Annually, there is a 10% chance of the residential structure having flood waters against it. In its current configuration, Lamong Road has nearly a 50% chance of overtopping annually.

The Moore's have reported lawn, garage, and driveway flooding numerous times since moving to the location in 2003. Adding to the difficulties of the property is frequent overtopping of Lamong Road preventing safe vehicular passage to the south. The residential structure has been ponded against several times, but has had water in the main floor only once, June 20, 2011. The Moore's main floor is approximately 19 ½" above the lowest adjacent grade. The Moore's house is placed on a crawl space. There is approximately 2 square miles of watershed at this point along the George Symons open drain.

3.3.5 Area 5

Area 5 is located further downstream along the George Symons drain where the drain crosses Eagletown road. A small, large lot subdivision, Fox Field Estates, and several adjacent properties abut the open drain. Flooding of these properties has been experienced on numerous occasions. The Koepkey's had a basement window blow out which flooded their basement during the June 20, 2011 event. To date, no main floor flooding has been reported. At the present time all these properties are partially located within the approximated Zone 'A' flood zone. Preliminary calculations show the Koepkey residential structure to be located not only within the 1% Zone AE flood zone, but within the regulatory floodway as well. Several other non-residential structures appear to be located within the flood fringe. Annually, there is between a 4% and 10% chance of the Koepkey residential structure having flood waters around and against it.

Adding to the difficulties in this area is the frequent overtopping of Eagletown Road. Local reports indicate the roadway has been overtopped at least twice since it was installed in 2005. Calculations show the arch structure begins pressurized flow in the 50% annual occurrence critical storm, and begins overtopping the roadway between the 10% and 4% annual occurrence events.

3.3.6 Area 6

Area 6 is located at the intersection of Eagletown Road and 246th Street. Currently, each of these roadways overtop frequently at the culvert crossings for Arm 3 of the George Symons drain. In order to accommodate the larger structures required to pass flow the open drain profile for Arm 3 must be lowered. At the time of publication of this study, the two culverts have been replaced and upsized by the Hamilton County Highway Department. Additional work downstream will be required to lessen the influence of tail water on the culvert's flow characteristics.

3.4 June 20, 2011 Event

A flood record event occurred on June 20, 2011. A simulated event using the best available data for June 20, 2011 was used to calibrate the modeling. Local residents expressed that 6" of rainfall occurred within a 3-hour period. The 6" of rainfall was applied to the existing conditions hydrologic and hydraulic model as a 3-hour event using a 1st quartile rainfall distribution from NOAA atlas 14 for the Tipton 5 SW station. NOAA Atlas 14 shows this rainfall depth distributed in three hours is nearly a 0.10% (1000 year, 6.07 inch) event. To calibrate the existing conditions modeling, observed high water elevations were used at several locations throughout the watershed. The following sections describe the June 20, 2011 event and compare the modeling results to observed data. Additionally, observed flooding challenges for each area are described in further detail.

Figure 3.3 Area 1 June 20, 2011

3.4.1 June 20, 2011 Event (Area 1)

The American Legion Post 67 reportedly had several feet of flood water in its parking lot, and against the building. The funeral home to the west had water around it, but the water did not get into the structure. Several other homes in the area had water against the structure, but no reports of water inside a residential structure were noted. Figure 3.3 shows approximate outlines of the June 20, 2011 event, 1% occurrence interval event, 10% occurrence interval event, and future 1% event. Under current regulations for Hamilton County subdivisions, all grades adjacent to structures near the Legion Post 67 would need to be at least 948 feet in elevation. Several structures would need to be elevated to meet this standard. Structures in need of being elevated would include American Legion Post 67, and all structures adjacent to Mallot Ave. south of Brick St.

Figure 3.4 Area 2 June 20, 2011

3.4.2 June 20, 2011 Event (Area 2)

Area 2, located on the east side of Sheridan, experienced significant flooding on June 20, 2011. The drainage area to this portion of Sheridan is approximately 100.5 acres. With portions coming from Biddle Park and American Legion Post 67 areas. The William Krause 24" pipe was quickly at capacity with the 6" in 3 hour rainfall. Water soon began overtopping SR 38 near the Apostolic Faith Church, and did so for several hours. Local observers estimated the roadway overtopped by +/- 3 inch for several hundred feet. Once the water quit overtopping

the highway, flooding of streets and intersections continued for at least 12 hours. Figure 3.4 shows approximate flooding impacts for various storm frequencies. Due to the wide overflow of SR 38, the 1% storm and June 20, 2011 storm route to nearly the same elevation and are shown as concurrent.

3.4.3 June 20, 2011 Event (Area 3)

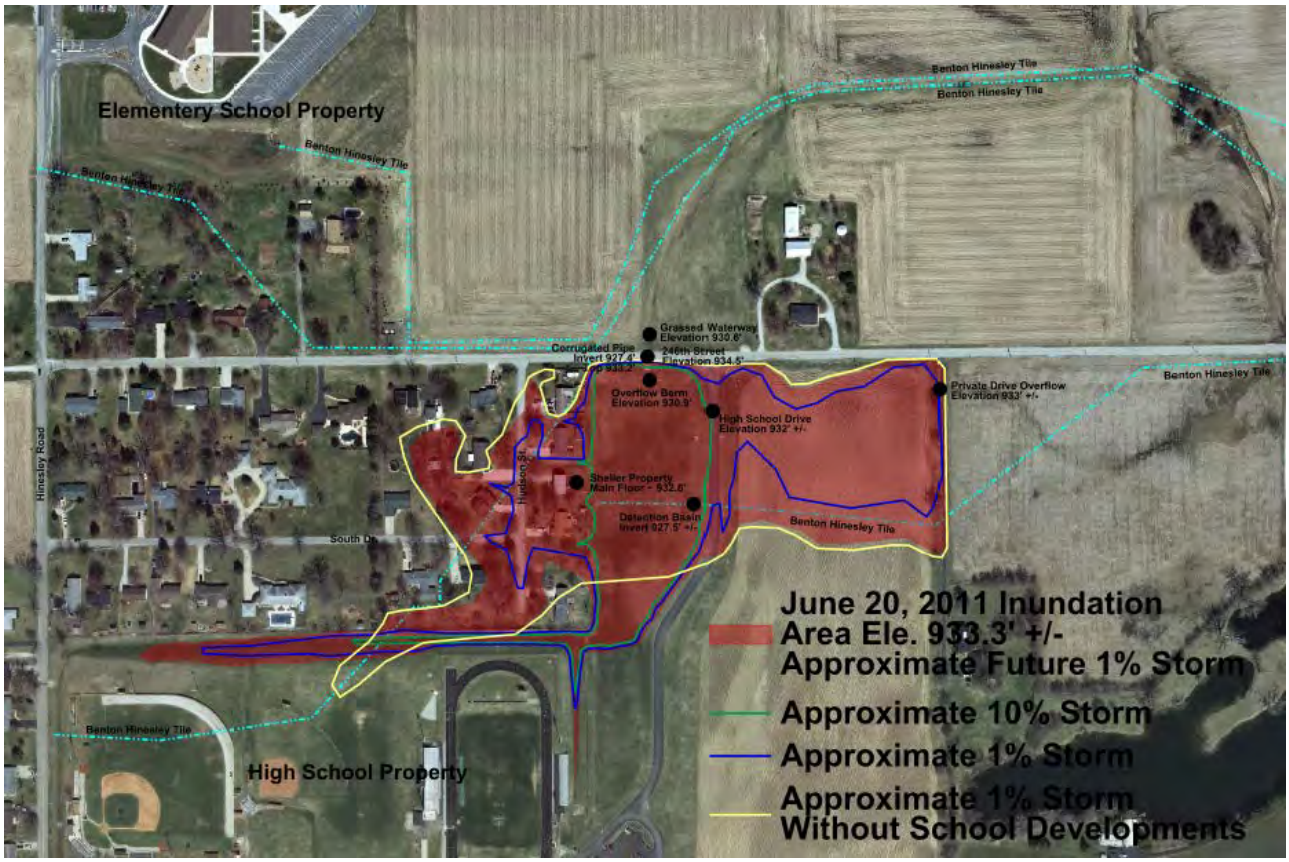


Figure 3.5 Area 3 June 20, 2011

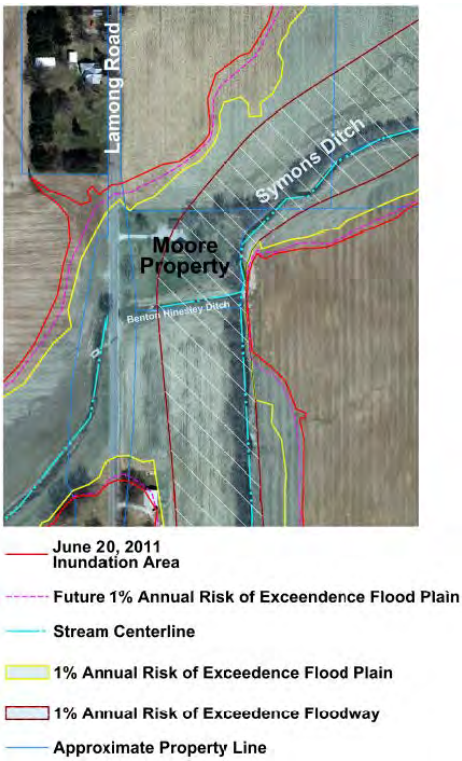
For purposes of calibrating the hydraulic model for Area 3, the Sheller residence was used. The Sheller residence is located at 24555 Hudson St., and reportedly received 8" of flood waters on the main floor. Based on this information it is estimated the Marion Adam High School detention facility routed to an elevation of 933.3 feet during the June 20, 2011 event. Modeling results for the synthetic June 20, 2011 event yielded a routed elevation of 933.4'. When compared to the observed high water elevation, the modeled appeared to accurately model the event impact.

Figure 3.6 Area 3 935 ft Contour

Over the years the Marion Adams High School detention facility has been altered several times.

Figure 1.4 shows the most recent configuration. In extreme events, such as the June 20, 2011 event the private drive overflow to the east becomes the critical elevation. During these high volume events, the primary 24" outlet to the east and auxiliary outlet under 246th Street flow at full capacity. Additionally, it appears that at least 2, but perhaps 5 residences are below this overland flow route elevation of 933 feet. Under current regulations for Hamilton County subdivisions, all grades adjacent to structures within the Curry and Puzey subdivision would need to be at least 935 feet in elevation. Figure 3.6 shows the area within Curry and Puzey subdivision below the 935 feet contour.

Figure 3.7 Area 4



3.4.4 June 20, 2011 Event (Area 4)

On June 20, 2011 the Moore residence, 24695 Lamong Road, in Area 4 received approximately 8 inches of flooding on the main floor. This equates to an elevation of 924.9 feet, which is 2.3 feet higher than the lowest adjacent grade to the structure. Hydraulic modeling estimated the high water at the Moore residence to be 924.8 feet. The high water elevation modeled is well within acceptable tolerances when compared to observed conditions.

Calculations for the detailed flood study yield a regulatory base flood elevation of 923.8 feet +/- at the Moore residence. While this elevation is slightly below the 924.2 feet main floor elevation, it is 1.2 feet higher than the lowest adjacent grade to the structure, and inundates the entire Moore property. With this new detailed flood study information the ground adjacent to the Moore residence would need to be raised 3.2 feet to meet current Hamilton County regulations for lowest adjacent grade elevations of a structure. Figure 3.7 shows the flood plain limits and June 20, 2011 high water for Area 5. Figure 3.8 is a photograph of the residence during the June 20th event. Additional photographs from the Moore residence during various flood events are located in the appendix.

3.4.5 June 20, 2011 Event (Area 5)

As the model continues downstream the observed versus modeled elevations diverge slightly. The Koepkey property is located in Area 5 just downstream of Eagletown Road. The property was reported to have a high water elevation of 921.0 feet. The reported elevation flooded the basement, and 1 foot into the garage level, but was short of the main floor elevation. Modeling estimates the peak elevation from a 3-hour 6 inches rainfall to be 921.5 feet at the Koepkey property. It is likely this irregularity is due to variability in rainfall depths and timing as you continue downstream from Sheridan along the

Figure 3.8 Area 4 June 20, 2011

George Symons open drain and storage effects behind road embankments that are not factored in the model.

Area 5 contains several properties adjacent to the George Symons open ditch. Under current regulations for Hamilton County subdivisions, it appears three structures would be built at higher elevations than existing. It is also likely that the Swan property and Koepkey property would either not be buildable, or require significant fill to meet the 1% elevation plus 2 feet for any grade adjacent to the structure. Presently the Koepkey main floor is at approximately 922.3 feet, and the lowest adjacent grade is at approximately 919.5 feet. The 1% detailed flood zone is at elevation 920.5 feet. The future predicted flood zone is at 921.2 feet. The Swan property does not have any elevation that currently meets the 921.5' lowest adjacent grade requirement.

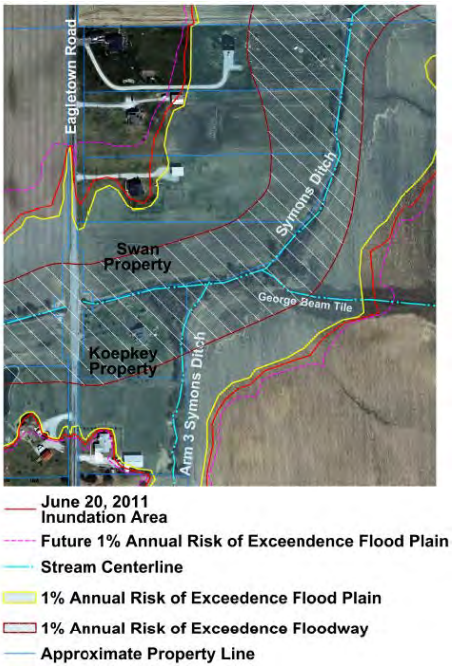


Figure 3.9 Area 5

3.4.6 June 20, 2011 Event (Area 6)

Though no elevation data is readily available for the June 20, 2011 event at Area 6 it is estimated that both roadways, Eagletown Road and 246th Street, were overtopped by floodwaters approximately 1.5 feet. Local information suggests that local flooding of 246th Street and Eagletown Road from Arm 3 of the George Symons Drain peaked and had discharged by the time the main George Symons Open Drain flood peak occurred. The Moore's reported floatables from their property being retrieved near the intersection of 246th Street and Eagletown Road. At the time of publication of this study the Hamilton County Highway Department has enlarged and lowered the culverts at Eagletown Road and 24th street along Arm 3 of the George Symons drain.

3.5 Marion – Adams School Detention Facilities

The Marion – Adams school detention facilities were analyzed as part of this study. Timeframe for installation of detention facilities and associated drainage outlets for Sheridan Elementary and High Schools are shown in Figure 1.4. Impacts of the school development were measured at two locations, Areas 3 and 4. Existing conditions prior to each development were obtained from construction plans and historical aerial photography.

The Sheridan Elementary School development was approved in 2008. Stormwater discharge from the site was required to meet a cubic feet per second per acre relationship outlined in a draft 2005 Stormwater Technical Standards Manual. The site was required to release only 0.3 cfs/acre in the 100% chance -year event, and 0.1 cfs/acre in the 10 - year event. Further detail is described in the manual about runoff curve numbers, rainfall depths, and rainfall distributions. In general, the manual is progressive in nature and requires much more storage than similar manuals for other municipalities. We

reviewed the approved drainage and construction plans, and performed onsite survey of the outlet configuration to evaluate the facility. It is our opinion the facility meets the discharge requirements as stated above. During a 1% annual risk of exceedence 100-year event the discharge from the elementary school site is reduced from 31.2 cfs (pre-project) to 3.8 cfs (post-project). Additionally, peak discharge from the June 20, 2011 event was estimated to be reduced from 47.9 cfs (pre-project) to 11.4 cfs (post-project).

The Sheridan High School development was designed and installed much earlier than the elementary school. The High School is developed on approximately 52.5 acres. There is an additional 162 acres draining through the property from the south and east. During a 1% risk of exceedence, 100-year analysis with just the 52.5 acres from the high school's drainage area, the high school detention basin routes to 931.1feet and discharges 15.5 cfs. Inflow during this event is 58.9 cfs. The detention basin does an adequate job of holding back onsite stormwater runoff form Sheridan High School.

The detention basin does not however allow for offsite runoff without affecting surrounding properties. The Curry and Puzey subdivision is adjacent to the detention basin. When considering all offsite runoff, the detention basin at the high school routes to an elevation of 932.7' and discharges 133 cfs during a 1% exceedence event (100-year). This is approximately 0.1foot higher than the Sheller property shown in Figure 3.5. Peak inflow during a 1% risk of exceedence event (100-year) is 190 cfs. Further analysis of the detention facility was needed to gage the full impact of the Sheridan High School development.

To complete this extended analysis, a pre project model was required. It is necessary to see the impact on elevations and discharge the Sheridan High School development has. Construction plans from the 1977 athletic facilities and aerial photography were used to piece together early 1970's conditions modeling. Table 3.2 summarizes the modeling results. Peak discharges downstream and stages upstream of 246th Street would be higher in all modeled events without the High School detention facility in place. Figure 3.5 shows the approximate 1% risk of exceedence event (100-year) inundation without the High School development. Based on the analysis, it is determined that the Marion – Adams School facilities have a net positive impact on both the upstream and downstream areas within the Benton Hinesley and George Symons watersheds.

Table 3.2 High School Detention Analysis

1% Risk of Exceendence				June 20, 2011 Event			
Pre 1977		2012 Conditions		Pre 1977		2012 Conditions	
Stage	Discharge	Stage	Discharge	Stage	Discharge	Stage	Discharge
933.5 ft	223 cfs	932.7 ft	133 cfs	933.7 ft	350 cfs	933.4 ft	300 cfs

4.0 Flooding Solution Set

Compiling all the information previously discussed yielded numerous opportunities for both public input and joint collaboration with local officials. These opportunities were used to develop projects to address the flooding issues noted and potential flooding issues. The following sections outline several projects for consideration. An economic analysis of benefits is also provided to better ascertain whether a project is viable for continued consideration. Project schematics and opinions of probable cost can be found in Appendix D for all ten projects.

4.1 Project 1

Project 1 is the most expensive project proposed. This project consists of over three thousand feet of new storm drain within the William Krause watershed. A 42 inch pipe would be installed near the current alignment under S.R. 38 near the Apostolic Faith Church. This pipe will serve as a viable connection point for Town of Sheridan drainage improvements within Area 2. In order for this 42 inch pipe to run at capacity, additional storm inlets and pipes would need to be installed by the Town of Sheridan throughout Area 2 and connected to the new 42" pipe.

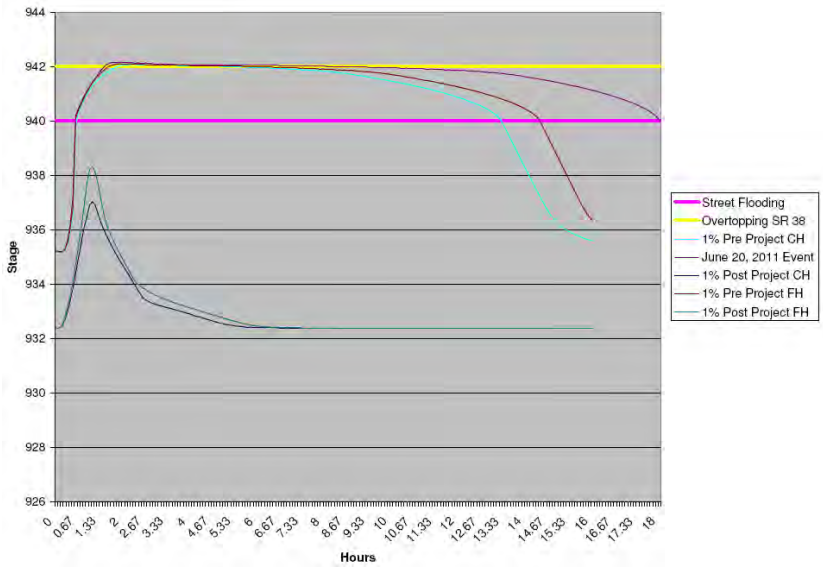


Figure 4.1 Project 1 Potential Impacts on Area 2

Additionally, Project 1 will divert the two watersheds draining through Area 2. The William Krause Drain running west along S.R. 47 near American Legion Post 67 will be diverted to the west at 9th Street. This new 24 inch pipe will run through the 9th Street Right of Way (ROW) to Fidelity Lodge 309 where it will intersect a new pipe installation from Biddle Park. The current pipe draining Biddle Park will be replaced with an 18 inch pipe with a modified inlet configuration to allow for better detention within Biddle Park and will provide better flow characteristics under S.R. 47. From the connection of these two pipes, a 36 inch pipe will be run under S.R. 38 to the Fox Farm. On the east side of S.R. 38, a 15 inch lateral will be run to the south to serve the northeast corner of S.R. 38 and 236th Street. The 36 inch pipe will extend around the Fox Farm residential property and discharge into a new detention facility on the property.

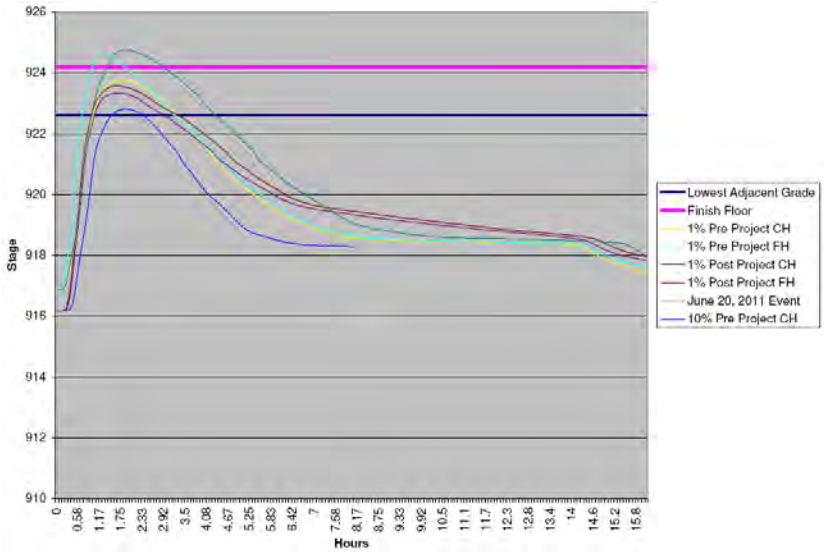


Figure 4.2 Project 1 Potential Impacts on Area 4

The proposed detention facility will serve two primary functions. First, the detention facility will serve as an adequate outlet for the new 36 inch and 42 inch pipe outlets. Secondly, the detention facility will suppress peak flows downstream of the WWTP. This new detention facility will consist of two parts. The upper part will serve as water quality treatment for the stormwater. A low lying bench will allow for frequent flooding of the ditch overbanks where wetlands and prairie planting will dominate the landscape and treat the stormwater. The lower portion of the detention facility will be a wet pond with a bottom deep enough to support a fish population.

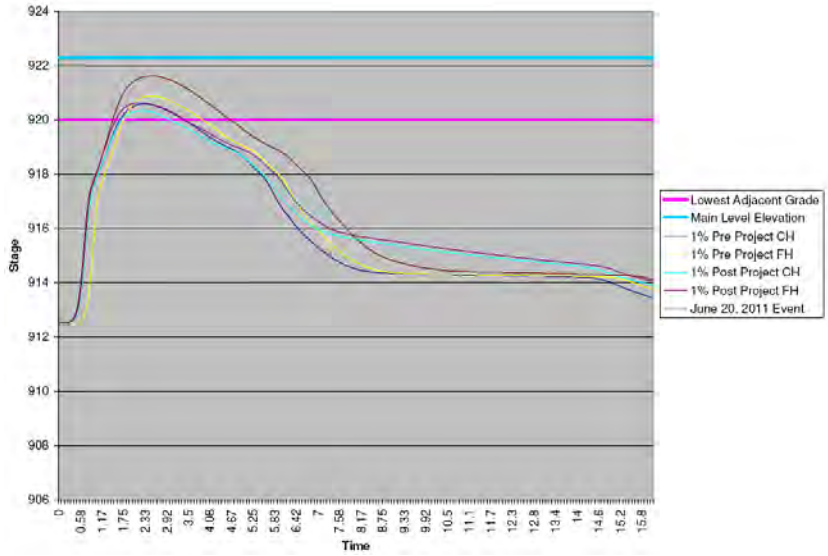


Figure 4.3 Project 1 Potential Impacts on Area 5

As part of this project, the current head wall at the beginning of the George Symons open drain will be replaced with a new 36 inch outlet with an overflow weir. All pipes intersected during the course of construction will be diverted into the detention facility. The proposed wet pond portion of the detention facility is 5 acres while the upper portion will be approximately 7 acres, for a total of 12 acres.

Provisions will need to be made for the distribution of the estimated 150,000 cubic yards of soil excavated to build the detention facility. The current estimated construction cost opinion for Project 1 is nearly $3,000,000. This cost opinion includes estimates for property acquisition, engineering, and contingencies. The potential benefits of the project include: lowering of the base flood elevation (BFE) at the Town of Sheridan WWTP by 1.5 feet; lowering the BFE at Area 4 by 0.3 feet; and lowering the BFE at Area 5 by 0.2 feet. Additionally, with the added capacity of the new 42 inch pipe and diversion upstream, Area 2 could be managed much more efficiently for stormwater removal. The extra capacity and diversion should allow the tile under S.R. 38 to have a 1% risk of exceedence (100-year capacity) event **IF** enough water is captured and sent to the new pipe, by other projects.

4.2 Project 2

Project 2 is a two-stage ditch construction project on the treeless side of the George Symons open drain downstream of 246th Street, extending to the wooded area at the downstream end of the study area. The project will run 7,000 feet. The two-stage ditch will begin several feet above the current ditch bottom and extend horizontally 20 feet then continue up to existing grade. Roughly 120 square feet of additional cross sectional ditch flow area will be added with this project.

Project 2 will benefit areas 4 and 5 by lowering the BFE by 0.3 feet throughout the area of construction (see Figure 4.4). An added benefit will be stormwater quality enhancement by allowing velocities to be lower during more frequent low flow events. The lower velocities will allow suspended solids to fall out

and lesson the likelihood of ditch bank sloughing as noted from field observations of the reach. Additionally, the project will increase the ditch capacity from a 50% risk of exceedence (2-year capacity) to approximately a 20% risk of exceedence (5-year capacity).

The current estimated construction cost opinion for Project 2 is $665,000. This estimate includes engineering and contingencies. No property acquisition is anticipated with this project.

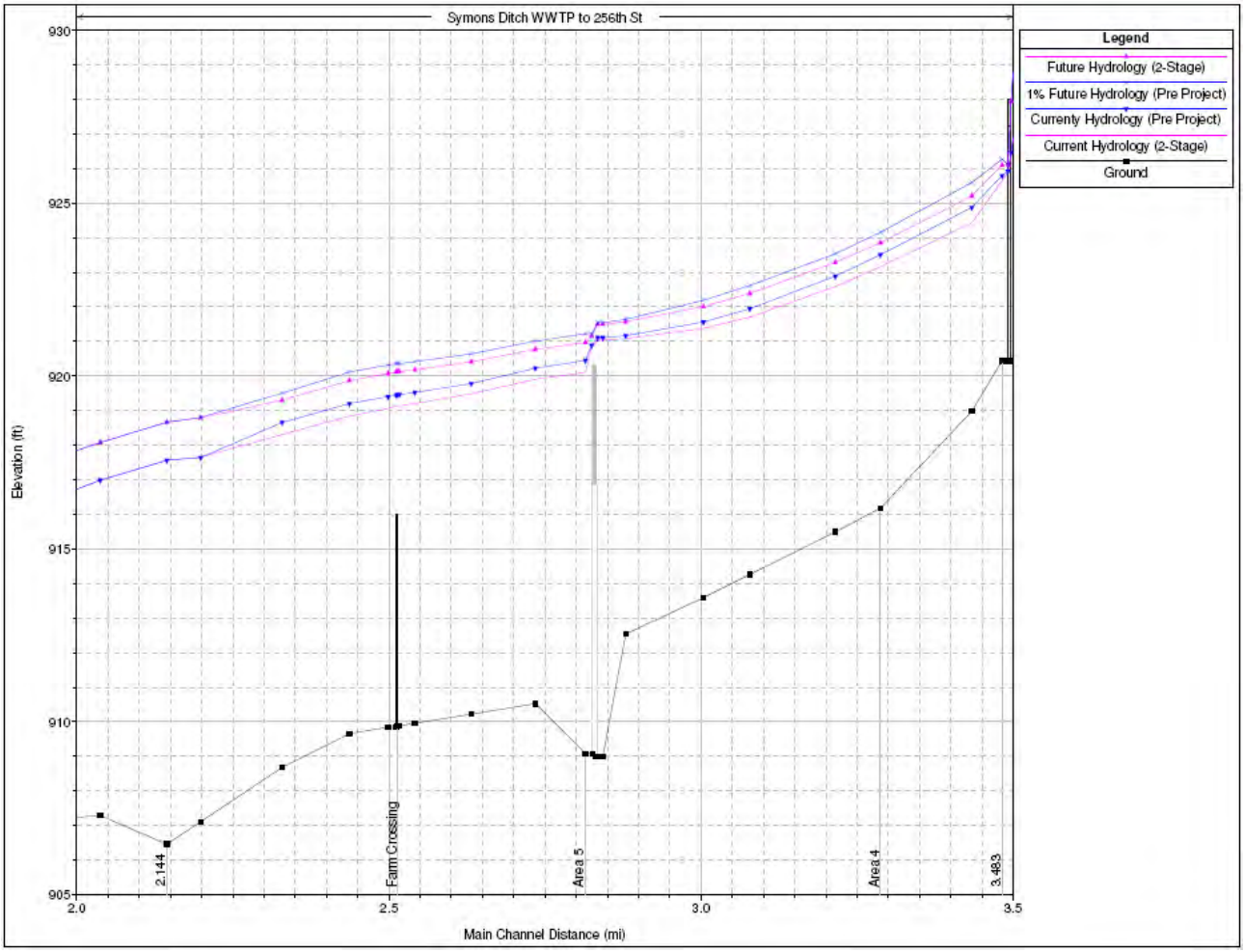


Figure 4.4 Project 2 Hydraulic Benefit Current Hydrology and Future Hydrology 1%

4.3 Project 3

Project 3 would involve the construction of a dry detention facility just to the west of the Curry and Puzey subdivision and Hinesley Road. The detention facility is proposed to be constructed on a 14.61-acre parcel currently owned by Community Bank. Additional ROW will need to be obtained through the Marion Adams School Corporation property to allow for the 12 inch outlet into the current 24 inch school detention outlet pipe. The new detention facility would control the 67 acres draining from this area and assist the planned expansion of 246th Street to S.R. 38.

Stormwater from the expansion of 246th Street could be diverted to the new detention basin with the basin enlarged to handle the additional runoff from the impervious pavement. The 37,500 cubic yards of excavated material from the basin could be used as fill material for the proposed roadway. The project

also benefits Area 3 of this study by lowering the 1% risk of exceedence (100-year) flood elevation by 0.3 feet for the school detention facility. The project would divert the stormwater that currently regularly floods South Street within the Curry and Puzey subdivision. An auxiliary benefit to the dry detention pond construction will be the wetlands planting and stormwater quality benefit of this treatment. This project has no definable benefits outside of Area 3.

The current estimated construction cost opinion for Project 3 is $1,030,000. This estimate includes property acquisition, engineering fees, and contingencies. One additional benefit to the acquisition of the Community Bank property is potential secondary use as part of the 246th Street expansion. This benefit was not included in this analysis.

4.4 Project 4

Project 4 is an expansion of the existing Sheridan High School detention pond. The project includes six (6) 36 inch pipes under the high school entrance to a new dry detention pond on the east side. The detention pond bottom will be lowered by 2 feet, but tie into the same pipe network for the outlet. It is recommended that native wetland and prairies species be planted in the bottom of the basin to allow for easier maintenance and less frequent mowing. The added detention facility will cover approximately 8 acres of the current Marion – Adams School Corporation property and additional land acquisition will be required.

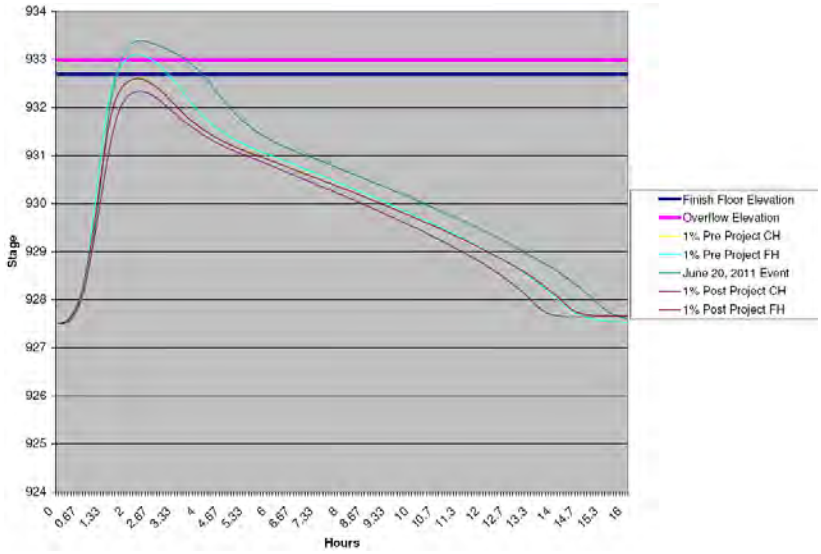


Figure 4.5 Project 3 Potential Impacts on Area 3

Approximately 70,000 cubic yards of material will be excavated to construct the expanded detention pond. This material is expected to be deposited to the south on existing school property in order to allow for potential expansion of the facilities. There is potential to expand the detention pond as needed by the school corporation to account for any additional runoff generated by future development.

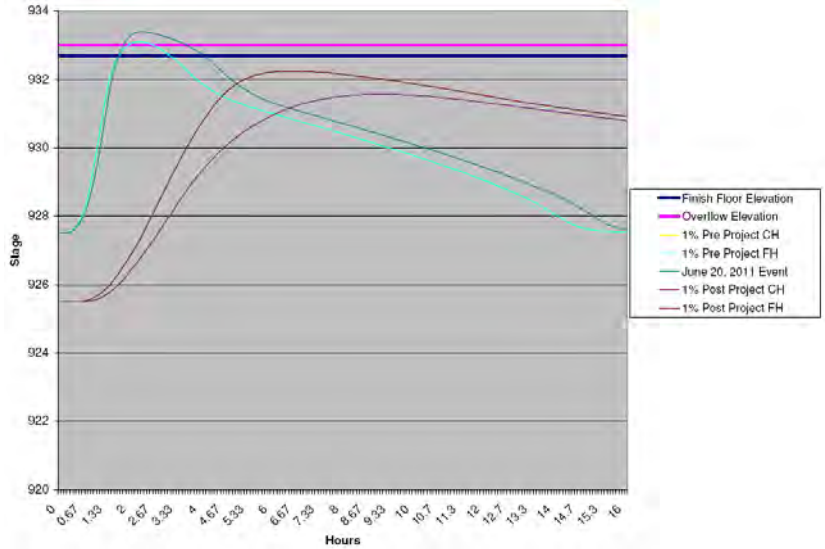


Figure 4.6 Project 4 Potential Impacts on Area 3

Project 4 benefits Area 3 by lowering the 1% risk of exceedence event (100-year) by 1.1 feet. This lowers the event below the main floors of residences within Curry and Puzey subdivision but does not eliminate flooding potential entirely due to the lack of an adequate overland flow route within the subdivision. There is no noticeable benefit to other areas of concern from this project.

The current estimated construction cost opinion for Project 4 is $1,343,000. This estimate includes property acquisition, engineering fees, and contingencies.

4.5 Project 5

Project 5 is the construction of a dry detention facility at the northwest corner of the intersection of 246th Street and Lamong Road. The detention facility is proposed to be constructed on property owned by the Cline Farm. The parcel totals over 72 acres, but only 46 acres are needed for this project. The project is designed in such a way to allow for ROW and lane expansion shown on the current thoroughfare plan. The new detention facility would control the nearly 640 Acres draining from the northwest side of Sheridan.

Approximately 140,000 cubic yards of material would need to be excavated to construct the basin. The excess material will be placed over the remaining 25 acres of property at an average depth of 3.5 feet. A 36 inch pipe outlet with concrete weir overflow will serve as the outlet for the basin. The project has potential stormwater benefits due to the use of wetlands and prairie planting throughout the detention basin.

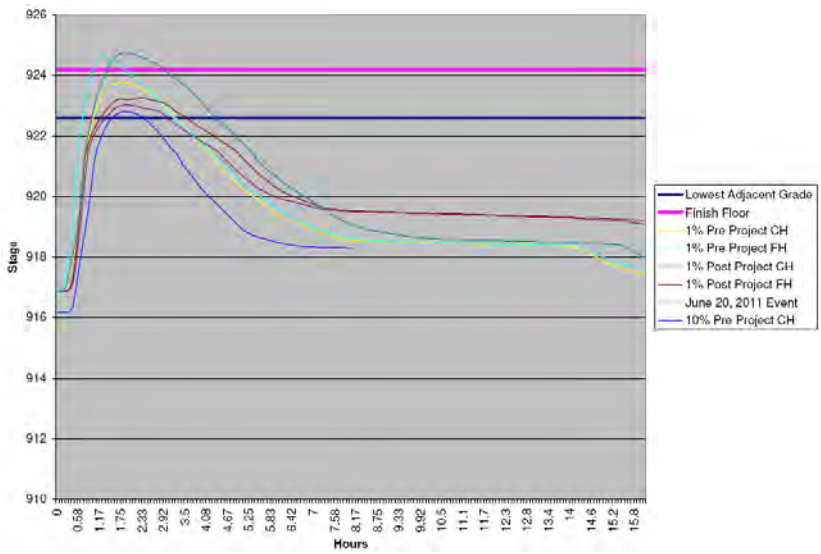


Figure 4.7 Project 5 Potential Impacts on Area 4

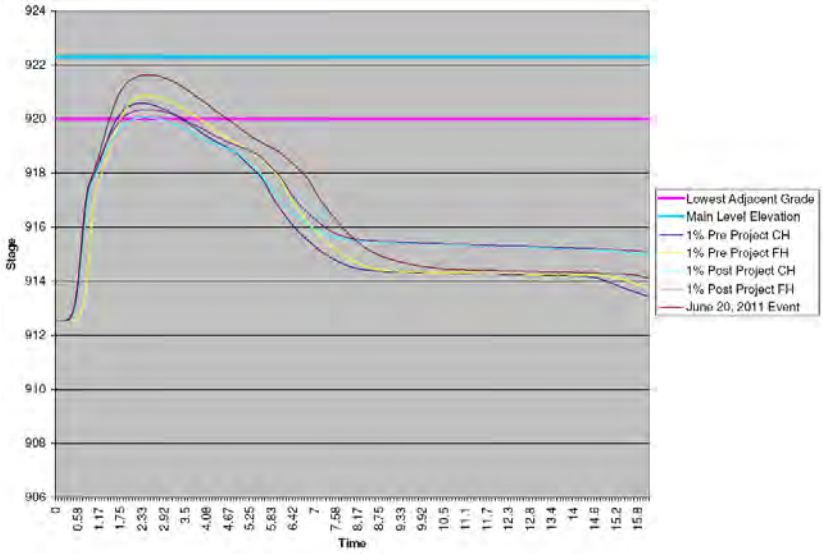


Figure 4.8 Project 5 Potential Impacts on Area 5

The project benefits Area 4 of this study by lowering the 1% risk of exceedence flood (100-year) elevation by 0.6 feet. It also benefits Area 5 by lowering the 1% risk of exceedence flood (100-year) elevation by 0.4 feet. This project would also allow Project 6 to be completed with minimal impact on Areas 4 and 5. An additional benefit is the placement of fill along Lamong Road and 246th Street to allow for expansion per the thoroughfare plan.

The current estimated construction cost opinion for Project 5 is $2,385,000. This estimate includes property acquisition, engineering fees, and contingencies.

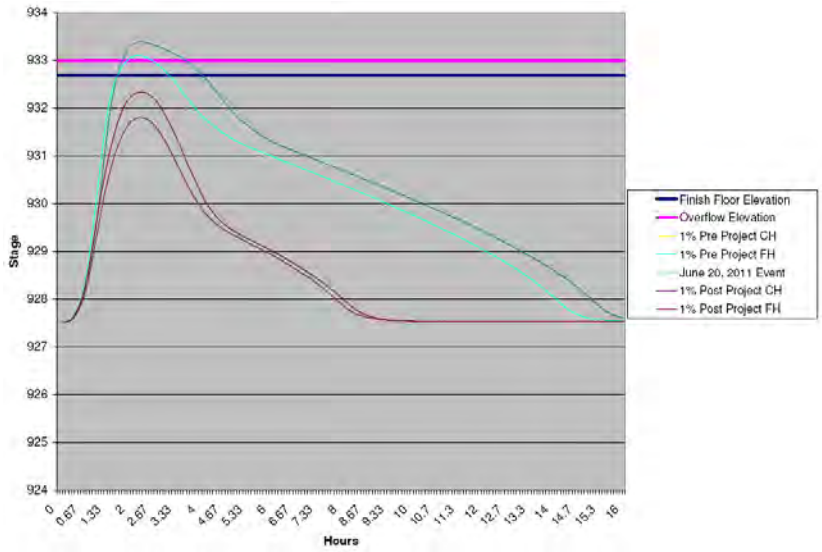


Figure 4.9 Project 6 Potential Impacts on Area 3

4.6 Project 6

Project 6 involves modifications to the auxiliary outflow structure from the Sheridan High School detention pond. The modifications include: cutting down the overflow weir by approximately 2 feet; lowering the existing grassed waterway downstream of 246th Street; and extending the grassed waterway through the Cline property.

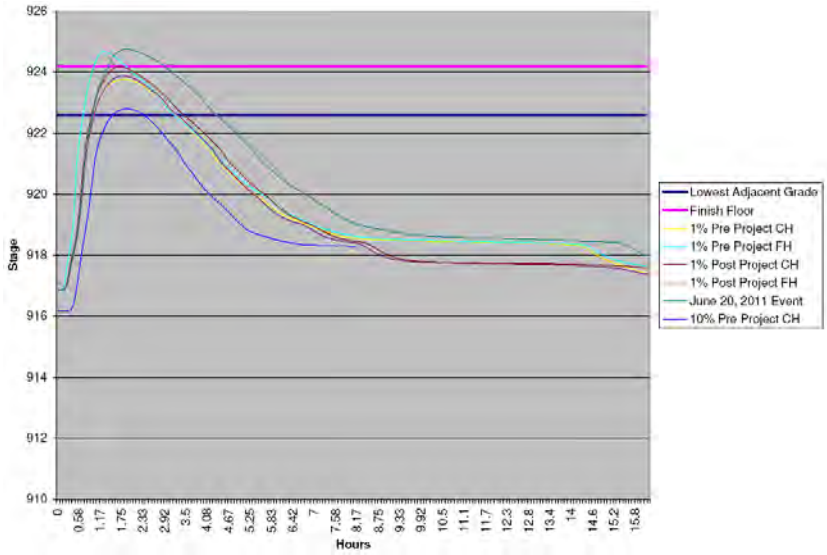


Figure 4.10 Project 6 Potential Impacts on Area 4

The project benefits Area 3 of this study by lowering the 1% risk of exceedence (100-year) flood elevation by 0.9 feet. However, this project is a detriment to Area 4 by raising the 1% risk of exceedence (100-year) flood elevation by 0.2 feet. Project 6 also impacts Area 5 by slightly raising the 1% risk of exceedence (100-year) flood. Potential flooding of areas within the Curry and Puzey subdivision still exist due to the elevation of the structures in respect to the overflow elevation to the east.

The current estimated construction cost opinion for Project 6 is $98,000. This estimate includes property acquisition, engineering fees, and contingencies.

4.7 Project 7

Project 7 includes the purchase and modification of the Swan property just east of Eagletown Road on the north side of Symons Ditch. The parcel has limited use for anything other than open space based on the flood study completed within this study. The project would be similar to the two-stage ditch concept but on a much larger scale for a shorter reach length. Ideally, for maximum benefit, the project would be done in conjunction with Project 2.

Approximately 24,000 cubic yards of material would need to be excavated to construct the inline capacity expansion and habitat construction. The shelf that would be present after construction would be planted in wetland and prairies plant species to allow for maximum stormwater benefit after construction. Additionally, to lessen the frequency of overtopping for Eagletown Road, six (6) 48 inch culverts would be added north of the existing bridge. The pavement would be modified to have the low point north of the existing crossing rather than south of the crossing as it is now. With a Letter of Map Revision (LOMR) based on the new channel configuration, this slight modification would allow the potential of removing the Koepkey residence from the floodway.

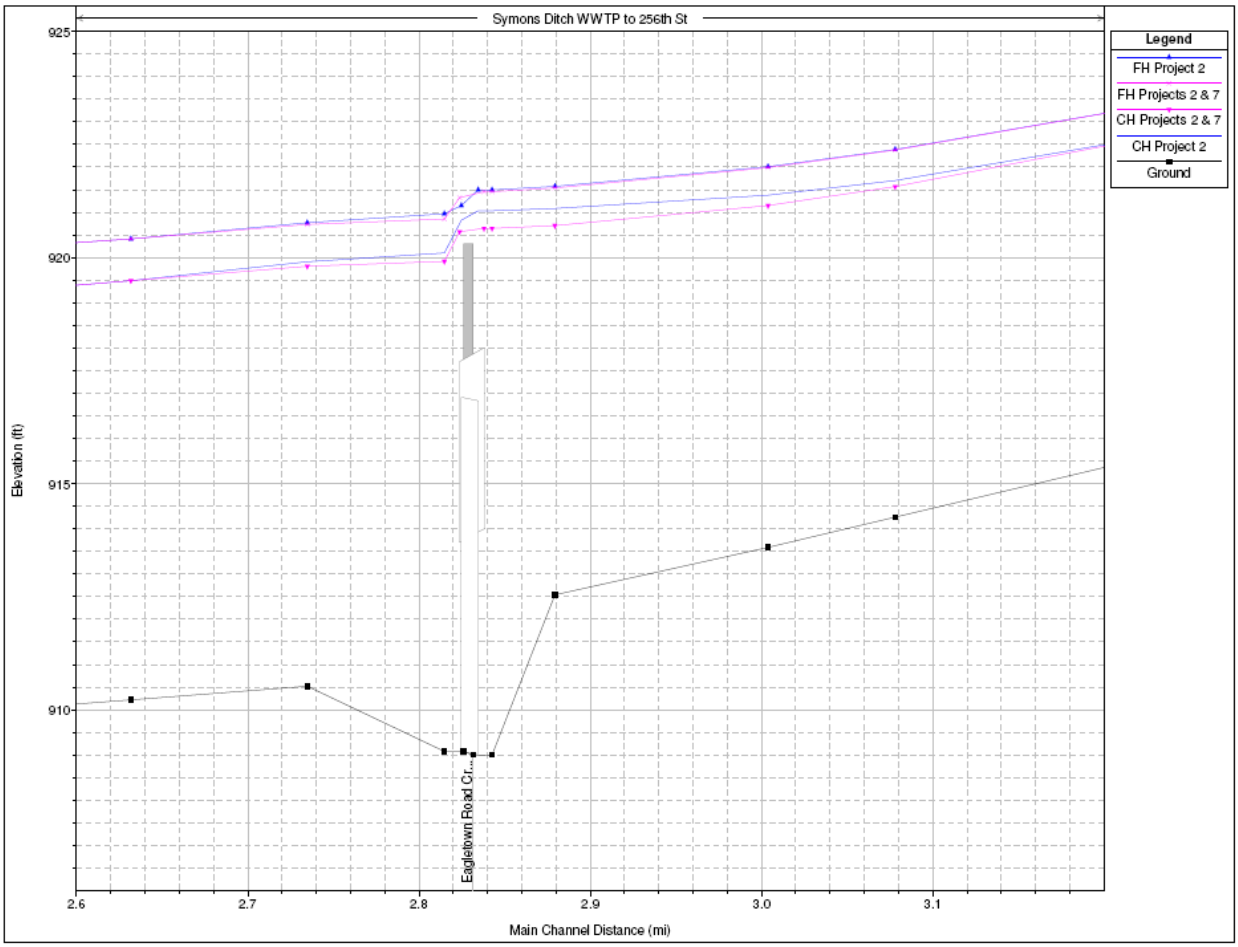


Figure 4.11 Projects 7 Hydraulic Benefit Area 5 Current Hydrology and Future Hydrology 1%

Project 7 benefits Area 5 of this study by lowering the 1% risk of exceedence (100-year) flood elevation by 0.2 feet. The Koepkey residence within Area 5 experiences an exceptional benefit with the potential removal from the floodway. The risk of overtopping Eagletown Road is reduced from between 4% and

10% chance annually to a 2% risk annually. The benefit of this project is reduced as you continue to go upstream. There is no definable benefit at Area 4.

The current estimated construction cost opinion for Project 7 is $887,000. This estimate includes property acquisition, engineering fees, and contingencies. Approximately 70% of the costs for this project are for work to upgrade the Eagletown Road crossing. This portion of the project costs should be paid by the local County Highway Department and is estimated to be $621,000.

4.8 Project 8

Project 8 is the relocation of the Moore residence within Area 4 to the north out of the future floodplain. The project estimate includes: 3 acres for a new lot; a new foundation; new well; new septic; new utility drops; moving the existing residential structure; and new landscaping. The project also includes upgrading the residence to meet existing codes and new mechanical systems. The old site would be demolished and converted to either open space or agricultural use.

The current estimated construction cost opinion for Project 8 is $218,000. This estimate includes property acquisition, engineering fees, and contingencies. A grant through the Indiana Department of Homeland Security would likely be available for the property acquisition, but would require at least a 25% local match or at least $49,000. The drainage board does not have the authority to undertake this project. It would have to be sponsored by another entity or from private funds.

4.9 Project 9

Project 8 is the reconstruction of Arm 3 of the George Symons Drain. 2,100 feet of the drain will need to be reconstructed to meet the elevations of the newly installed structures at 246th Street and Eagletown Road. In the wetlands identification portion of this study, JF New noted three (3) potential wetlands just downstream of Eagletown Road along Arm 3. The wetlands will need to be avoided as much as practical in order to minimize the cost of this project. A 2 foot or 3 foot bottom width ditch should be sufficient to serve the needs of the drain.

The current estimated construction cost opinion for Project 9 is $75,000. This estimate includes engineering fees, and contingencies.

4.10 Project 10

Project 10 is the acquisition and demolition of (4) frequently flooded properties. The properties would be turned into open space after demolition, and deed restrictions placed on the parcels. The properties proposed for buyout are: the Moore property within Area 4, the Koepkey and Swan properties within Area 5; and the American Legion Post 67 property within Area 1.

The current estimated cost opinion for Project 10 is $749,000. This estimate includes property acquisition and engineering fees. The 2011 assessed value was used with a 1.25 multiplier to determine the acquisition costs. It is estimated that demolition of structures on these properties will range between $10,000 and $25,000, but this number could rise significantly if hazardous materials are found. An appraisal performed by a professional would be required for the project to proceed.

A grant through the Indiana Department of Homeland Security would likely be available for all the properties except for the American Legion Post 67 property. A local match of at least 25% would be required. An estimate of the local match required for each property is: $34,812 for Moore property; $85,125 for Koepkey property; and $8,553 for Swan property. The drainage board does not have the authority to undertake this project. It would have to be sponsored by another entity or from private funds.

4.11 Recommended Projects

Thorough review of the various projects listed yielded five projects that appear justifiable for implementation. The projects listed below are in prioritized order for construction and funding. The total cost of the recommended projects is $4,725,000. Approximately $621,000 of this is assumed to be provided by the Hamilton County Highway Department as part of Project 7. The projects listed benefit Areas 2, 3, 4, 5 and 6.

- Project 1
- Project 2
- Project 6
- Project 7
- Project 9

4.12 Project Phasing

The Surveyor's staff suggested phasing the recommended projects to address the concerns for total cost noted by the Hamilton County Drainage Board, Town of Sheridan and the general public. Two scenarios were evaluated for this phased approach. Table 4.1 below shows the scenarios evaluated.

Table 4.1 Project Phasing Scenarios

Phase	Scenario 1	Scenario 2
Pre-Project		$200,000 Purchase Moore property, demolish and utilize areas for Water Quality and Quantity BMP
Phases 1 and 2	$2,543,840 Project 1 to 50% of detention, Project 2, Project 7, 42" pipe under SR 38, Project 6	$1,408,840 Project 1 outlet with two-stage ditch to east side of Sheridan, Project 2 to Eagletown Road, acquisition Project 7, 42" pipe under SR 38, Project 6
Phase 3	$559,750 Project 1 detention to 75%	$756,438 Project 1 detention to 33%
Phase 4	(By Others) Provide outlet for northwest portion of William Krause Drain	(By Others) Provide outlet for northwest portion of William Krause Drain
Phase 5	$990,688 Expand Project 1 detention to 100% and complete diversion from Biddle Park	$929,063 Expand Project 1 detention to 50% and complete diversion from Biddle Park

The first scenario was developed considering the watershed in its present state. The first two phases of Scenario 1 includes construction of 50% of Project 1, Project 2, Project 6, land acquisition for Project 7, and a 42" pipe under State Road 38 to Area 2. The third Phase of Scenario 1 includes expanding Project 1 to 75% of its recommended size. Phase 4 of Scenario 1 is to be performed by others. The last phase, Phase 5, includes completing Project 1. All told, Scenario 1 is estimated to cost $4,094,278.

Scenario 2 differs from Scenario 1 by requiring a pre-project installation of a water quality and water quantity Best Management Practice (BMP) at Area 4. This BMP would include the purchase and demolition of the Moore residence. After completion of the BMP, Scenario 2 mimics Scenario 1, but the proposed projects are smaller in scope. The total detention volume for Project 1 is reduced by 50% as well as the length of Project 2. The benefits to Areas 2, 3, 4 and 5 are maintained, but the estimated cost of implementation is reduced by approximately $800,000.

Scenario costs do not match costs associated with each project when totaled. Redundancy of efforts due to phasing will raise the overall cost of the final product. Additionally, each scenario listed will require more work to complete Projects 7 and 9 as outlined in the recommended project schedule shown in section 4.11. Completion of these projects was not included in the scenarios for three reasons. First, the projects are identical in both scenarios. Secondly, Project 7 is primarily funded by the Hamilton County Highway Department. Lastly, Project 9 is a relatively small project that benefits Arm 3 of the George Symons Drain, which is outside the area where phasing appears beneficial.

A public meeting was held on February 13, 2013 at the Town of Sheridan Community Center. Both the report and potential scenarios were unveiled to the residents within the watershed. Thirty-two members of the public attended the meeting. Additionally, nine Hamilton County and Banning Engineering, P.C. staff were present. Public comments and questions were insightful and positive in nature. Several constituents leant their support to Scenario 2 as outlined in the presentation. Detailed minutes of the meeting are available at the Hamilton County Surveyor's Office for review.

4.13 Programmatic Initiative 1

Programmatic initiative 1 was previously mentioned in Section 3.2. It is recommended the future floodplain elevation and delineation be utilized for planning purposes throughout the George Symons open drain. The area of additional inundation is minor when compared to the benefit of added protection. The future floodplain as delineated represents a 0.2% chance of exceedence (500-year) precipitation depth based on NOAA Atlas 14 (Table 2.2). To place these rainfall depths in further perspective, consider Figure 4.11 showing the single point maximum rainfall depth per duration for the United States. To surpass the 3 hour maximum total shown in northeast Pennsylvania, an area would need to record more than 28.5 inches of rainfall in that time. Per Figure 4.12, Southeast Ohio has received 7 inches of rainfall in 30 minutes.

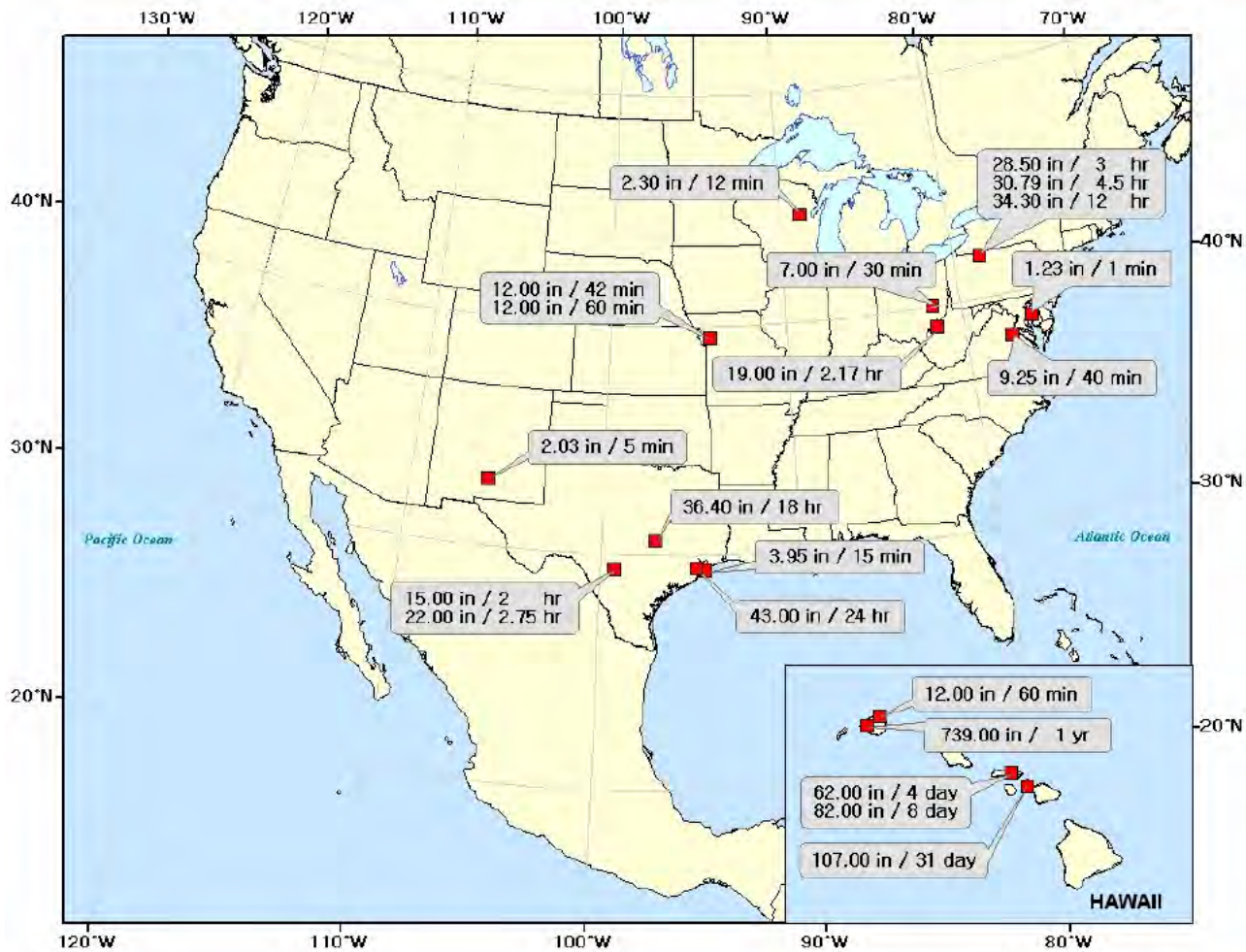


Figure 4.12 US Maximum Point Rainfall (NOAA)

4.14 Programmatic Initiative 2

Programmatic initiative 2 recommends changing the lowest adjacent grades requirements for structures immediately downstream of roadways. The recommendation is to set the lowest adjacent grade 2 feet above the lowest road elevation upstream or base flood elevation whichever is higher. If this was in place at time of construction of the Koepkey and Moore structures, the tracts would still have flooded, but the structures would have remained dry during the June 20, 2011, event.

5.0 Wetlands Investigation

Cardno JFNew was contracted to perform a field survey of potential wetlands that may occur along Symons Ditch between the Sheridan Wastewater Treatment Plant (WWTP) and Six Points Road, which is located approximately two (2) miles east of Sheridan. The boundaries of potential wetlands were not delineated, but areas where wetlands may occur were identified and are shown on the attached figures. Observations of site hydrology and live vegetation, along with county soil maps and National Wetland Inventory (NWI) maps, were used to determine the presence of potential wetlands in the field.

For the purposes of this report, four specific areas; Project 1, Project 2, Project 5 and Project 9, were identified as sites for flood remediation along Symons Ditch. Project 1, an approximately 40-acre site located upstream of the WWTP, would include the creation of a large regional detention basin designed as a large wetland system that would provide flood storage and groundwater recharge for stormwater inputs from the Town of Sheridan. Project 2 proposes restructuring the banks of approximately 7,000 linear feet (LF) of Symons Ditch this work establishes a two-stage ditch that incorporates in-channel floodplain zones, called benches, into the ditch by removing the ditch banks roughly 2-3 feet above the bottom for a width of about 20 feet on one side. This allows the water to have more area to spread out on and decreases the velocity - or energy - of the water during high flow events. A two stage ditch provides both stabilization of erosion as well as increased drainage capacity of a traditional trapezoidal ditch. Photos below show typical erosion and channel conditions along Symons Ditch. Project 5 is an approximately 45-acre site located upstream of Lamong Road north of 246th Street. Project 9 is the reconstruction of Arm 3 of the George Symons Regulated Drain from Eagletown Road to George Symons open drain.

Figure 5.1 Trapezoidal Ditch and Typical Erosion

5.1 Regulatory Definitions

5.1.1 Waters of the United States

"Waters of the U.S." are within the jurisdiction of the USACE under the CWA. "Waters of the U.S." is a broad term, which includes waters that are used or could be used for interstate commerce. This includes wetlands, ponds, lakes, territorial seas, rivers, tributary streams including any definable intermittent waterways, and some ditches below the ordinary high water mark (OHWM).Also included are manmade water bodies such as quarries and ponds, which are no longer actively being mined or constructed and are connected to other "waters". Wetlands, mudflats, vegetated shallows, riffle and pool complexes, coral reefs, sanctuaries, and refuges are all considered special aquatic sites which involve

more rigorous regulatory permitting requirements. A specific, detailed definition of “waters of the U.S.” can be found in the Federal Register (33 CFR 328.3).

On January 9, 2001, the U.S. Supreme Court issued a decision, Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers (No. 99-1178). The decision reduces the regulation of isolated wetlands under Section 404 of the CWA, which assigns the USACE authority to issue permits for the discharge of dredge or fill material into "waters of the U.S.". Prior to the SWANCC decision, the USACE had adopted a regulatory definition of "waters of the U.S." that afforded federal protection for almost all of the nation's wetlands. The Supreme Court decision interpreted that the USACE’s jurisdiction is restricted to navigable waters, their tributaries, and wetlands that are adjacent to these navigable waterways and tributaries. The decision leaves the majority of "isolated" wetlands unregulated by the CWA. Therefore, most wetlands that are not adjacent to, or contiguous with, any other “waters of the U.S.” via a surface drain such as a swale, ditch, or stream are considered isolated and thus no longer jurisdictional by the USACE.

On June 19, 2006, the U.S. Supreme Court issued decisions in regards to John A. Rapanos v. United States (No. 04-1034) and June Carabell v. United States (04-1384), et al. The plurality decision created two ‘tests’ for determining CWA jurisdiction: the permanent flow of water test (set out by Justice Scalia) and the “significant nexus” test (set out by Justice Kennedy). On June 5, 2007 the USACE and EPA issued joint guidance on how to interpret and apply the Court’s ruling. According to this guidance, the USACE will assert jurisdiction over traditionally navigable waters, adjacent wetlands, and non-navigable tributaries of traditionally navigable waters that have “relatively permanent” flow, and wetlands that border these waters, regardless of whether or not they are separated by roads, berms, and similar barriers. In addition, the USACE will use a case-by-case “significant nexus” analysis to determine whether waters and their adjacent wetlands are jurisdictional. A “significant nexus” can be found where waters, including adjacent wetlands, alter the physical, biological, or chemical integrity of the traditionally navigable water based on consideration of several factors.

5.1.2 Waters of the State

“Waters of the state” are within the jurisdiction of the Indiana Department of Environmental Management (IDEM). They are generally defined as surface and underground water bodies, which extend through or exist wholly in the State, which includes, but is not limited to, streams and both isolated and non-isolated wetlands. Private ponds, or any pond, reservoir, or facility built for reduction of pollutants prior to discharge are not included in this definition. In addition to “waters of the U.S.”, the IDEM also regulates and issues permits for isolated wetland impacts.

The State relies on the USACE decision regarding wetland determinations and delineations including whether or not a wetland is isolated or non-isolated.

5.1.3 Wetlands

Wetlands are a category of “waters of the U.S.” for which a specific identification methodology has been developed. As described in detail in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987), wetland boundaries are delineated using three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology. In addition to the criteria defined in the 1987 Manual,

the procedures described in the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Environmental Laboratory, 2008) were used to evaluate the project area for the presence of wetlands.

5.1.4 Hydrophytic Vegetation

In the course of developing the wetland determination methodology the USACE, in cooperation with the U.S. Fish and Wildlife Service (USFWS), Environmental Protection Agency (EPA), and the Soil Conservation Service (SCS), compiled a comprehensive list of wetland vegetation. The indicator status of plant species is expressed in terms of the estimated probability of that species occurring in wetland conditions within a given region. The indicator categories as defined by the USACE are:

Obligate Wetland (OBL): Occurs almost always (estimated probability >99 percent) under natural conditions in wetlands.

Facultative Wetland (FACW): Usually occurs in wetlands (estimated probability 67 to 99 percent), but occasionally found in non-wetlands.

Facultative (FAC): Equally likely to occur in wetlands or non-wetlands (estimated probability 34 to 66 percent).

Facultative Upland (FACU): Usually occurs in non-wetlands, but occasionally found in wetlands (estimated probability 1 to 33 percent).

Obligate Upland (UPL): Occurs almost always (estimated probability >99 percent) in uplands.

Plants that are OBL, FACW, and FAC are considered wetland species. The percentage of the dominant wetland species in each of the vegetation strata in the sample area determines the hydrophytic or wetland status of the plant community. Soil type and hydroperiod are two factors important in controlling species composition.

In order for an area to be considered a wetland, it must display a dominance of hydrophytic vegetation, which is determined using the 50/20 rule. The methodology for the 50/20 rule is as follows:

1. For each stratum (tree, sapling, shrub, woody vine, herb):
    a. Estimate percent areal cover (alternatively, use basal area or stem density) for each species.
    b. Calculate the relative percent areal cover by dividing each species percent cover into the total percent cover for all species and multiplying by 100.
    c. In descending order of relative percent cover, select species that when cumulatively totaled immediately exceed 50% of total relative cover. Species of equal cover value that would contribute to meeting this requirement must all be selected. These are considered dominants.
    d. Identify any other species that by themselves account for 20% or more of the relative percent cover. These are also considered dominant species.
2. Look up wetland indicator status of all dominant species in all strata.

3. Determination of prevalence:
    a. If more than 50% of the dominant species are FAC or wetter, then hydrophytic vegetation is prevalent.
    b. If the number of dominant species FAC or wetter is equal to the number of dominant species FACU or drier or all dominant species are FAC:
        i. Use the FAC-neutral test to determine prevalence (see below).
        ii. If the FAC-neutral test results in a tie, base the determination on soils and hydrology indicators.

5.1.5 Hydric Soils

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. In general, hydric soils are flooded, ponded, or saturated for a week or more during the growing season when soil temperatures are above 32 degrees Fahrenheit. The anaerobic conditions created by repeated or prolonged saturation or flooding result in permanent changes in soil color and chemistry, which are used to differentiate hydric from non-hydric soils.

In this report, soil colors are described using the Munsell notation system. This method of describing soil color consists of separate notations for hue, value, and chroma that are combined in that order to form the color designation. The hue notation of a color indicates its relation to red, yellow, green, blue, and purple; the value notation indicates its lightness, and the chroma notation indicates its strength or departure from a neutral of the same lightness.

The symbol for hue consists of a number from 1 to 10, followed by the letter abbreviation of the color. Within each letter range, the hue becomes more yellow and less red as the numbers increase. The notation for value consists of numbers from 0 for absolute black, to 10 for absolute white. The notation for chroma consists of numbers beginning with /0 for neutral grays and increasing at equal intervals. A soil described as 10YR 3/1 soil is more gray than a soil designated 10YR 3/6.

5.1.6 Wetland Hydrology

Wetland hydrology is defined as the presence of water for a significant period of time at or near the surface (within the root zone) during the growing season. Wetland hydrology is present only seasonally in many cases, and is often inferred by indirect evidence. Hydrology is controlled by such factors as seasonal and long-term rainfall patterns, local geology and topography, soil type, local water table conditions, and drainage. Primary indicators of hydrology are inundation, soil saturation in the upper 12 inches of the soil, watermarks, sediment deposits, and drainage patterns. Secondary indicators such as oxidized root channels in the upper 12 inches of the soil, water-stained leaves, local soil survey data, and the FAC-neutral vegetation test are sometimes used to identify hydrology. A primary indicator or two or more secondary indicators are required to establish a positive indication of hydrology.

5.1.7 Wetland Definition Summary

In general, an area must meet all three criteria to be classified as a wetland. In certain problem areas such as seasonal wetlands, which are not wet at all times, or in recently disturbed (atypical) situations, areas may be considered a wetland if only two criteria are met. In special situations, an area that meets the wetland definition may not be within the USACE's jurisdiction due to a specific regulatory exemption.

5.2 Existing Maps

Several sources of information were consulted to identify potential wetlands and wetland soil units on the site. These include the USFWS's National Wetland Inventory (NWI) and the Natural Resources Conservation Service's (NRCS) Soil Survey for Hamilton County. These maps identify potential wetlands and wetland soil units on the site. The NWI maps were prepared from high altitude photography and in most cases were not field checked. Because of this, wetlands are sometimes erroneously identified, missed, or misidentified. Additionally, the criteria used in identifying these wetlands were different from those currently used by the USACE. The county soil maps, on the other hand, were developed from actual field investigations. However, they address only one of the three required wetland criteria and may reflect historical conditions rather than current site conditions. The resolution of the soil maps limits their accuracy as well. The mapping units are often generalized based on topography and many mapping units contain inclusions of other soil types for up to 15 percent of the area of the unit. The USACE does not accept the use of either of these maps to make wetland determinations.

Figure 5.2 Wet Area in Field, November

5.3 National Wetland Inventory

The NWI map of the area (Appendix B) did not identify any wetland complexes within the areas proposed for any of the projects listed.

5.4 Soil Survey

The NRCS Soil Survey of Hamilton County identified 3 prominent soil series on the site (Appendix C). The following table identifies the soil unit symbol, soil unit name, and whether or not the soil type contains components that meet the hydric soil criteria.

Table 5.1 Soil Types within Project 1 and Project 2 Areas

Symbol	Description	Hydric
Project 1		
Br	Brookston silty clay loam	Yes
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	No
Pn	Patton silty clay loam, limestone substratum	Yes
Project 2		
Pn	Patton silty clay loam, limestone substratum	Yes
FxC3	Fox clay loam, 8 to 18 percent slopes, severely eroded	No

5.5 Investigation Methodology

The delineation of wetlands and other "waters of the U.S." on the site were based on the methodology described in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Environmental Laboratory, 2008) as required by current USACE policy.

Prior to field work, background information was reviewed to establish probability and potential location of wetlands on the site. Next, the site was walked with the specific intent of determining potential wetland areas. No attempt was made to examine a full soil profile to confirm any soil series designations. Complete descriptions of typical soil series can be found in the soil survey for this county.

Project 1

Project 1 is a 30-acre agricultural field located south of the WWTP and upstream of the head of the Symons Ditch channel. Existing stormwater pipes are buried under the field and outlet directly into the ditch, See Figure 5.3. The proposal for Project 1 is to daylight the pipes and grade the field into a large wetland basin designed to provide flood retention and groundwater recharge. The goal of the retention basin will be to help reduce peak discharges downstream and alleviate flooding problems downstream.

Figure 5.3 Headwall at beginning of Symons Ditch

Although there are no NWI polygons in the vicinity of Project 1, the entire field is dominated by hydric soils and consists of a number of low spots that could potentially hold water for a period that would allow wetland conditions to develop if left undisturbed, see Figure 5.2, or fallow for a growing season. It does not appear that there are currently wetlands in the Project 1 area, but a full delineation of the site will be required before construction can commence. It is recommended that the site is farmed continuously until the project commences.

Project 2

Project 2 will create a two-stage channel along 7,000 LF of Symons Ditch to provide flood relief to the adjacent properties. The entire ditch channel along Project 2 is located in a hydric soil unit, though there are no recorded NWI polygons in the area.

The site reconnaissance was completed in November 2011. A number of wet areas in the adjacent agricultural fields were noted, but it did not appear that these areas had been wet during the growing season. No rutting of the surface was present, which would have indicated wet conditions when machinery was working, and no evidence of stunted crops (algal mats on the surface or rotting vegetation) were observed. There are not likely wetlands present in the fields along the ditch in the area for Project 2, but a full delineation is recommended.

Figure 5.4 Wetland of George Beam Drain

There was one area where an existing wetland was observed, but not delineated, along the Project 2 area. The George Beam Drain flows into the main ditch just east of Eagletown Road. The George Beam Drain appears to be a buried tile that is daylighting near its outflow into Symons Ditch. In the areas where the drain is becoming exposed, a wetland has developed. This wetland will likely be a "regulated water" and will need to be investigated further prior to construction for Project 2. A photo of the existing wetland is shown in Figure 5.4.

5.6 Permitting Overview

5.6.1 Corps of Engineers and the Indiana Department of Environmental Management

The USACE has authority over the discharge of fill or dredged material into "waters of the U.S.". This includes authority over any filling, mechanical land clearing, or construction activities that occur within the boundaries of any "waters of the U.S.". A permit must be obtained from the USACE under Section 404 of the Clean Water Act (CWA) before any of these activities occur. Permits can be divided into three general categories: Individual Permits, Nationwide Permits, and the Regional General Permits for Indiana.

Individual Permits are required for projects that do not fall into one of the specific Nationwide Permits (NWP) or the Regional General Permit (RGP) or are deemed to have significant environmental impacts. These permits are much more difficult to obtain and receive a much higher level of regulatory agency and public scrutiny and may require several months to more than a year for processing.

Nationwide Permits have been developed for projects which meet specific criteria and are deemed to have minimal impact on the aquatic environment. In Indiana, however, most NWP's have been rescinded and replaced by the Regional General Permit.

The Regional General Permit (RGP) for Indiana authorizes activities associated with the construction or installation of new facilities or structures as well as for agriculture or mining. Proposed wetland impacts must be less than 1 acre and meet specific criteria in order to qualify for these permits. Section 401 Water Quality Certification (WQC) must be obtained from the IDEM before the USACE will perform their permit review.

The IDEM is responsible for issuing CWA Section 401 WQCs in conjunction with the USACE Section 404 permits. The IDEM requires notification for all non-isolated wetland impacts less than 0.10 acre, which entails a brief notification form that must be signed by the applicant. However, for non-isolated wetland impacts greater than 0.10 acre, an application for WQC must be submitted concurrently with a wetland mitigation plan. The IDEM will not initiate their review process until both the application and wetland mitigation plan have been submitted.

Applicants proposing an impact to an "isolated wetland," which is a wetland that the USACE has determined to be a non-federally jurisdictional wetland, are required to apply for and obtain Isolated Wetland Permits from IDEM. Isolated wetland permits are required under Indiana's State Isolated Wetland Law (Indiana Code 13-18-22 and 327 Indiana Administrative Code 17).

5.7 Potential Stormwater Best Management Practices

Projects 1 through 7 have varying forms of stormwater best management practices (BMPs) associated with them. It is recommended these practices be further scrutinized as they can be valuable tools to assist with funding for project specific activities. Banning Engineering has met with Lake and River Enhancement (LARE) Upper White River Watershed Alliance (UWRWA) staff on July 18, 2012 to further scrutinize the potential projects. Table 5.2 below shows the 2011 Morse Reservoir / Cicero Creek Watershed Management Plan (WMP) suggested BMPs for Teter Branch. The George Symons Drain is part of the Teter Branch watershed.

Table 5.2 Suggested BMP's for Teter Branch from 2011 WMP

Critical Area	Reason for being Critical	Suggested BMP
High Priority Subwatersheds		
Teter Branch	Total Phosphorus	Alternative Watering System
		Bioretention Practices
		Buffer/Filter Strips
		Education and Outreach
		Exclusionary Fencing
		Filtration Basin
		Naturalized Detention Basin
		Nutrient/Waste Management
		Pervious Pavement
		Reforestation
		Stream Restoration
		Wetland Restoration
	Nitrate+Nitrite	Alternative Watering System
		Bioretention Practices
		Buffer/Filter Strips
		Education and Outreach
		Exclusionary Fencing
		Filtration Basin
		Nutrient/Waste Management
		No-till/Reduced Till (Conservation Tillage)
		Pervious Pavement
		Reforestation
		Stream Restoration
	E. coli	Alternative Watering System
		Buffer/Filter Strips
		Education and Outreach
		Exclusionary Fencing
		Nutrient/Waste Management
		Wetland Restoration
	Livestock Access	Alternative Watering System
		Education and Outreach
		Exclusionary Fencing
		Nutrient/Waste Management
		Stream Restoration
	Conventional Tillage Practices	Education and Outreach
		Nutrient/Waste Management
		No-till/Reduced Till (Conservation Tillage)
	In-stream Debris	Education and Outreach
	Streambank Erosion	Alternative Watering System
		Buffer/Filter Strips
		Education and Outreach
		Exclusionary Fencing
		Stream Restoration
		Wetland Restoration

6.0 Potential Funding Mechanisms

There are several potential funding mechanism for the various projects listed. A brief overview of the funding sources, requirements, and limitations is listed in the following sections.

6.1 Regulated Drain Reconstruction

Under the Indiana Drainage Code IC 36-9-27, a regulated drain may be reconstructed. The cost share for reconstruction is split between the parcels within the watershed and directly associated with the regulated drain being reconstructed. Reconstructing a regulated drain is the only way to: increase the size of the drain; change the alignment of the drain; or lower the drain. Sections 49 through 52 of IC 36-9-27 discuss in detail the procedural process for reconstructing a regulated drain. Some of the basic parameters to meet are an understanding that: the project is to be paid for by the residents owning property within the watershed; per the code; the balance must be paid for in equal installments within 5 years, 10% interest will be applied to any unpaid balance; failure to pay may result in a lien on the

property or eventual tax sale; a public hearing and approval by the county drainage board is required before any construction may occur; under Section 98 of IC 36-9-27 the property assessments within the municipal boundaries may be paid for by the municipal fiscal body on behalf of the owners. There is no limit to the amount of funds raised under this code. However, since the funds are borrowed and paid back to the County General Drain Improvement Fund (GDIF), fiscal responsibility is required by the county.

The William Krause Drain is slightly different than the other regulated drains studied. The William Krause Drain is classified as an urban drain. Under this classification, the owners may elect to pay the assessment in equal installments of at least one hundred dollars ($100) per year, plus interest on the deferred payments, over a period of not more than twenty (20) years. The yearly payments are to be made semiannually at the time general taxes are payable.

6.2 Section 319 Grant Program

The Section 319 grants program is administered by the Indiana Department of Environmental Management's (IDEM) Office of Watershed Management (OWM). Work plans, grants administration, financial administration, annual reporting, and use of the Grants Reporting and Tracking System (GRTS) are carried out by the OWM, in accordance with U.S. Environmental Protection Agency (EPA) guidance from Region 5.

Section 319 projects are normally contracted for two to four years. Projects fall into several categories: watershed planning; implementation of plans; education; and demonstration. The application package submitted by the sponsor contains a budget, schedule, description of the problem, proposed activities for addressing the problem, how the project will be evaluated, and letters of commitment from project partners. Project managers work with the sponsor to refine the application package as needed. This package is used to develop the grant agreement between IDEM and the sponsor.

The requirements for Section 319 project grants are: project sponsors must be units of government; nonprofit organizations; or universities; and the area in which the project takes place must be within the watershed of a waterbody which is listed in the current 303(d) list as impaired due to a pollutant that may have a non-point source pollutant (NPS) or is listed in the current 305(b) report as not fully supporting a designated use due to an impairment that may be due to a NPS.

Currently the Upper White River Watershed Alliance is reviewing February 2011 Morse Reservoir / Cicero Creek Watershed Management Plan in an effort to prioritize more specific goals and projects. In the 2011 report, the Teter Branch, includes George Symons Drain, is listed as highly impaired and one of the three critical sub-watersheds for Morse Reservoir. Table 5.2 shows the stormwater Best Management Practices (BMPs) needed for Teter Branch. Several of the projects listed have potential as stormwater quality BMPs and warrant consideration for funding under the Section 319 grant program. Typically $400,000 to $500,000 is the maximum grant size, but at the current time, no actual limit has be set. There is a 40% in kind match required for the project grant. The 2012 deadline for application is expected to be November 30.

6.3 State Revolving Fund Loan Program (SRF)

Although loans are typically distributed for wastewater and drinking water projects, any project that is needed for pollutant removal is eligible for the SRF program. National Park Service (NPS) projects may be eligible for consideration if they provide the following: wetland protection or restoration; on-site sewage disposal; BMPs for agricultural and stormwater runoff; riparian buffers or conservations easements; and wellhead and source water protection. Several of the projects listed herein provide these potential benefits.

Stormwater projects are not eligible if they are intended: solely for economic development; primarily for fire suppression; or for stormwater projects that have no water quality benefit. The SRF is a 20-year loan where the interest rates are reset quarterly and are at or below 90% of the average 2 year triple A rated municipal bond market. The rate may be additionally discounted based on median household income and local user rates. Cities, towns, and conservancy districts are all eligible for the SRF loan program. There is no set maximum allocation for the loan program, but funds are limited for the program as a whole.

6.4 Flood Control Revolving Fund

The Flood Control Revolving Fund was created by the Indiana General Assembly in the 1950's in order to provide a low interest loan program to help finance local flood control programs. Through I.C. 14-28-5, a loan may be made to a municipality, city, town, county, or special taxing district for the purpose of instituting, accomplishing, and administering any approved flood control program as defined in the Flood Control Revolving Fund Act. The administration of the fund and the responsibility for the provisions of the Act are vested in the Natural Resources Commission. The Indiana Department of Natural Resources (DNR), Division of Water, is the agency that coordinates matters related to the Flood Control Revolving Fund.

The Flood Control Revolving Fund is also available to a conservancy district to pay for the costs of establishing a district and costs associated with preparing the district plan for any of the purposes for which a conservancy district can be established. An approved flood control program includes: clearing and straightening of channels; creating new or enlarged channels; repairing levees or other flood control works; establishing floodways; and removing accumulated debris. The proposed flood control program is subject to approval by the Natural Resources Commission. The program must be needed for the purpose of protecting public health, safety, and general welfare. A Flood Control Revolving Fund Loan to any local unit of government cannot exceed $300,000. A Flood Control Revolving Fund Loan may be made for a period not to exceed ten years and has an interest rate of 3 percent.

6.5 Community Focus Funds Grant (CFF)

CFF Grants are funded with federal Community Development Block Grant (CDBG) dollars from the U.S. Department of Housing and Urban Development (HUD). The goal of the CFF program is to encourage communities with eligible populations to focus on long-term community development. Storm drainage projects are an eligible activity through the CFF program. The project funding is based on the following criteria: low to moderate income population 51 percent or greater; addresses long term planning and development efforts for the community; the funds granted will have a significant impact on

the proposed project; and project is ready to proceed and will be completed within 18 months of award. The program is administered through the Indiana Office of Community and Rural Affairs (OCRA).

There is approximately $20 million available each year through this program. Approximately fifty-five percent (55%) of available funds are dedicated to infrastructure projects (water, sewer, storm drainage, dams and levees) with the remaining percentage being divided among the other projects types. The maximum award amount cannot exceed $500,000 for infrastructure and $400,000 for all other construction project types. Fire trucks are limited to $150,000. A local match of at least 10% of the total project cost is required. A minimum of 5% must be in the form of cash or debt. Additional in-kind contributions can be counted as a local match up to 5% of the total project cost, with a maximum of $25,000.

There is one competitive funding round per year. The application process consists of the submittal of a proposal to OCRA, a site visit, and submittal of a final application. Please contact the Grant Support Division for application deadlines. An interested applicant should also meet with a Community Liaison to discuss the project prior to submitting a proposal. At the time of application, a city or town cannot have more than one open CFF, MSRP, FF or Planning Grant, and a county cannot have more than two open CFF, FF, MSRP and/or Planning Grants. Any open FFs, MSRPs or CFFs must be under construction, and a Notice of Construction received by OCRA before another application is submitted. Open Planning Grants must be under contract with the consulting engineer/architect.

6.6 Property Acquisition Grants –Indiana Department of Homeland Security

Several potential funding opportunities exist through the Indiana Department of Homeland Security (IDHS) in conjunction with the Federal Emergency Management Agency (FEMA). Funding levels vary significantly based on federal dollars available for the various programs. In general, a minimum 25 percent match is required for the project with a maximum project cost based on availability of funds.

Several types of projects are available for grants funds. A basic fee-simple acquisition project simply acquires land and structures, and demolishes the structures located on the land. It is conducted like any other real estate transaction and is the easiest type of acquisition project to implement and manage. The second type of project is a relocation project. A relocation project is a basic acquisition that acquires land but offers an alternative to demolishing structures by moving them outside the floodplain.

A conservation easement may be used in lieu of fee-simple acquisition in areas where the owner wants to retain title. A conservation easement is an easement that prevents the property owner from developing the property. The property owner retains title to his or her property and can transfer title. However, the terms of a conservation easement acquired using grant funds carry the same restrictions as fee-simple acquisition, and the property is forever subject to those terms, regardless of who has title.

A deed restriction is placed on the property during the fee-simple acquisition and conservation easement process. The restriction limits the use of the property to be of open space or wetlands management. No new structures may be built on the property except for the following: a public facility open on all sides and related to open space or recreational use; or a public rest room that is wet flood-proofed.

To start the property acquisition process, a notice of pre-application should be sent to IDHS. After the pre-application letter is sent in, a public meeting is required to further prepare property owners and tenants for the property acquisition project. Additional information will be required for a formal application.

6.7 Lake and River Enhancement Grant

The goal of the Indiana Department of Natural Resources Division of Fish and Wildlife's Lake and River Enhancement (LARE) Program is to protect and enhance aquatic habitat for fish and wildlife to ensure the continued viability of Indiana's publicly accessible lakes and streams for multiple uses, including recreational opportunities. This is accomplished through measures that reduce nonpoint sediment and nutrient pollution of surface waters to a level that meets or surpasses state water quality standards.

This policy allows a specified portion of the match to be provided as in-kind contributions by the sponsor. Any in-kind contributions provided in excess of the established maximum allowable percentage will be viewed as a generous contribution by the sponsor. However, the minimum percentage cash match required will be 10 percent with a local in-kind match of 10 percent or a total match required for all project types of 20 percent. Generally, the grant is limited to $100,000 per project with a grantee limit of $300,000 over a lifetime. In 2012, the grant application deadline was January 15, 2012. A similar deadline is expected for 2013.

6.8 Community Facilities Loan (USDA)

The United States Department of Agriculture has loans available for communities to address long term facility needs. The loans can fund a variety of projects and include stormwater projects. There is no deadline for project submittal, though funding will be allocated during the next federal fiscal year (October 1). Projects have been funded into the $40,000,000 range, with no lower or upper limit specified. The loan does require a financial bond to be in place for the community to pay back the loan. It is possible for the County to issue a revenue bond against the drainage assessments within the watershed. The loan can be used to pay back previously indebted expenses, such as engineering or environmental studies. Funds can be used for property acquisition, but acquisition is required before closing of the loan. At the time of this study the term of the loan is 40 years with a 3.5% interest rate compounded daily. There is no penalty for early repayment. A general timeline for the loan program is shown below.

1. A Preliminary Engineering Report (PER), environmental study and application are prepared and submitted to the USDA. The environmental study normally takes 60 to 120 days to complete. The PER must be approved by the Rural Development State Engineer. The application consists of the application form, several certifications and financial information. A rate study may also be required.

2. Once the above items are received, reviewed and approved the application is sent to the State Office for approval. If the application is approved and funds are available, a letter of conditions is provided to the applicant and the applicant signs a form called the 1940-1 or “Request for Obligation of Funds”. The funds are then obligated in our Finance Office which means that funds have been set aside for the applicant’s project.

3. The following are completed after loan approval and before loan closing:

- Final design is completed and reviewed by Rural Development
- Obtain easements and rights-of-way
- Bond counsel prepares the bond and any ordinances that are required, such as a rate ordinance
- Bid documents and prepared and reviewed by Rural Development
- The project is bid
- The winning bid is selected and reviewed by Rural Development
- Contract documents are prepared and reviewed by Rural Development

4. Loan Closing
   - Pre-Construction conference
   - Notice to Proceed
   - Construction begins
   - Monthly pay meetings are held
   - Inspection by on-site resident inspector during construction period
   - Substantial Completion
   - Final Inspection
   - Use of remaining funds
   - Project close

6.9 The Nature Conservancy Two-Stage Ditch Program (319 Grant)

The Nature Conservancy is administering eight (1/2 mile long) two-stage ditch projects within the Wabash River Watershed. The funding is limited to a ½ mile long section of two-stage ditch, and pays up to 75% of the project costs not to exceed $7.50 per linear foot. A minimum municipality local match is $1.50 per linear foot. Where applicable, municipalities can use local resources as the local match responsibility.

6.10 Conservation Reserve Enhancement Program (CREP)

The intent of CREP is for farmers to convert their lands from agricultural production to wetlands and other vegetation in 15 year contracts. The Indiana CREP has grown to 11 watersheds and has enrolled roughly 26,000 acres. The converted lands reduce nonpoint sediment and herbicide/pesticides from reaching waterways by creating natural buffers.

The State will pay one-time payments of $500 per acre to participants in the upper White River watershed. CREP may help cover the costs of Project 1 up to $500/acre x 30 acres for a total of $15,000. Additionally, the Federal Government would pay 40% of the eligible installation costs for a wetland restoration. In addition, CREP's program, CP-23, could cover up to $950 per acre for wetland restoration with a cost share of 50% of the installation cost.

6.11 Conservation Reserve Program (CRP)

The CRP allows farmers to convert their agricultural land into wildlife habitats that reduce runoff and erosion. It exchange, CRP would cover up to 50% of the establishment cost and pay annual rental payments for the converted acreage based on agricultural rental value. Enrollment in the program continues for the duration of a 10 to 15 year contract. The CRP may help finance Project 1 if the farmer has owned the land for at least 12 months or meets other criteria listed on their website.

6.12 Conservation Stewardship Program (CSP)

Candidates for the CSP program must meet multiple criteria which can be found on their website. The goal of CSP is to address the issues of erosion, water quality, and environmental resources. Participants would receive land use payments ($40,000 maximum / year, $200 K maximum / 5 year) annually based on the benefits they produce for the environment. Each contract lasts 5 years which could potentially benefit Projects 1, 5, 8, and 10.

6.13 Debt for Nature (USDA)

The Debt for Nature program allows farmers who have loans with the Farm Service Agency (FSA) to cancel up to 33% of their debt in exchange for long term conservation contracts ranging from 10 to 50 years. The contract prohibits the landowner from utilizing the resources of the land for the duration of the contract. Recreation, such as hunting and fishing, are allowable. However, any construction, farming, timber harvesting, waste disposal, water alterations, or vegetation alteration are prohibited.

6.14 Environmental Quality Incentives Program (EQIP)

The EQIP has contracts up to 10 years in length that help improve soil, water, and plant resources on farmland and forestland. The maximum funding allowed is $300,000 for during a six year period. The program is geared toward underserved farmers looking to fix natural resource concerns on the acreage. The EQIP may be applicable to Projects 1, 8, and 10 since those lands will be improved hydrologically to incorporate the new wetland basin.

6.15 Wetlands Reserve Program (WRP)

The Wetlands Reserve Program may be applicable to Project 1 if the farmland floods regularly. There are several programs available through the WRP. The first option creates a permanent easement by the USDA which would fund up to 100% of the restoration costs and pay 100% of the easement value. The second option creates a 30 year easement where the USDA would cover up to 75% of the restoration costs and 75% of the easement value. The third option is a cost-share agreement where the USDA would cover up to 75% of the restoration costs. The fourth option is a 30 year contract for tribal lands only and covers up to 75% of the restoration costs. The WRP is especially applicable to Projects 1, 8, and 10.

6.16 Other Potential Funding Sources

Other potential funding sources may include, to a lesser extent; the Emergency Watershed Protection, the EPA Brownfields Program, the Wildlife Habitat Incentive Program, and the national Fish and Wildlife Foundation.

6.17 Matrix of Potential Funding Sources

Table 6.1 Potential Funding Source Matrix

1= High potential of use; 2= Medium potential of use; 3= Low potential of use; n/a= Not applicable

Potential Funding Source	Project									
	1	2	3	4	5	6	7	8	9	10
Regulated Drain Reconstruction	1	1	1	1	1	1	1	n/a	1	n/a
Section 319 Grant	1	1	n/a	n/a	3	n/a	3	n/a	n/a	n/a
State Revolving Loan Fund (SRF)	2	3	n/a	n/a	3	n/a	3	n/a	n/a	n/a
Flood Control Revolving Fund	1	1	3	3	3	3	1	2	3	2
Community Focus Fund Grant	1	3	3	3	3	3	3	3	n/a	3
Property Acquisition Grants	3	n/a	n/a	n/a	n/a	n/a	3	1	n/a	1
Lake and River Enhancement Grant	1	1	n/a	n/a	3	n/a	1	n/a	n/a	n/a
Community Facilities Loan (USDA)	1	3	3	3	3	n/a	n/a	n/a	n/a	n/a
The Nature Conservancy Two-Stage Ditch Program	n/a	1	n/a	n/a	n/a	n/a	3	n/a	3	n/a
Conservation Reserve Enhancement Program (CREP)	1	n/a	n/a	n/a	3	n/a	n/a	n/a	n/a	n/a
Conservation Reserve Program (CRP)	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Conservation Stewardship Program (CSP)	3	n/a	n/a	n/a	3	n/a	n/a	3	n/a	3
Debt for Nature (USDA)	3	3	n/a	n/a	n/a	n/a	n/a	3	n/a	2
Emergency Watershed Protection (USDA)	1	n/a	n/a	n/a	n/a	n/a	n/a	1	n/a	1
Environmental Quality Incentives Program (EQIP)	3	n/a	n/a	n/a	n/a	n/a	n/a	2	n/a	2
EPA Brownfields Program	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1*
Wetlands Reserve Program (WRP)	1	2	n/a	n/a	n/a	n/a	n/a	1	n/a	1
Wildlife Habitat Incentive Program	3	n/a	n/a	n/a	n/a	n/a	3	n/a	n/a	n/a
National Fish and Wildlife Foundation	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*Applicable if there are hazardous materials involved

7.0 References

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Appendix 'A' – May 16, 2012 Public Meeting Summary

Sign In Sheet List

	Name	Address
1	Robert Clements	205 W. 2nd Street
2	Glen Bougher	103 Jarit Drive
3	Brenda Bush	100 S. Main Street
4	Jennifer Shepard	3299 South Drive
5	Steve Shepard	3299 South Drive
6	Charles Singleton	24545 Hudson
7	Jim M	25540 Dunbar
8	David Kinkead	106 N. Sherman Street
9	Melissa Moore	24695 Lamong Road
10	Jay Moore	24695 Lamong Road
11	Steve Fisher	508 E. 6th Street, Sheridan
12	Michele Hampton	101 N. Hudson Street, Sheridan
13	Betty Ayers	25450 Eagletown
14	Jake Koepkey	24827 Eagletown
15	Amber Sheller	24555 Hudson Street
16	Parvin Gillian	310 S. Main Street
17	Andy Conover	Hamilton County Surveyor's Office
18	Christie Kallio	Hamilton County Surveyor's Office
19	Jeff Healy	Banning Engineering, P.C.
20	Jon LaTurner	DLZ Indiana, LLC
21	Joe Miller	Banning Engineering, P.C.

Symons & Krause Public Information Open House Comments

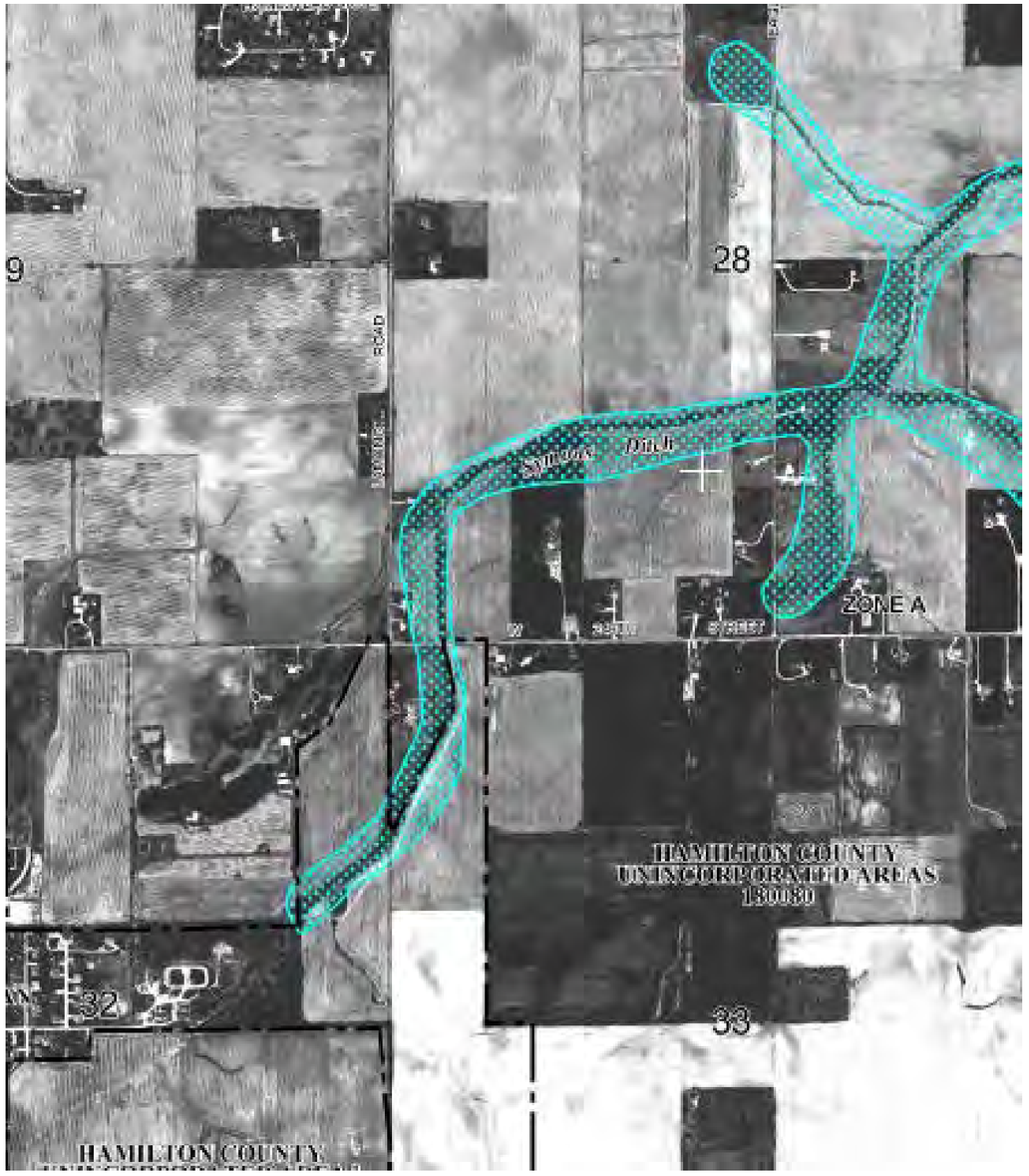
May 16, 2012 (6:30 pm), Sheridan Community Center

Place	Name	Location	Comment
1	Jake & Amy Koepkey	24827 Eagletown	Water above basement windows in 2010 and 2011. Filled basement, approx. 12" in garage. Water overflows from over the bridge and the arm behind our house.
2			Identified as unbuildable lot, possibly an overflow area.
3			Ditch takes a dog-leg instead of flowing straight. The water seems to slow & swirl at that point.
4			Arm overflows at this point.
5	Betty Ayers	24450 Eagletown	Like County Surveyor's Office to be responsible for overflow with tile beneath.
6	Nick & Michele Hampton	101 N. Hudson	Basement flooding, lawn flooding, entire street flooding. Told flooding started when school built. Told that route of drain was re-routed when high school was built and now we are lower and water collects on our block.
7			Eagletown Rd. Bridge OT 2 x in 4 years
8	Charles Singleton	24545 Hudson Street	Water runs down road - south drive
9	Steve Fisher	508 E. 6th Street, Sheridan	We have flooded the last 3 years. Water has circled our building and came in to our business and home.
10	Sheridan American Legion	10th Street	Several floods
11	Jennifer & Steve Shepard	South Drive	Curreyville flooding problem. Water flows down street! Serious issues in winter.
12	Amber Sheller	24555 Hudson Street	A. Culvert under new pump station drive is too small. (Will be fixed by Co. Hwy) B. Drain in front of house gets plugged easily (needs a beehive inlet and new concrete ring around inlet). C. Overflow (check dam) is too high. Appears to be at the same elevation as my foundation, last June I had 8" of flood water throughout my entire first floor. D. Detention basin size needs to be confirmed – for all of the area that water flows into it. Please call if you have any questions 574-315-3201
13	Jay & Melissa Moore	24695 Lamong Road	Property has flooded at least 4 times since purchase in 2003. Main floor flooded 8” in June 2011 flood.

Map of Public Comments

Appendix 'B' – Floodplain and Wetland Mapping

Current Floodplain Mapping



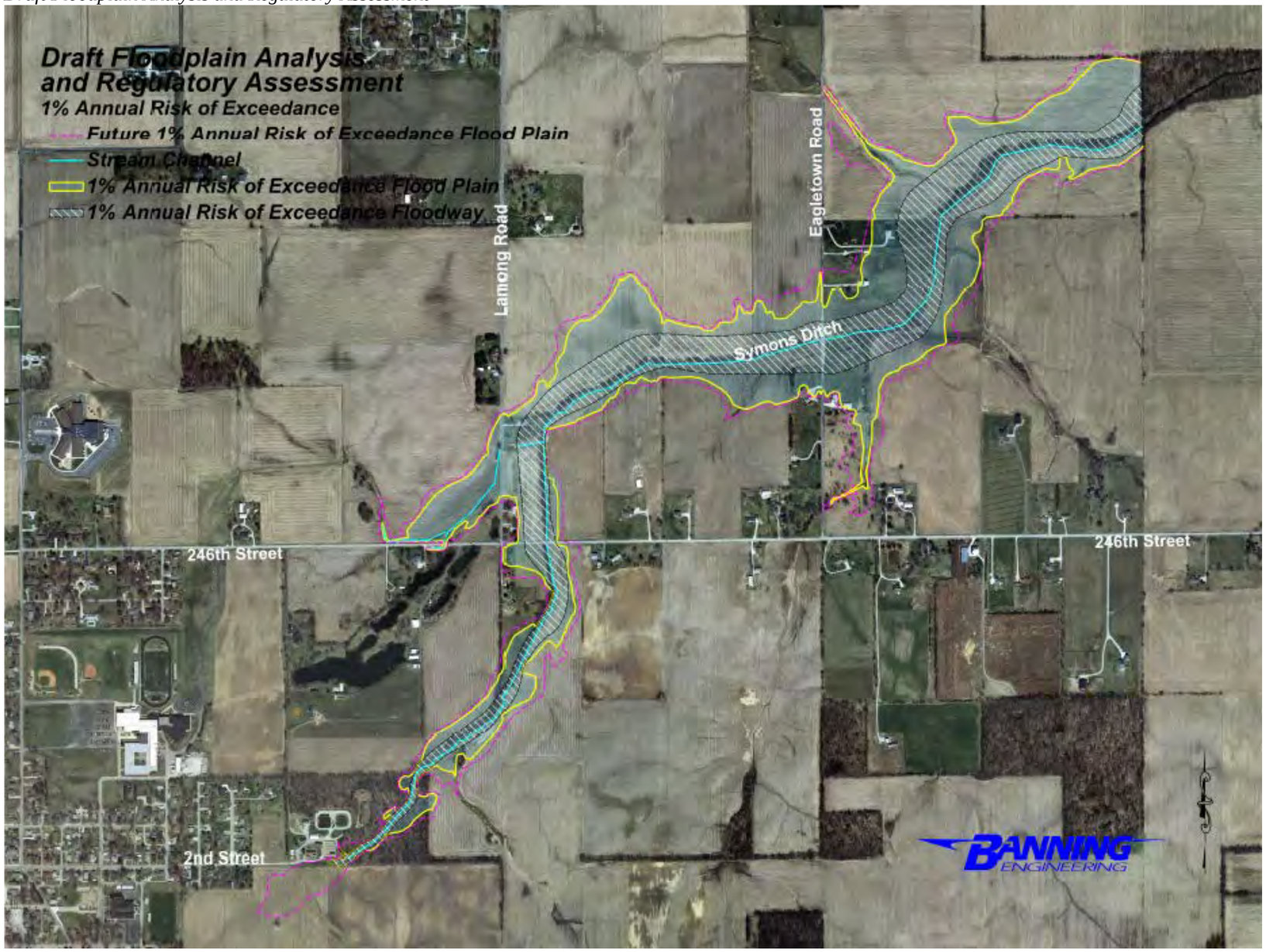

Draft Floodplain Analysis and Regulatory Assessment
1% Annual Risk of Exceedance
Future 1% Annual Risk of Exceedance Flood Plain
Stream Channel
1% Annual Risk of Exceedance Flood Plain
1% Annual Risk of Exceedance Floodway
Lamong Road
Eagletown Road
Symons Ditch
246th Street
246th Street
2nd Street
BANNING
ENGINEERING

Figure 2: Potential Wetlands
Symonds and Kraus Drain
Banning Engineering
Hamilton County, Indiana

March 2012
Job No. 1109068

Draft Wetlands Restoration Potential

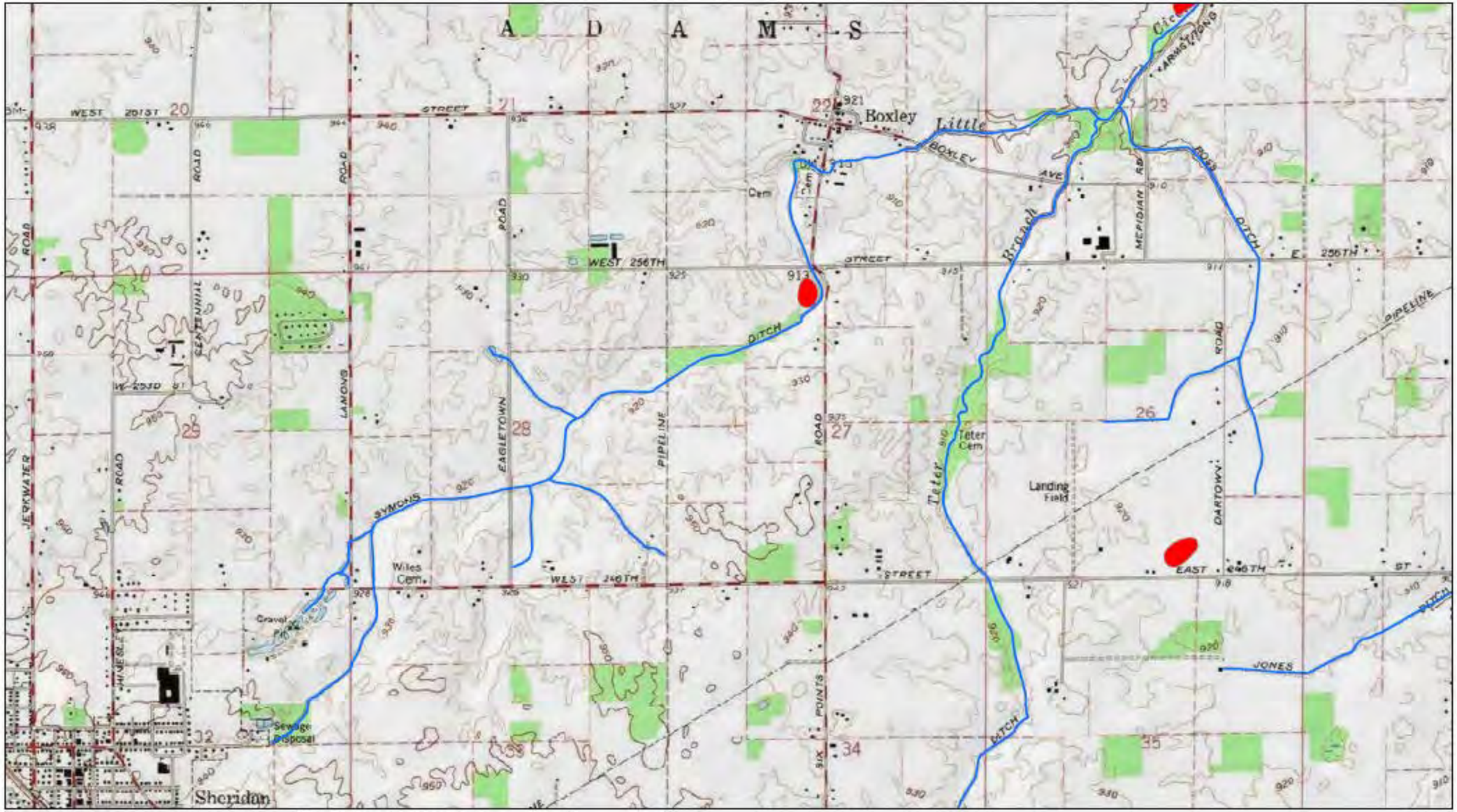


Figure 1: Potential Wetland Restoration
Symonds and Kraus Drain
Banning Engineering
Hamilton County, Indiana

December 2011
Job No. 1109068

Projected Coordinate System: NAD 83, UTM Zone 16 North

0 375 750 1,500 Feet

NHD Stream / River

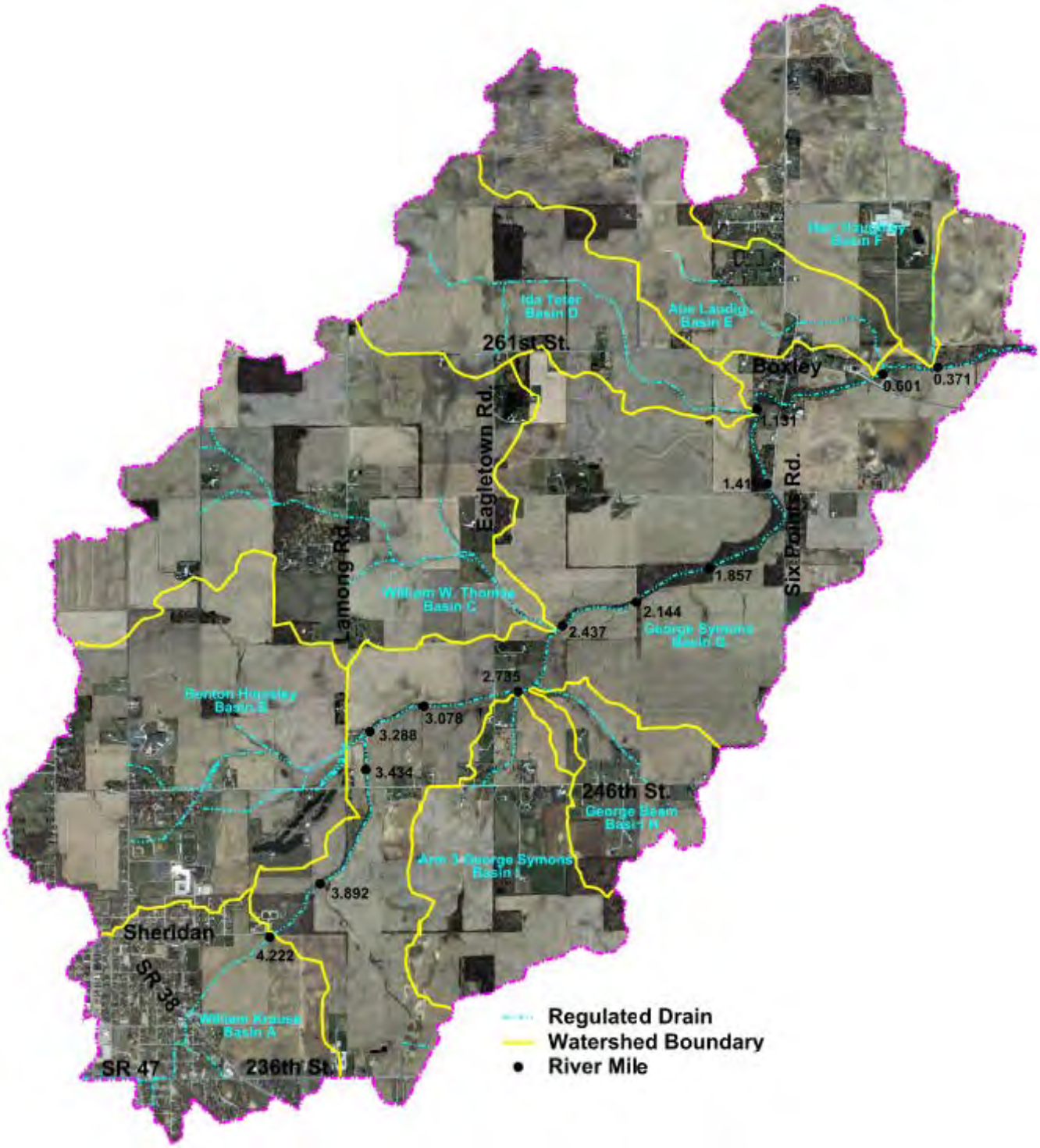
Wetland Restoration Opportunities

DRAFT

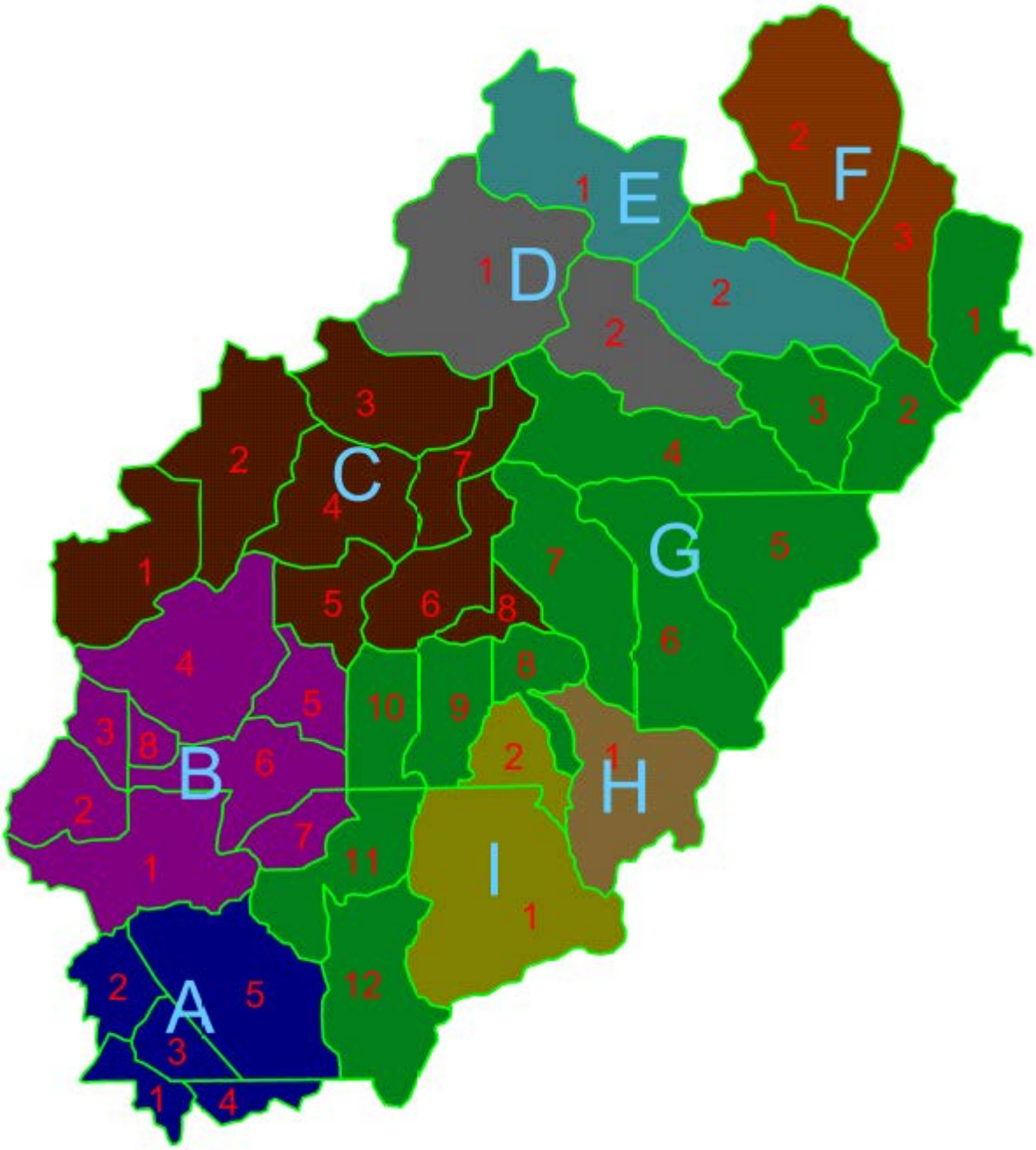
Gardino JFNew

Appendix 'C' – Sub Basin RCN, Tc & Soils Information

Overall Basin Map



Overall Sub-Basin Map



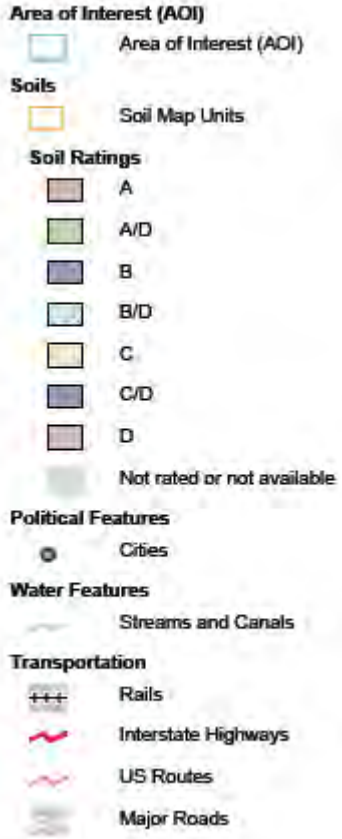
Regulated Drain	Basin	Drainage Area (mi^2)
William Krause	A	0.53
Benton Hinesley	B	1.00
William W. Thomas	C	1.23
Ida Teter	D	0.58
Abe Laudig	E	0.56
Herr Haughley	F	0.59
George Symons	G + All Others	Total Watershed= 7.40
George Beam	H	0.24
George Symons Arm 3	I	0.48

TR-55
COMPOSITE RCN-VALUES & TIME OF CONCENTRATION

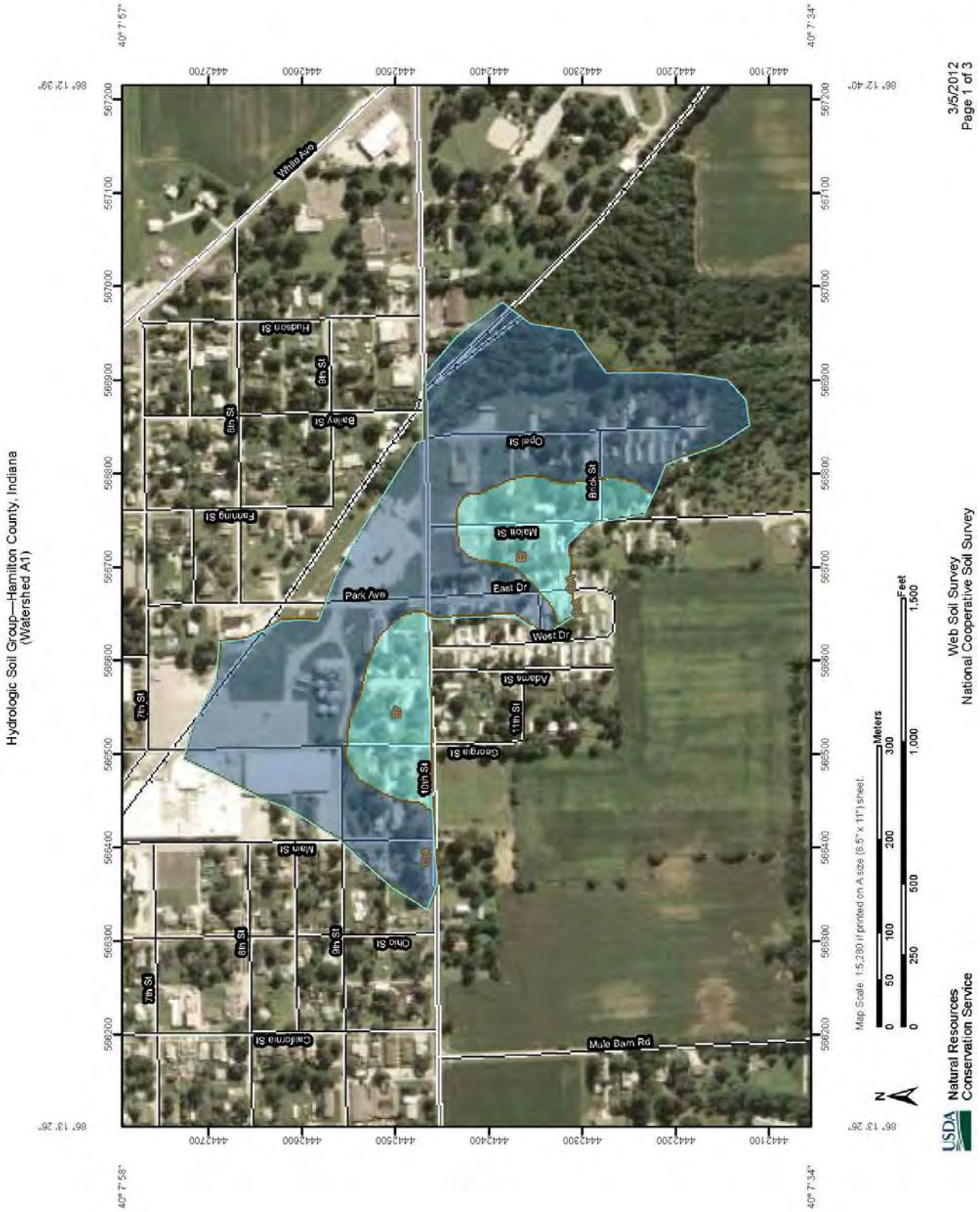
PROJECT: Symons-Krause
JOB #: 11194
DATE: 4/9/12
COMPUTED BY: TJB

Basin	RCN	Area (ft2)	Area (acres)	Area (miles)	Tc
A1	87	1405246	32.26	0.05	100.4
A2	85	2208492	50.7	0.08	26.2
A3	83	1719313	39.47	0.06	47.0
A4	76	1253657	28.78	0.04	30.6
A5	81	8009813	183.88	0.29	57.6
B1	79	6452543	148.13	0.23	72.4
B2	74	2919391	67.02	0.10	79.0
B3	77	1557706	35.76	0.06	50.2
B4	68	7484044	171.81	0.27	67.5
B5	79	2380990	54.66	0.09	50.9
B6	80	4498006	103.26	0.16	55.2
B7	79	1796850	41.25	0.06	28.6
B8	81	785387	18.03	0.03	38.1
C1	78	5669334	130.15	0.20	69.1
C2	75	6515705	149.58	0.23	61.8
C3	79	5456761	125.27	0.20	59.5
C4	75	5361800	123.09	0.19	39.8
C5	76	2911115	66.83	0.10	56.1
C6	77	4284126	98.35	0.15	64.6
C7	77	2962080	68	0.11	72.4
C8	81	1292425	29.67	0.05	34.2
D1	68	10331996	237.19	0.37	67.0
D2	80	5950732	136.61	0.21	62.6
E1	79	7970173	182.97	0.29	128.6
E2	78	7580747	174.03	0.27	107.1
F1	76	2753428	63.21	0.10	45.1
F2	78	9284378	213.14	0.33	66.6
F3	81	4370375	100.33	0.16	57.1
G1	77	4381265	100.58	0.16	53.9
G2	81	3605461	82.77	0.13	53.3
G3	78	4082443	93.72	0.15	66.0
G4	78	7766748	178.3	0.28	87.2
G5	77	7209180	165.5	0.26	45.4
G6	78	8492022	194.95	0.30	53.2
G7	80	6614150	151.84	0.24	71.7
G8	78	2495552	57.29	0.09	48.3
G9	81	3344972	76.79	0.12	34.7
G10	80	3177702	72.95	0.11	26.0
G11	78	4593402	105.45	0.16	36.7
G12	79	6297034	144.56	0.23	27.4
H1	75	6721744	154.31	0.24	62.0
I1	78	10998029	252.48	0.39	63.2
I2	76	2390137	54.87	0.09	42.9
Basin B1 Breakdown					
SHS	83	2286900	52.5	0.08	69.8
Rest of Basin	77	4165643	95.63	0.15	72.4

Soils Map Legend



Sub-Basin Maps

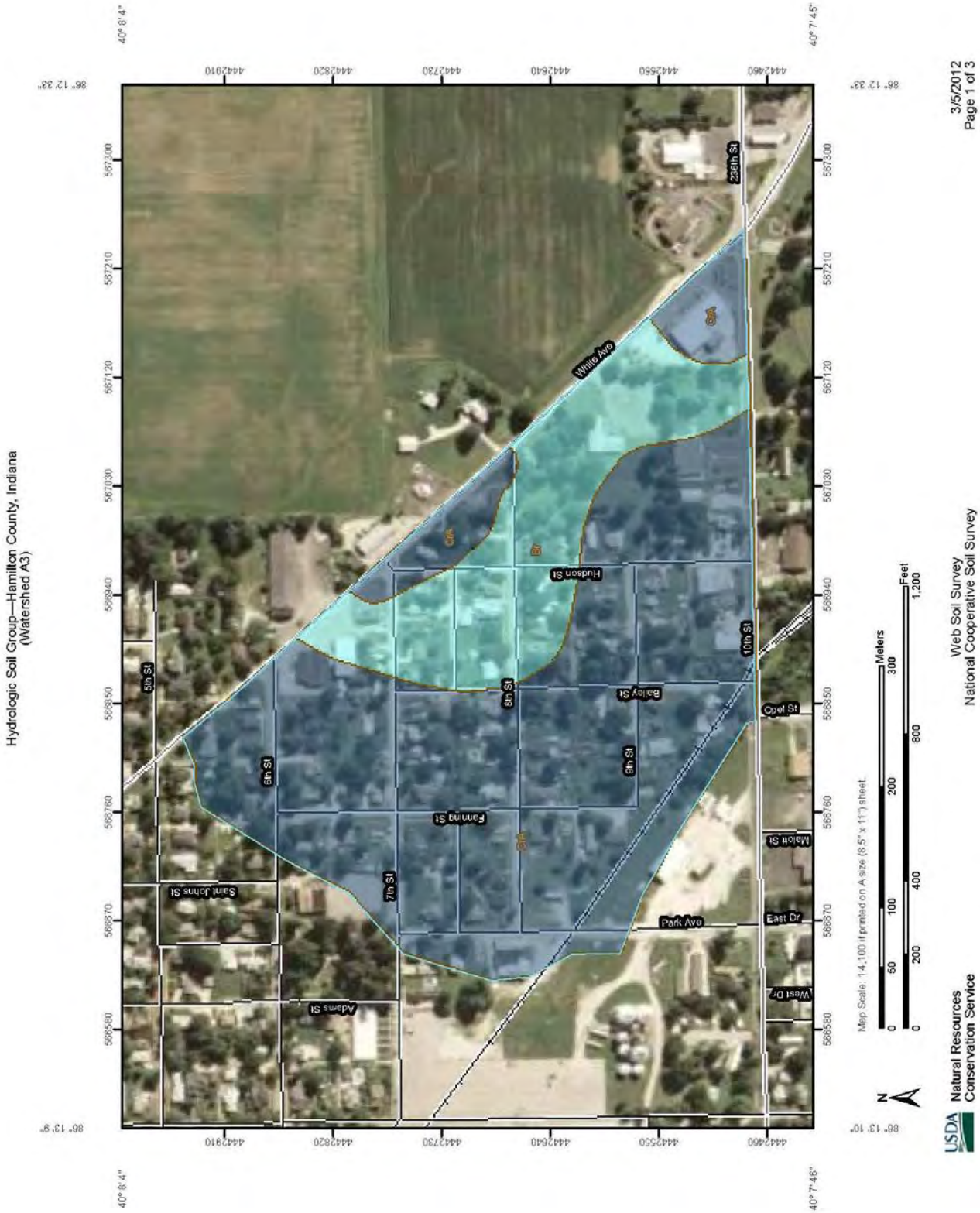


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed A2)

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
Page 1 of 3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National Cooperative Soil Survey
Natural Resources
Conservation Service
USDA
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Feet
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Hudson St
Bailey St
Fanning St
Adams St
Saint Johns St
Park Ave
East Dr
West Dr
Malott St
Opel St
236th St
10th St
9th St
8th St
7th St
6th St
5th St
40° 8' 4"
40° 7' 45"
40° 7' 46"
86° 12' 33"
86° 13' 10"
86° 13' 9"
444290
444280
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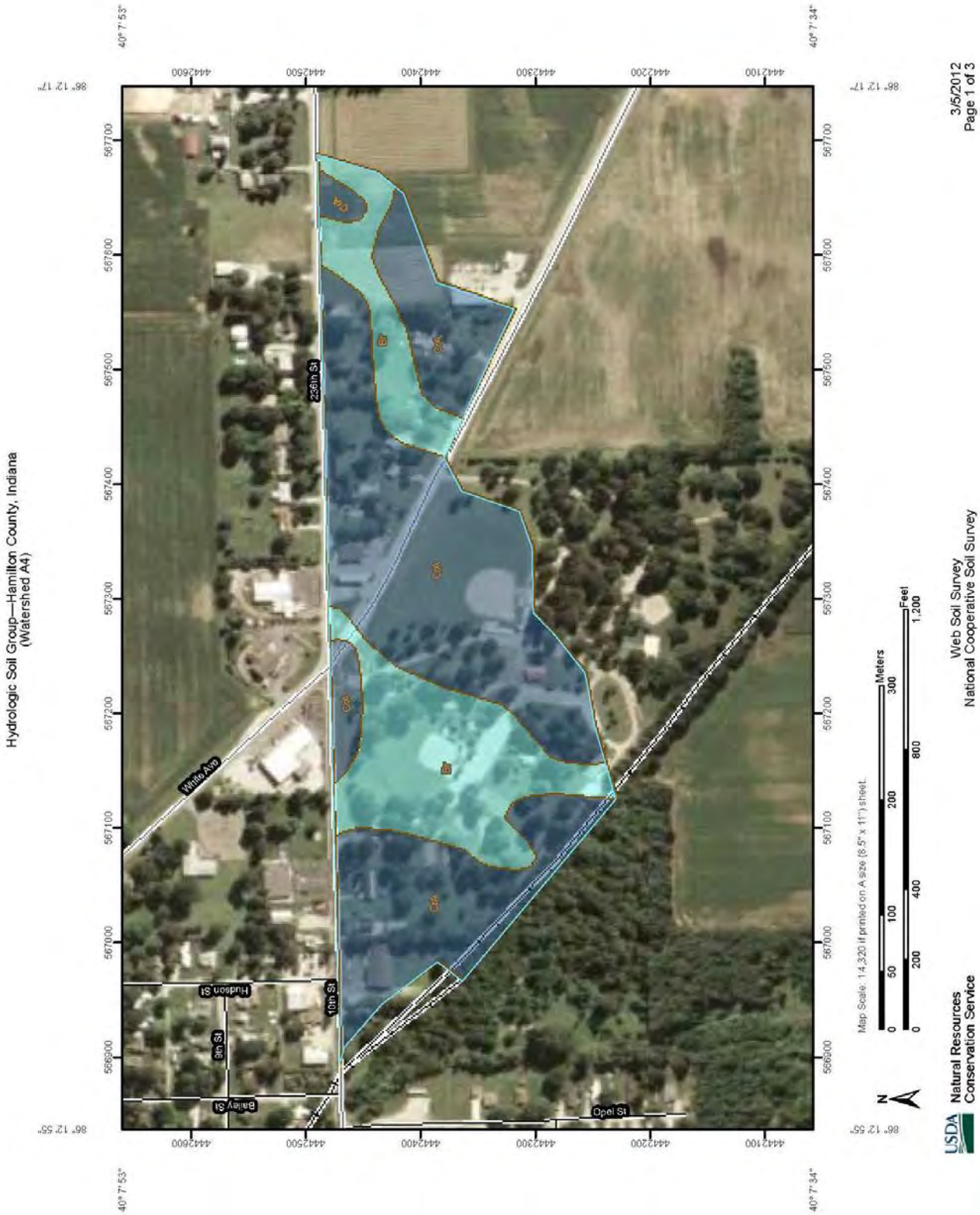
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Natural Resources
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9th St
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Opel St
CeA
BrA
CkA
CkB
BrB
CkC
40° 7' 53"
40° 7' 34"
86° 12' 17"
86° 12' 55"
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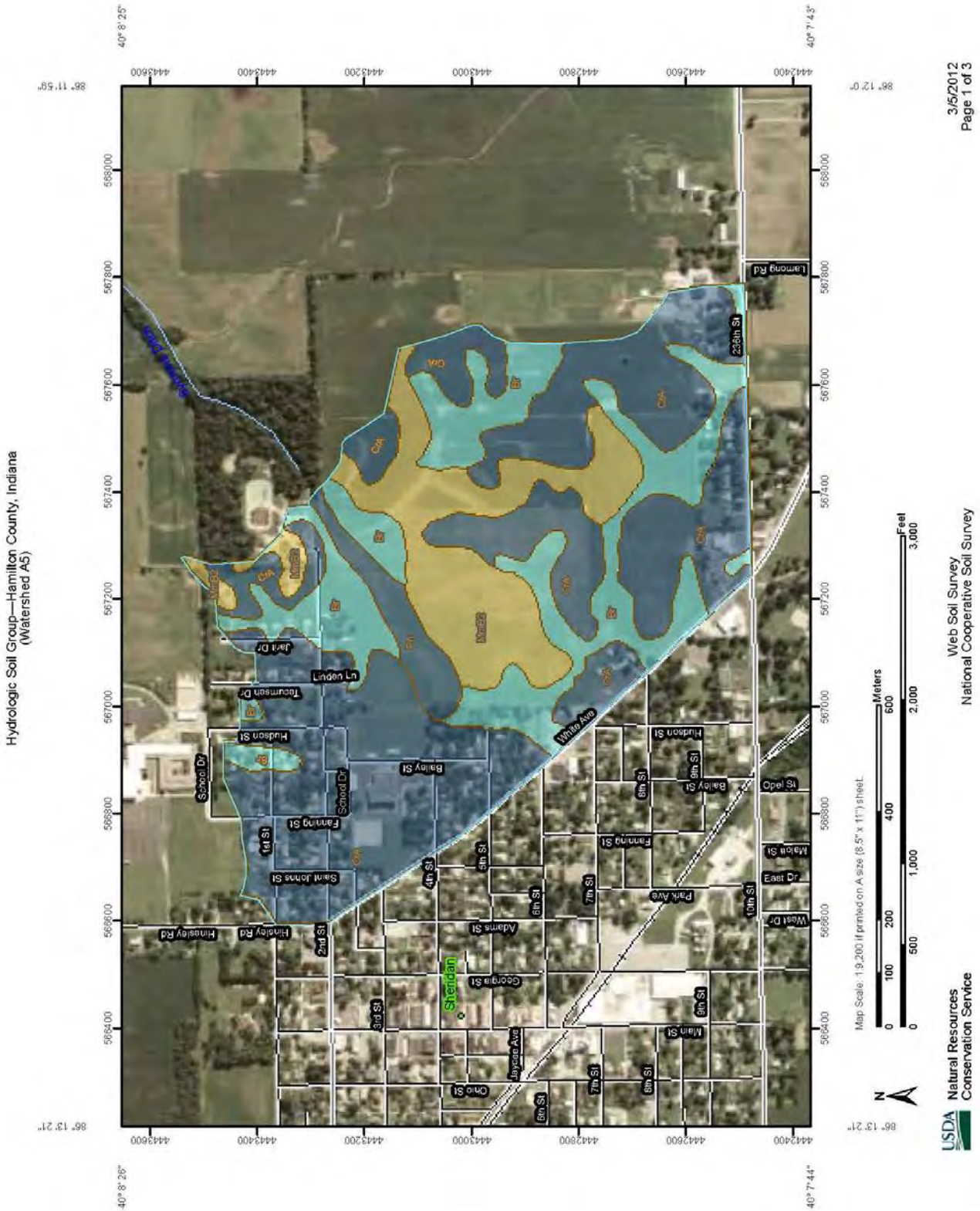
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3/5/2012
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Lamong Rd
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Tecumseh Dr
Jan Dr
Hudson St
School Dr
Bailey St
Fanning St
1st St
Saint Johns St
2nd St
Hinsley Rd
3rd St
4th St
5th St
6th St
7th St
8th St
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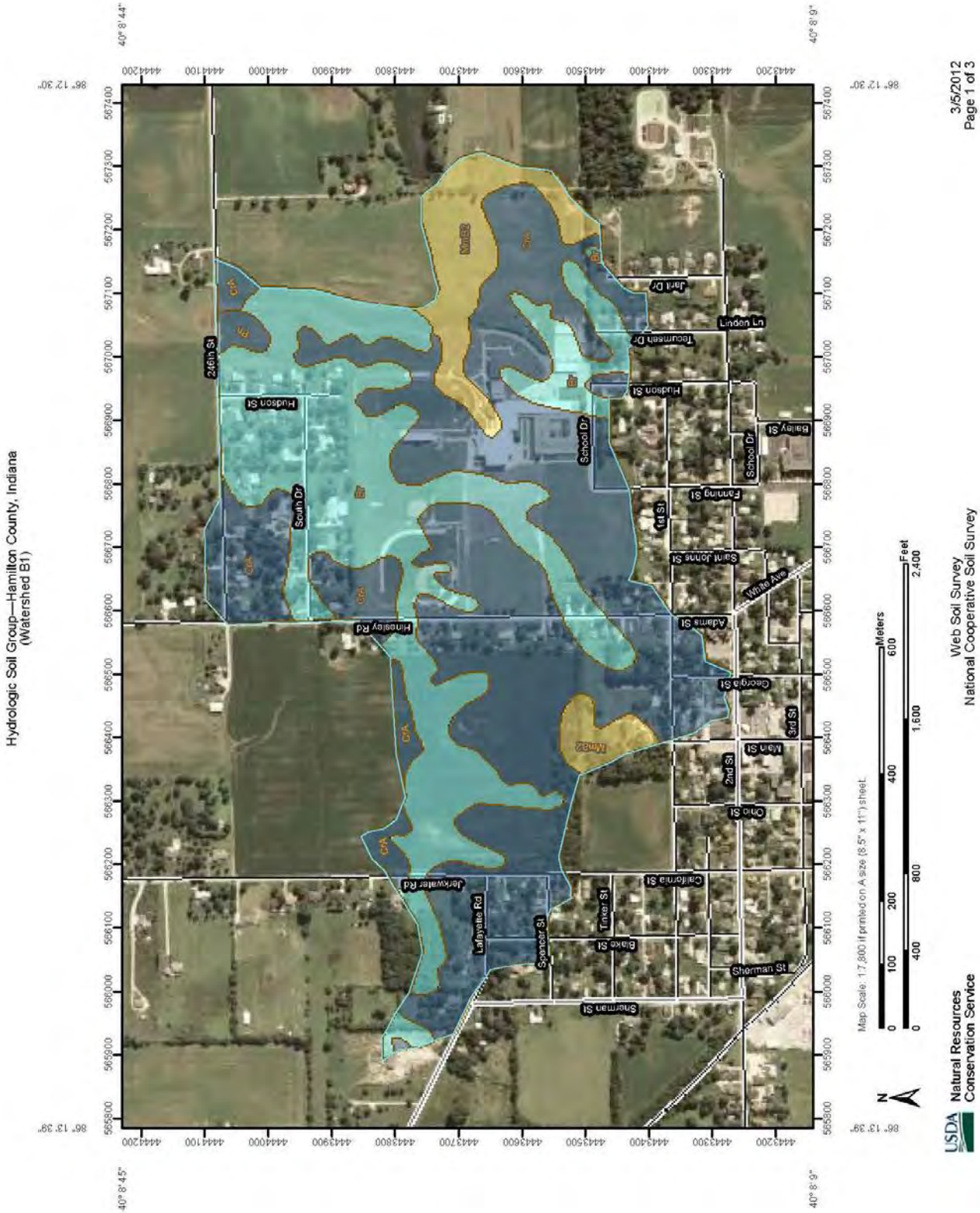
Oak
Maple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Natural Resources
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Blake St
Tinker St
California St
Ohio St
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Main St
3rd St
Georgia St
Adams St
1st St
Saint Johns St
Fanning St
School Dr
Bailey St
Hudson St
Tecumseh Dr
Linden Ln
Jan Dr
White Ave

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed B2)
3/5/2012
Page 1 of 3
Jerkwater Rd
Hinsley Rd
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South Dr
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Feet
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Conservation Service
USDA

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed B3)

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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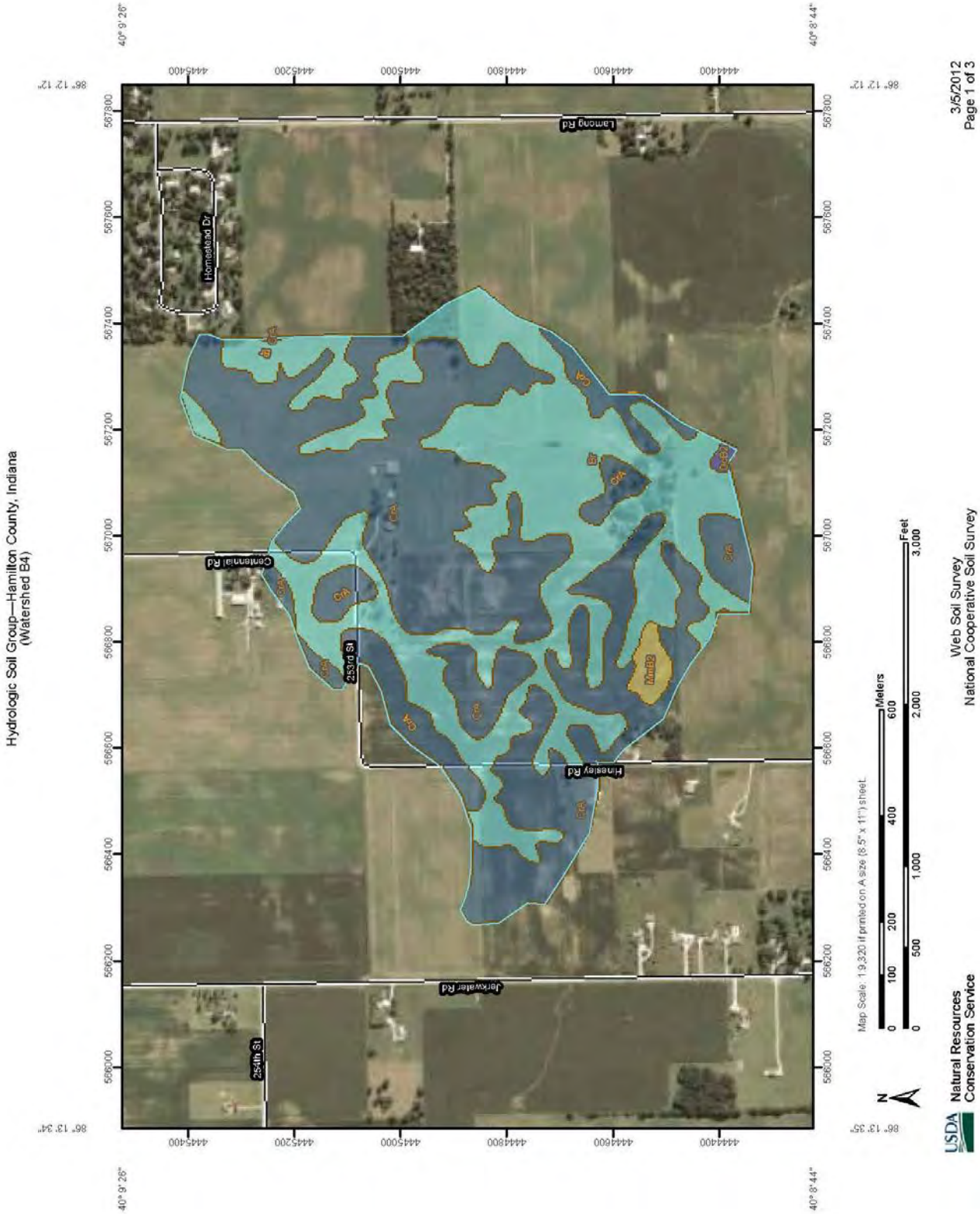
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(Watershed B4)
Homestead Dr
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253rd St
Hinsley Rd
Jerkwater Rd
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Meters
Feet
Natural Resources
Conservation Service
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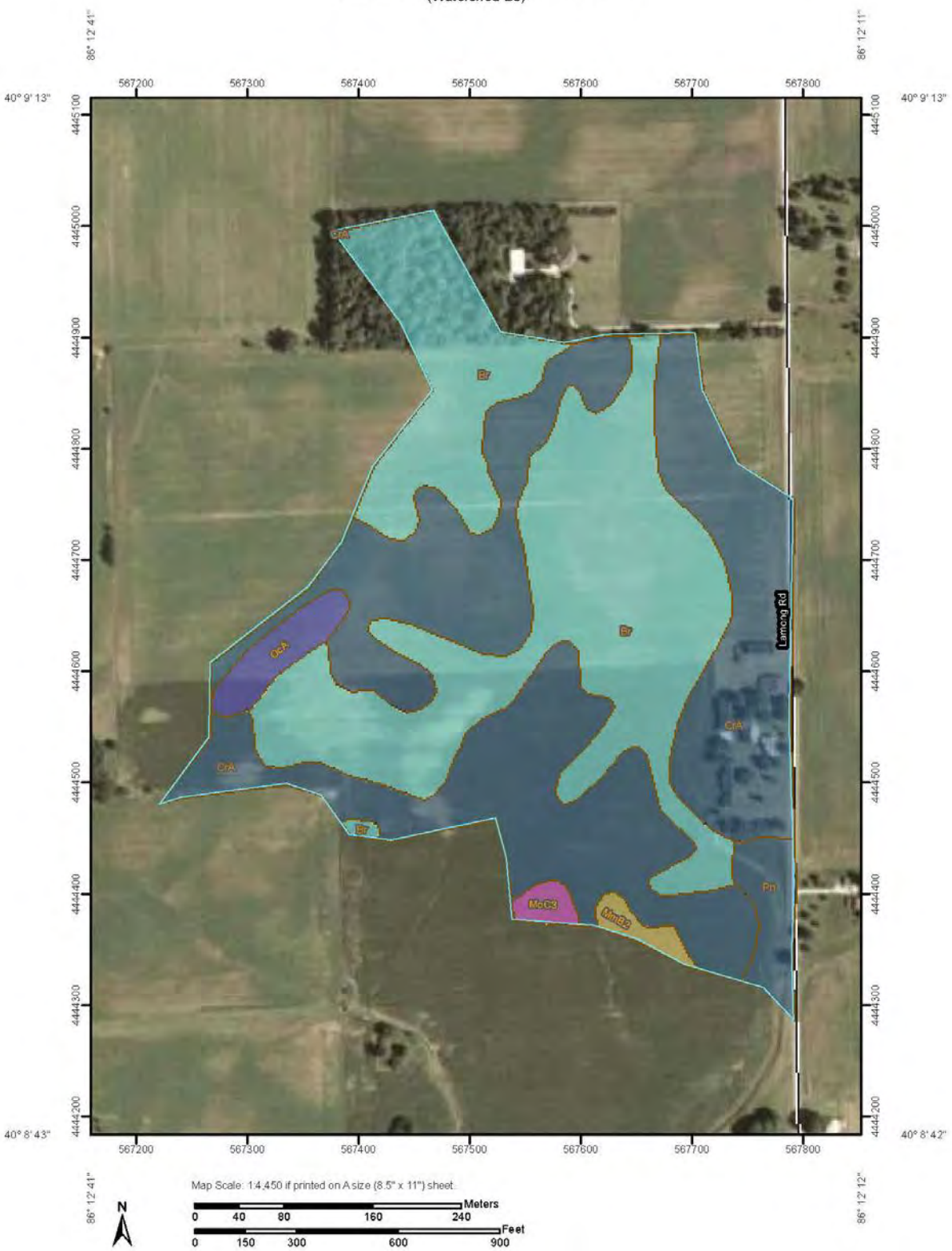
National Cooperative Soil Survey
3/5/2012
Page 1 of 3

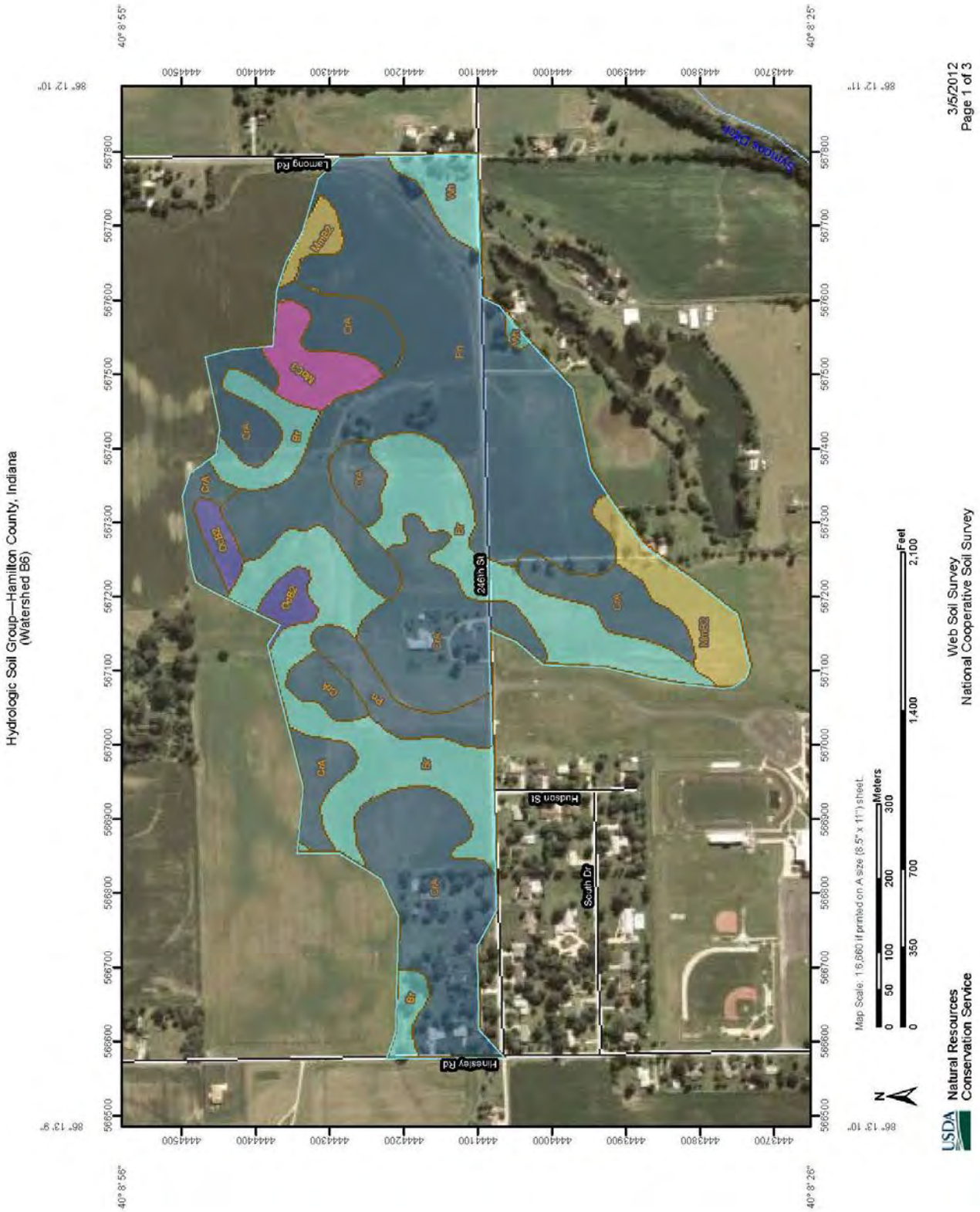
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed B5)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
Page 1 of 3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(Watershed B6)
3/5/2012
Page 1 of 3
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Hinsley Rd
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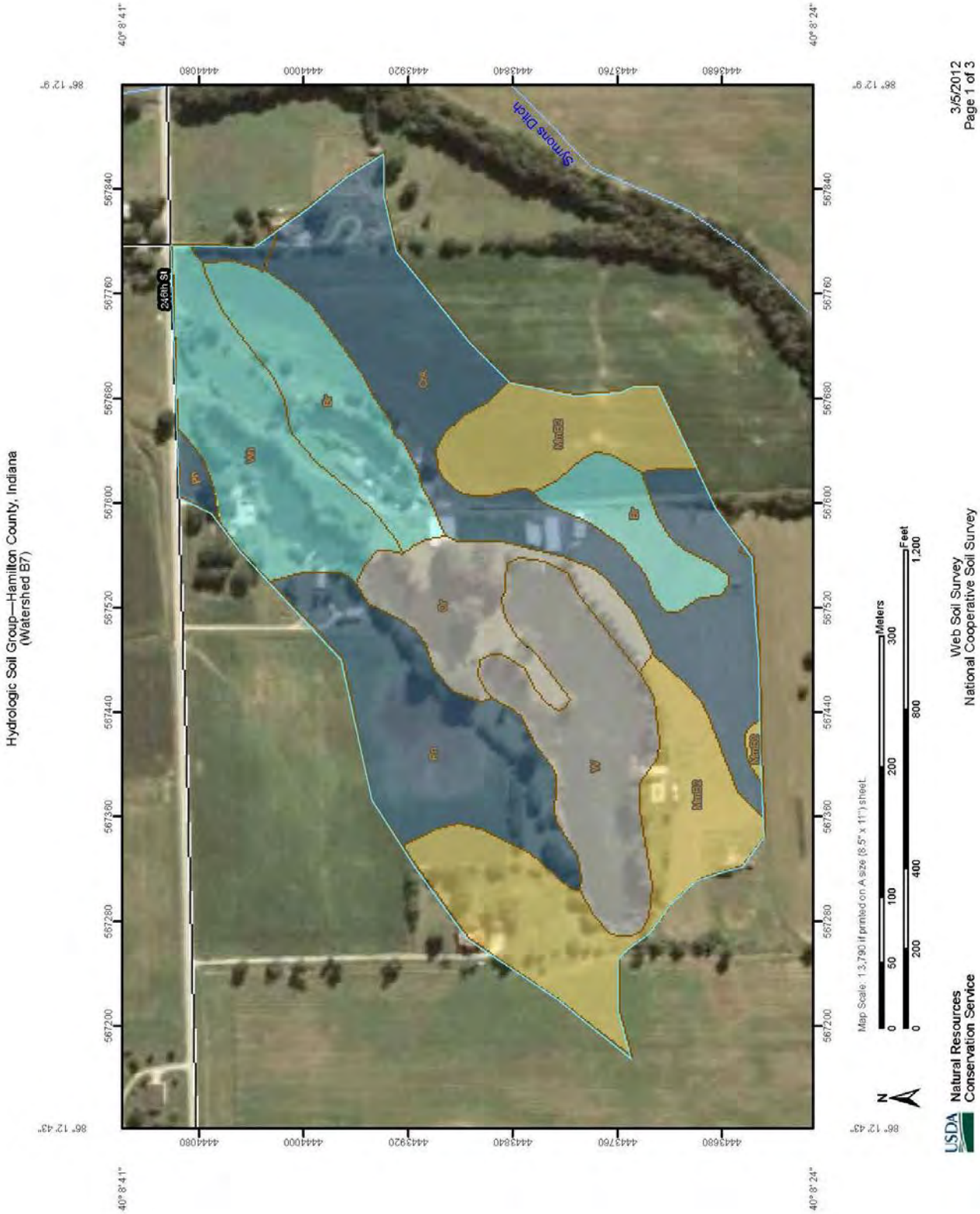
National Cooperative Soil Survey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Conservation Service
3/5/2012
Page 1 of 3

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed B8)

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C1)

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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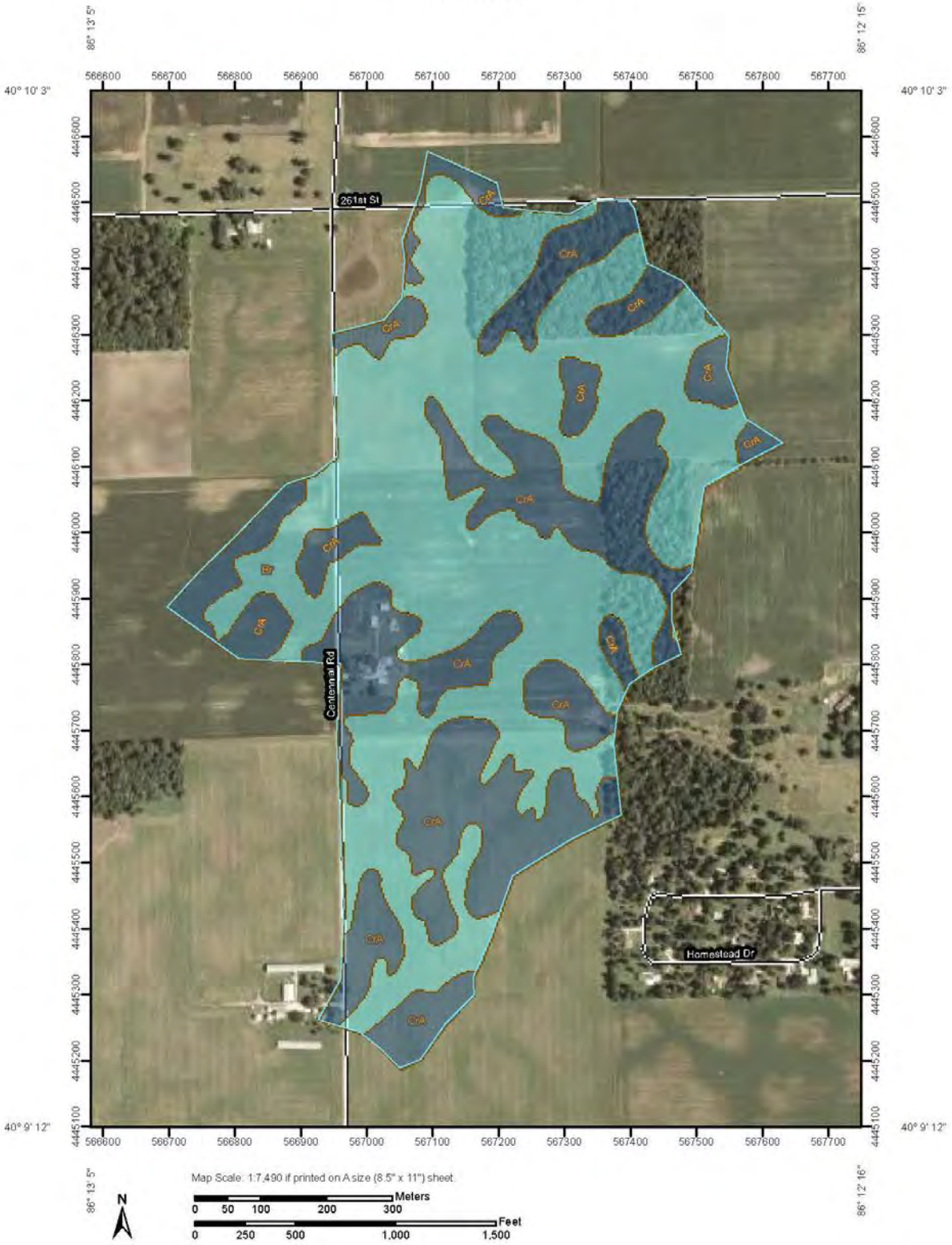
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C2)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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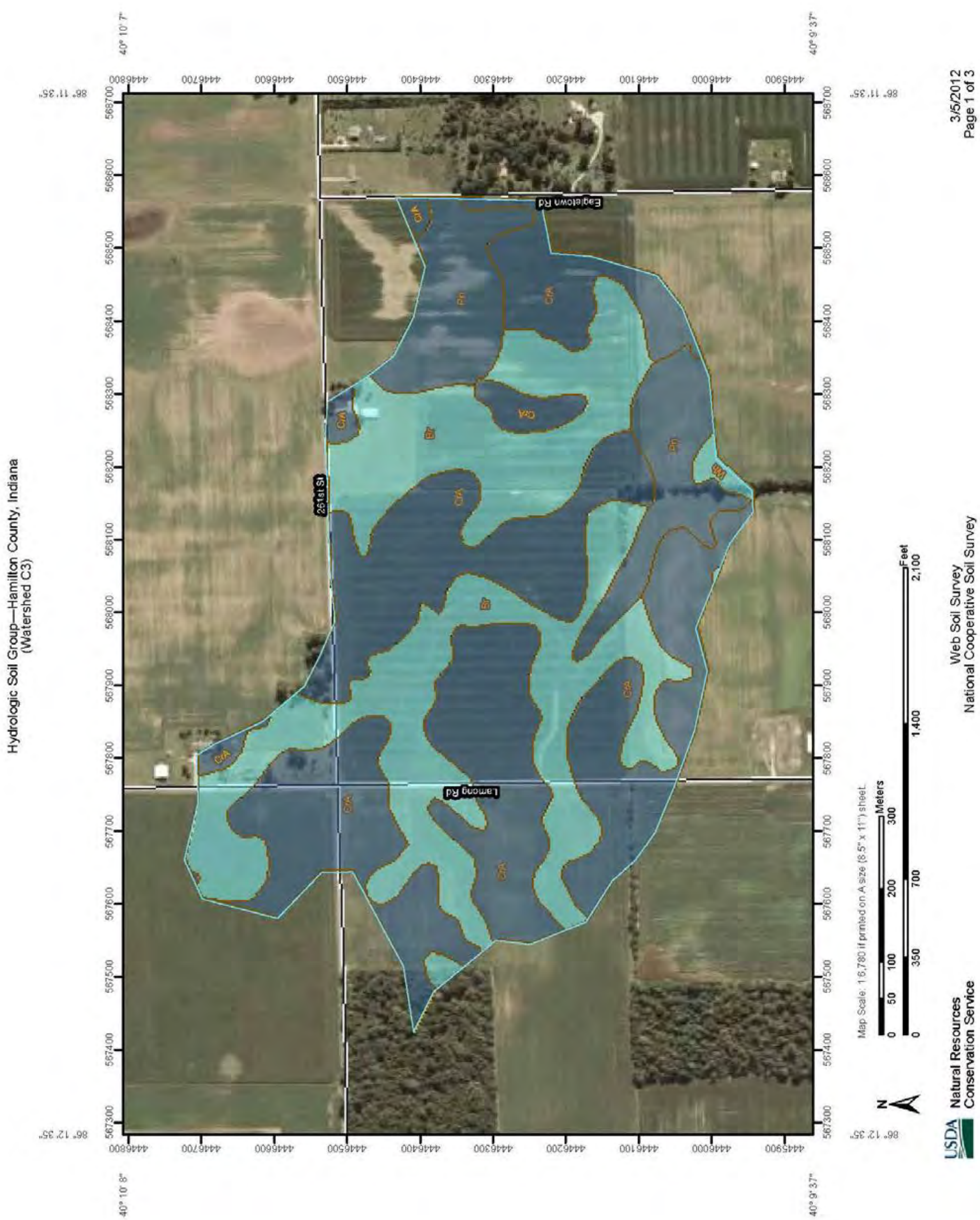
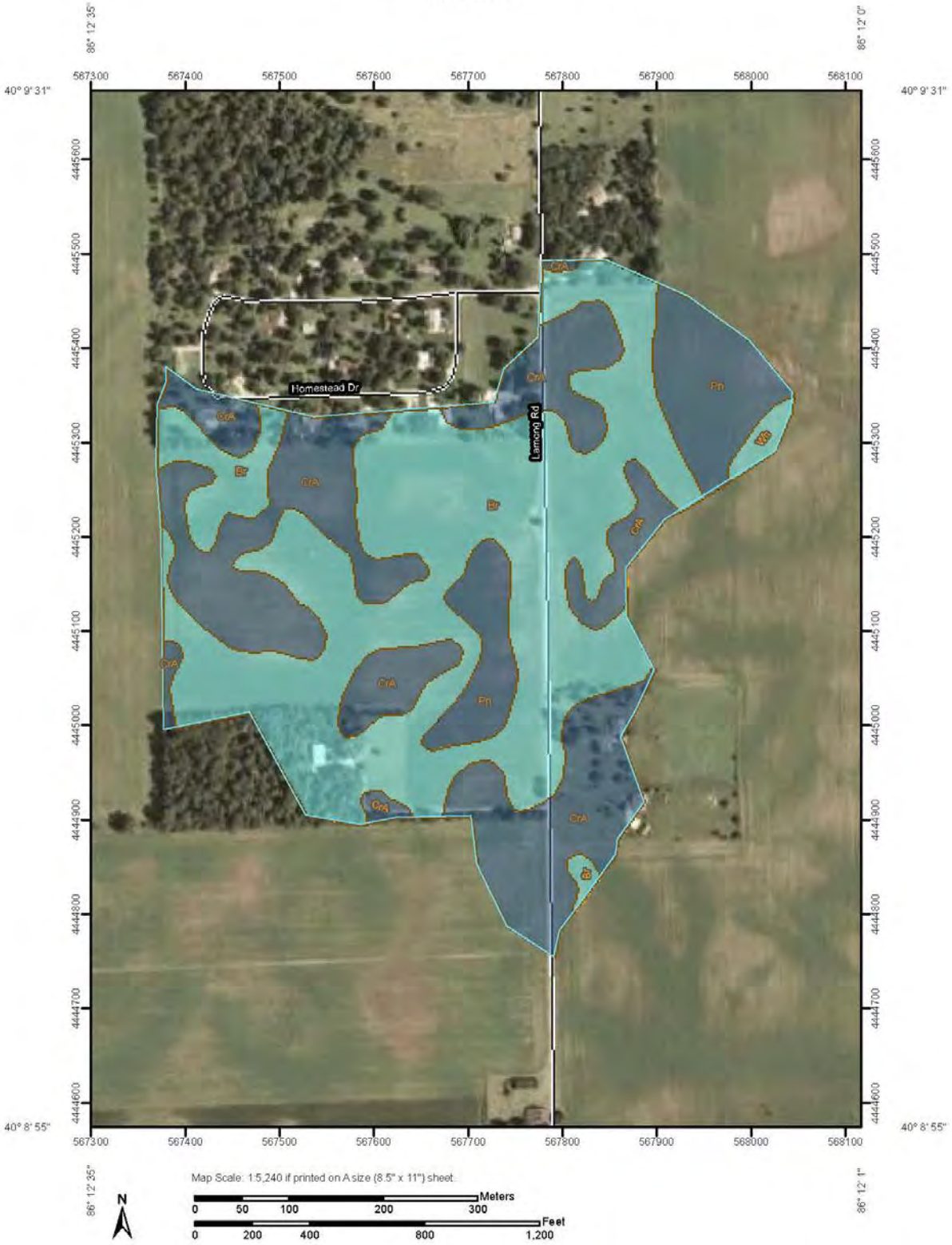

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C3)
Eagletown Rd
261st St
Lamong Rd
Map Scale: 1:6,780 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
3/5/2012
Page 1 of 3

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C4)
Lamong Rd
Homestead Dr
Br
CrA
WaB
Map Scale: 1:6,990 if printed on A size (8.5" x 11") sheet.
Meters
0 50 100 200 300
Feet
0 350 700 1,400 2,100
N
Natural Resources
Conservation Service
USDA
Web Soil Survey
National Cooperative Soil Survey
3/5/2012
Page 1 of 3

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C5)



USDA Natural Resources Conservation Service

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National Cooperative Soil Survey

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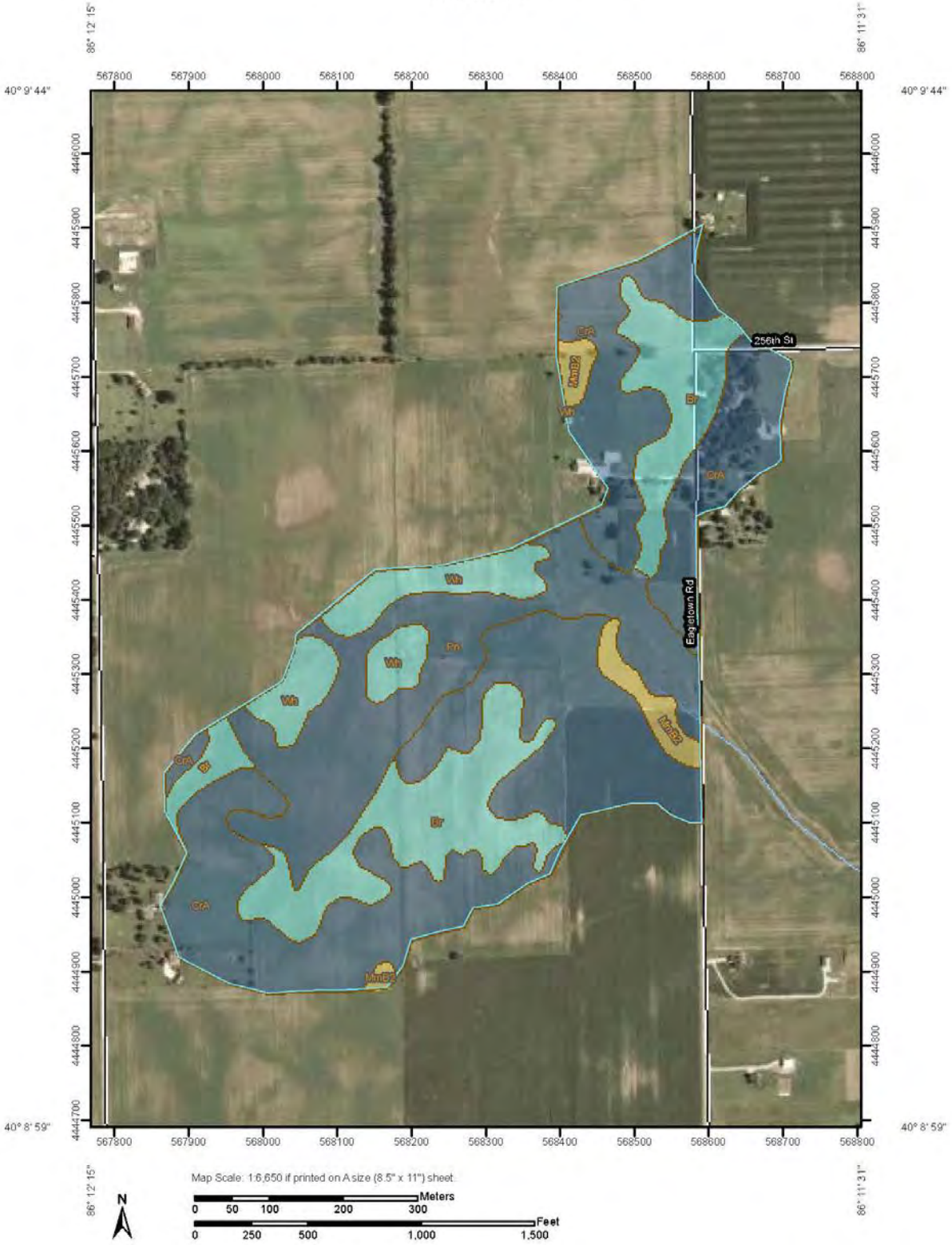
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C6)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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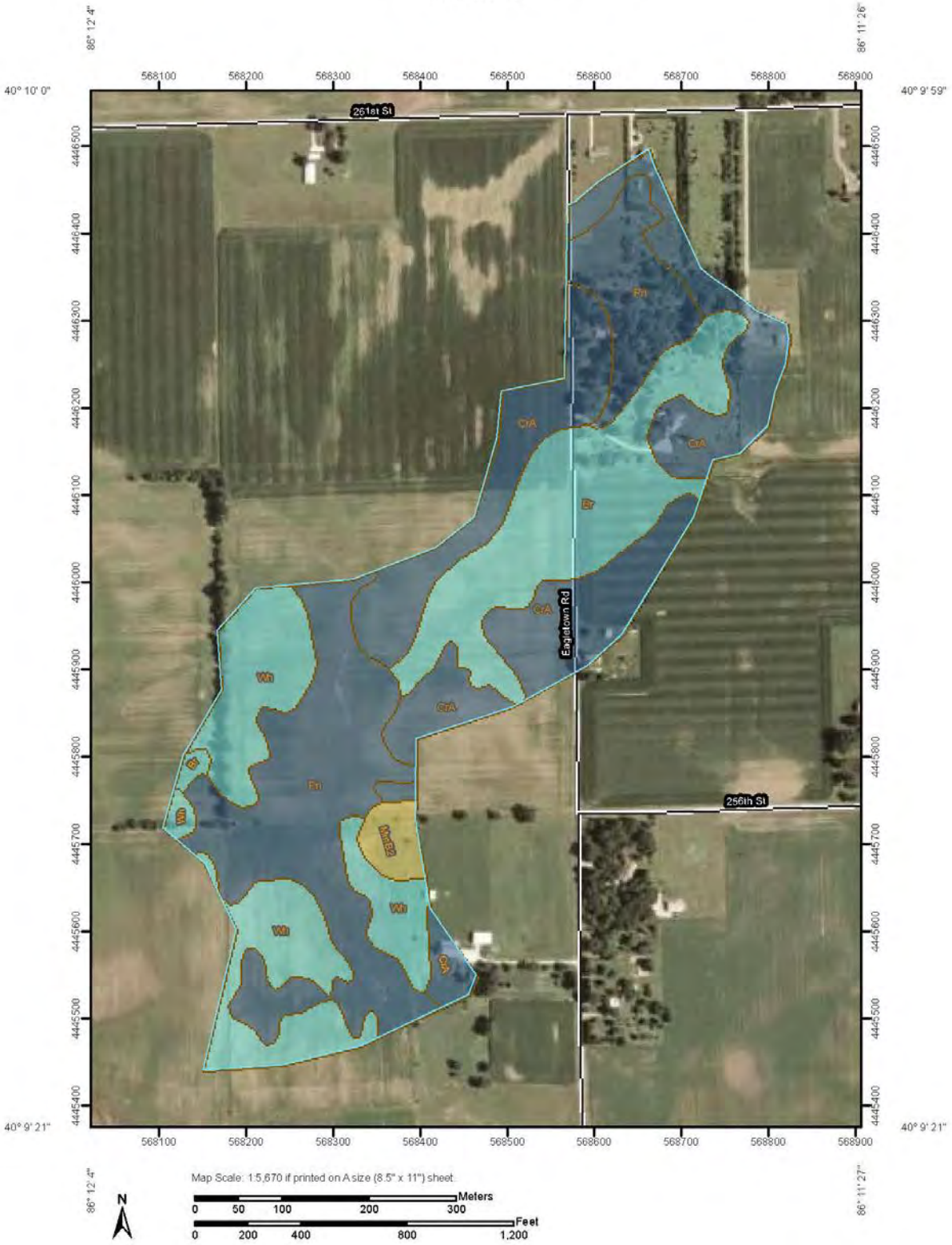
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C7)



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National Cooperative Soil Survey

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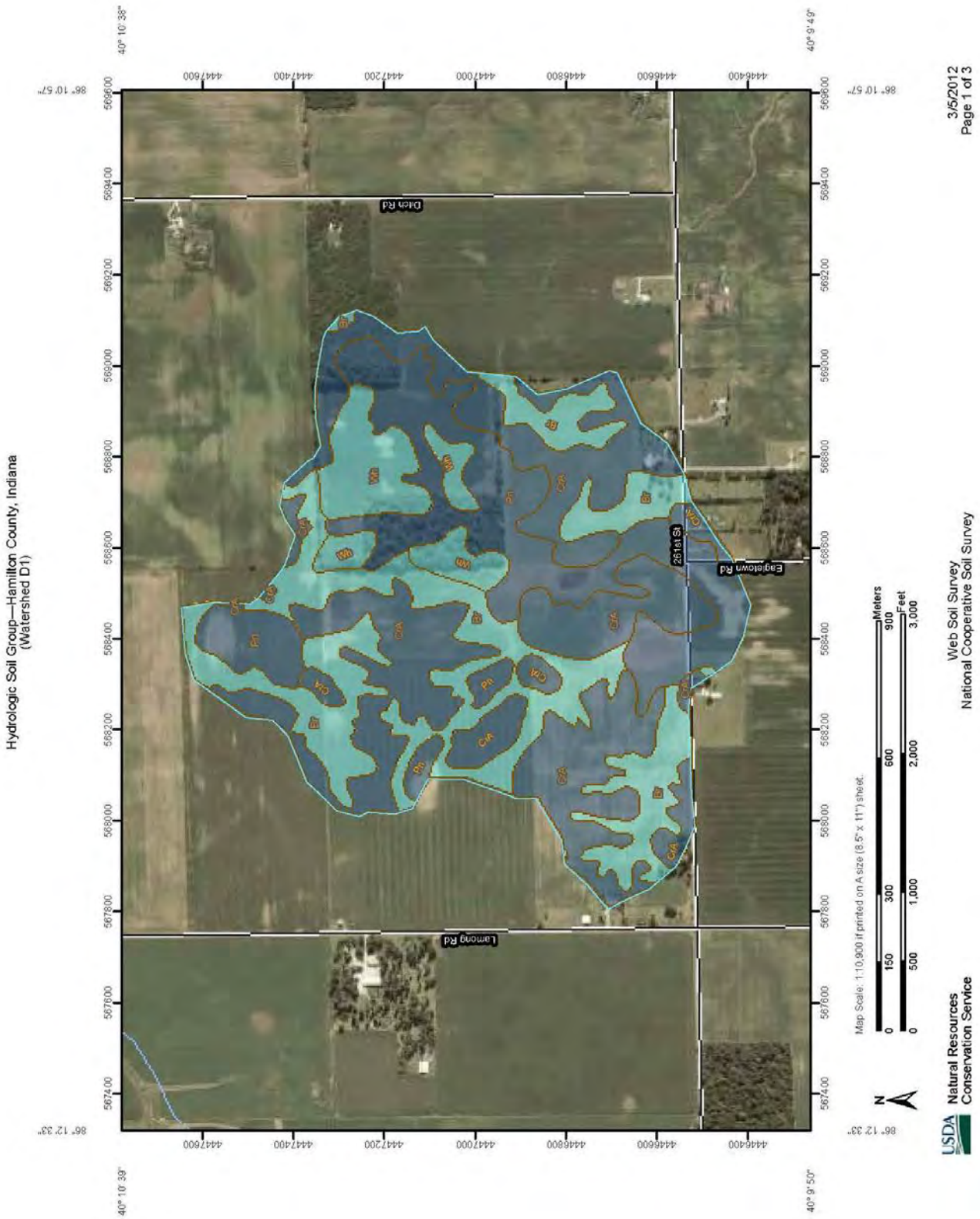
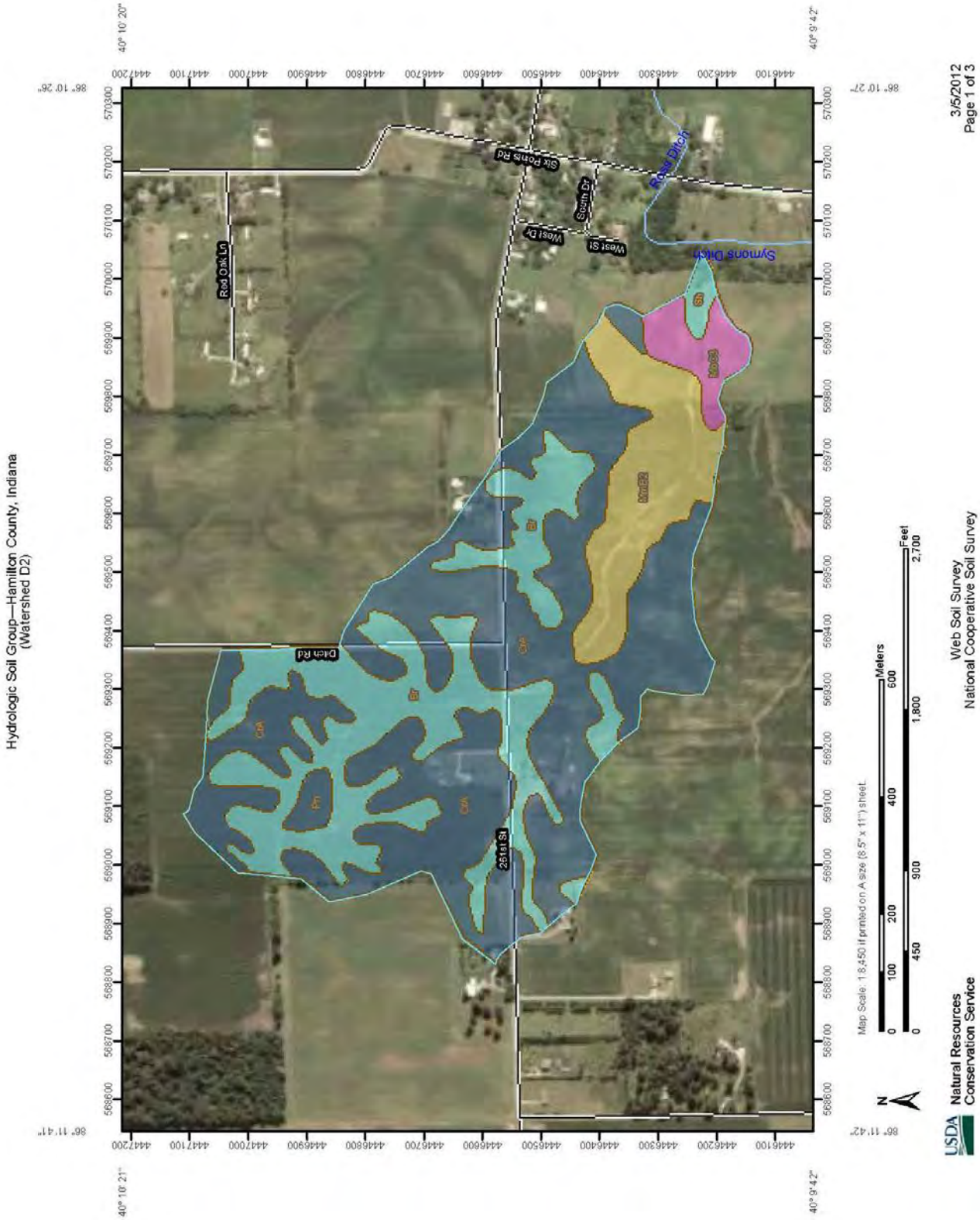
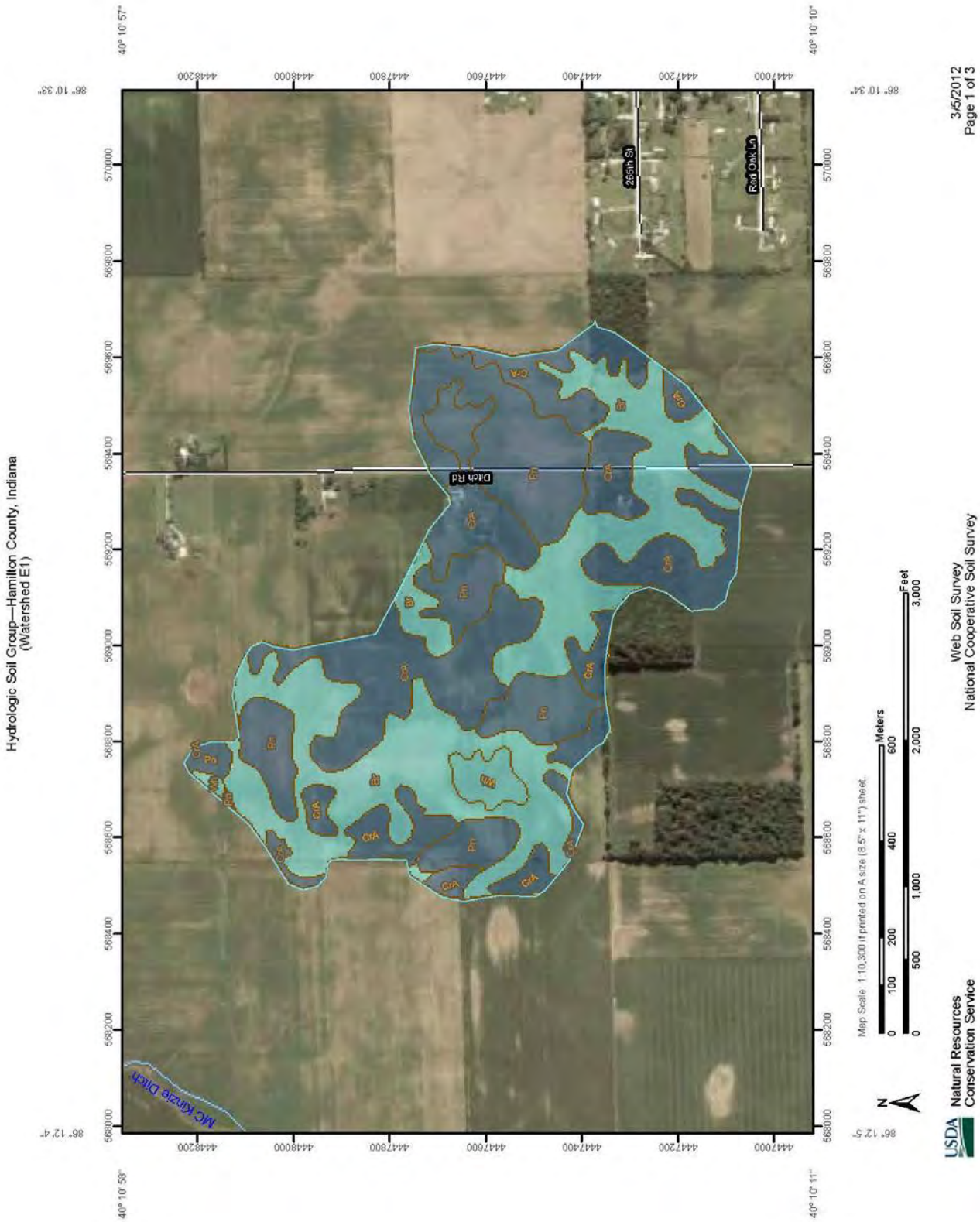
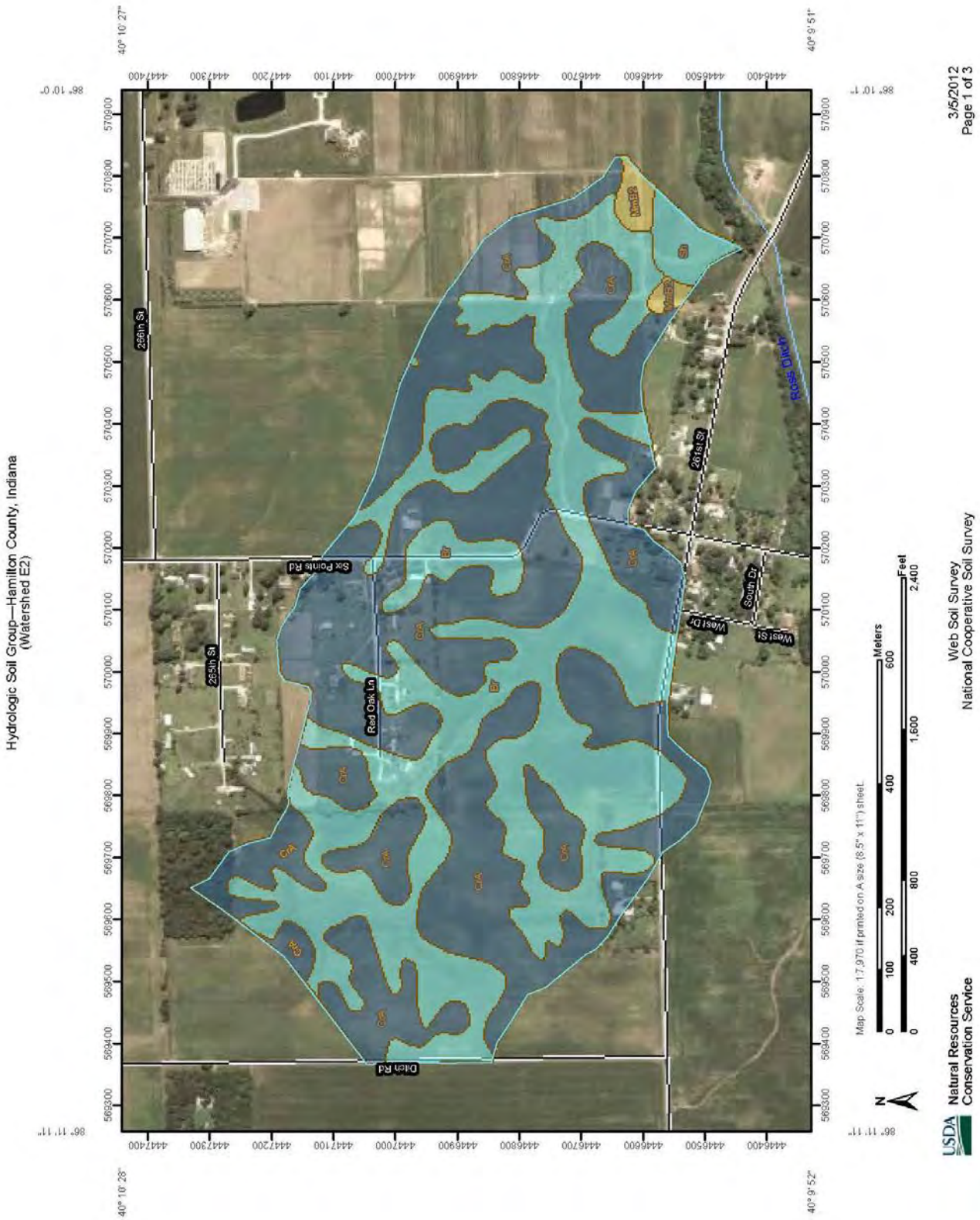
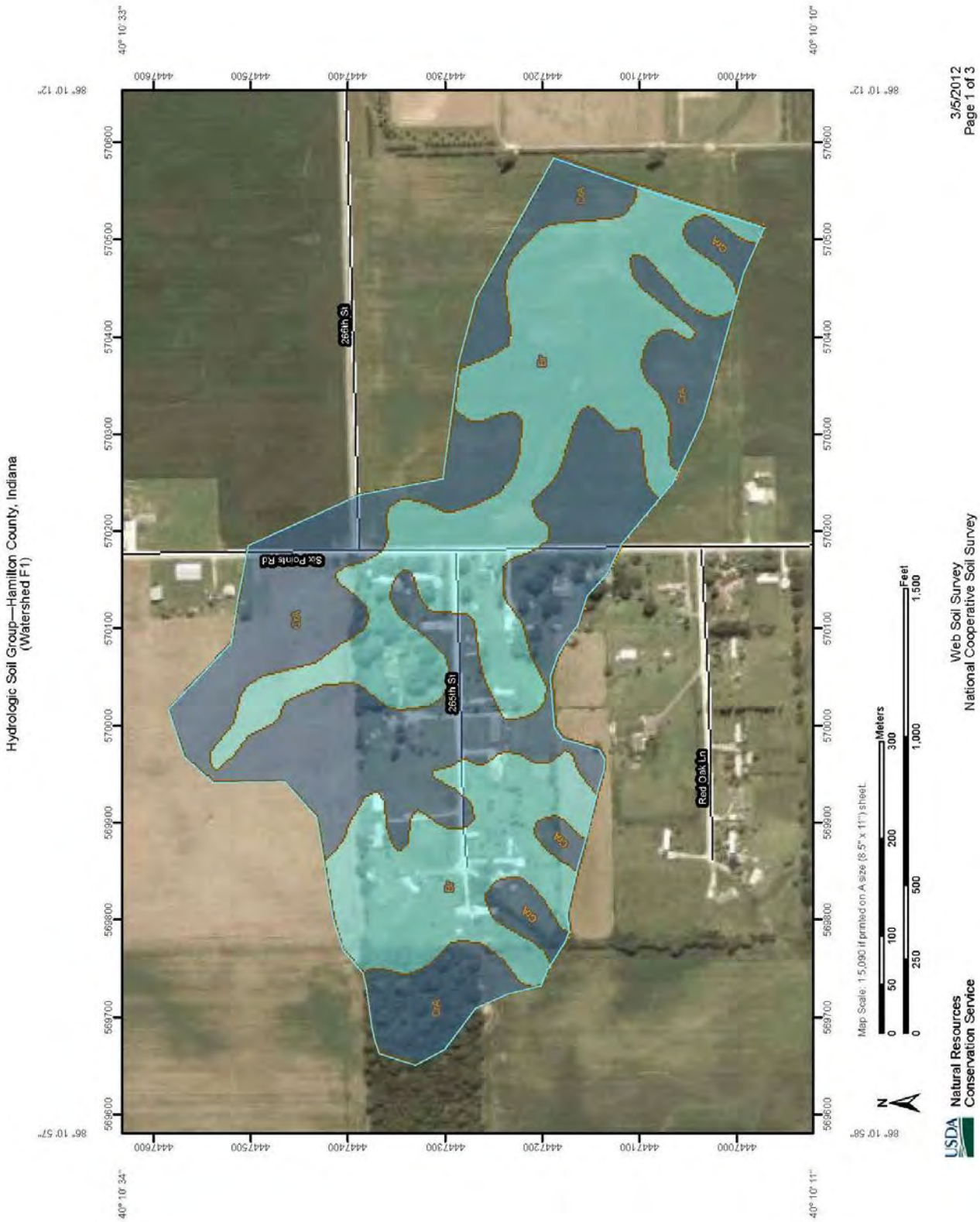
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed C8)
Symons Ditch
Eaglebrook Rd
Map Scale: 1:4,210 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
3/5/2012
Page 1 of 3


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed D1)
3/5/2012
Page 1 of 3
Ditch Rd
Lamong Rd
Eagletown Rd
261st St
Map Scale: 1:10,900 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed D2)
Ditch Rd
261st St
Red Oak Ln
Six Points Rd
South Dr
West Dr
West St
Symons Ditch
Rose Ditch
Map Scale: 1:8,450 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
3/5/2012
Page 1 of 3


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed E1)
3/5/2012
Page 1 of 3
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
USDA
Map Scale: 1:10,300 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Red Oak Ln
265th St
Ditch Rd
McKinzie Ditch
40° 10' 57"
40° 10' 10"
40° 10' 58"
40° 10' 11"
86° 10' 33"
86° 10' 34"
86° 12' 4"
86° 12' 5"


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed E2)
3/5/2012
Page 1 of 3
256th St
255th St
261st St
Six Points Rd
Red Oak Ln
Dilen Rd
West St
West Dr
South Dr
Ross Ditch
CrA
Br
MmB
Map Scale: 1:7,970 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
USDA


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed F1)
3/5/2012
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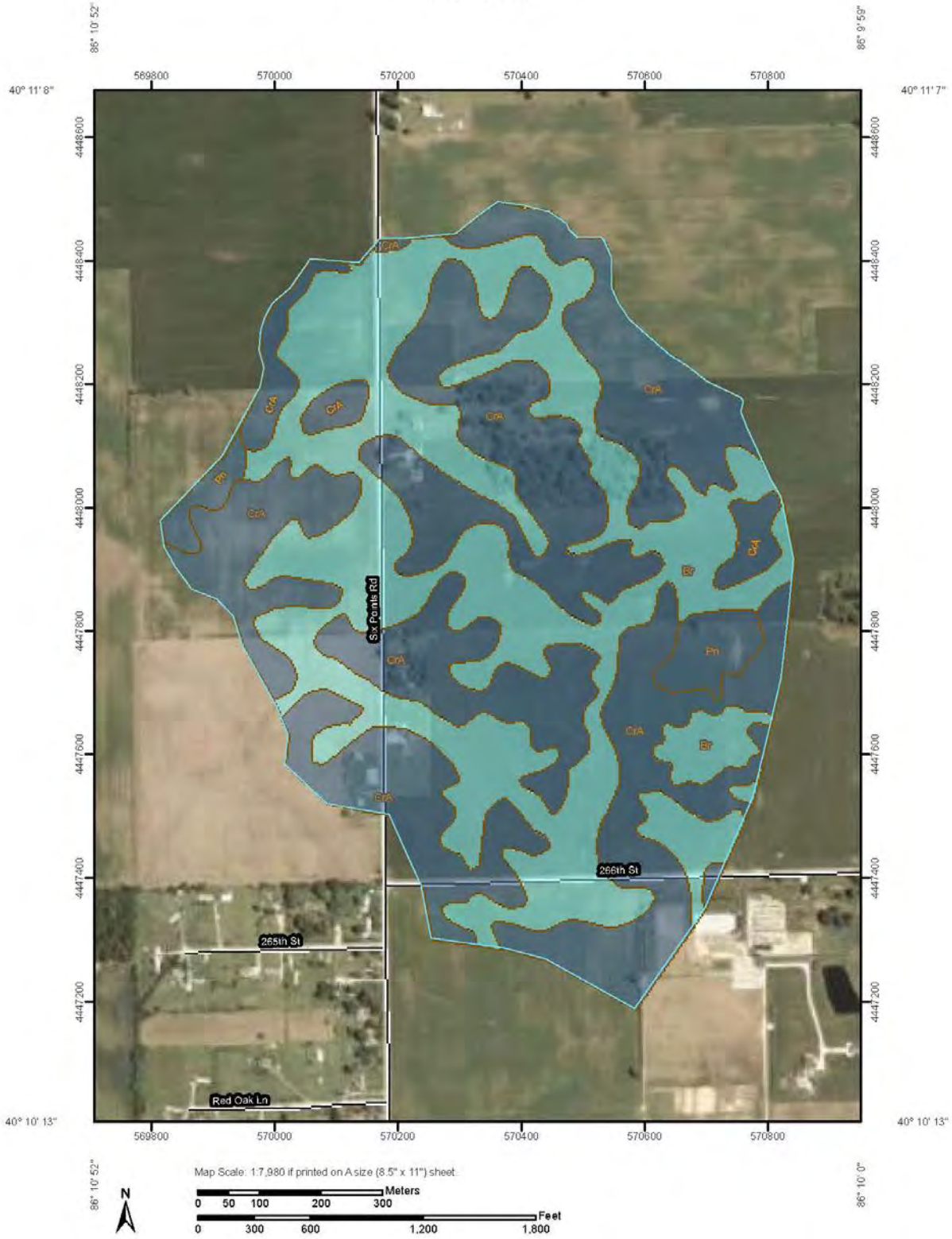
Six Points Rd
266th St
Red Oak Ln
Map Scale: 1:5,090 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
USDA

Hydrologic Soil Group—Hamilton County, Indiana
(Watershed F2)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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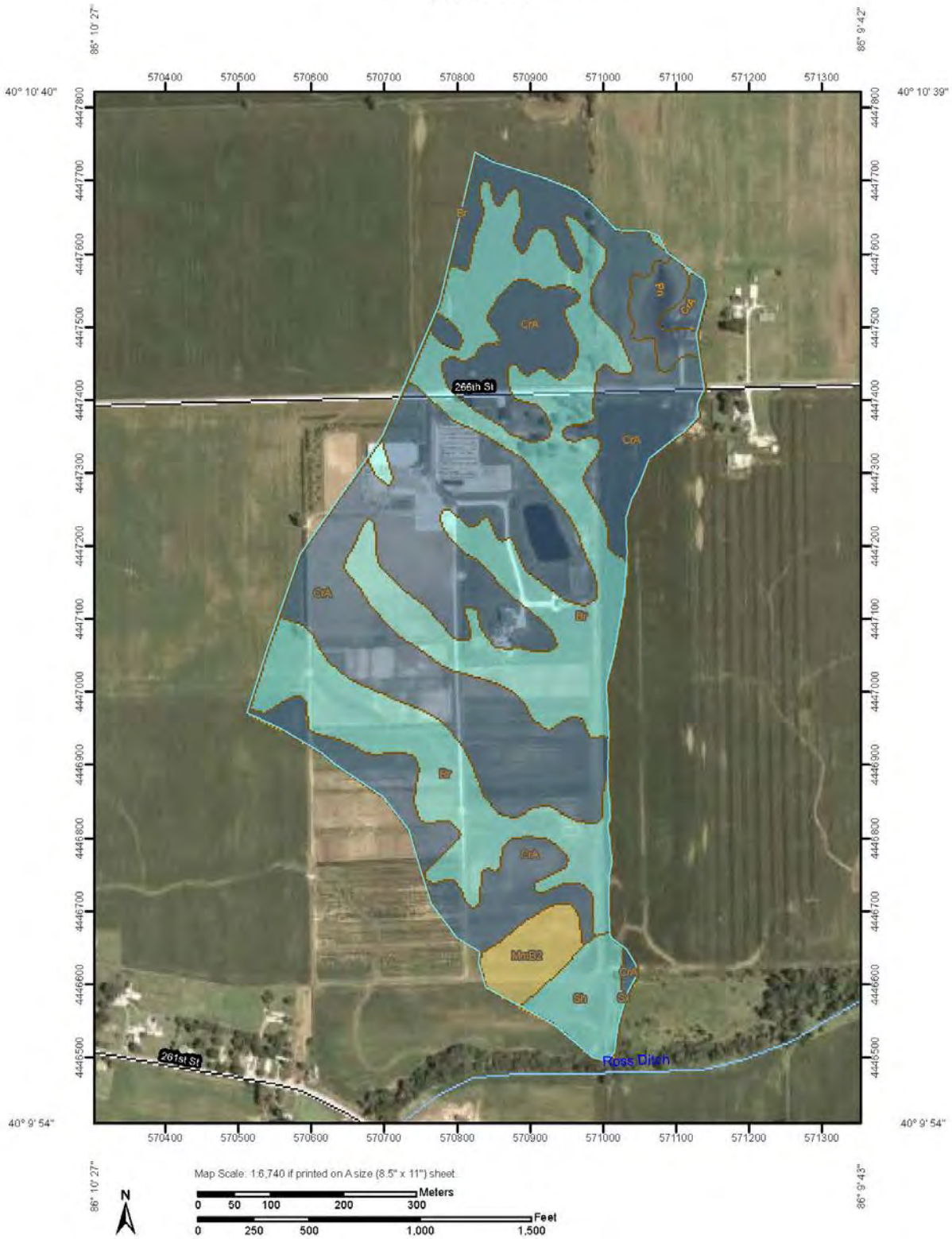
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed F3)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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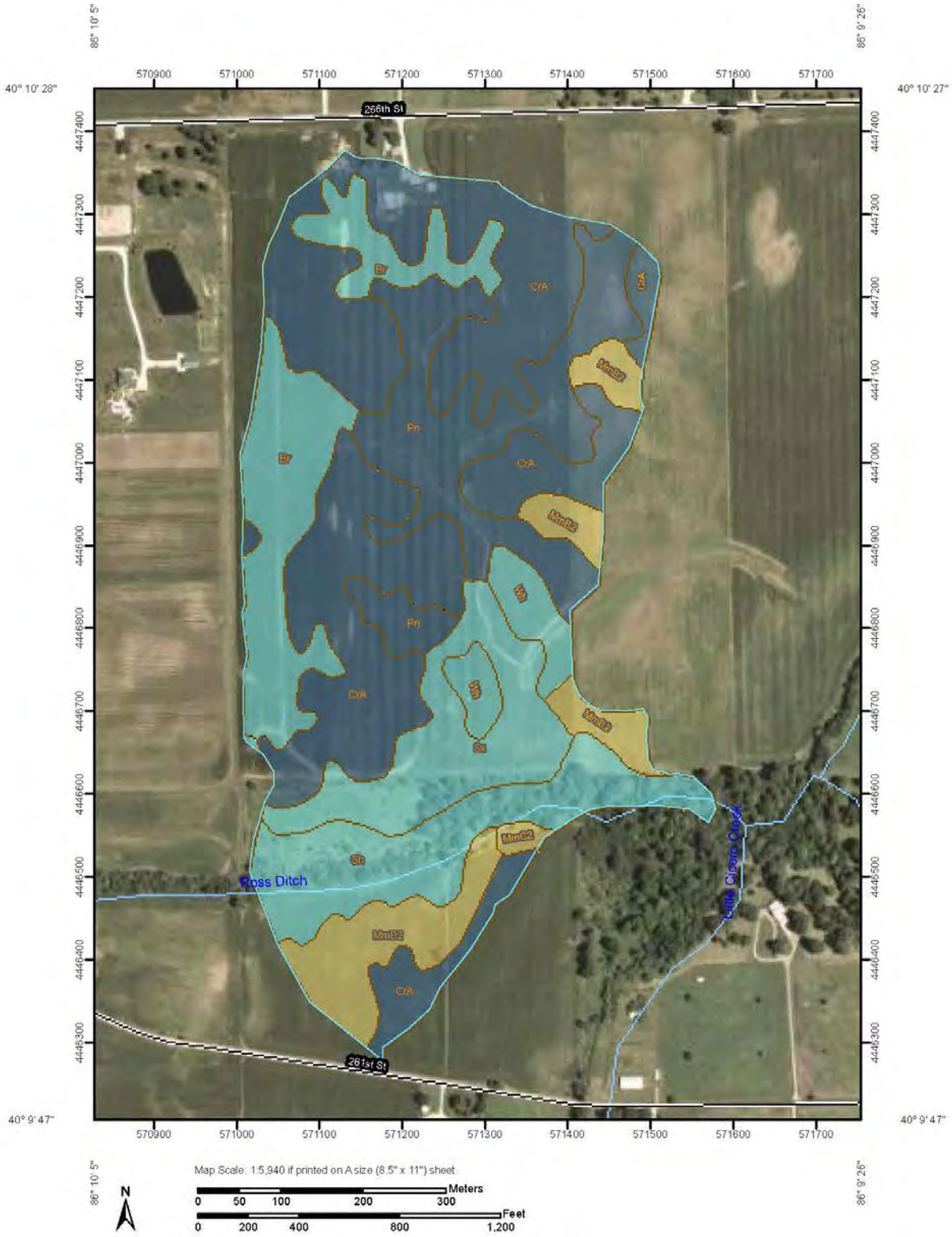
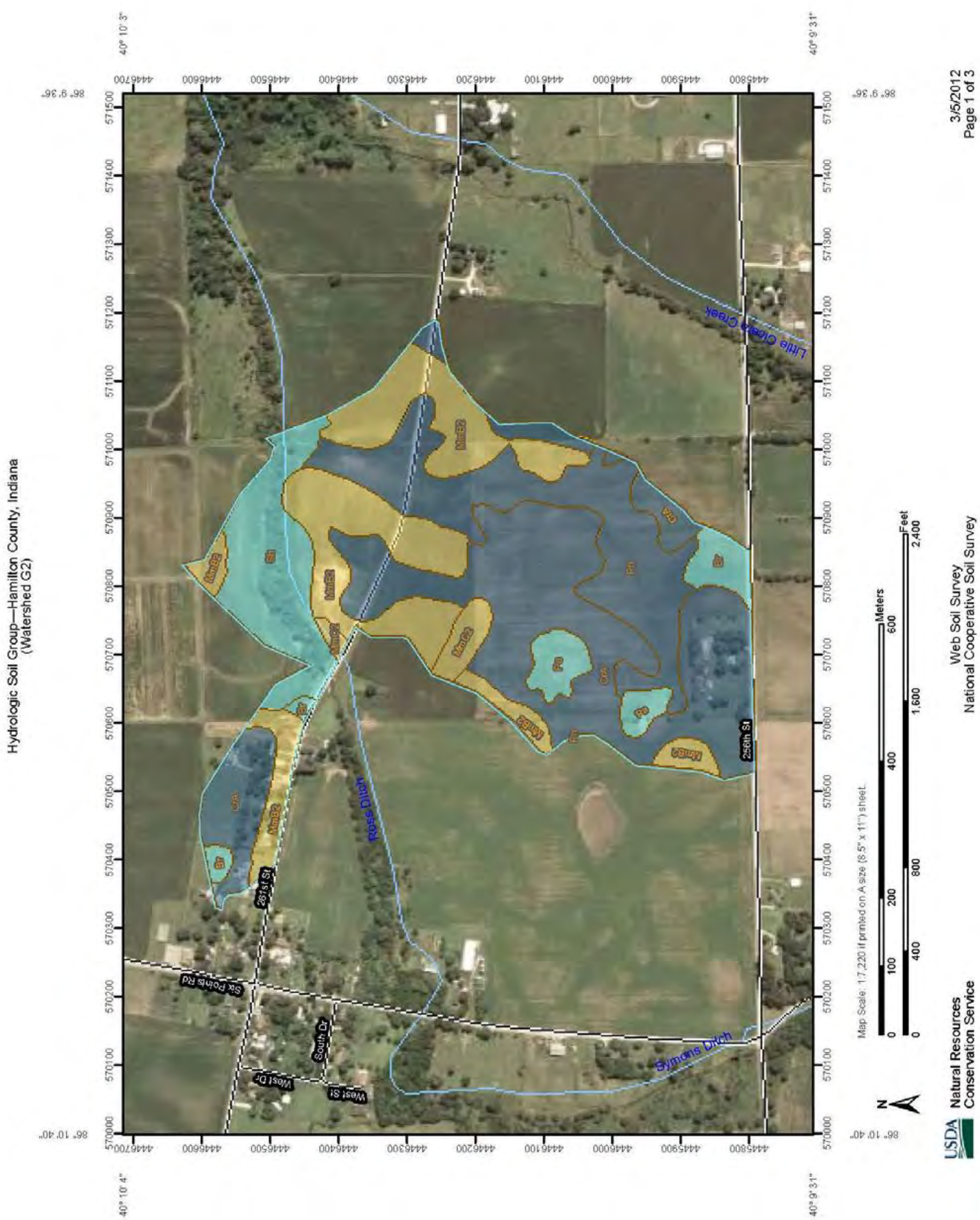
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G1)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
Page 1 of 3


Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G2)
Little Cicero Creek
Ross Ditch
Symons Ditch
256th St
261st St
Six Points Rd
South Dr
West Dr
West St
Map Scale: 1:7,220 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
3/5/2012
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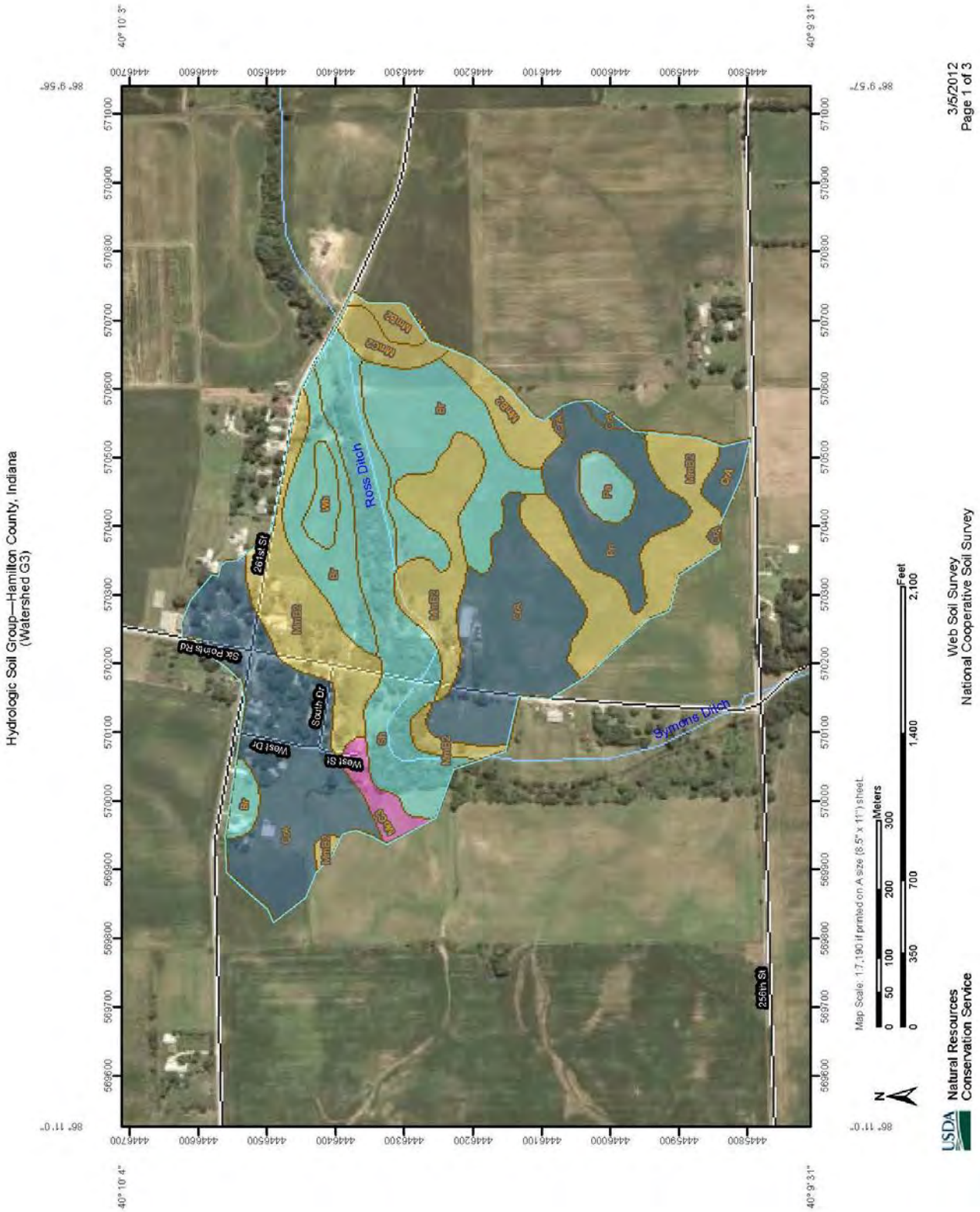
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G3)
Ross Ditch
Symons Ditch
261st St
Six Points Rd
South Dr
West Dr
West St
256th St
Br
Wb
MmB
MmC
MmB2
MmC2
Ge
Wg
Ga
Pd
Dr
Dr2
Map Scale: 1:7,190 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
3/5/2012
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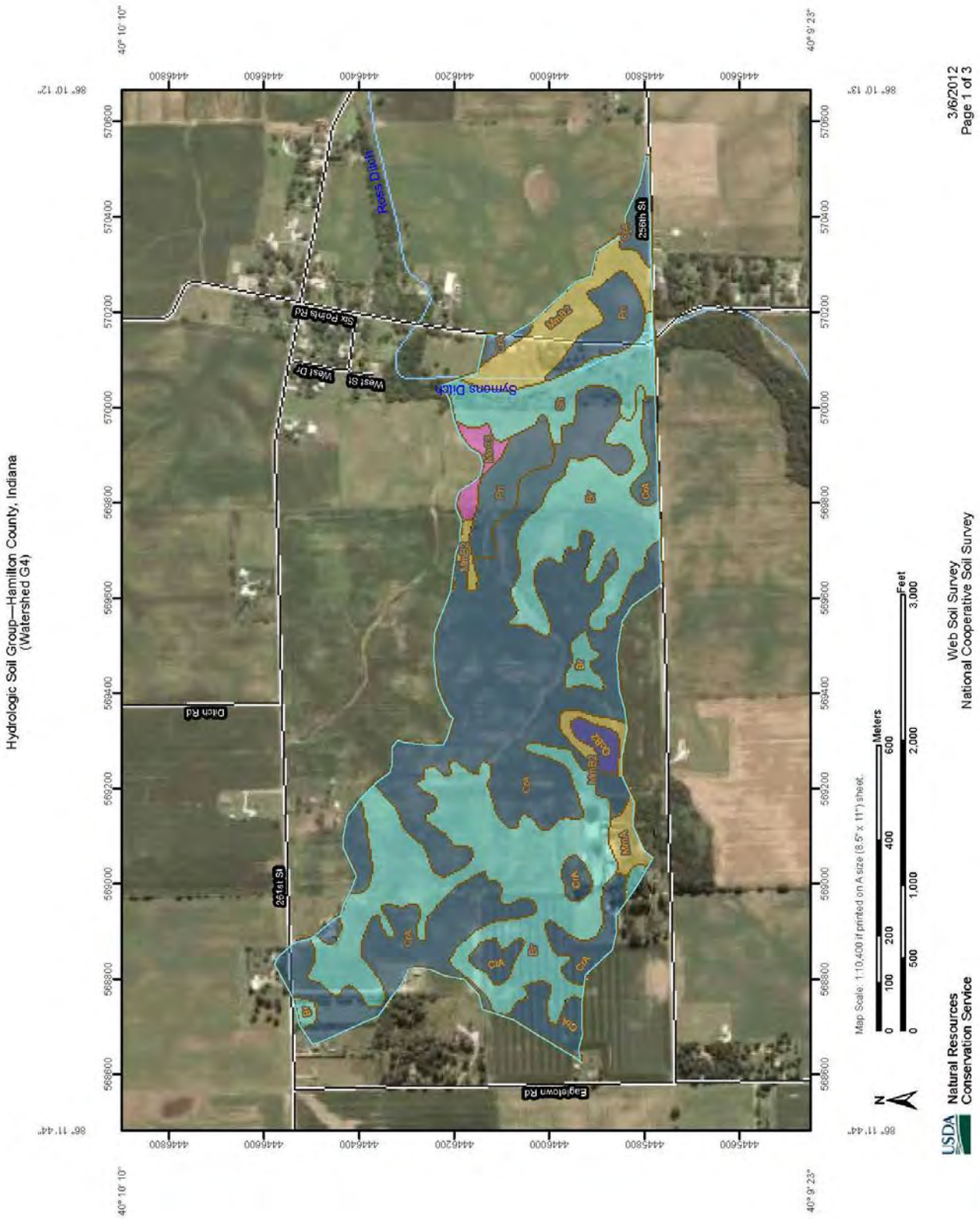
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G4)
Ross Ditch
Symons Ditch
Six Points Rd
West Dr
West St
Ditch Rd
Eagletown Rd
256th St
261st St
Br
CrA
CtA
CvA
MnB2
MnC2
MnA
Pn
Ch
Map Scale: 1:10,400 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
3/6/2012
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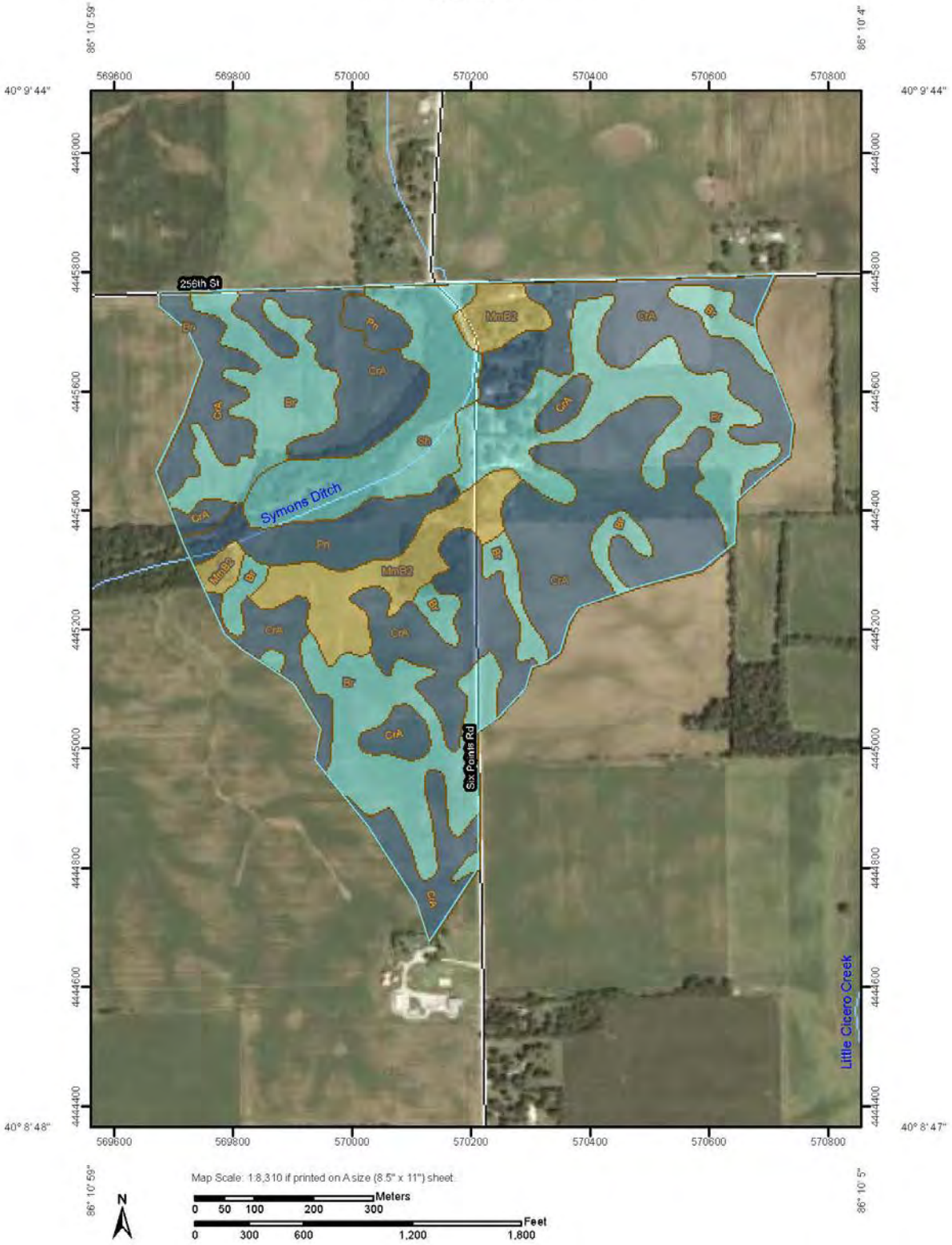
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G5)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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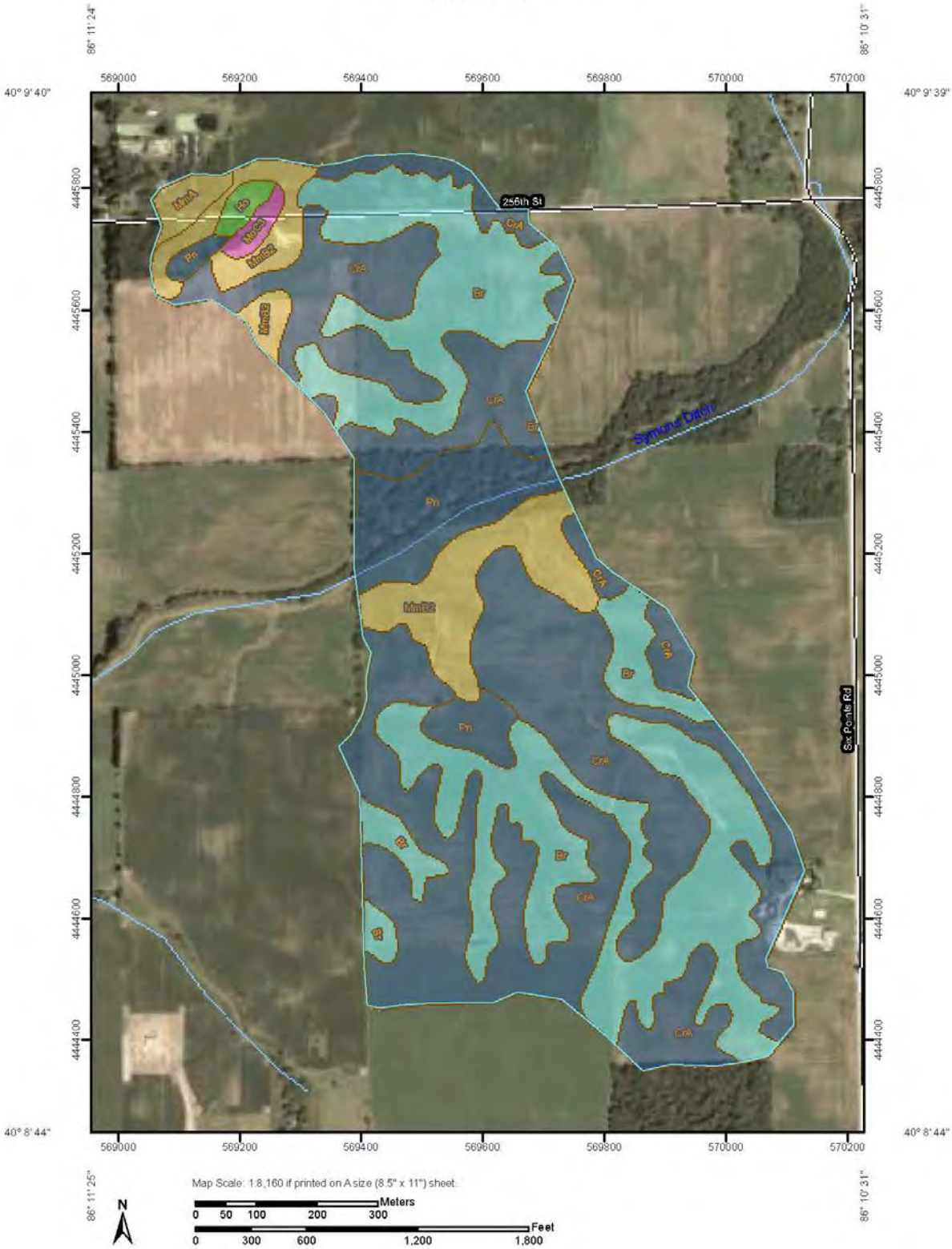
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G6)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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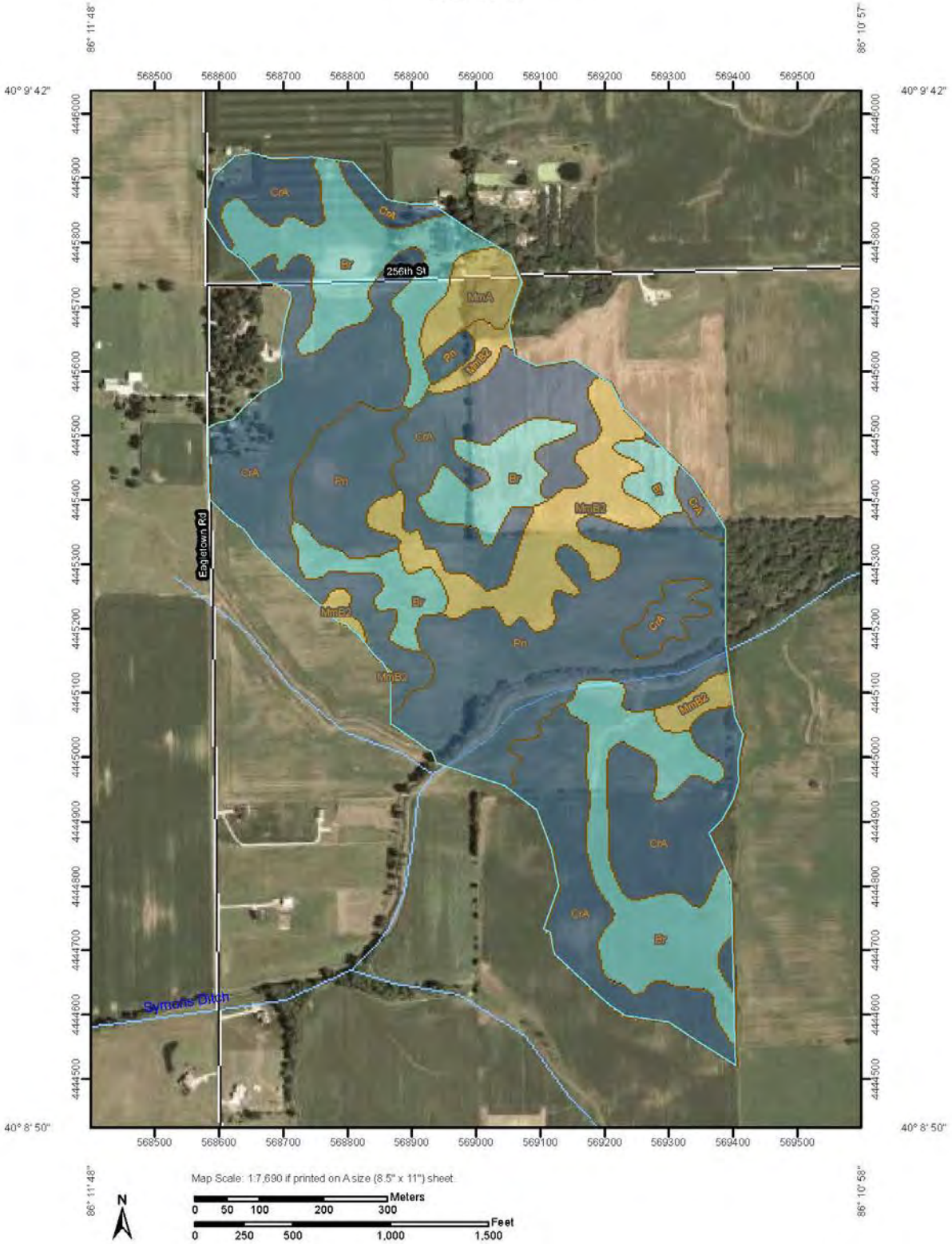
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G7)



USDA Natural Resources Conservation Service

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Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G8)

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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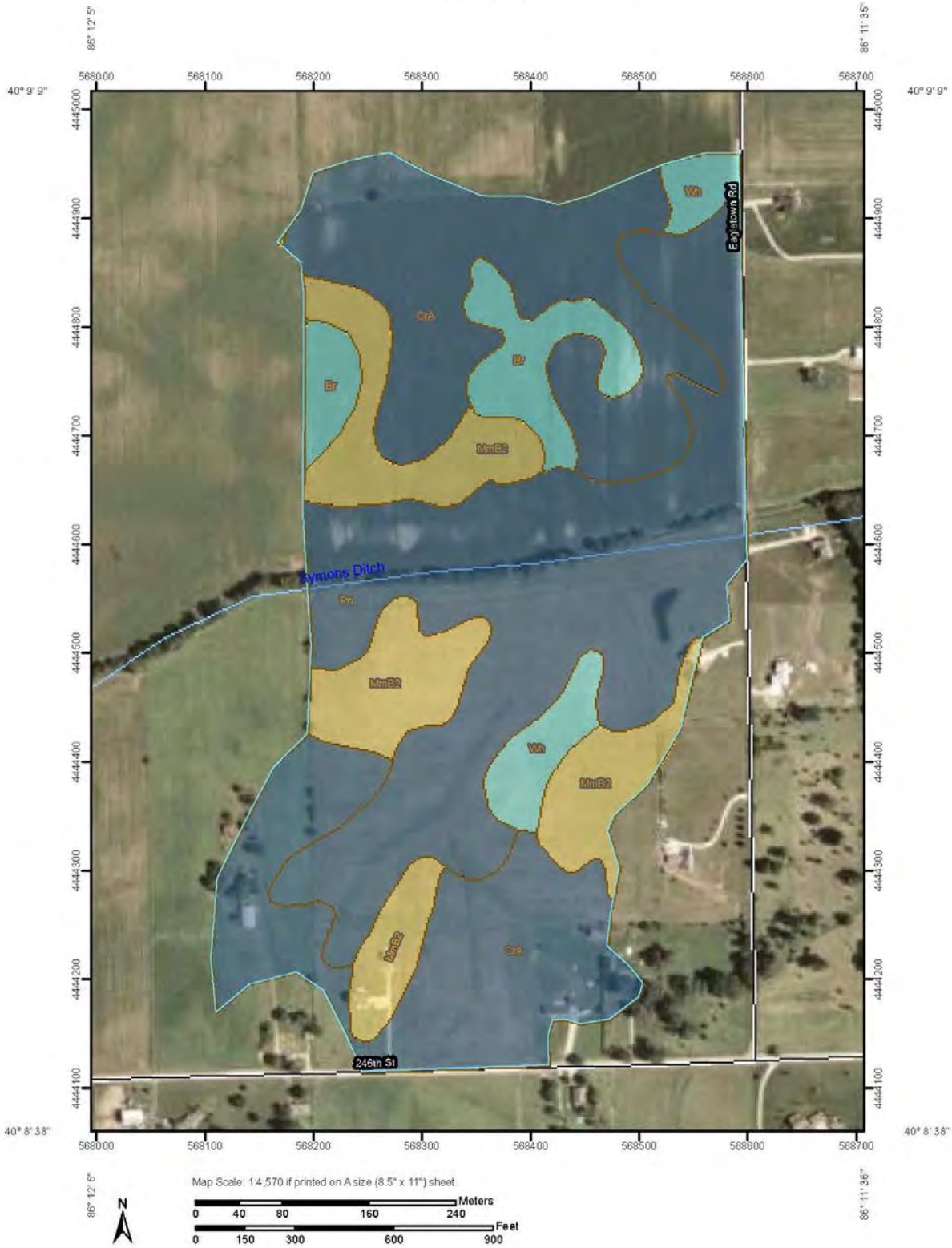
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G9)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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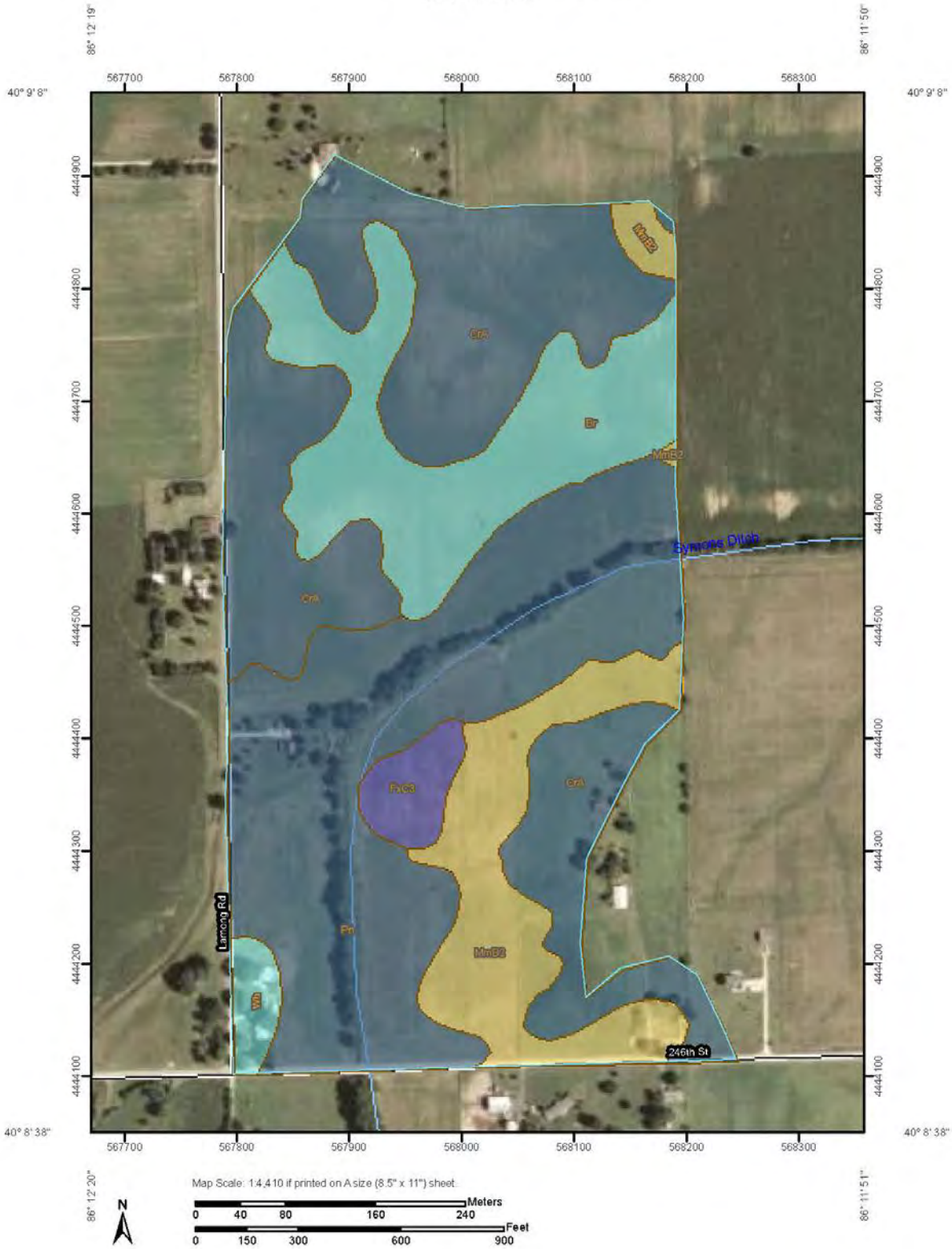
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G10)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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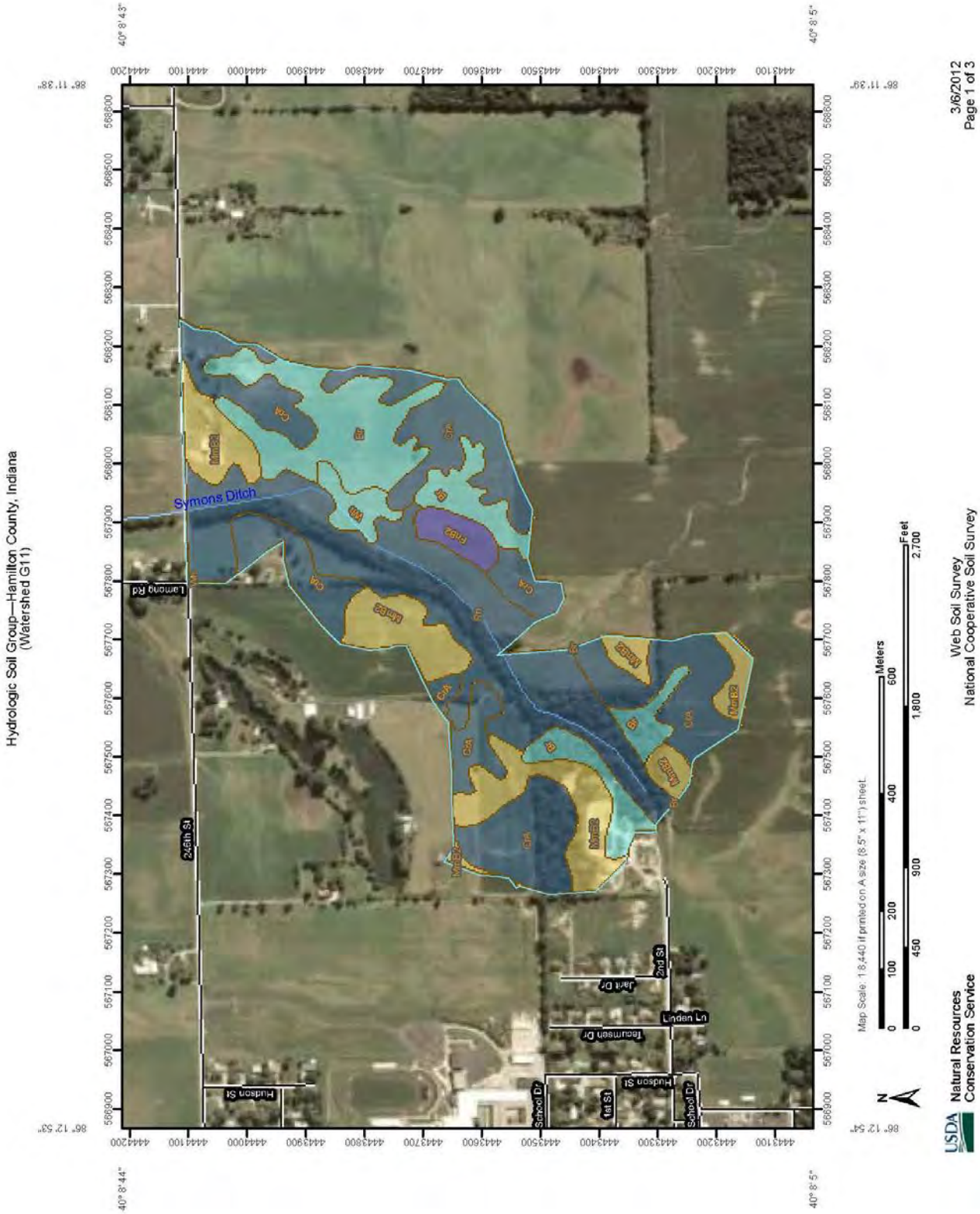
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G11)
Symons Ditch
Lamona Rd
245th St
Hudson St
School Dr
1st St
2nd St
Jane Dr
Linden Ln
Tecumseh Dr
Map Scale: 1:8,440 if printed on A size (8.5" x 11") sheet.
Meters
Feet
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
3/6/2012
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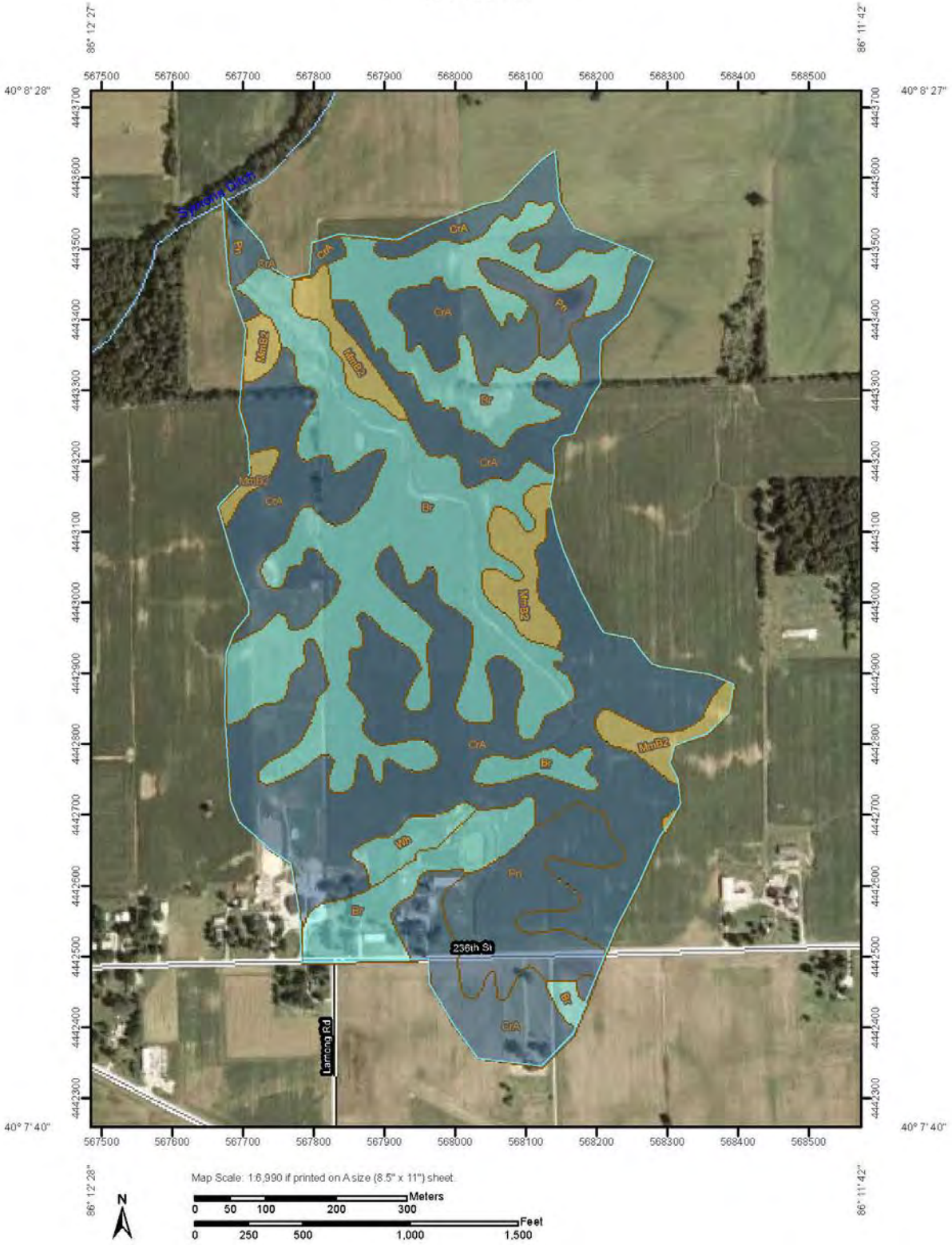
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed G12)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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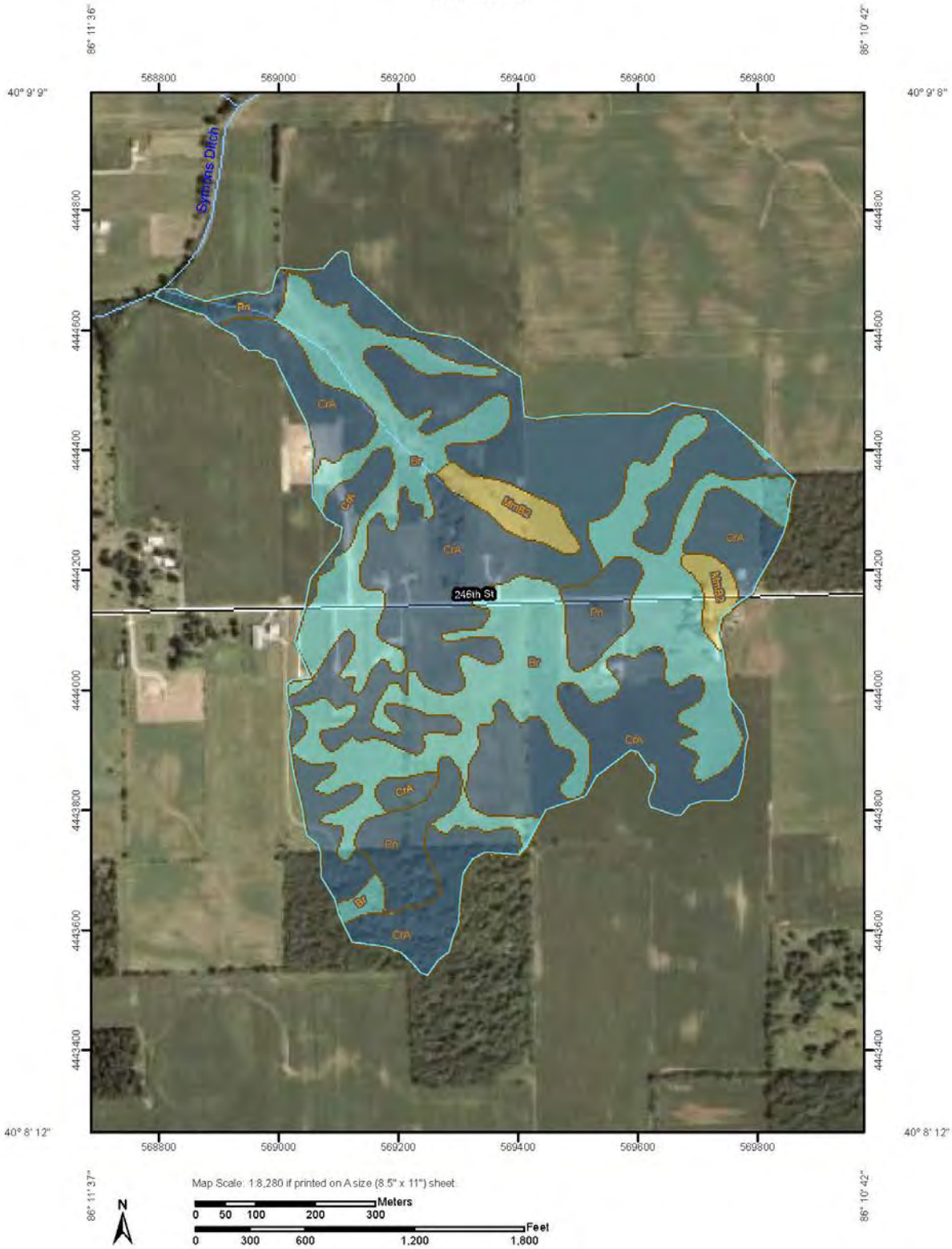
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed H1)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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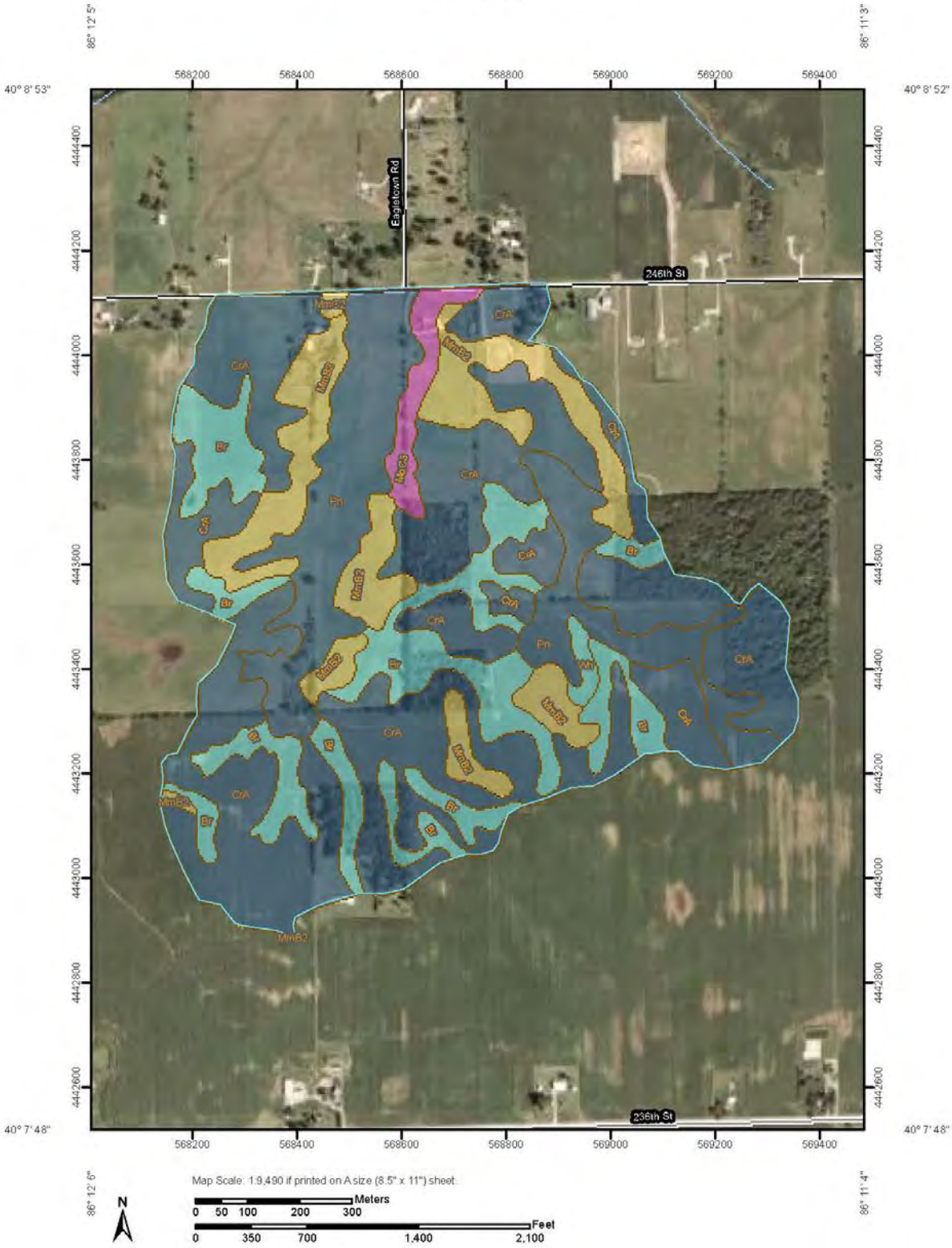
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed I1)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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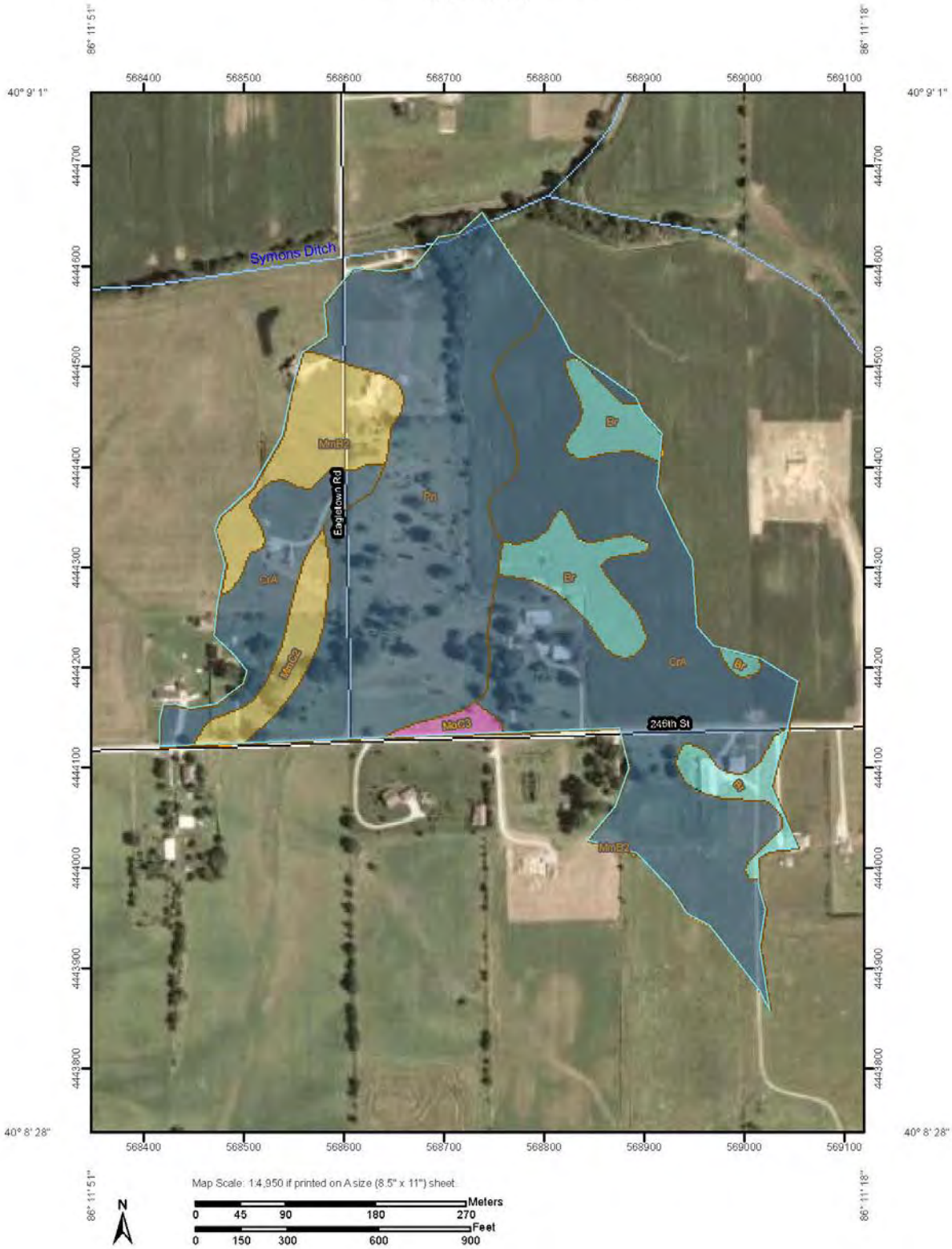
Hydrologic Soil Group—Hamilton County, Indiana
(Watershed I02)



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

3/5/2012
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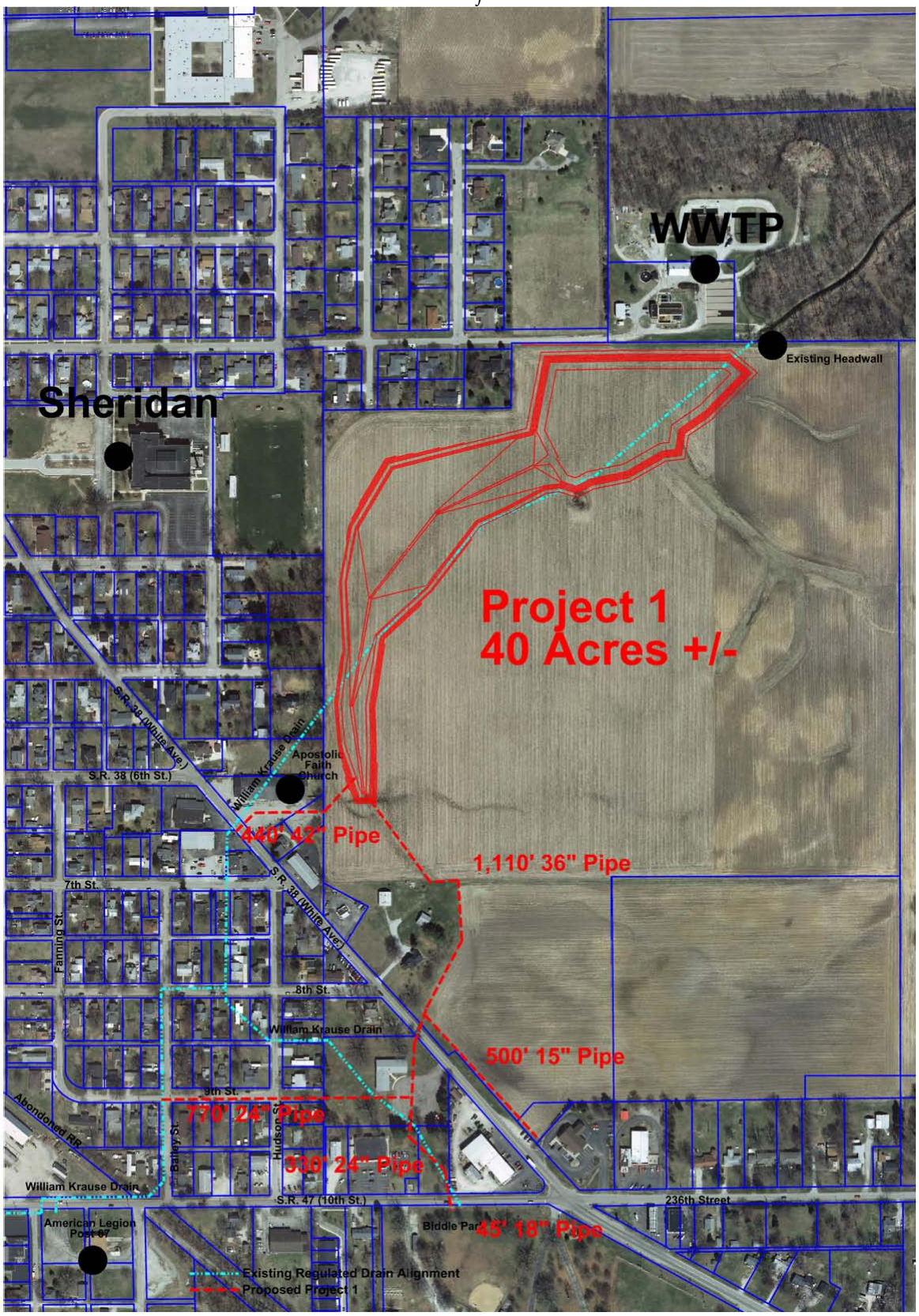
Appendix 'D' – Project Schematics and Cost Opinions

Project 1



ESTIMATED CONSTRUCTION COST OPINION
for
Project 1 (Fox Property Detention)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

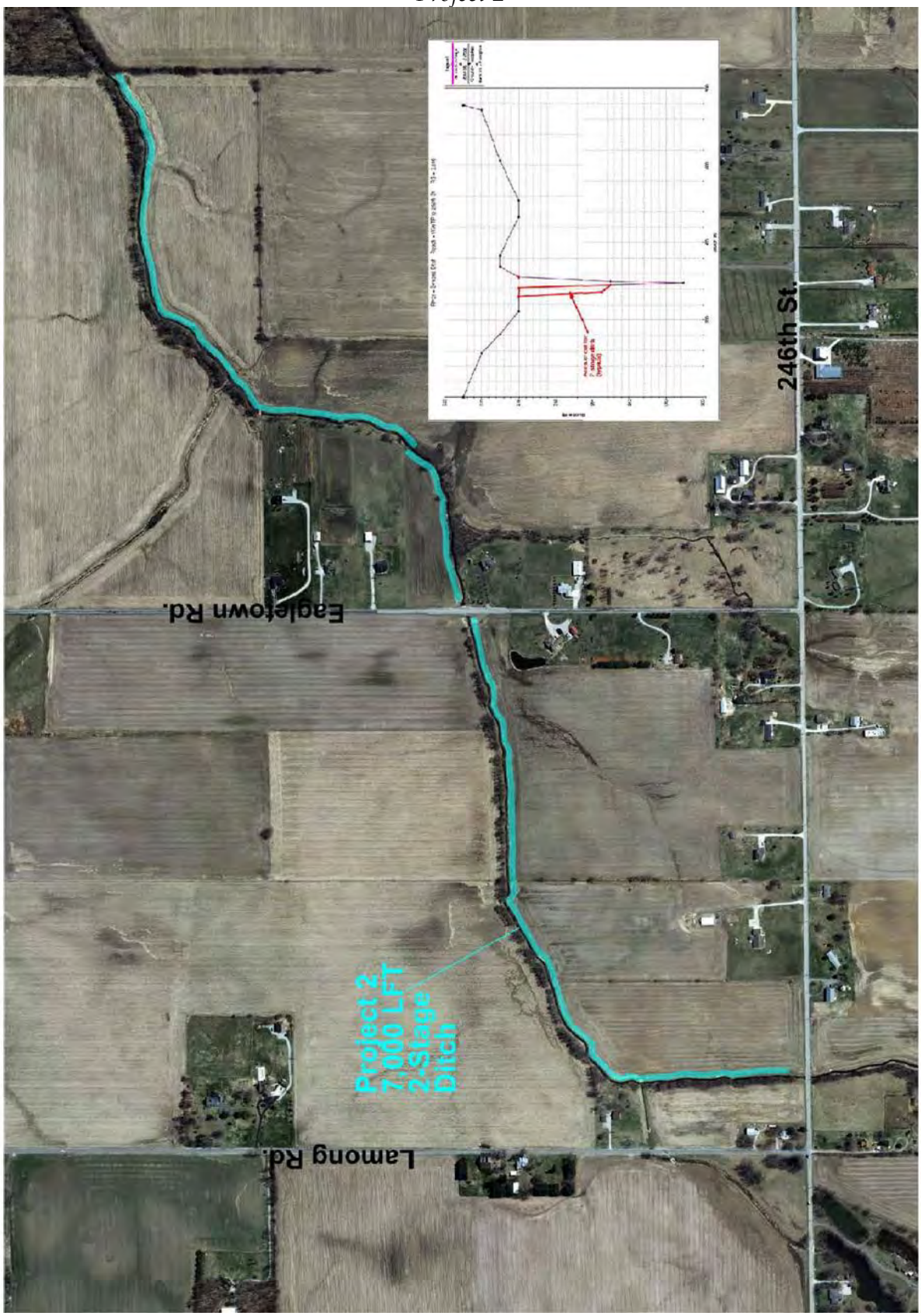
Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	42" RCP	440	LFT	$ 105.00	$46,200.00
2	36" RCP	1230	LFT	$ 75.00	$92,250.00
3	24" RCP	1100	LFT	$ 60.00	$66,000.00
4	18" RCP	45	LFT	$ 50.00	$2,250.00
5	15" RCP	500	LFT	$ 35.00	$17,500.00
6	42" End Section	1	EA	$ 1,900.00	$1,900.00
7	36" End Section	3	EA	$ 1,500.00	$4,500.00
8	24" End Section	2	EA	$ 1,200.00	$2,400.00
9	18" End Section	4	EA	$ 1,000.00	$4,000.00
10	Manholes	20	EA	$ 4,000.00	$80,000.00
11	Concrete Headwall Removal	1	LS	$ 10,000.00	$10,000.00
12	Concrete Overflow Weir	70	CYD	$ 350.00	$24,500.00
13	Wetlands Plantings	5	Acres	$ 4,500.00	$22,500.00
14	Temporary Seeding	38	Acres	$ 3,500.00	$133,000.00
15	Permanent Seeding	33	Acres	$ 3,500.00	$115,500.00
16	Stone	1000	Tons	$ 30.00	$30,000.00
17	Excavation	150000	CYD	$ 6.00	$900,000.00
18	Pavement Repair	940	LFT	$ 60.00	$56,400.00
19	Utility Conflicts	15	EA	$ 5,000.00	$75,000.00
		Total			$ 1,683,900.00
		Engineering & Admin			$336,780.00
		Mobilization/Demobilization		5%	$85,000.00
		Contingencies		15%	$252,585.00
		Bonding, Council, Local Services			$252,585.00
		INDOT Portion			($12,550.00)
		Property Acquisition			$377,500.00
		Net Total			$ 2,975,800.00

Property	Acres	*Value	Multiplier	Total
Fox Property	41	$7,000.00	1.25	$358,750.00
Lodge	0.5	$30,000.00	1.25	$18,750.00
			Total	$377,500.00

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

Project 2

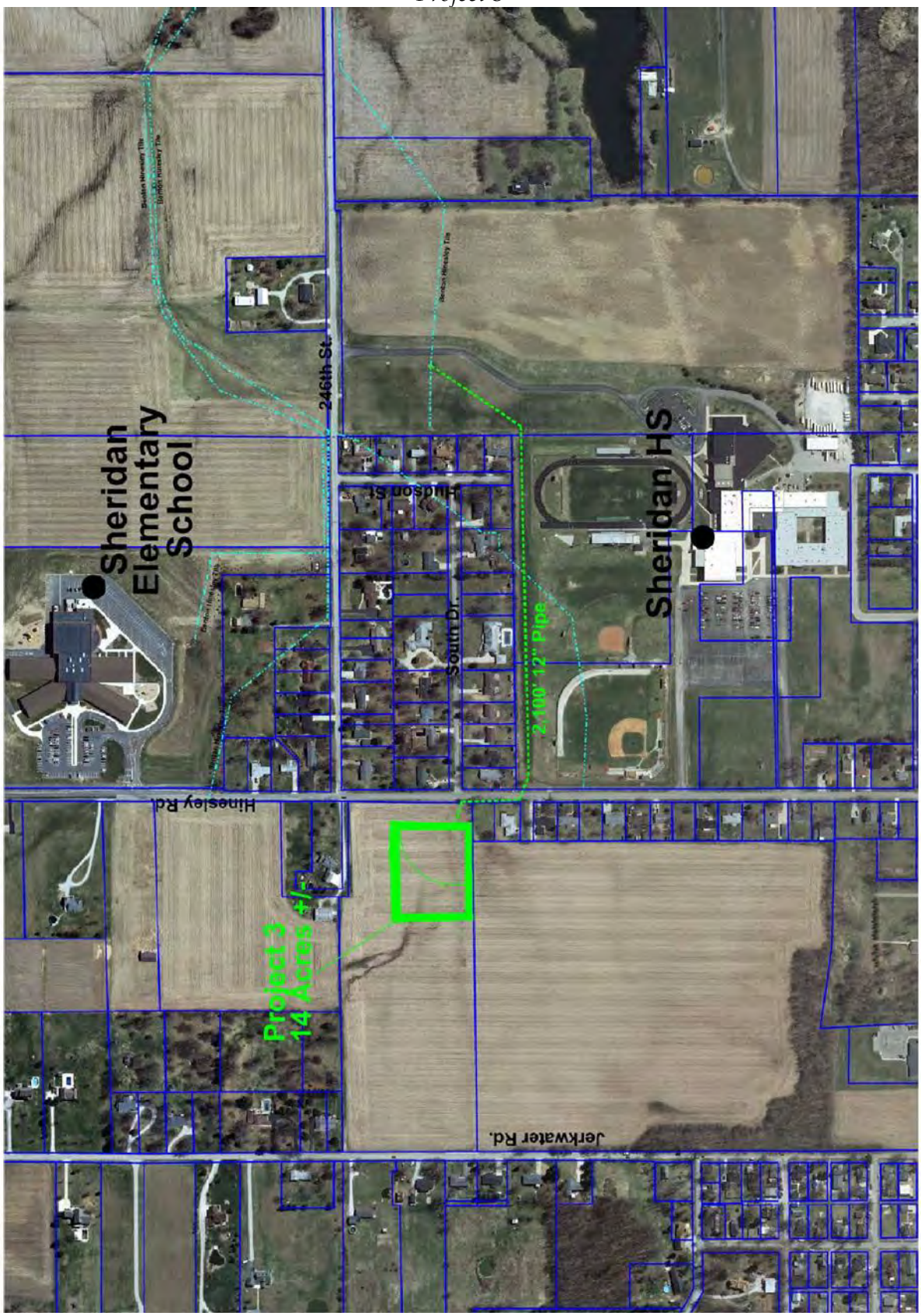

Project 2
7,000 LFT
2-Stage
Ditch
Lamong Rd.
Eagletown Rd.
246th St.

ESTIMATED CONSTRUCTION COST OPINION
for
Project 2 (Two-Stage Ditch)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount	
1	Temporary Seeding	5	Acres	$ 1,200.00	$6,000.00	
2	Permanent Seeding	5	Acres	$ 3,500.00	$17,500.00	
3	Stone	1000	Tons	$ 30.00	$30,000.00	
4	Excavation	30000	CYD	$ 12.50	$375,000.00	(Hauling Material)
		Total			$ 428,500.00	
		Engineering & Admin			$85,700.00	
		Bonding, Council, Local Services			$64,275.00	
		Mobilization/Demobilizatior		5%	$22,000.00	
		Contingencies		15%	$64,275.00	
		Net Total			$ 664,750.00	

Project 3


Sheridan Elementary School
246th St.
Hudson St.
South Dr.
2,100' 12" Pipe
Sheridan HS
Hinesley Rd.
Project 3
14 Acres +/-
Jerkwater Rd.

ESTIMATED CONSTRUCTION COST OPINION
for
Project 3 (Community Bank Detention)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

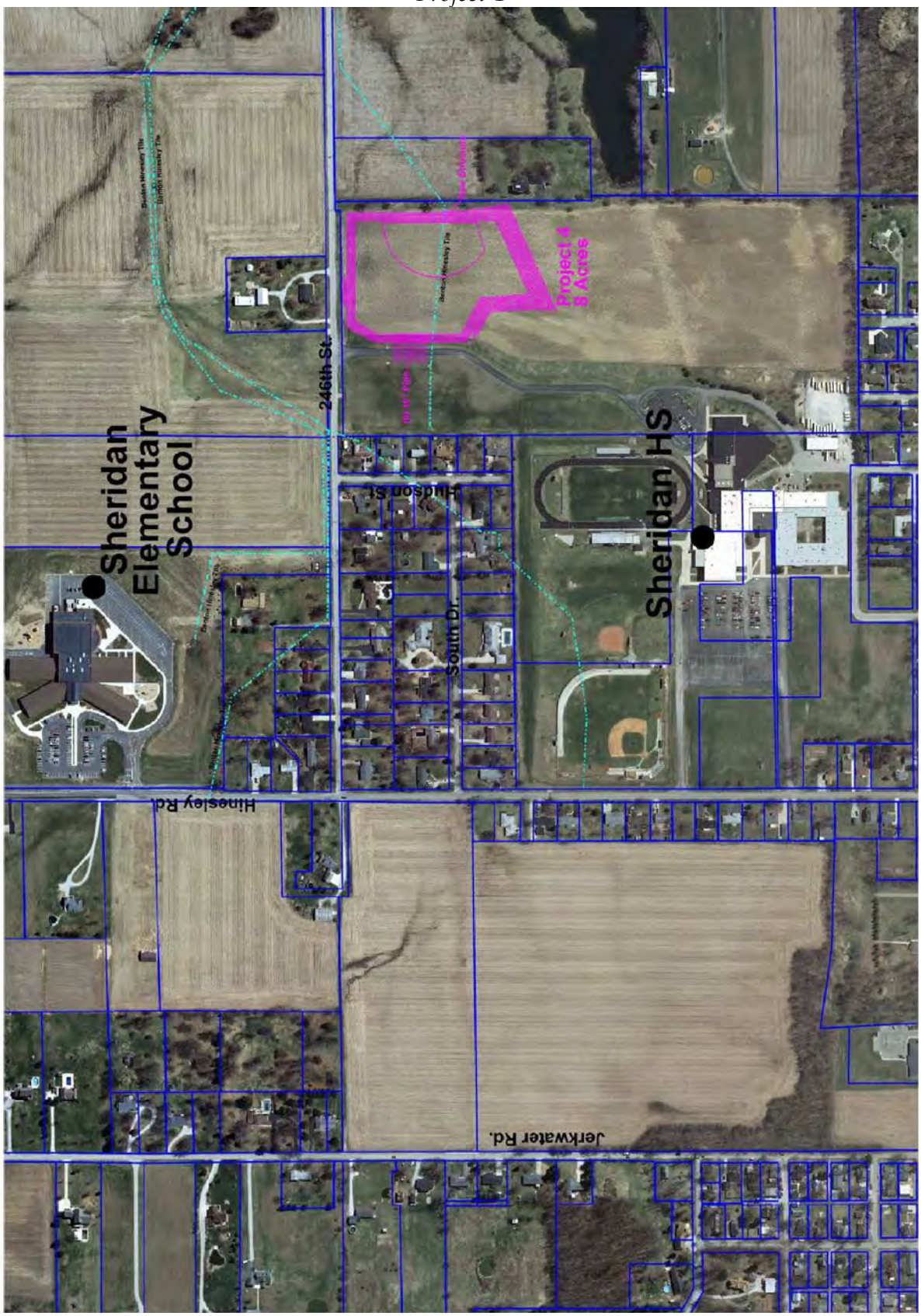
Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	12" RCP	2100	LFT	$ 32.50	$68,250.00
2	12" End Section	1	EA	$ 500.00	$500.00
3	Drop Structure	1	EA	$ 5,000.00	$5,000.00
4	Manholes	10	EA	$ 3,500.00	$35,000.00
5	Wetlands Plantings	2	Acres	$ 4,500.00	$9,000.00
6	Temporary Seeding	16	Acres	$ 3,500.00	$56,000.00
7	Permanent Seeding	16	Acres	$ 3,500.00	$56,000.00
8	Excavation	37500	CYD	$ 7.00	$262,500.00
9	Fence	1400	LFT	$ 28.00	$39,200.00
10	Pavement Repair	25	LFT	$ 60.00	$1,500.00
11	Utility Conflicts	3	EA	$ 5,000.00	$15,000.00
		Total			$ 547,950.00
		Engineering & Admin			$136,987.50
		Mobilization/Demobilization		5%	$28,000.00
		Contingencies		15%	$82,192.50
		Bonding, Council, Local Services			$82,192.50
		Property Acquisition			$151,112.50
		Net Total			$1,028,435.00

Property	Acres	*Value	Multiplier	Total
Community Bank Property	14.61	$7,000.00	1.25	$127,837.50
School Property	1.4	$13,300.00	1.25	$23,275.00
			Total	$151,112.50

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

Project 4


Sheridan Elementary School
246th St.
Hinseley Rd.
Hudson St.
South Dr.
Sheridan HS
Jerkwater Rd.
Project 4
8 Acres

ESTIMATED CONSTRUCTION COST OPINION
for
Project 4 (Additional School Detention)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

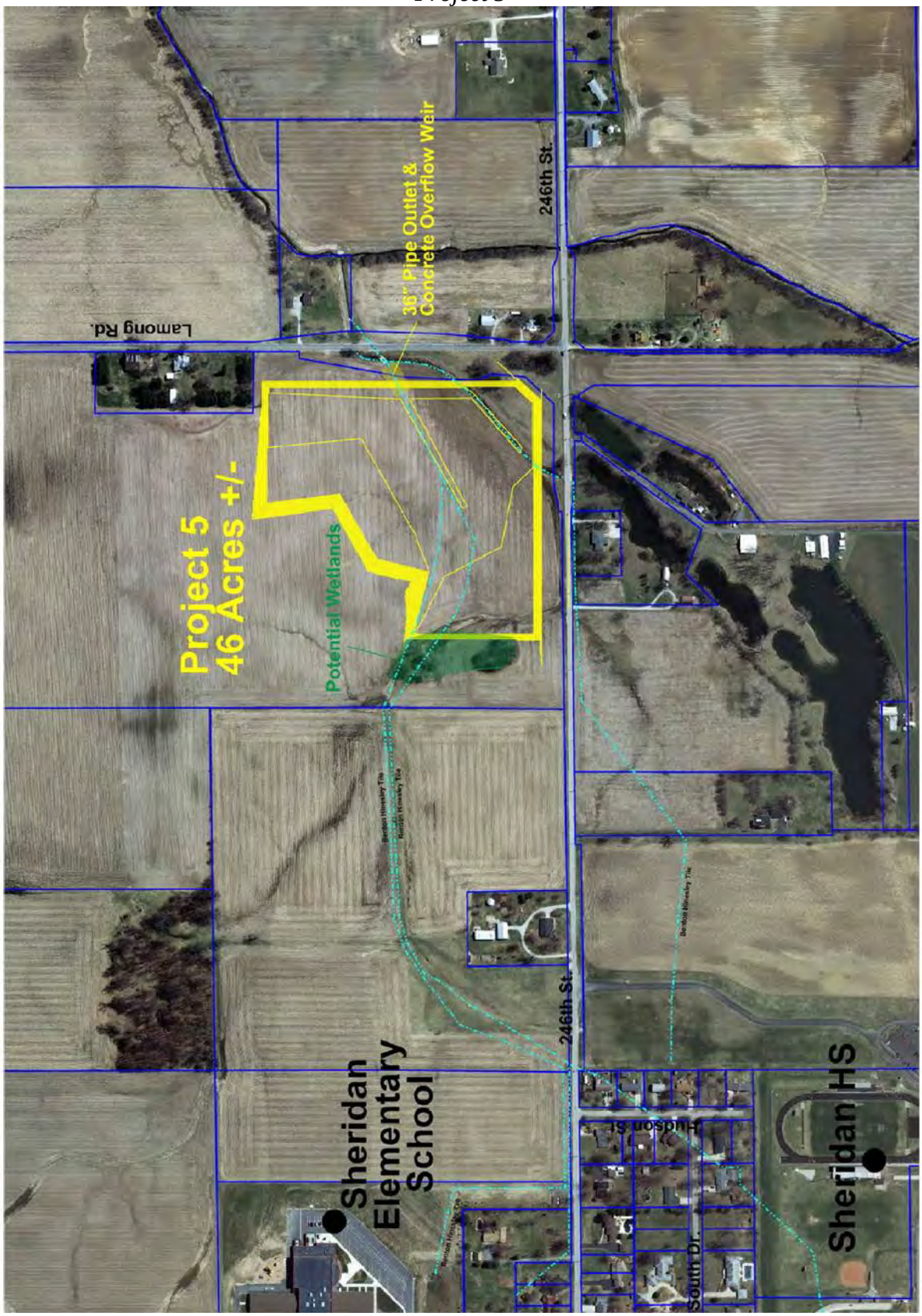
Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	36" RCP	625	LFT	$ 100.00	$62,500.00
2	36" End Section	12	EA	$ 1,500.00	$18,000.00
3	Structure Modification	1	LS	$ 4,000.00	$4,000.00
4	Wetlands Plantings	5	Acres	$ 4,500.00	$22,500.00
5	Temporary Seeding	25	Acres	$ 3,500.00	$87,500.00
6	Permanent Seeding	20	Acres	$ 3,500.00	$70,000.00
7	Stone	200	Tons	$ 30.00	$6,000.00
8	Excavation	70000	CYD	$ 7.00	$490,000.00
9	Pavement Repair	200	SYD	$ 100.00	$20,000.00
10	Utility Conflicts	3	EA	$ 5,000.00	$15,000.00
		Total			$ 795,500.00
		Engineering & Admin			$198,875.00
		Mobilization/Demobilization		5%	$40,000.00
		Contingencies		15%	$119,325.00
		Bonding, Council, Local Services			$119,325.00
		Property Acquisition			$70,000.00
		Net Total			$1,343,025.00

Property	Acres	*Value	Multiplier	Total
School Property	8	$7,000.00	1.25	$70,000.00
			Total	$70,000.00

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

Project 5


Project 5
46 Acres +/-
Potential Wetlands
36" Pipe Outlet &
Concrete Overflow Weir
Lamong Rd.
246th St.
246th St.
Sheridan
Elementary
School
Hudson St.
South Dr.
Sheridan HS

ESTIMATED CONSTRUCTION COST OPINION
for
Project 5 (Cline Property Detention)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Concrete Overflow Weir	75	CYD	$ 350.00	$ 26,250.00
2	36" RCP	150	LFT	$ 125.00	$ 18,750.00
3	36" End Section	2	EA	$ 1,500.00	$ 3,000.00
4	Wetlands Plantings	20	Acres	$ 4,500.00	$ 90,000.00
5	Temporary Seeding	46	Acres	$ 3,500.00	$ 161,000.00
6	Permanent Seeding	26	Acres	$ 3,500.00	$ 91,000.00
7	Stone	300	Tons	$ 30.00	$ 9,000.00
8	Excavation	140000	CYD	$ 6.00	$ 840,000.00
		Total			$ 1,239,000.00
		Engineering & Admin			$309,750.00
		Mobilization/Demobilization		5%	$62,000.00
		Contingencies		15%	$185,850.00
		Bonding, Council, Local Services			$185,850.00
		Property Acquisition			$402,500.00
		Net Total			$ 2,384,950.00

Property	Acres	*Value	Multiplier	Total
Cline Property	46	$7,000.00	1.25	$402,500.00
			Total	$402,500.00

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

Project 6

Project 6 - 2,860'
Grassed Waterway
Potential Wetlands
Lower Grassed Waterway
to Culvert Invert
Remove Overflow Berm
Sheridan
Elementary
School
Sheridan HS
Lamong Rd.
246th St.
246th St.
Hudson St.
South Dr.

ESTIMATED CONSTRUCTION COST OPINION
for
Project 6 (Modifications to 246th Street Overflow for School Detention)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

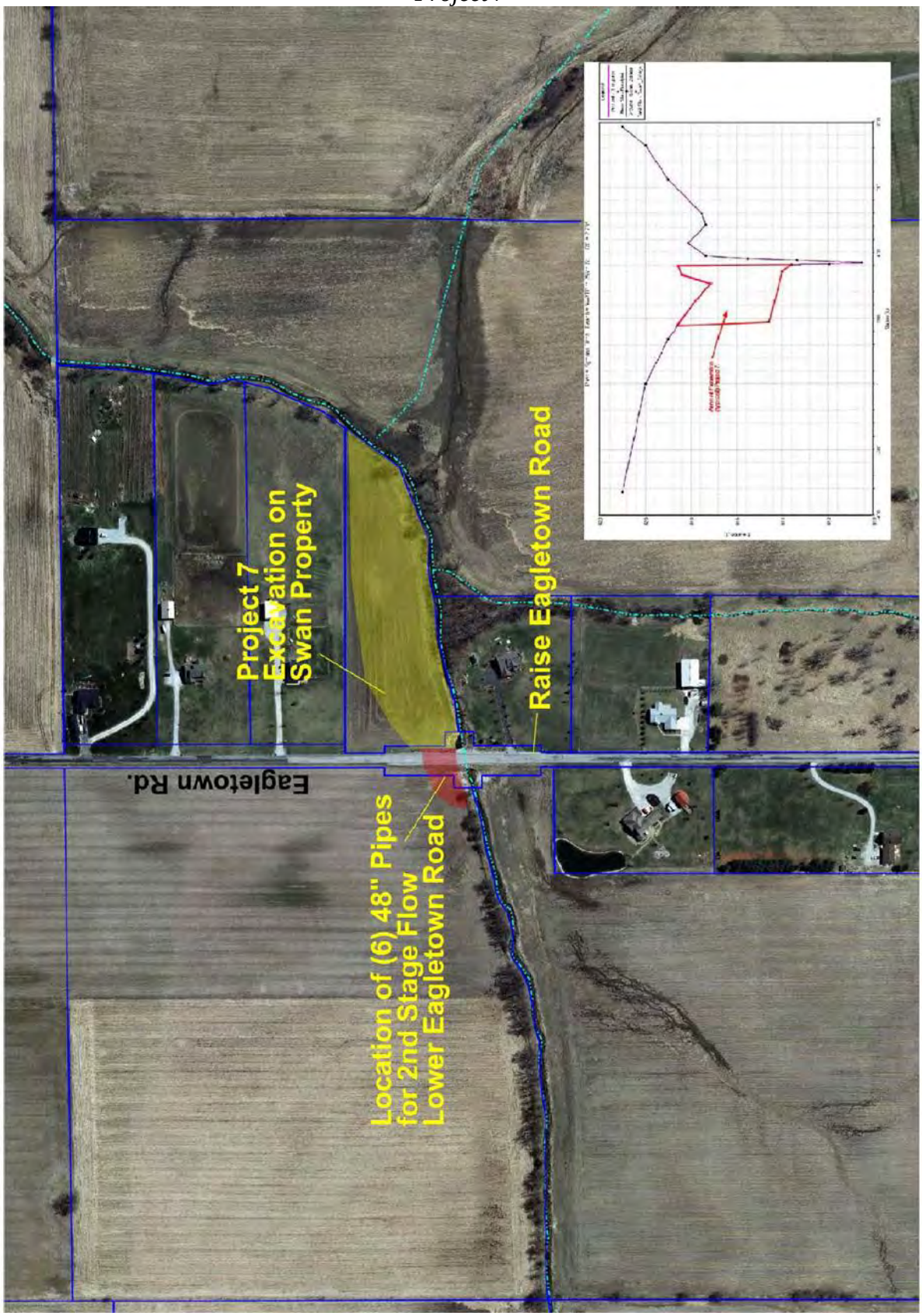
Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Modificaiton of 246th Street Structure	1	LS	$ 3,000.00	$3,000.00
2	30' Grassed Waterway Installation	2850	LFT	$ 10.00	$28,500.00
3	Temporary Seeding	3	Acres	$ 3,500.00	$10,500.00
4	Permanent Seeding	3	Acres	$ 3,500.00	$10,500.00
5	Stone	100	Tons	$ 30.00	$3,000.00
		Total			$ 55,500.00
		Engineering & Admin			$13,875.00
		Mobilization/Demobilization		5%	$3,000.00
		Contingencies		15%	$8,325.00
		Bonding, Council, Local Services			$8,325.00
		Property Acquisition			$8,750.00
		Net Total			$ 97,775.00

Property	Acres	*Value	Multiplier	Total
Cline Property	1	$7,000.00	1.25	$8,750.00
			Total	$8,750.00

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

Project 7


Project 7
Excavation on
Swan Property
Raise Eagletown Road
Eagletown Rd.
Location of (6) 48" Pipes
for 2nd Stage Flow
Lower Eagletown Road

ESTIMATED CONSTRUCTION COST OPINION
for
Project 7 (Modifications to Eagletown Road Crossing / Swan Property)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	48" RCP	300	LFT	$ 150.00	$45,000.00
2	48" End Section	12	EA	$ 2,500.00	$30,000.00
3	Guardrail Removal and Repair	400	LFT	$ 30.00	$12,000.00
4	Wetlands Plantings	3	Acres	$ 4,500.00	$13,500.00
5	Temporary Seeding	3	Acres	$ 3,500.00	$10,500.00
6	Stone	300	Tons	$ 30.00	$9,000.00
7	Excavation	25000	CYD	$ 12.50	$312,500.00
8	Pavement Repair	600	SYD	$ 150.00	$90,000.00
9	Utility Conflicts	2	EA	$ 5,000.00	$10,000.00
		Total			$ 532,500.00
		Engineering & Admin			$133,125.00
		Mobilization/Demobilization		5%	$27,000.00
		Contingencies		15%	$79,875.00
		Bonding, Council, Local Services			$79,875.00
		Property Acquisition			$34,212.50
		Net Total			$ 886,587.50
		County Highway Portion		70%	$620,611.25
		Remaining Total for Assessments			$265,976.25

Property	Acres	*Value	Multiplier	Total
Swan Property	3.91	$7,000.00	1.25	$34,212.50
			Total	$34,212.50

*Value per Acre Estimated from Assessed Value on Tax Records and Previous Acquisition Costs

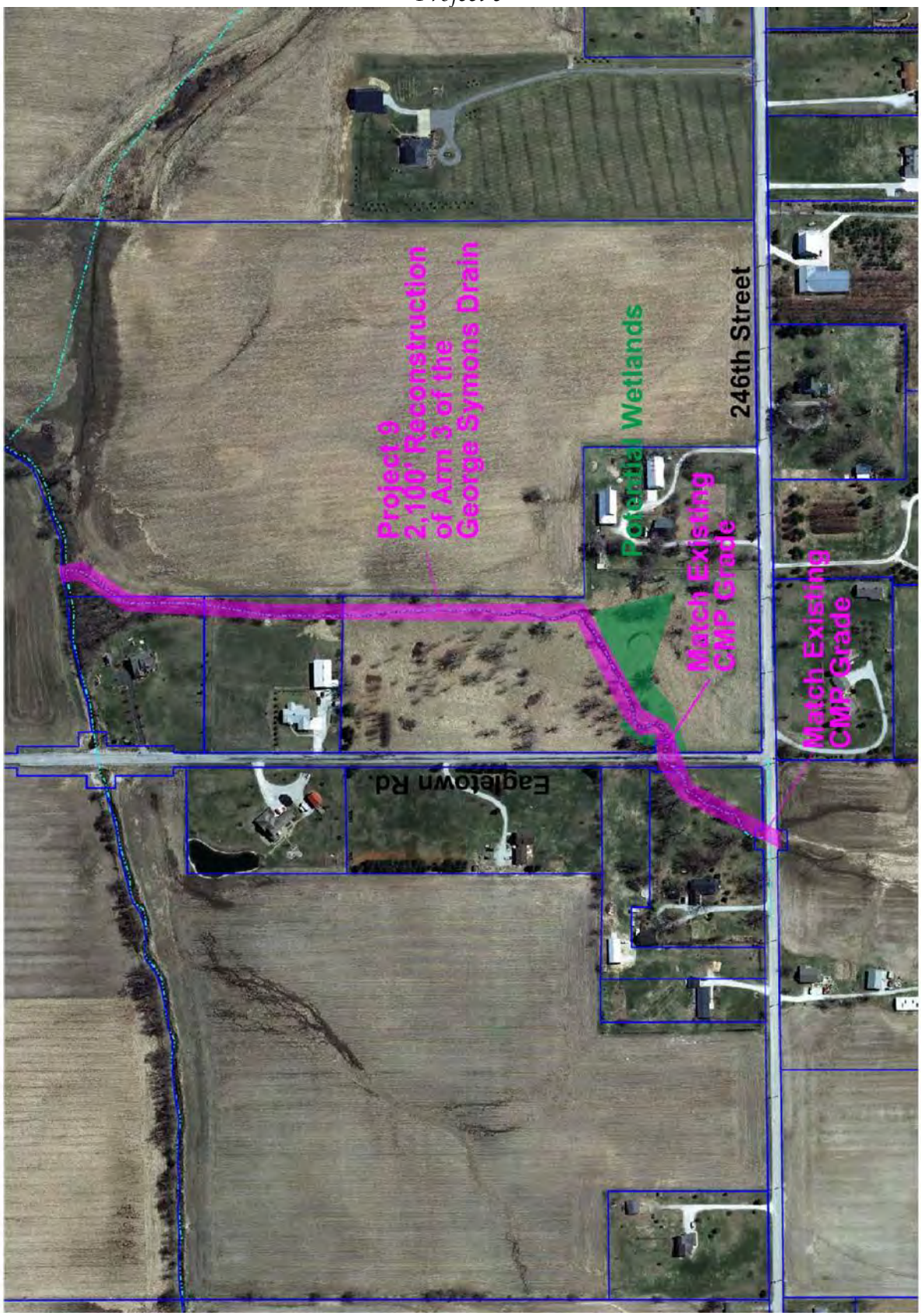
Project 8

ESTIMATED CONSTRUCTION COST OPINION
for
Project 8 (Relocation of Moore Residence)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	New Lot	3	Acres	$ 10,000.00	30000
2	New Foundation	1	LS	$ 20,000.00	20000
3	New Well	1	LS	$ 5,000.00	5000
4	New Septic	1	LS	$ 20,000.00	20000
5	New Utility Drops	1	LS	$ 10,000.00	10000
6	New Building Permit	1	EA	$ 1,000.00	1000
7	New Landscapting	1	EA	$ 5,000.00	5000
8	Cleanup Old Site	1	EA	$ 7,500.00	7500
9	Disconnect Utilities	1	LS	$ 2,500.00	2500
10	Clear Path	1	LS	$ 1,000.00	1000
11	Structure Move	900	SQFT	$ 20.00	18000
12	Reconnect Utilities	1	LS	$ 5,000.00	5000
13	Remodel / Code Updates	1	LS	$ 5,000.00	5000
14	Upgrade Mechanical Systems	1	LS	$ 15,000.00	15000
		Total			$ 145,000.00
		Engineering & Admin			$29,000.00
		Bonding, Council, Local Services			$21,750.00
		Contingencies		15%	$21,750.00
		Net Total			$ 217,500.00

Project 9


Project 9
2,100' Reconstruction
of Arm 3 of the
George Symons Drain
Potential Wetlands
Match Existing
CMP Grade
Match Existing
CMP Grade
246th Street
Eagletown Rd.

ESTIMATED CONSTRUCTION COST OPINION
for
Project 9 (Reconstruction of Arm 3 of the George Symons Drain)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Small Ditch Reconstruction	2100	LFT	$ 12.00	$25,200.00
2	Temporary Seeding	2	Acres	$ 3,500.00	$7,000.00
3	Wetlands Plantings	1	Acres	$ 4,500.00	$4,500.00
4	Permanent Seeding	1	Acres	$ 3,500.00	$3,500.00
5	Stone	100	Tons	$ 30.00	$3,000.00
		Total			$ 43,200.00
		Engineering & Admin			$15,120.00
		Bonding, Council, Local Services			$6,480.00
		Mobilization/Demobilization		5%	$3,000.00
		Contingencies		15%	$6,480.00
		Net Total			$ 74,280.00

Project 10

ESTIMATED COST OPINION
for
Project 10 (Potential Property Buyouts)
George Symons & William and Krause Hydraulic Study
Hamilton County, Indiana

Date: 10/30/2012
By: JLM

	Property	*Value	Multiplier	Total
1	Moore Property	$111,400.00	1.25	$139,250.00
2	Koepkey Property	$272,400.00	1.25	$340,500.00
3	American Legion Post 67 Property	$188,200.00	1.25	$235,250.00
4	Swan Property	$27,370.00	1.25	$34,212.50
			Total	$749,212.50

*Value Estimated from Assessed Value on Tax Records and Previous Acquisition Costs
Demolition estimated to range between $10,000 and $25,000 per property demolished.

Appendix 'E' – Photos

Area 2 Photo Log

Area 2 – June 20, 2011

Photo 2-1- Looking across SR 38 from Apostolic Faith Church

Photo 2-2- Looking across SR 38 from Apostolic Faith Church

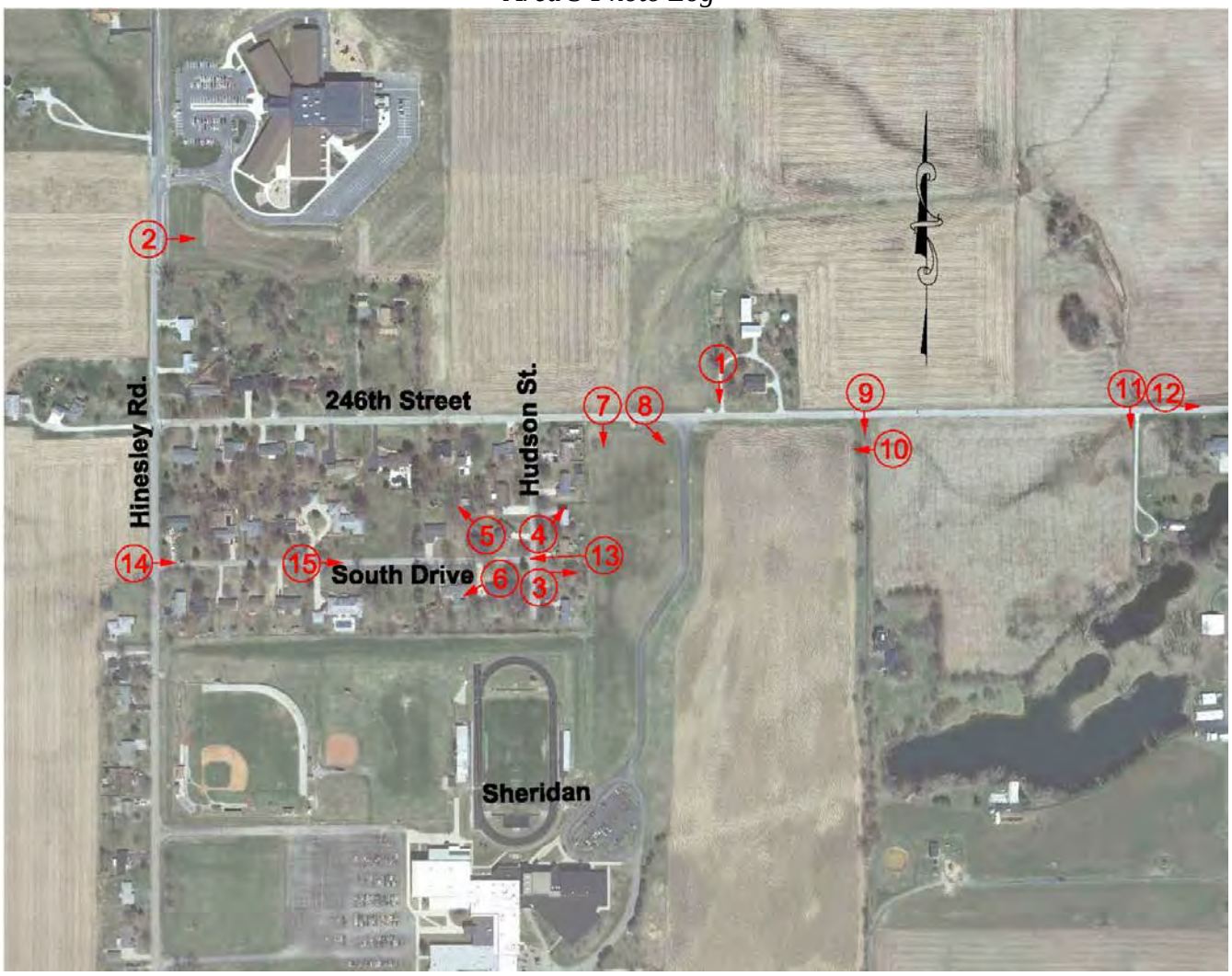
Photo 2-3 - From 508 6th Street looking east across SR 38

Photo 2-4 - La Posh Salon & Spa at 508 6th Street

Photo 2-5 - Flooding adjacent west to SR 38

Photo 2-6 - Road closed sign at the intersection of SR 38 & 6th Street

Area 3 Photo Log



Area 3 – 2008

Photo 3-1 - Looking south from 2940 West 246th Street to Area 3

Photo 3-2 - Elementary School detention pond during construction

Area 3 – 2010

Photo 3-3 - Looking at detention pond from back porch of 24555 Hudson St.

Photo 3-4 - Looking at detention pond from back porch of 24555 Hudson St. across 246th Street

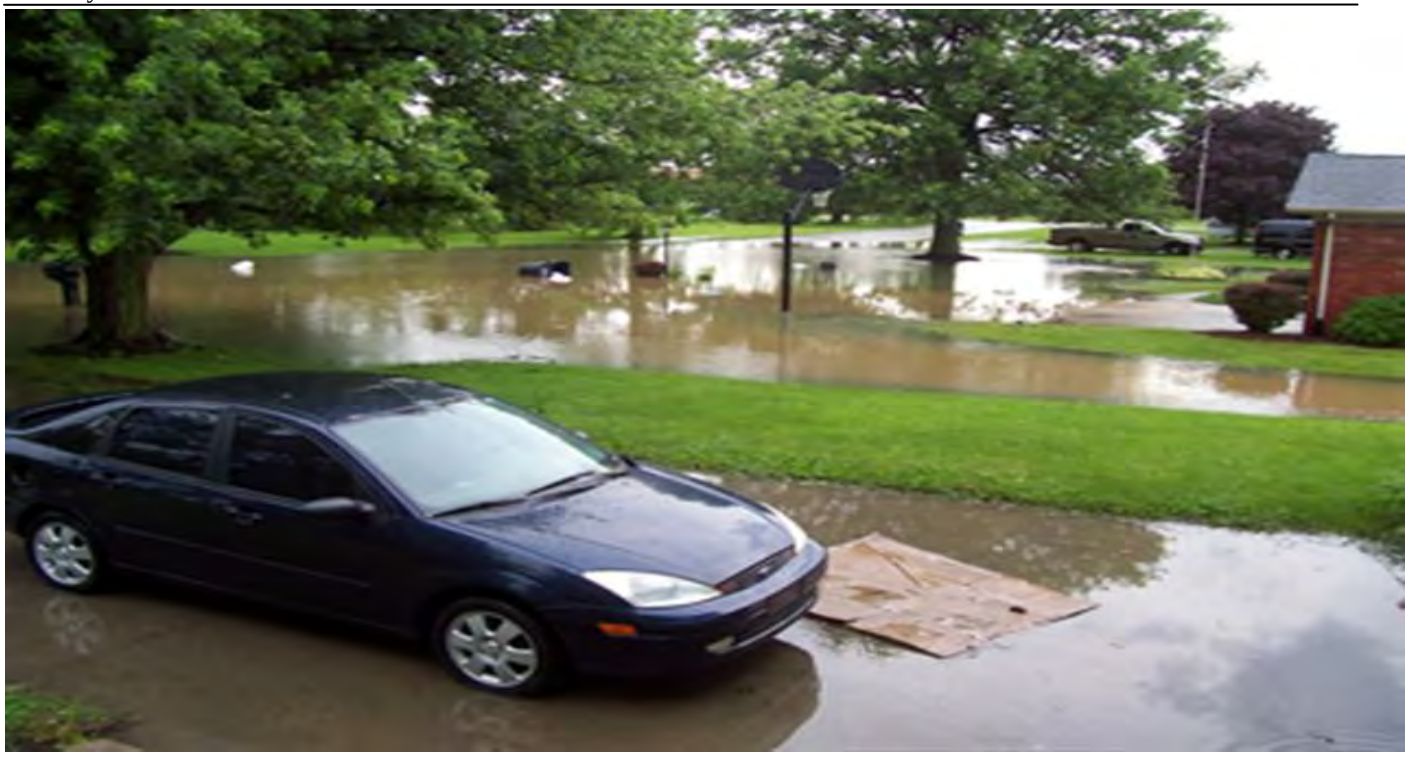


Photo 3-5 - Looking at Hudson Street from front door of 24555 Hudson St. (North)

Photo 3-6 - Looking at Hudson Street from front door of 24555 Hudson St. (Sorth)

Area 3 – June 20, 2011

Photo 3-7 - Looking south along east line of Curry & Puzey subdivision from 246th Street

Photo 3-8 - Looking south across Sheridan HS detention pond from 246th Street

Photo 3-9 - East overland overflow from Sheridan HS detention pond

Photo 3-10 - Looking west across school property from overland overflow location

Photo 3-11 - Gravel drive further east of overland flow route 2447 West 246th Street

Photo 3-12 - Looking east along 246th street from 2447 West 246th Street

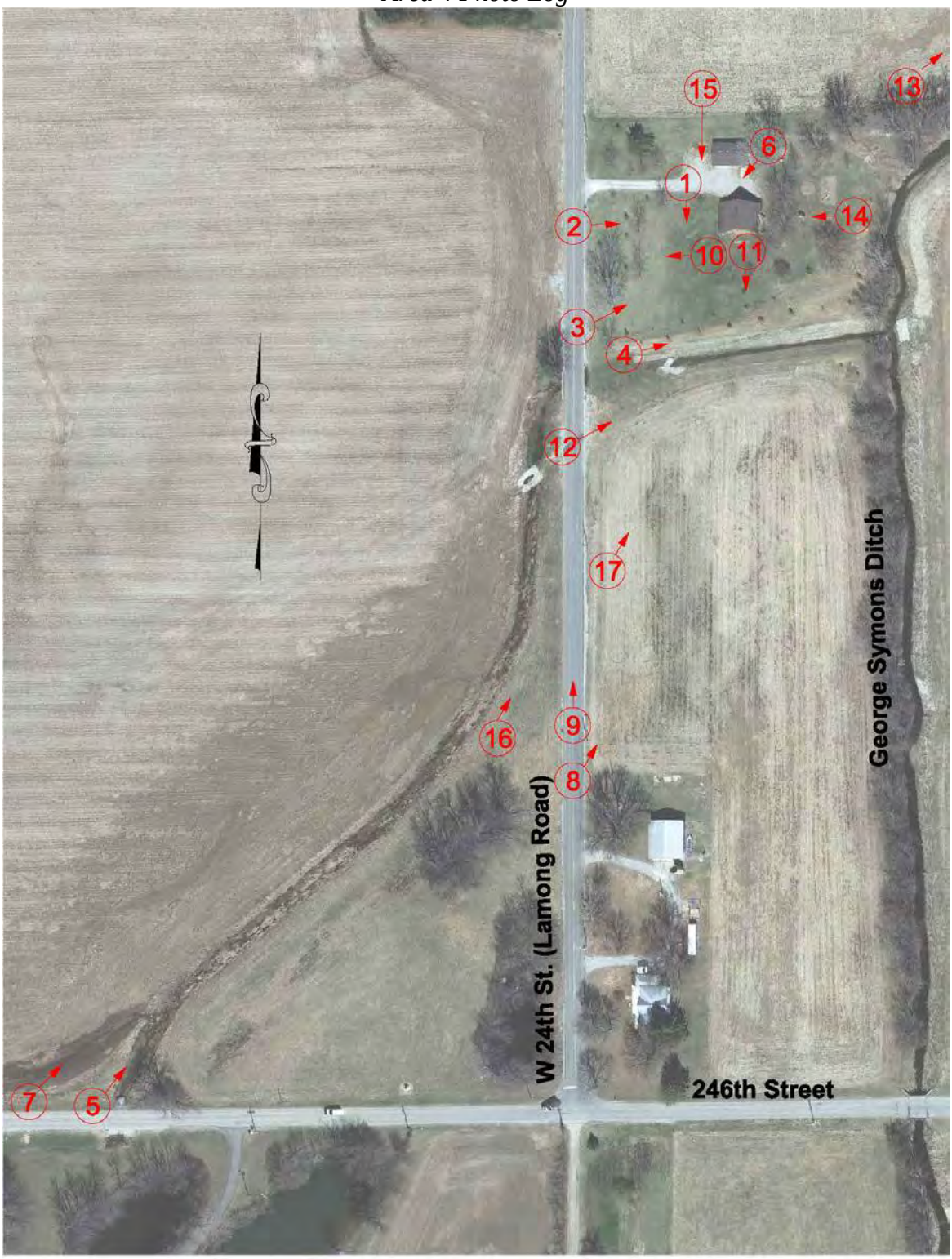
Photo 3-13 - Ponding depth against 24555 Hudson St.

Area 3 – January 2012

Photo 3-14 - Looking east along South Street

Photo 3-15 - Looking east towards intersection of South Street and Hudson St.

Area 4 Photo Log



Area 4 – 2008

Photo 4-1 - Front Porch of 24695 Lamong Road

Photo 4-2 - From Lamong Road looking at residential structure at 24695 Lamong Road

Photo 4-3 - From Lamong Road Bridge over Benton Hinesley Drain looking at 24695 Lamong Road

Photo 4-4 - From Lamong Road Bridge over Benton Hinesley Drain looking at George Symons Drain

Photo 4-5 - From 246th street looking northeast towards Lamong Road (Benton Hinesley Drain)

Area 4 – June 20, 2011

Photo 4-6 - From north property line of 24695 Lamong Road Looking at residential structure

Photo 4-7 - From 246th street looking northeast towards Lamong Road (Benton Hinesley Drain)

Photo 4-8 - Near the intersection of Lamong Road & 246th Street looking at 24695 Lamong Road

Photo 4-9 - Water overtopping Lamong Road just north or 246th Street

Photo 4-10 - From 24695 Lamong Road looking at Bridge

Photo 4-11- Open ditch downstream of Lamong Road Bridge

Photo 4-12 -Open ditch downstream of Lamong Road Bridge, (confluence with George Symons)

Photo 4-13 - Overbank flooding on northeast side of George Symons Open Drain
(24695 Lamong Road North property line)

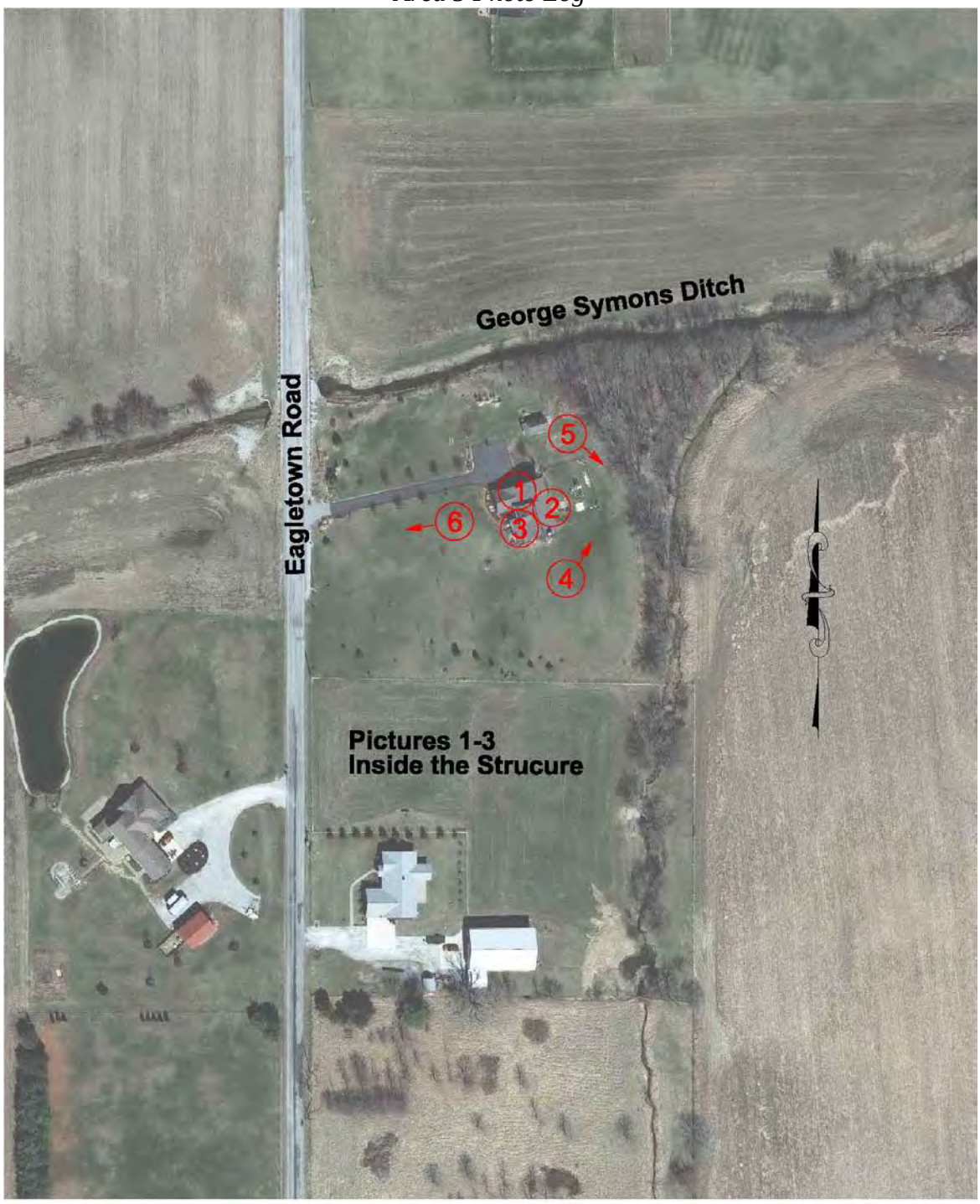
Photo 4-14 - Debris left by flood at 24695 Lamong Road

Photo 4-15 - Garage flooding at 24695 Lamong Road

Photo 4-16 - Near the intersection of Lamong Road & 246th Street looking at 24695 Lamong Road (During highest stages of flood)

Photo 4-17 - Near the intersection of Lamong Road & 246th Street looking at 24695 Lamong Road (During highest stages of flood)

Area 5 Photo Log



Area 5 – June 20, 2011

Photo 5-1 - Basement flooding levels at 24827 Eagletown Road

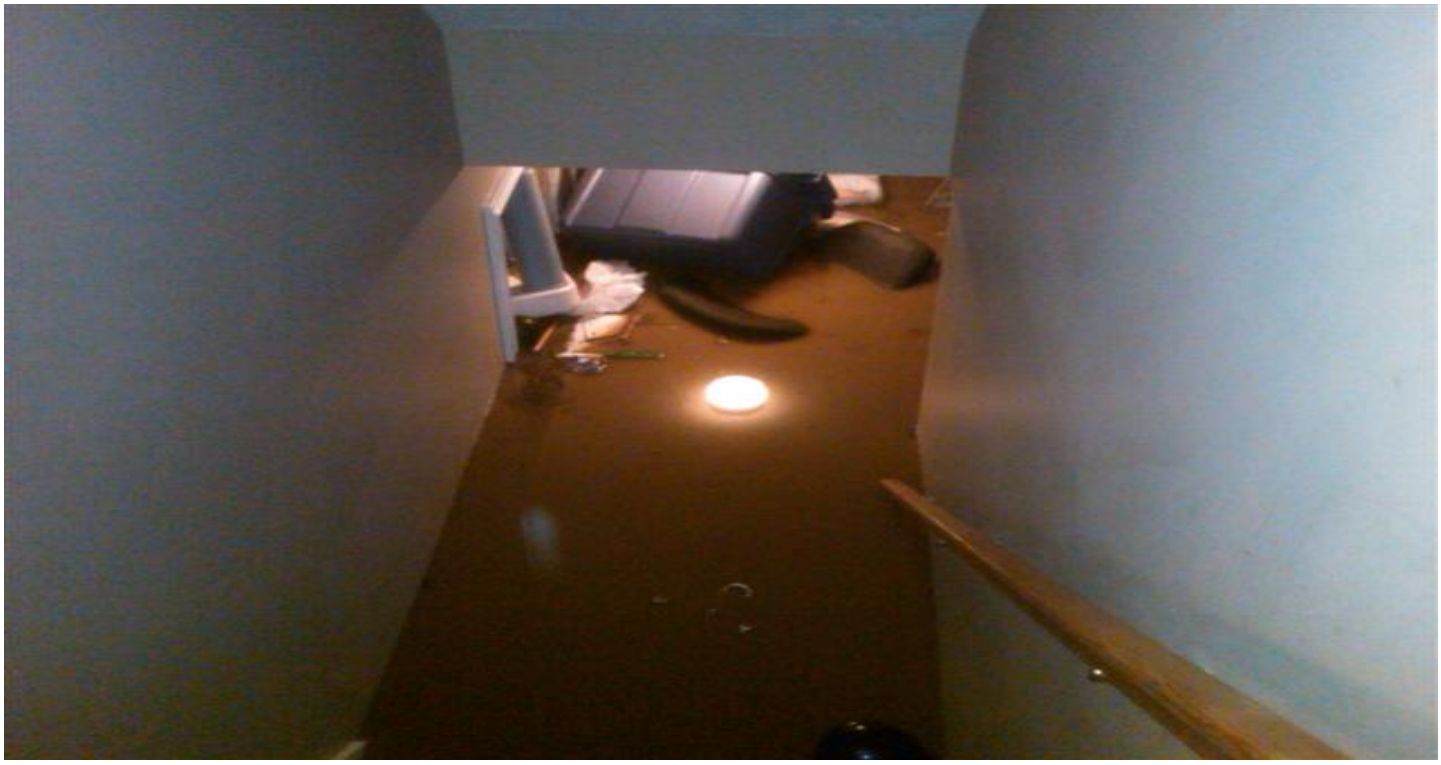


Photo 5-2 -Basement flooding levels at 24827 Eagletown Road

Photo 5-3 - Flood waters entering basement window at 24827 Eagletown Road

Photo 5-4 - Rear yard flooding at 24827 Eagletown Road (Arm 3 of George Symons drain to right)

Photo 5-5 - Back patio flooding at 24827 Eagletown Road (Arm 3 of George Symons drain)

Photo 5-6 - From front porch of 24827 Eagletown Road looking across Eagletown road (west)

Appendix 'F' – Figures

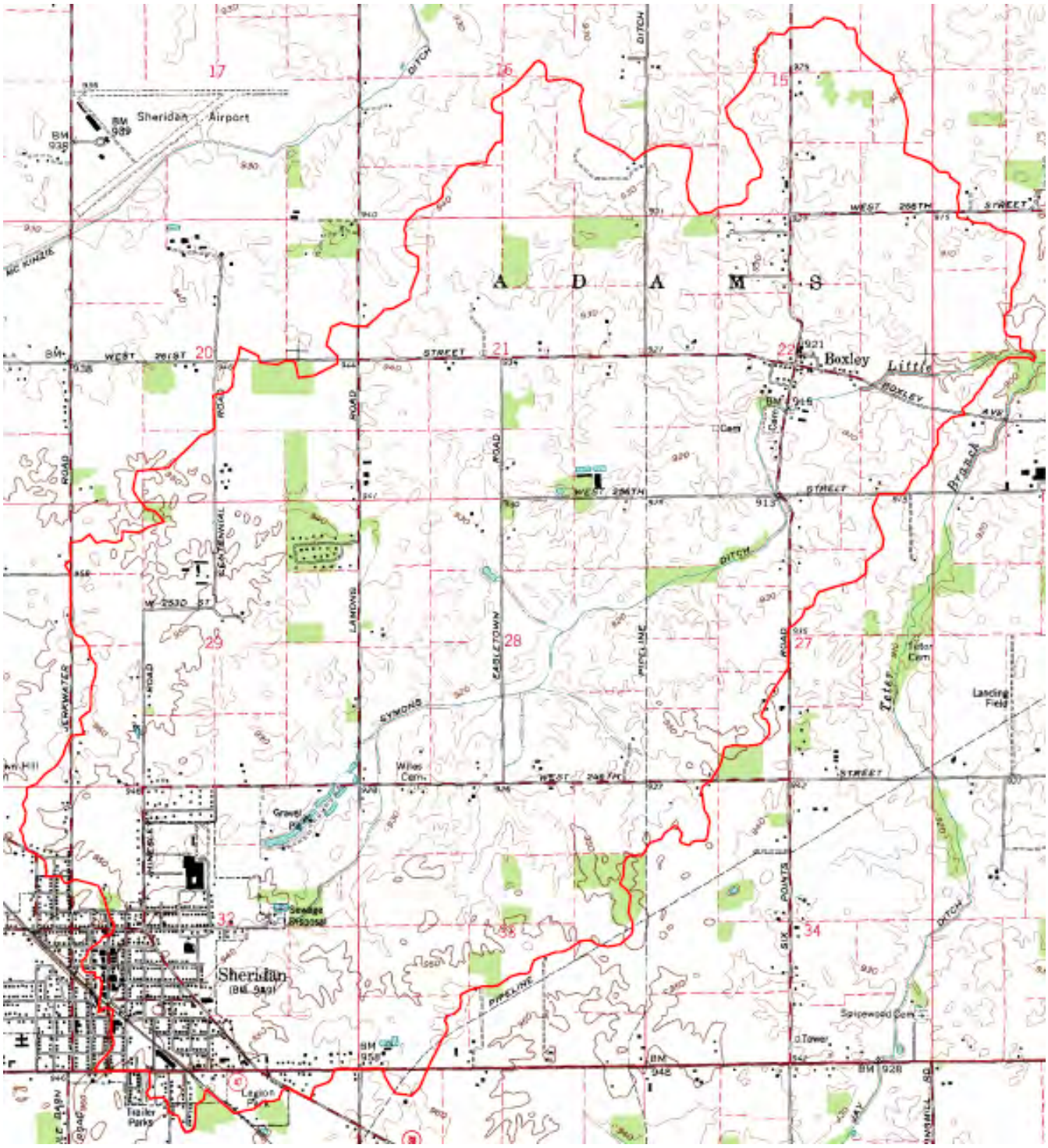


Figure 1.1 Overall Watershed Boundary

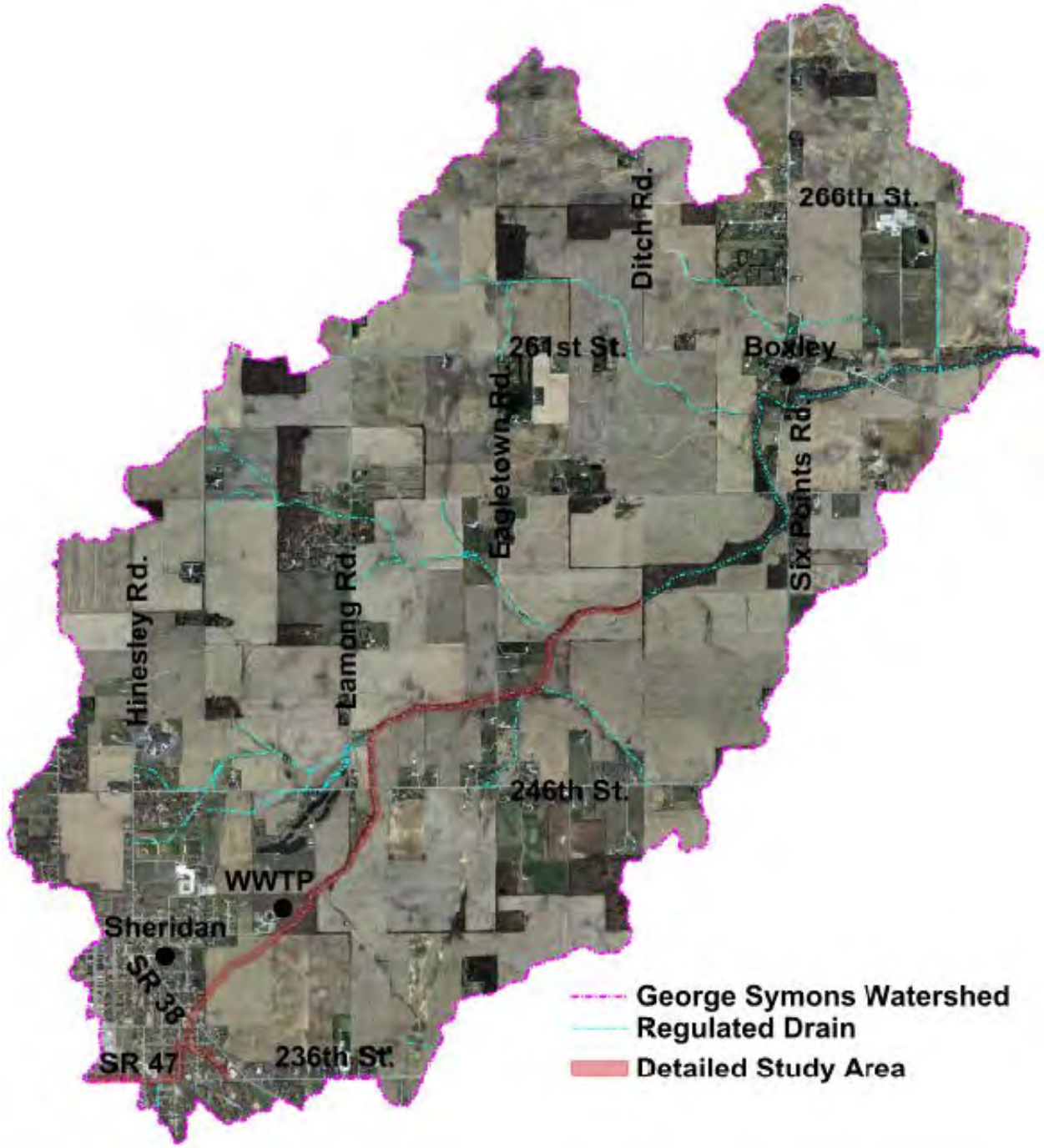


Figure 1.2 Detailed Study Area

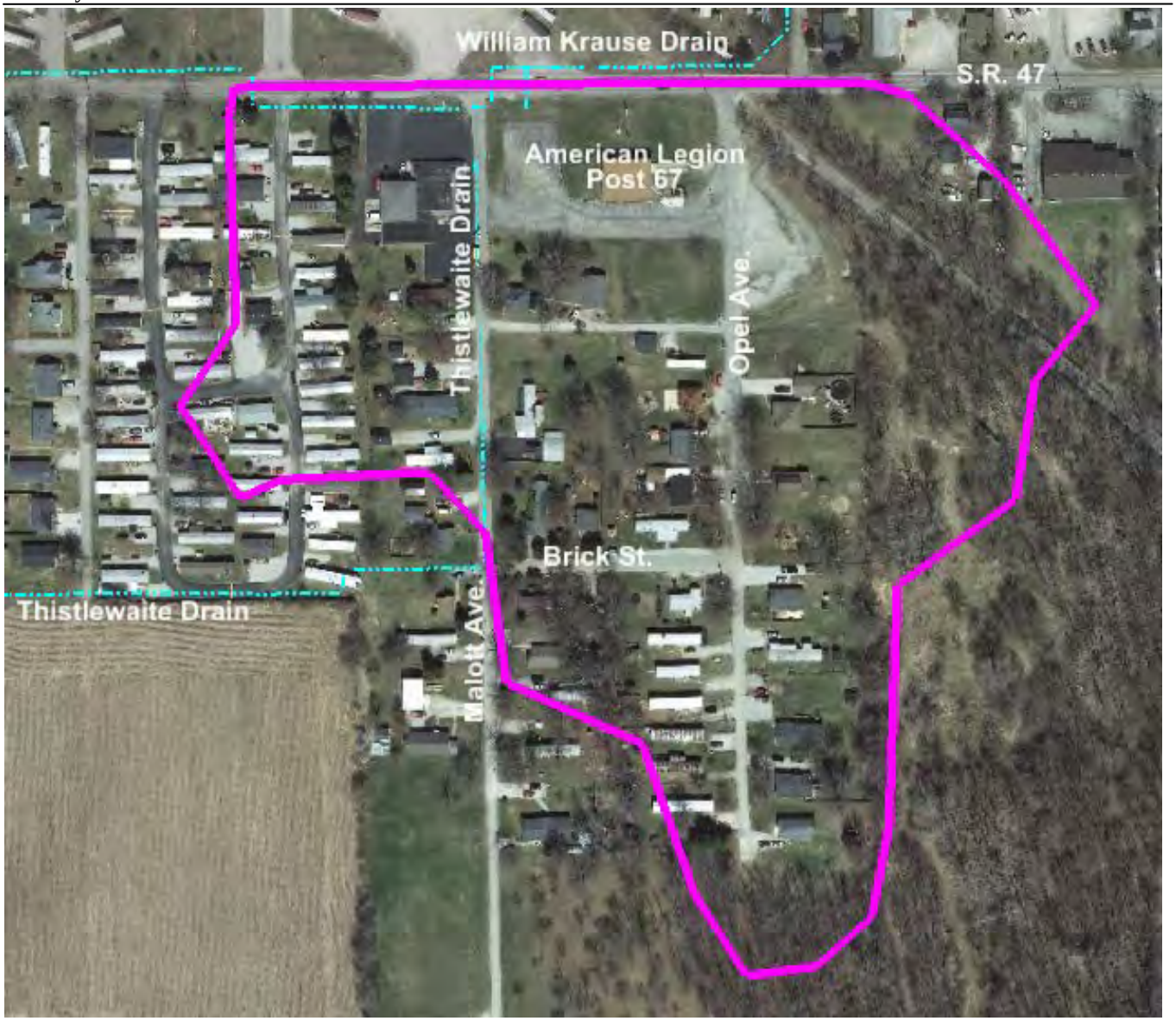


Figure 1.3 Combined Watershed Area

Figure 1.4 Benton Hinesley Drain

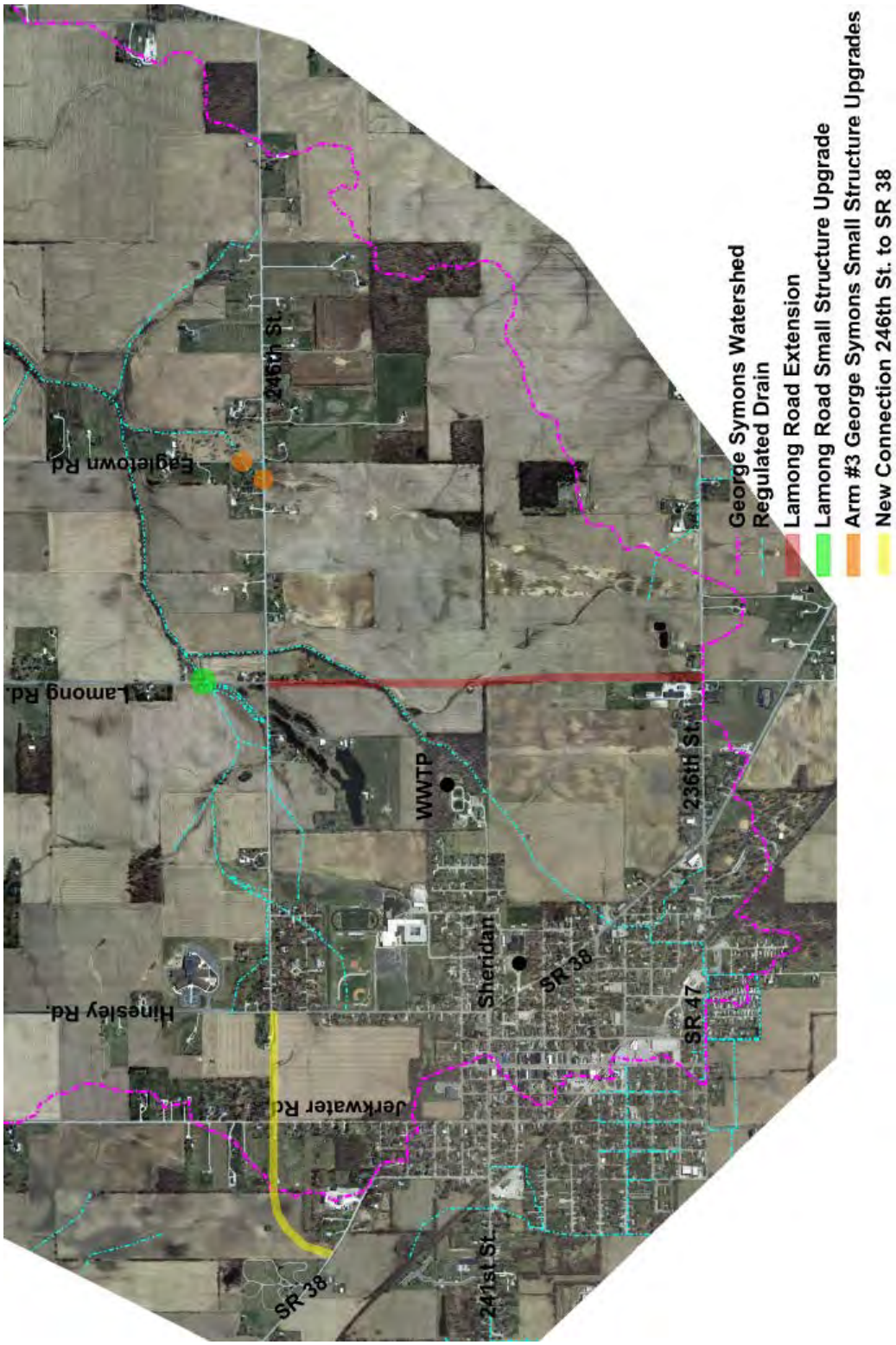


Figure 2.1 Future Potential Transportation Projects

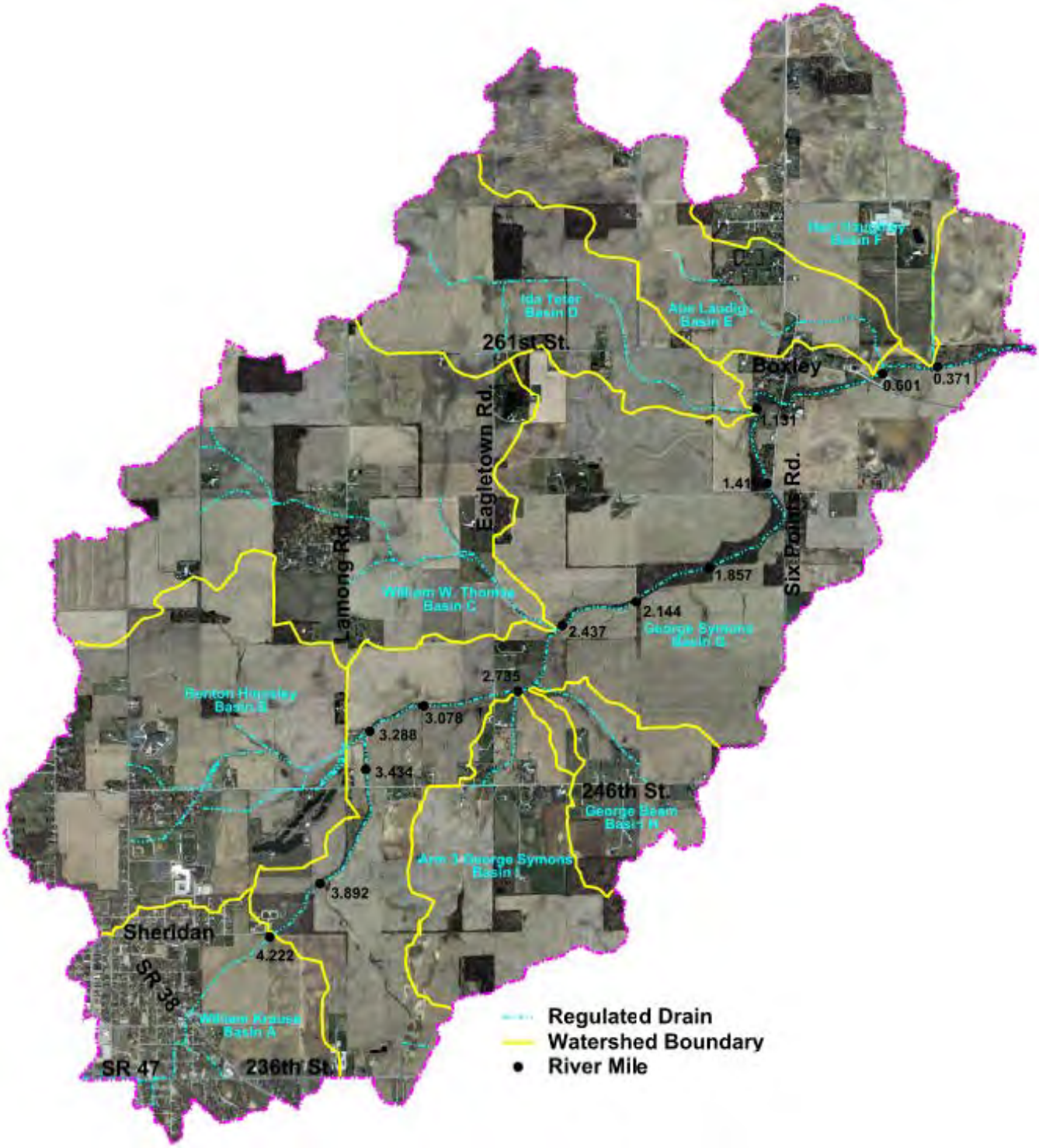


Figure 3.1 Watershed Basins and River Miles

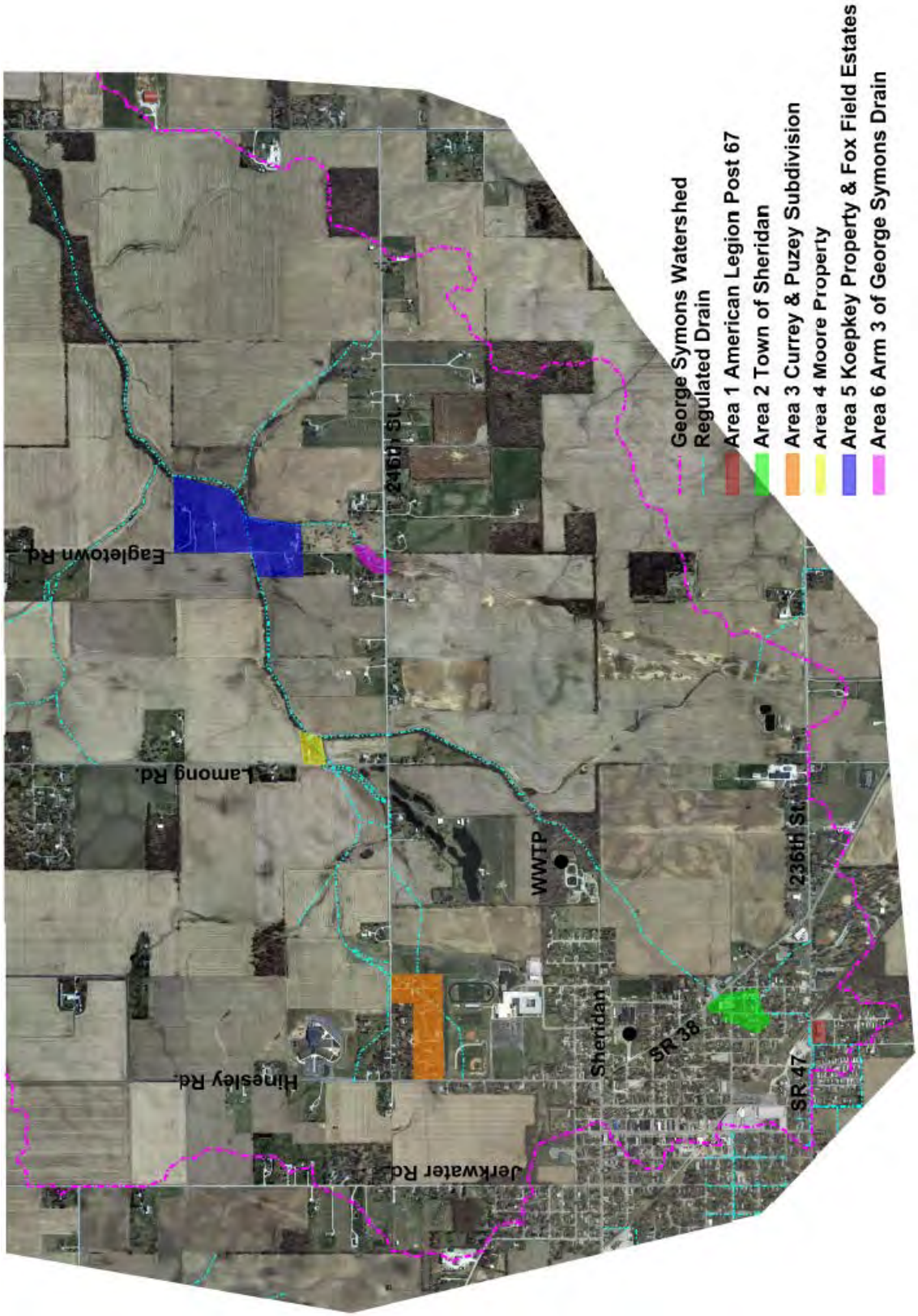


Figure 3.2 Areas of Concern

Figure 3.3 Area 1 June 20, 2011

Figure 3.4 Area 2 June 20, 2011

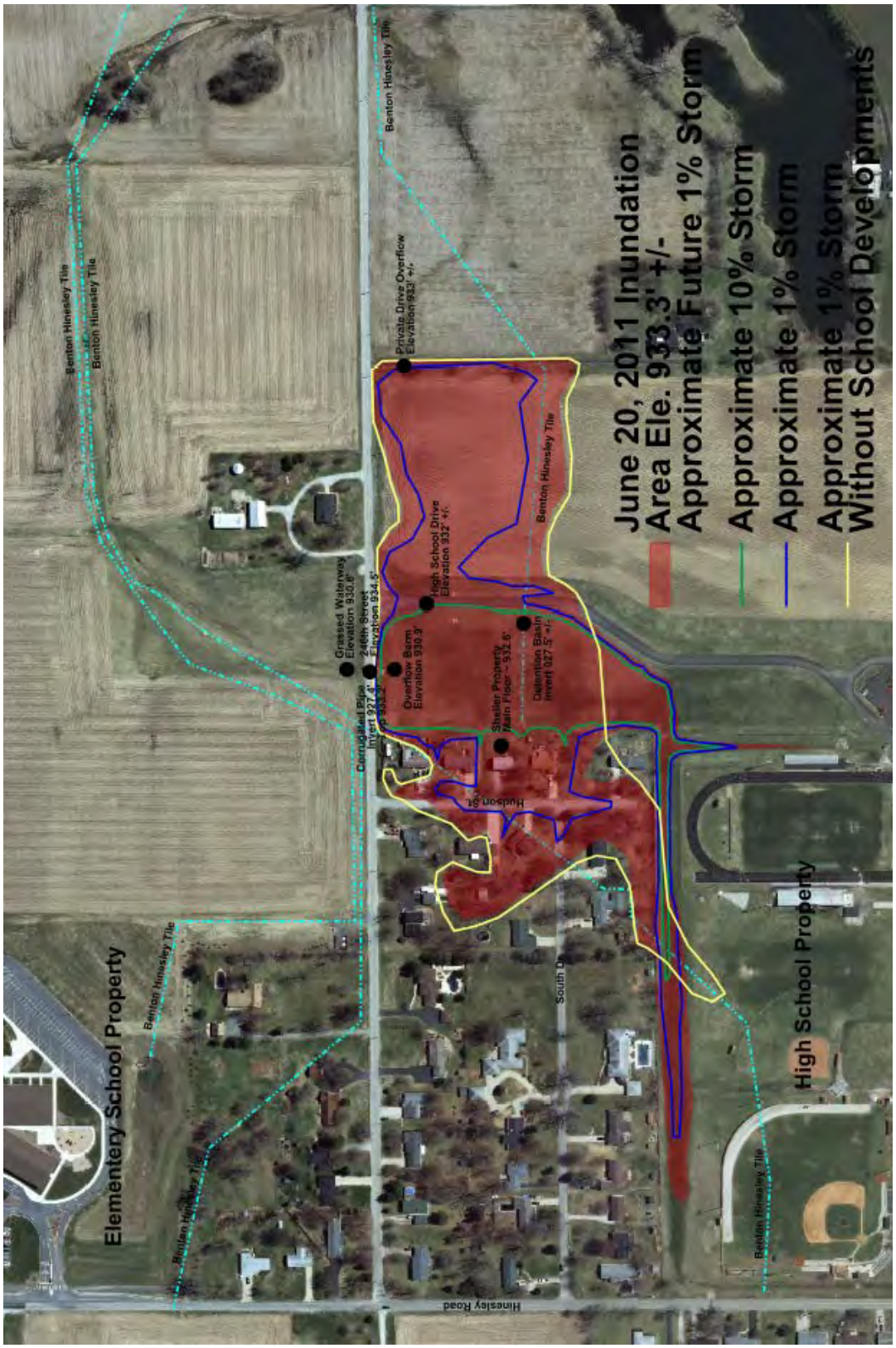


Figure 3.5 Area 3 June 20, 2011

Figure 3.6 Area 3 935' Contour

Figure 3.7Area 4

Figure 3.8 Area 4 June 20, 2011

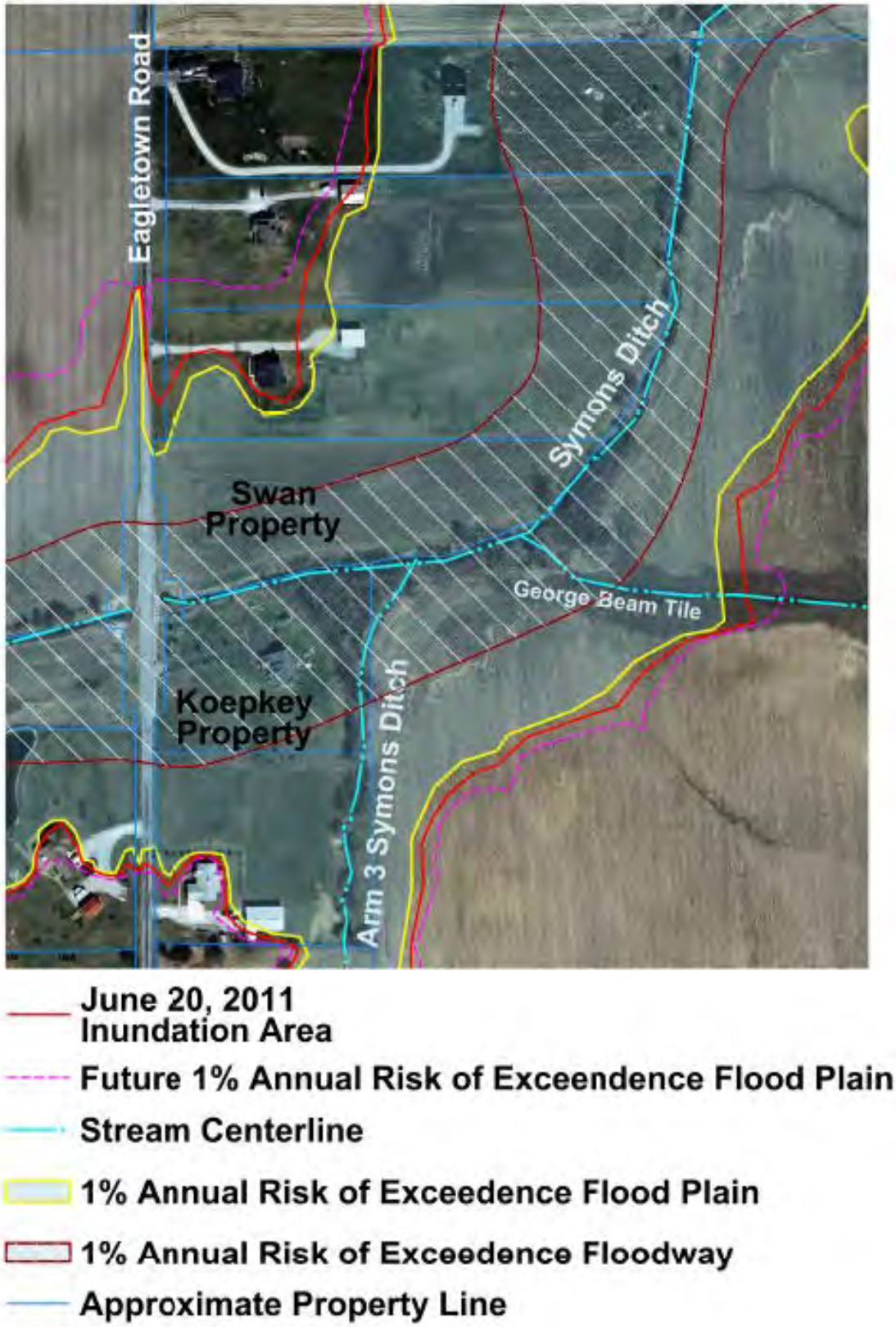


Figure 3.9 Area 5

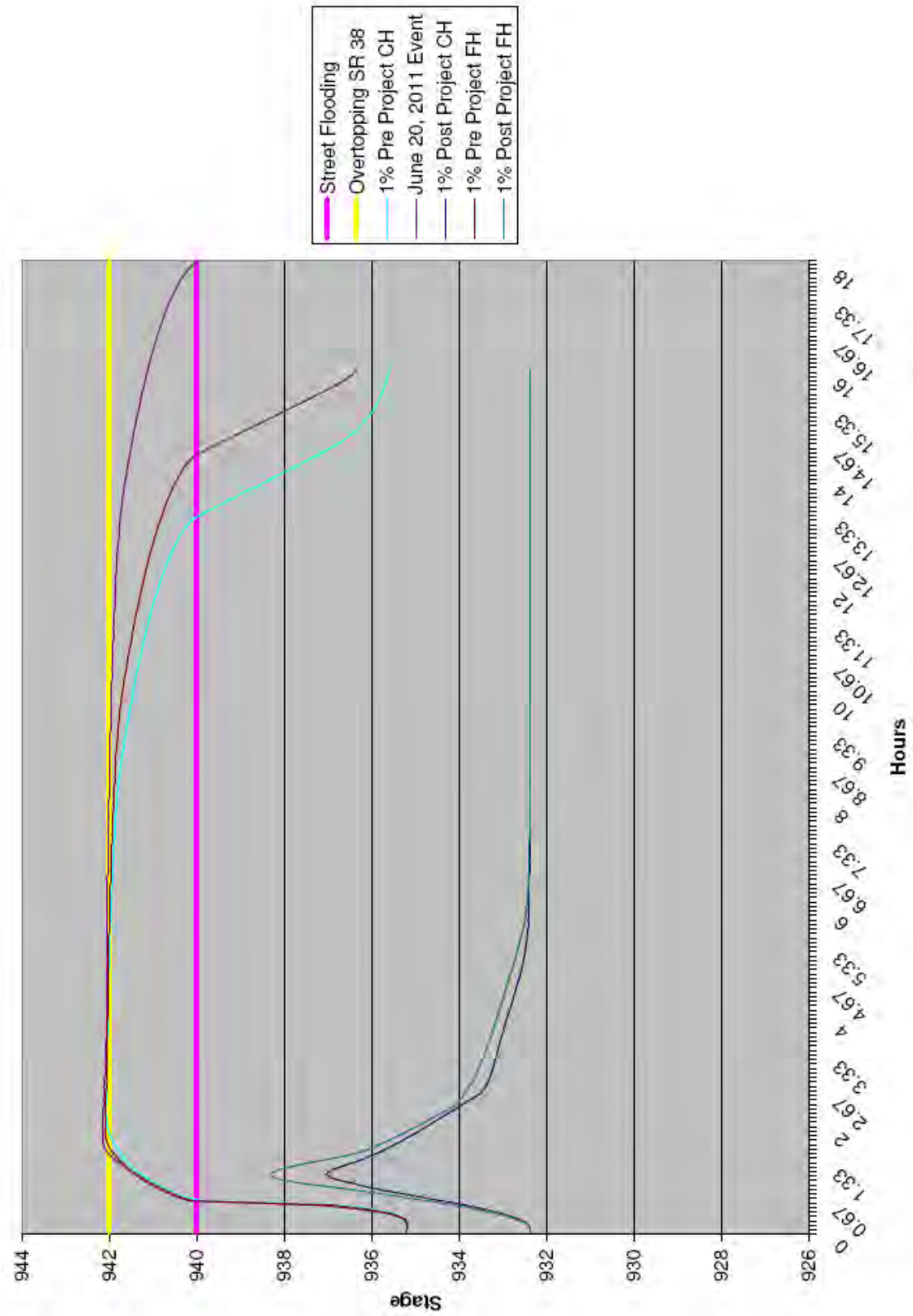


Figure 4.1 Project 1 Potential Impacts on Area 2

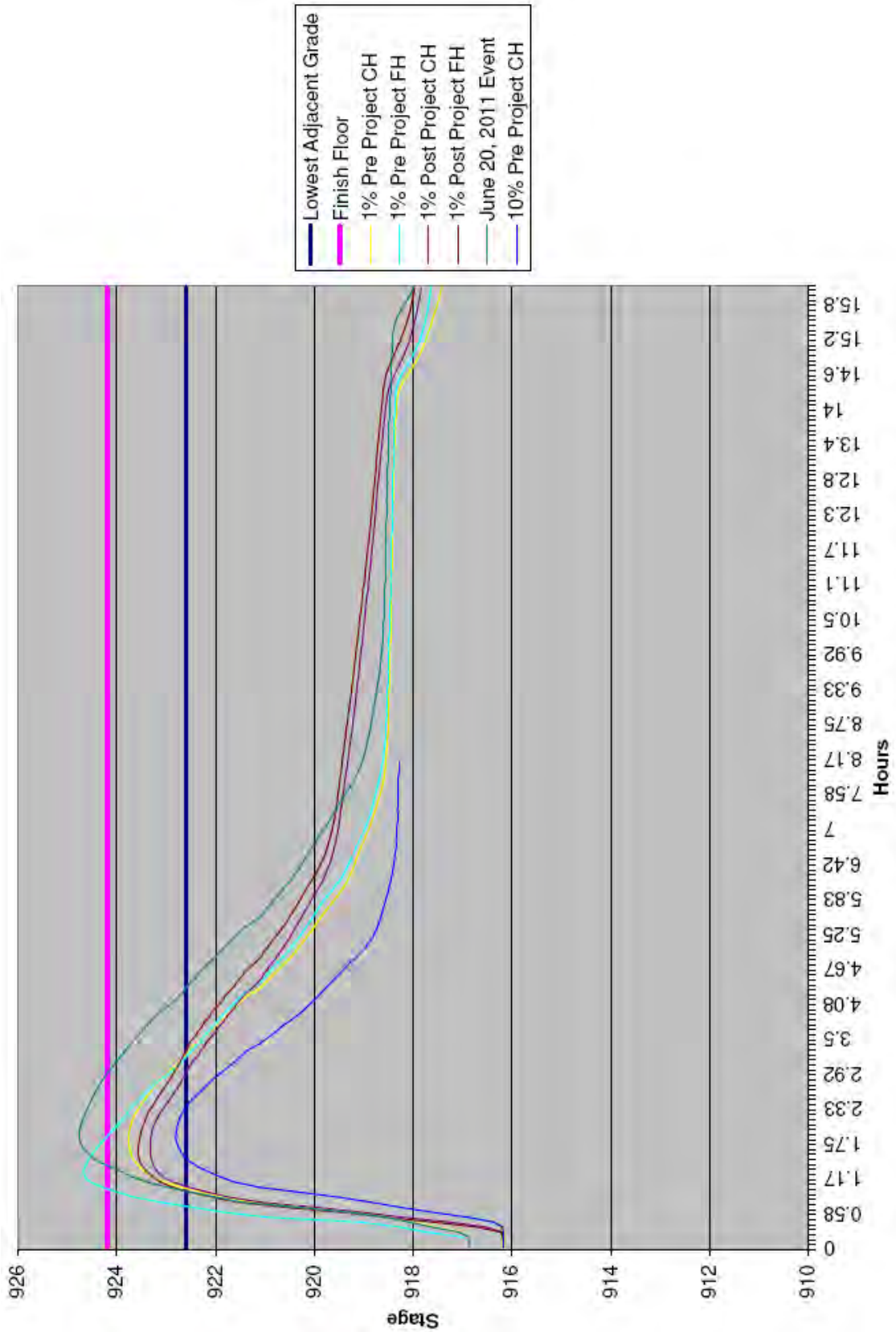


Figure 4.2 Project 1 Potential Impacts on Area 4

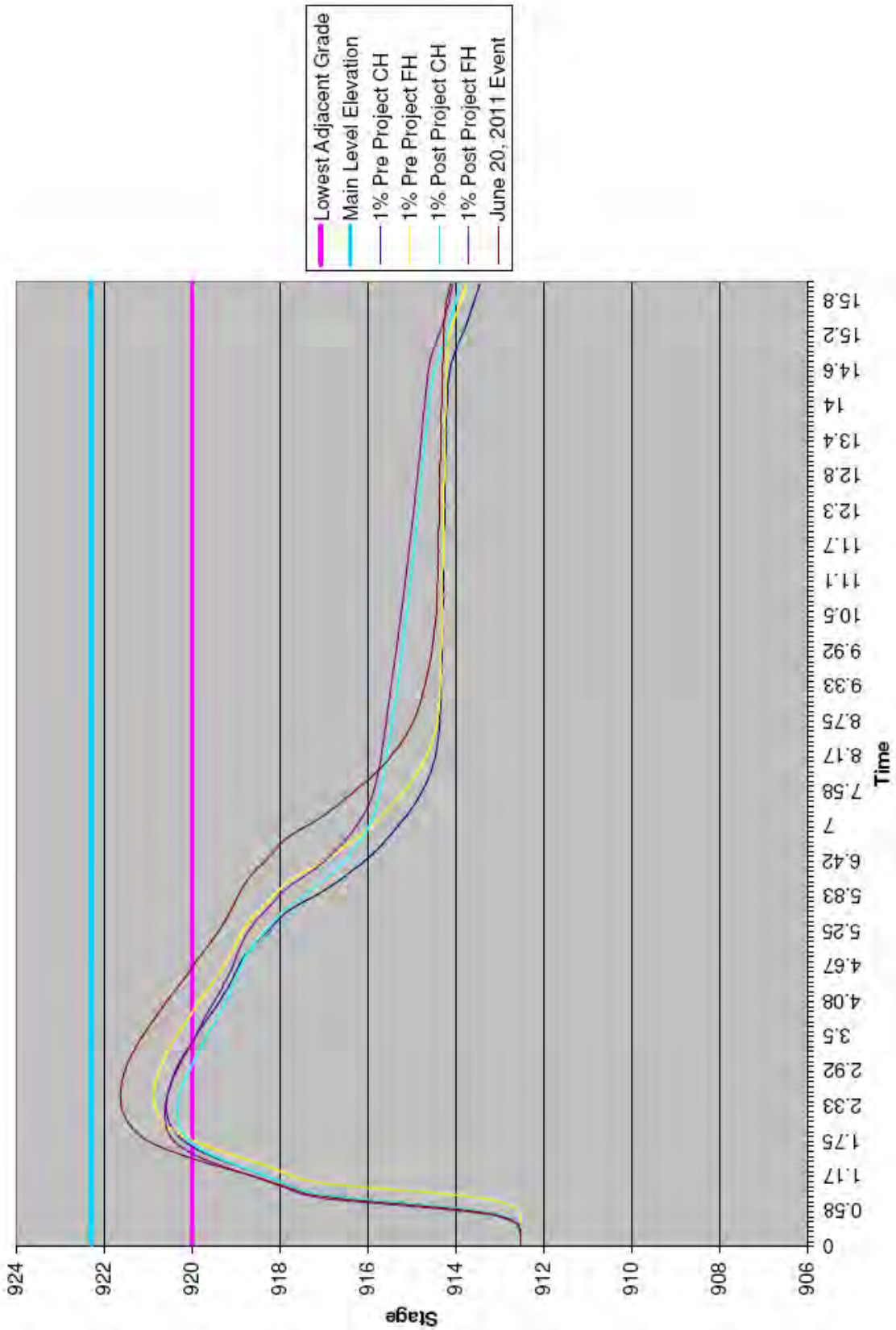


Figure 4.3 Project 1 Potential Impacts on Area 5

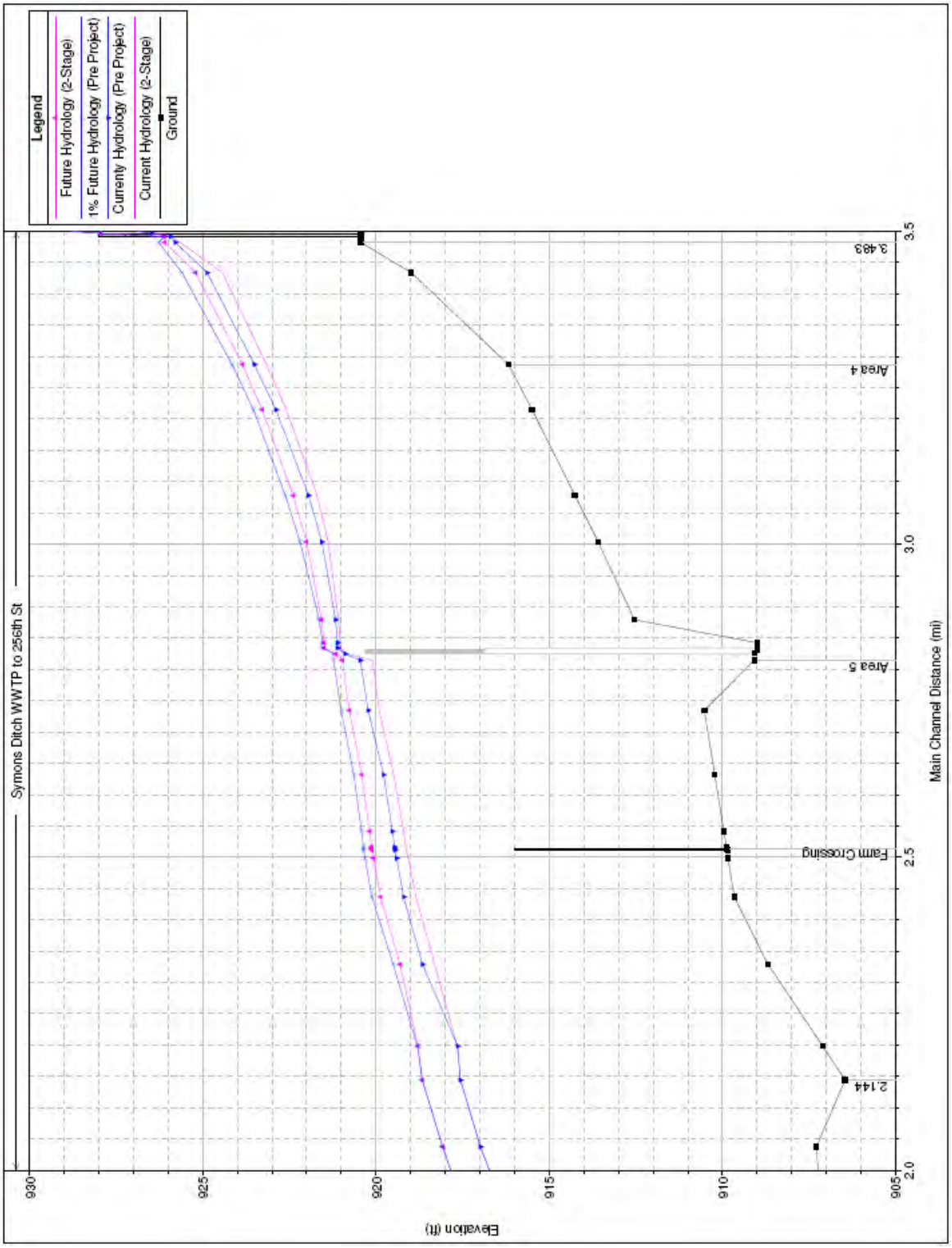


Figure 4.4: Project 2 Hydraulic Benefit Current Hydrology and Future Hydrology 1%

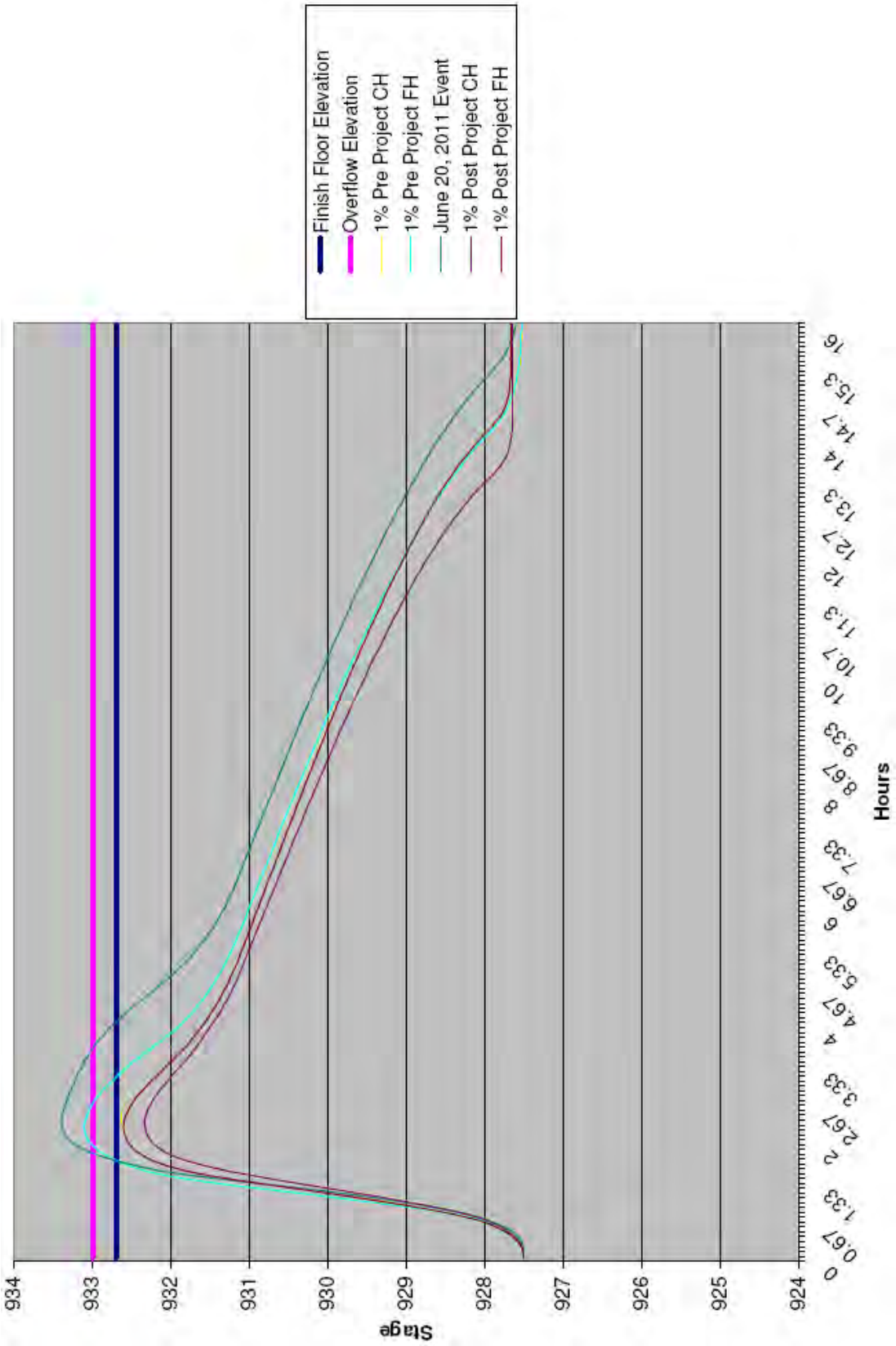


Figure 4.5 Project 3 Potential Impacts on Area 3

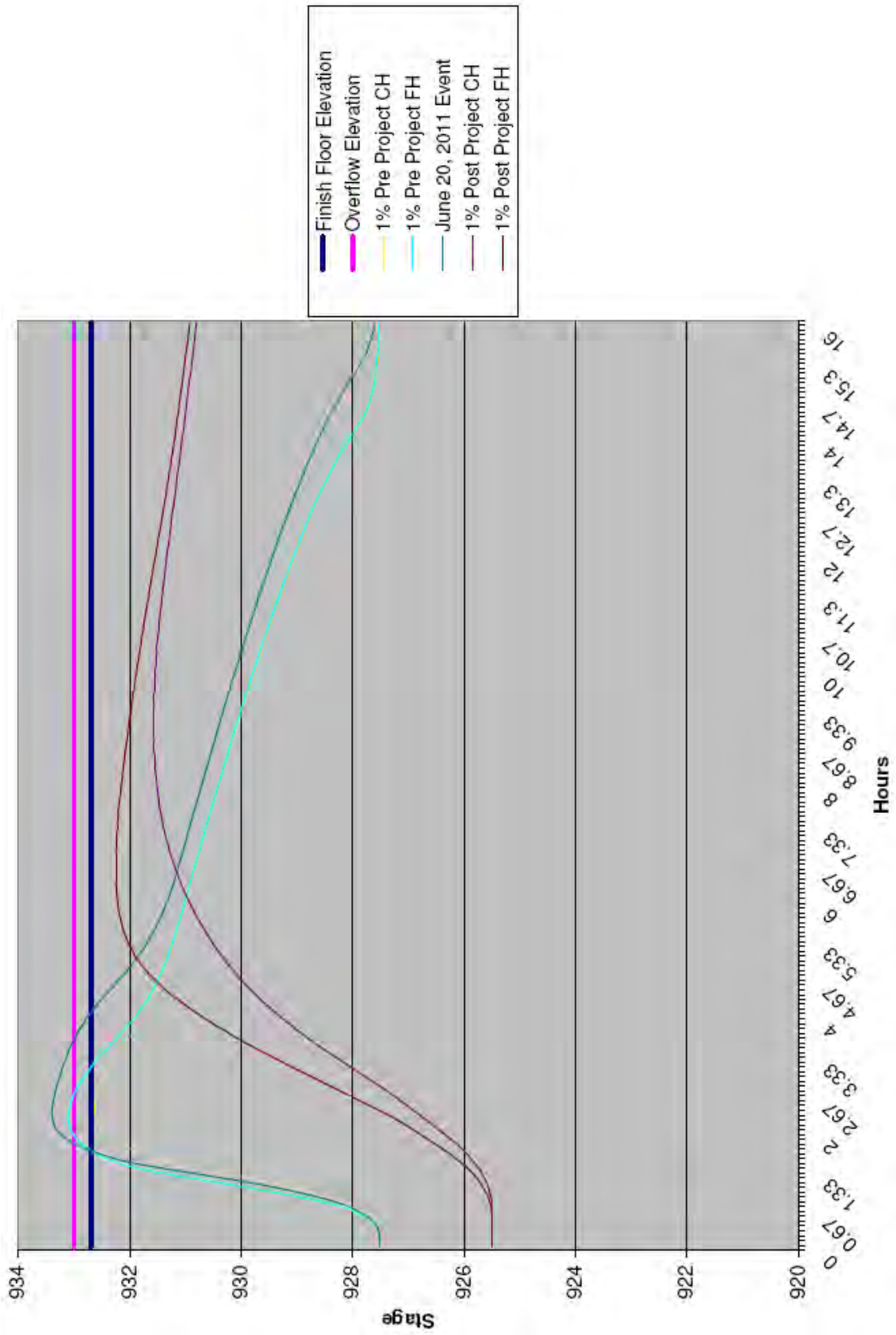


Figure 4.6 Project 4 Potential Impacts on Area 3

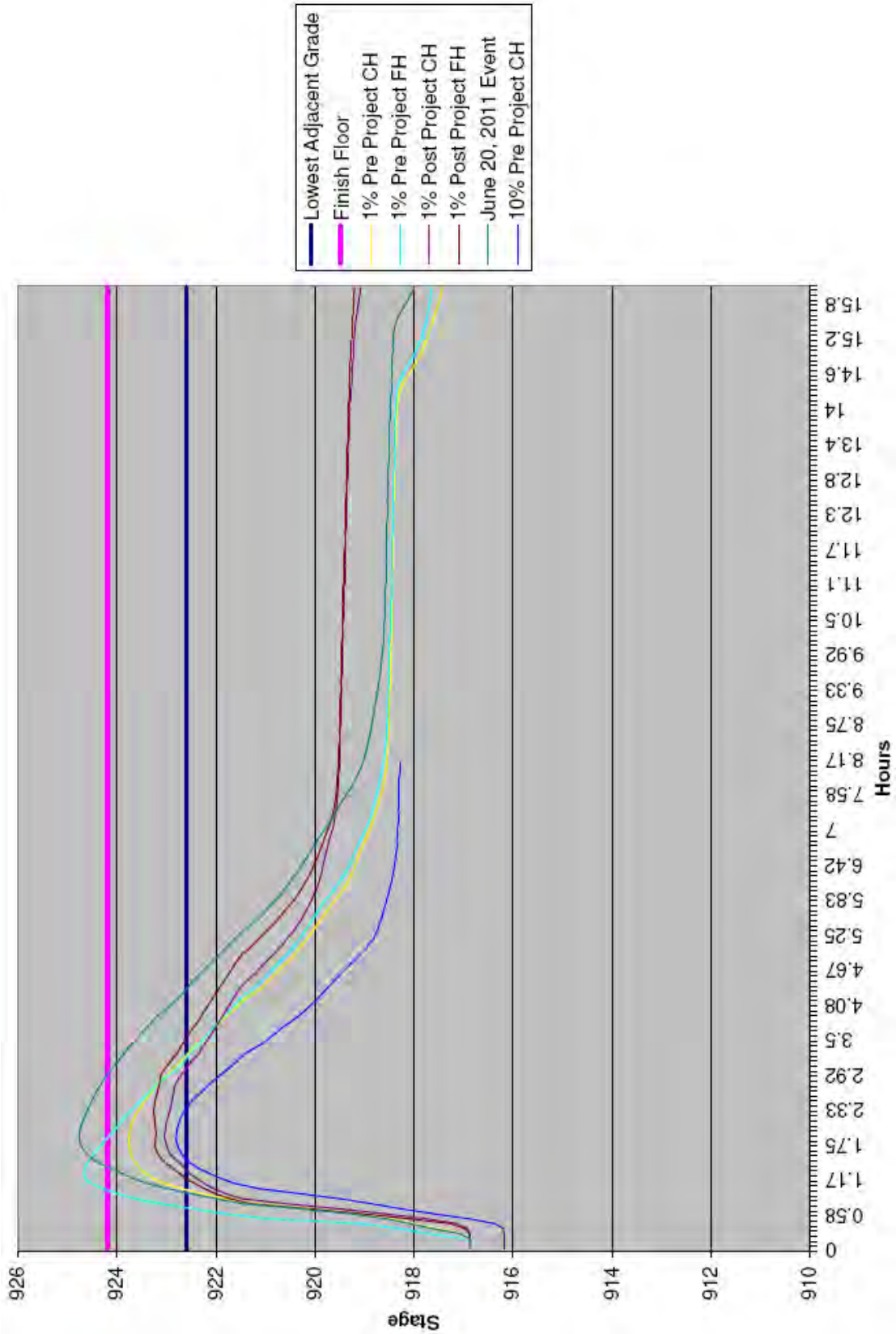


Figure 4.7 Project 5 Potential Impacts on Area 4

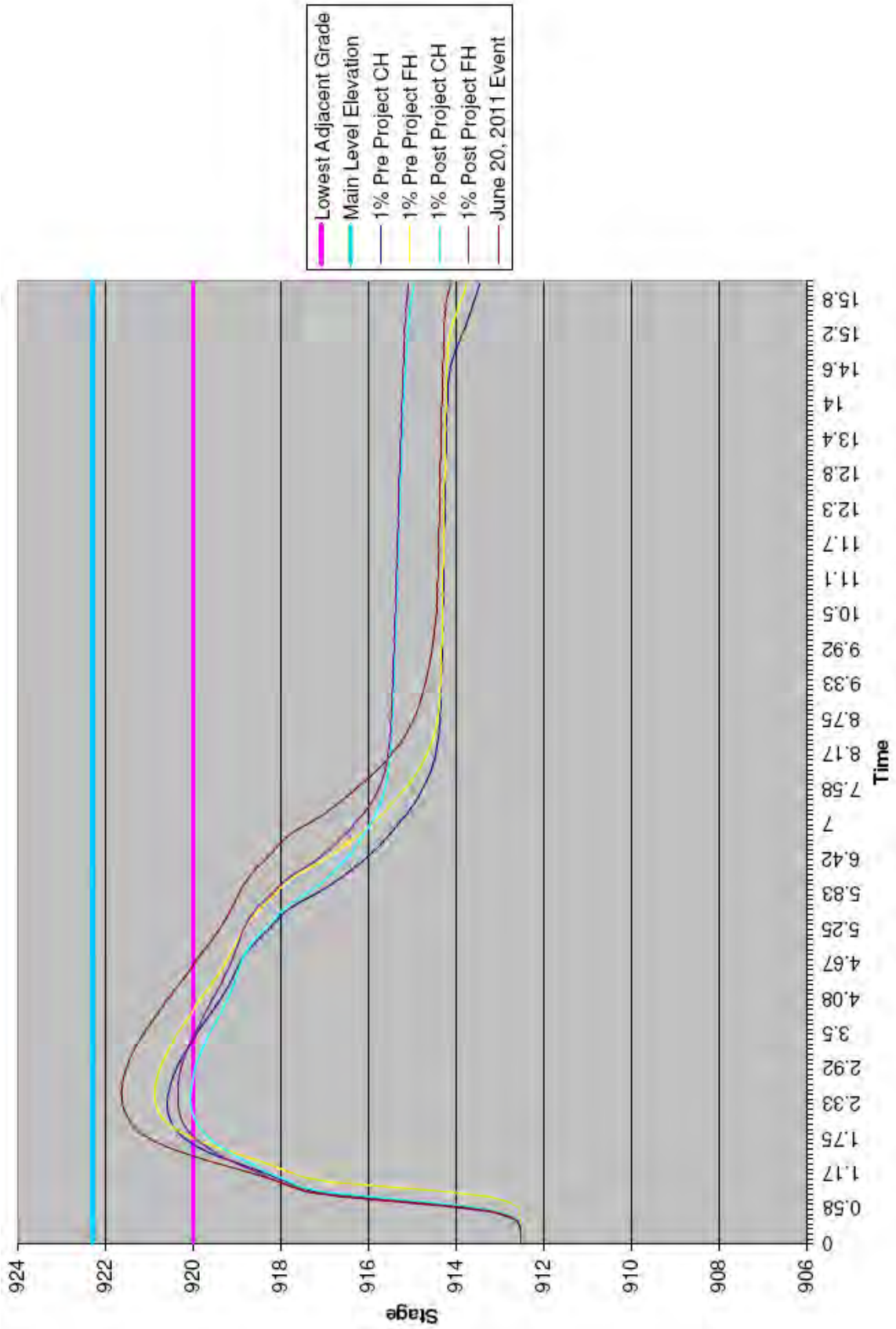


Figure 4.8 Project 5 Potential Impacts on Area 5

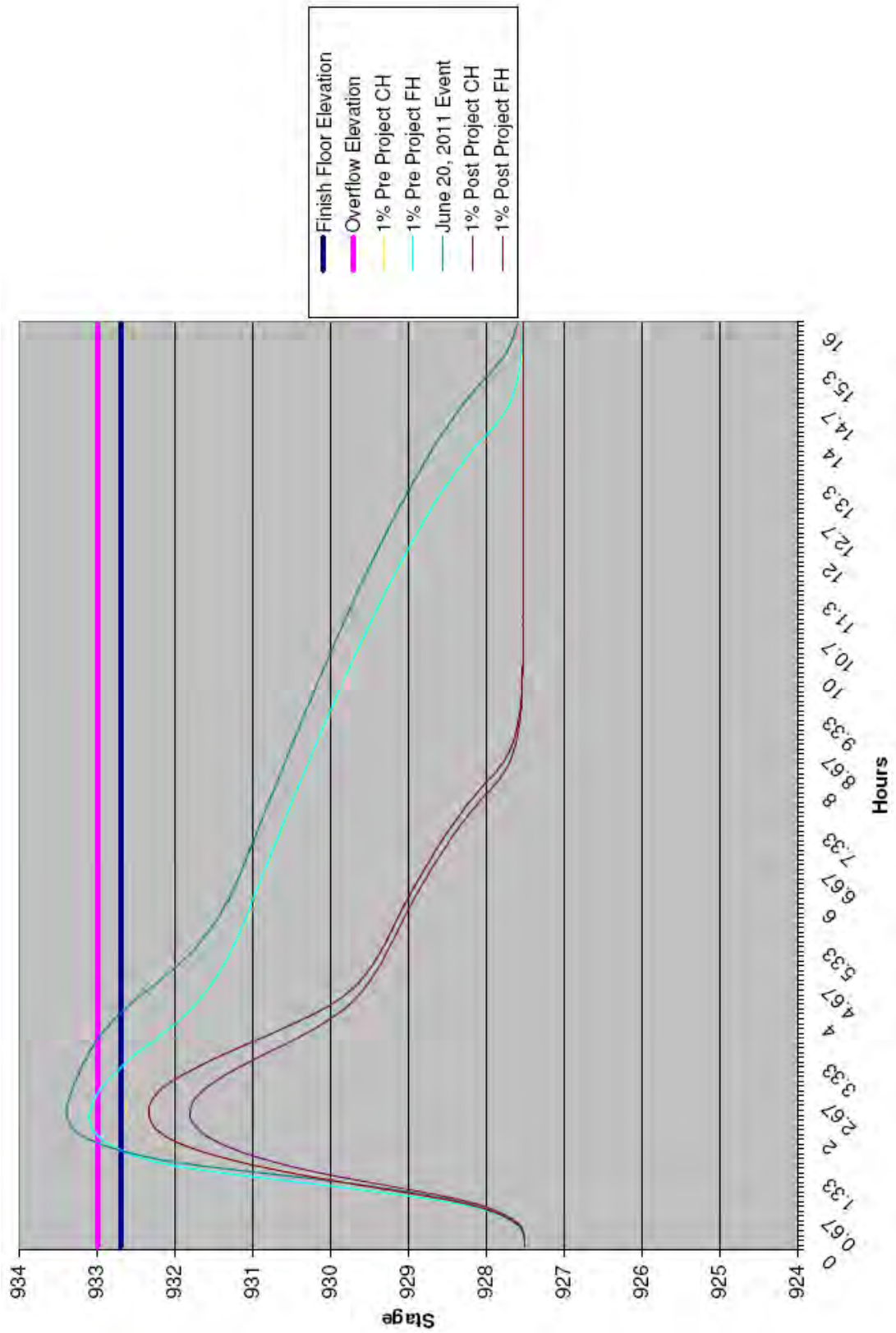


Figure 4.9 Project 6 Potential Impacts on Area 3

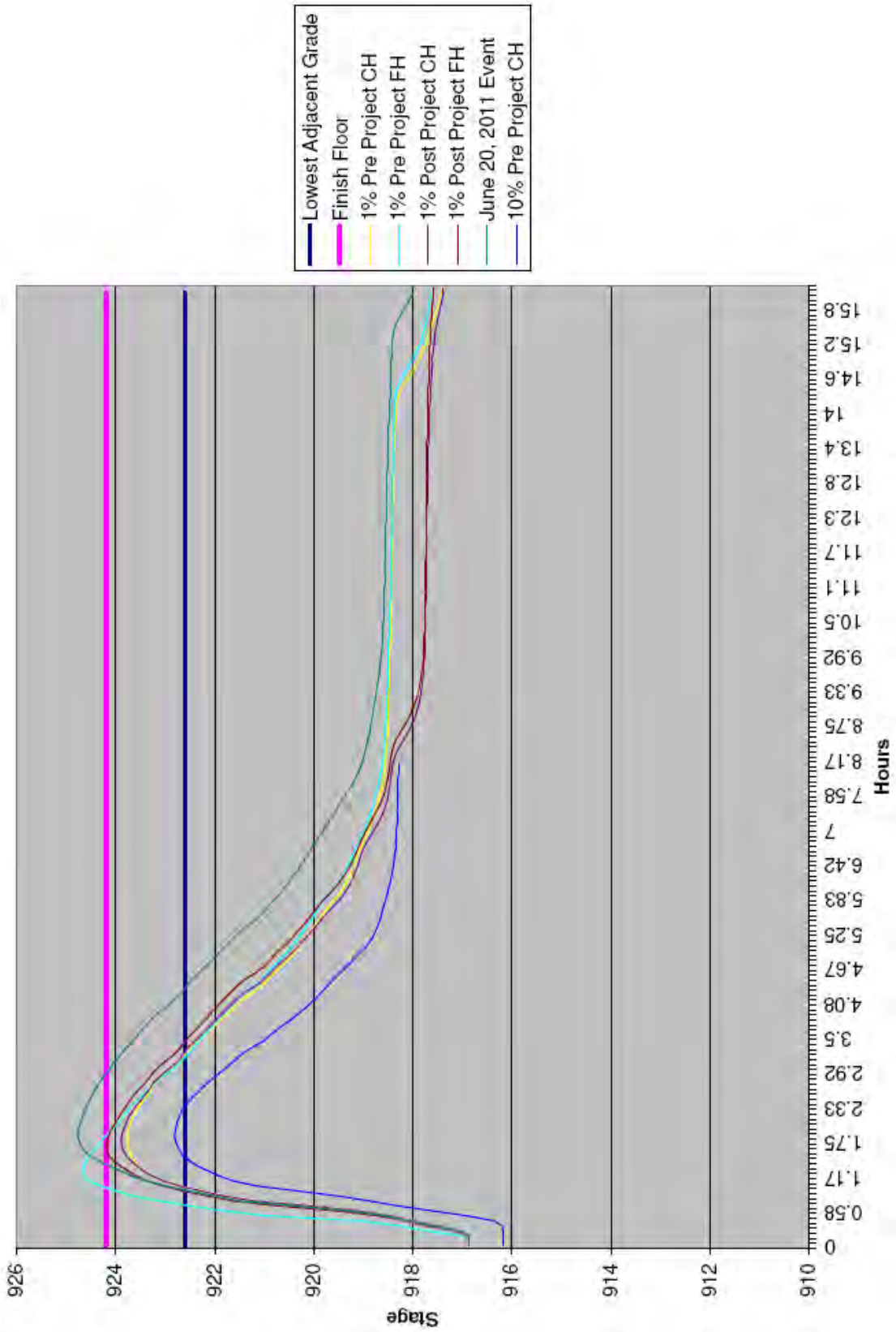


Figure 4.10 Project 6 Potential Impacts on Area 4

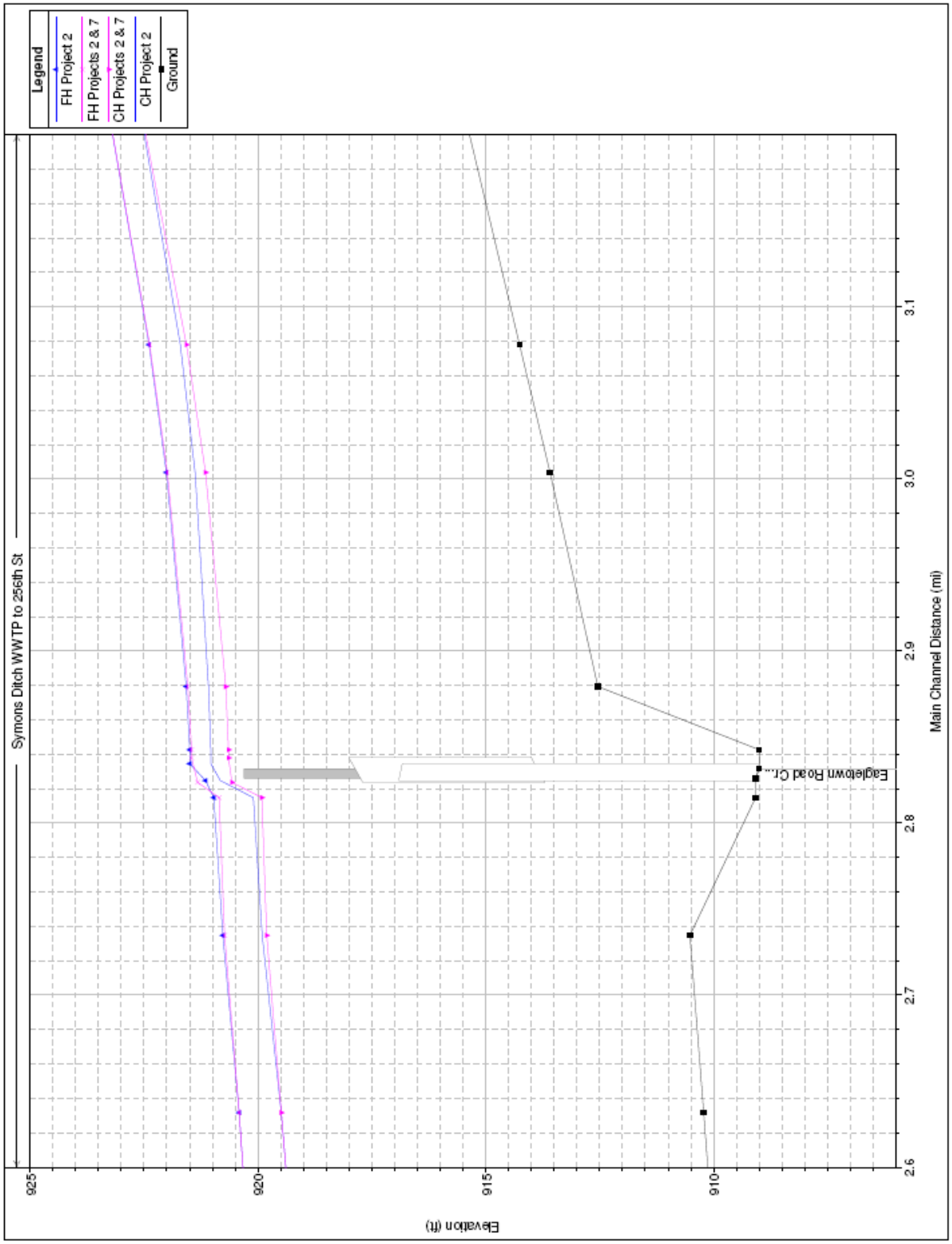


Figure 4.11: Projects 7 Hydraulic Benefit Area 5 Current Hydrology and Future Hydrology 1%

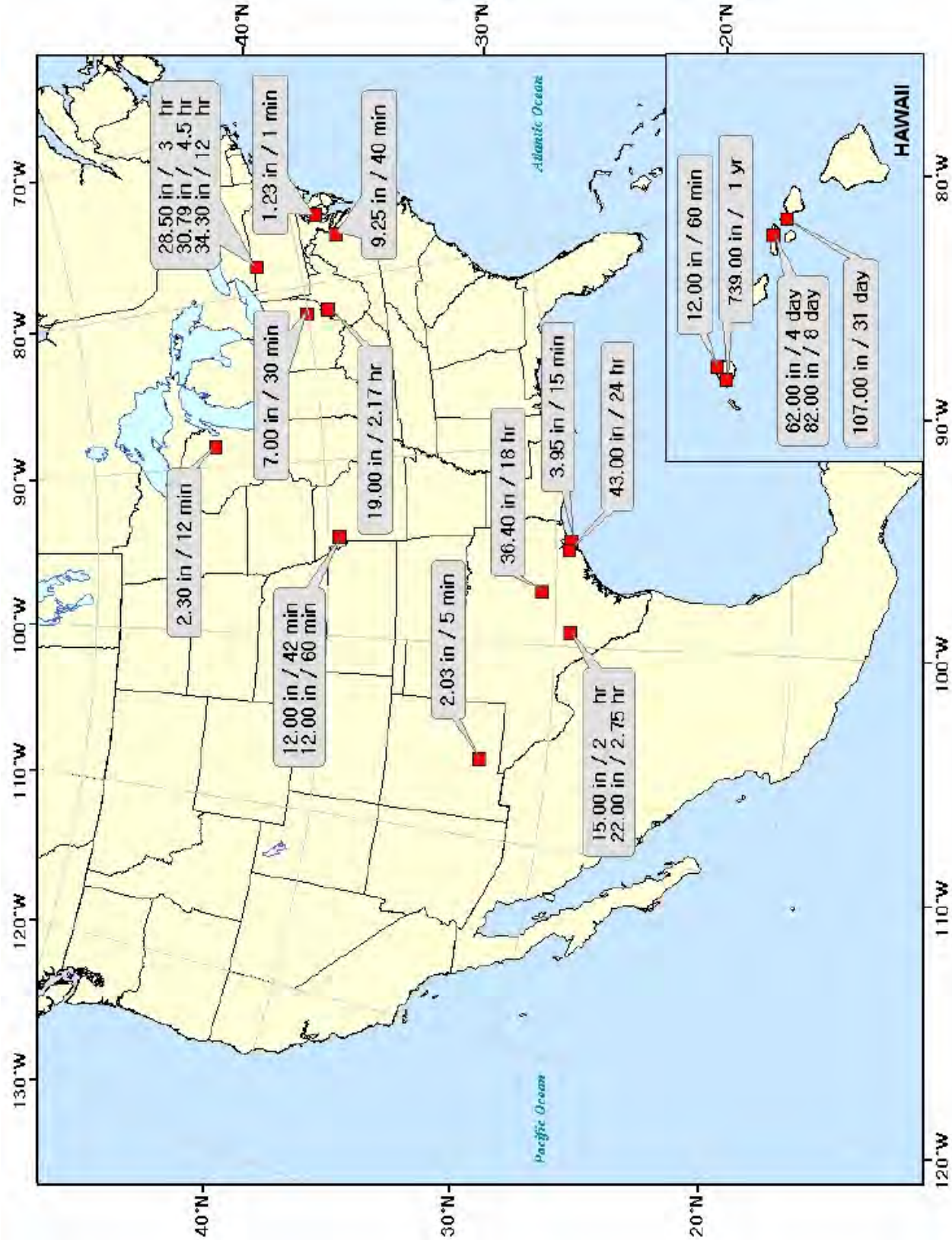


Figure 4.12 US Maximum Point Rainfall (NOAA)

Figure 5.1 Trapezoidal Ditch and Typical Erosion

Figure 5.2 Wet Area in Field, November

Figure 5.3 Headwall at beginning of Symons Ditch

Figure 5.4 Wetland of George Beam Drain