ALAN BRUBAKER, P.E., P.S.

SUMMIT COUNTY ENGINEER

August 28, 2015

County of Summit
Russell M. Pry, Executive
175 S. Main St.
Akron, OH 44308

Summit County Council Members
175 S. Main St.
Akron, OH 44308

City of Barberton
Mayor William Judge
576 W. Park Avenue, #100
Barberton, OH 44203

City of Norton
Mayor Mike Zita
4060 Columbia Woods Dr.
Norton, OH 44203

Copley Township Board of Trustees
1540 S. Cleveland-Massillon Road
Copley, Ohio 44321-1908

Re: Wolf Creek Drainage Analysis

Dear Mr.Russell Pry, Honorable County Council Members, City Mayors and Township Trustees,

Please find transmitted herewith a copy of the Wolf Creek Rehabilitation Study. This study was commissioned by the Summit County Engineer to provide public officials, concerned property owners and residents information on the magnitude of the problem of failing drainage ditches serving the Wolf Creek Drainage Basin.

Summit County property owners, within the Wolf Creek Drainage Basin, have experienced significant and substantial property damage due to flooding in recent years. Flooding losses have included the closure of Barber Road in Norton and Barberton and the closure of Collier Road on the Akron – Copley border. Properties that have been damaged include the Fred Martin Car Dealership in Barberton, the S A Comunale Company in Norton and a number of homes in Copley Township. The magnitude of the flood damages and the frequency of flooding incidents have led many to seek the assistance of the county to provide relief.

The principal drainageways, within the Wolf Creek Drainage Basin, were established as County Ditches in the early 1930's. Utilizing financial assistance through the federal WPA program, streams and ditches were cleared of debris, widened, deepened and channelized. Consisting of 21.8 miles of ditch and stream and encompassing Wolf Creek, Pigeon Creek and tributary ditches Schocalog, Viers, Copley, Frederick, Weinpert, Rousch, Black Pond, Bessemer, Infirmary, Hands and Frank these channels became the core infrastructure for draining the land within the basin. Upon completion, in accordance with the Ohio Ditch Law at the time, these improved facilities became the maintenance responsibility of the individual property owners through which the streams and drainage channels pass.

Eighty plus years has passed since the stream and ditch improvements were completed. Due to the difficulties, individual property owners face in attempting to maintain streams and ditches that flow through their properties, these facilities deteriorated and are now unable to function properly. Homes and businesses constructed within the drainage basin are dependent upon a drainage system that is no longer properly functioning due to many years of maintenance neglect. Continued development within the drainage basin is increasing the amount of runoff that must be conveyed through the deficient drainageways. The result is flooding downstream homes and businesses with increasing regularity and severity.

The attached study includes maps and photos of the drainageway problems and provides an estimate of $24M to restore the channels to their 1930's design condition. The study also recommends that a detailed hydraulic analysis of the drainage basin should be prepared as a part of the plan. The hydraulic analysis would provide the information needed to determine the nature and cost of additional improvements that may be needed to properly control today's storm water flows. The assumption is Wolf Creek area flooding cannot be properly controlled unless improvements are included in the project to accommodate the current rate of runoff in addition to the restoration of the 1930's Wolf Creek and its tributaries. While restoration of the original Wolf Creek improvement is critical to provide a functioning outlet for storm water flow, it is highly probable that today's flood flows will exceed the capacity of the restored 1930's channels. Additional improvements, within the drainage basin, that would be needed may include adding retention areas, creating wetlands, providing stream and riparian zone enhancements and possibly purchasing properties where flooding cannot be mitigated by restoring the stream and ditches. Assuming $10M to $30M as the cost of the additional improvements, beyond the restoration project, the total cost of the improvements to alleviate flooding within the Wolf Creek Drainage Basin may be between $34M and $54M. Financing a $34M improvement over a period of 30 years would require a payment of approximately $2M/YR. Financing a $54M improvement over the same 30 years requires approximately $3.2M/YR.

The costs stated herein are very preliminary. Should the project proceed, the design study and hydraulic analysis will identify in detail the improvements needed and their related cost. The study will also attempt to identify potential sources of outside funding that may be available to reduce costs for benefited properties.

The maintenance of all drainage improvements is critical to ensure that the facilities continue to function properly. Wolf Creek and its tributaries flow at a very flat grade such that sediment carried by storm water will settle out causing blockage of flow. Sediments must be removed at

regular intervals. Annual cost for maintenance of the improvements may be anticipated to be about $1M/YR.

Several methods have been discussed for implementing storm water controls within the area including the creation of a countywide storm water utility and the creation of a storm water conservancy district. It is hoped that the cost analysis included herein will be beneficial to all who are concerned with storm water issues in aiding in the development of a plan for moving forward.

The Ohio Petitioned Ditch statutes could be utilized as the legal mechanism for improving storm water drainage within the Wolf Creek area, whereby costs for construction and maintenance would be prorated among the various properties within the drainage area based upon the respected benefits conferred upon each individual property. This means that similar properties located in similar areas pay similar assessment costs. Properties more remote from the improvement may pay proportionately less than properties adjacent to the improvement and properties that are heavily developed with buildings and parking areas may pay proportionately more than properties developed as individual home sites. Properties consisting of forests or wetlands may realize little benefit and consequently share in little or none of the project cost.

The Wolf Creek Drainage Basin encompasses approximately 52,500 Acres (17,016 in Medina County and 35,450 in Summit County) consisting of approximately 41,000 parcels of land (7,192 in Medina County and 33,824 in Summit County). Using the lower cost of improvement ($2M/YR) and including the maintenance cost ($1M/YR) the annual cost to property owners will be approximately $3M/YR. From this, it may be estimated that the average cost per parcel of land would be about $73/YR or that the average cost per acre of land would be about $57/YR. A detailed analysis of development within the drainage area is needed to determine a cost for a typical homeowner; however, the average annual per parcel assessment for construction and maintenance of the improvements may be between $70 and $100. Given the magnitude of flooding that has occurred and the negative economic impact this flooding has on properties within the Wolf Creek Drainage Basin one may conclude that the benefit of the improvement exceeds the cost.

Since the early 1980's Summit County has been successfully managing drainage within subdivisions where the drain facilities have been established as County responsibility through the Ditch Petition process provided by Sections 6131 and 6137 of the Ohio Revised Code. This project would require the Joint County Ditch process provided by Section 6133 of the Ohio Revised Code which is similar to the process in Section 6131. Please take time to review this report, consider the Ditch Petition process as a solution, and pass this report along to concerned citizens within the study area. If the Township Trustees, and/or property owners, desire to proceed with a petitioned improvement, my office will be pleased to provide assistance with the preparation of the necessary petition documents.

Should you have any comments or questions, please do not hesitate to contact Tim Boley of this office at (330)-643-8430 or via e-mail at tboley@summitengineer.net.

Sincerely,

Alan Brubaker, P.E., P.S.
Summit County Engineer

TRB/AB/xx

enclosure

cc: Larry Fulton
Tim Boley
file

ms consultants, inc.
engineers, architects, planners

One South Main Street, Suite 801
Akron, Ohio 44308-1864
p 330.258.9920
f 330.258.9921
www.msconsultants.com

June 30, 2015

Mr. Larry Fulton, PE
Chief Deputy Engineer
Summit County Engineer
538 E. South Street
Akron, OH 44311

Re: Drainage Engineering: Task Order #2
Wolf Creek Rehabilitation Study
Conceptual Cost Estimate

Dear Mr. Fulton:

ms consultants, inc. thereby submits the attached summary report which describes all tasks conducted as part of the scope of work for developing conceptual cost estimates for the rehabilitation of Wolf Creek.

Field Investigations were conducted to determine sediment depth, significant woods and other obstructions/debris, and erosion along Wolf Creek and Tributaries for approximately 22 miles of ditch length. The field investigations were conducted over a three-day period at various locations throughout the project area.

GIS Strip maps were prepared for the entire project length using available imagery and shapefiles from the Summit County Auditor's office. The maps show observations from field investigations including locations where sediment was identified, eroded banks, tree logs, debris, obstructions in the creek and pictures taken during the field investigations. A total of 45 GIS panels were created along the entire length of Wolf Creek and tributaries.

A conceptual construction cost estimate for the restoration of Wolf Creek and its tributaries was developed. The cost estimate included line items for clearing and grubbing, excavation sediment removal, bank stabilization, and removal of structures and obstructions to reestablish the 1930s condition of Wolf Creek and its tributaries. The total project cost estimate is approximately $24 million.

In addition, Summit County has requested a scope of work to conduct hydrologic and hydraulic modeling of Wolf Creek and its tributaries and portions of Hudson Run and Tuscarawas River in Summit County. ms consultant's Scope of Work and fee is included in Appendix A – Conceptual Cost Estimate Summary.

Federal, state and local permitting requirements and associated tasks have been identified and will include an Ohio EPA NPDES permit, U.S. Army Corp of Engineers (USACE) Section 401/404 permits and FEMA Flood Hazard Area Development Permit. ms consultants coordinated with the USACE in regards to the 401/404 permitting and confirmed that an Individual section 401/404 permit may be required unless waived

by the USACE. Also, the USACE indicated it is not likely that mitigation would be required for stabilization impacts greater than 500 linear feet.

Other items discussed by ms consultants with your staff during the meeting of December 16, 2014, have been addressed in the summary report include environmental concerns with waste removed from streams near manufacturing/industrial facilities and the impacts of sedimentation due to Barberton Reservoir.

The letter report attached with this summary provides a detailed discussion of all the tasks and includes appendices providing the deliverables for the scope of Work for Wolf Creek Rehabilitation Task Order #2. Upon the County's review of this project, we would like to propose a meeting to discuss. Should you have any questions in the meantime, please feel free to call me at (614) 898-7100.

Sincerely,

Brenda I. VanCleave, P.E., CPESC, CFM
Project Manager

(BIV:abs)

cc: Tim Boley, Summit County Engineer's Office
MDK
File (Contract)

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APPENDIX A

CONCEPTUAL PROJECT SUMMARY

PROJECT OBJECTIVES

ms consultants was contracted by the Summit County Engineer's Office (SCEO) to develop a conceptual cost estimate for the rehabilitation of Wolf Creek and its tributaries. The goal of the project was to return the streams to the cross-sections of the last rehabilitation project, which was 1930. The total amount of stream evaluated was approximately 22 miles. Per our July 9, 2014, Scope of Services, we have performed the following tasks:

Field Investigation

Field investigations were conducted along Wolf Creek and its tributaries (approximately 22 miles of ditch length) over a three day period at various locations throughout the project area during the week of March 16, 2015. Field investigations were done to determine sediment depths, areas of significant debris/obstructions in the creeks, and bank erosion.

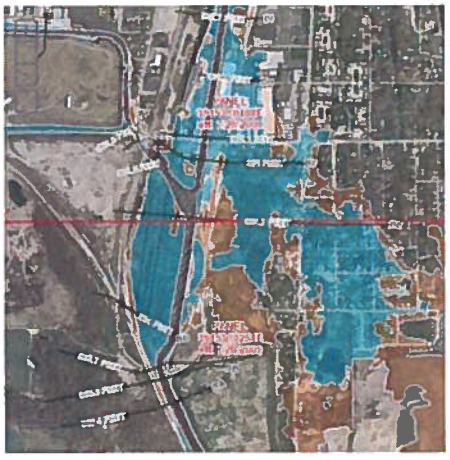
Sediment depth was estimated from field measurements at various locations along Wolf Creek and its tributaries. In areas where sediment depths could not be adequately estimated during our field investigations due to high water and /or frozen soils, digital surveys were performed using Google Maps and Bing Maps to supplement any sediment and obstructions observed. Doing so provided a "worst case" scenario/cost to remove what was present. A field survey to develop cross sections at 300 to 500 foot intervals are recommended to secure a more accurate estimate of construction costs.

Analysis of Field Conditions

GIS strip maps were prepared for the entire project length using available imagery and shapefiles from the Summit County Auditor's office. The maps show several observations and locations from our field investigations where sediment, eroded banks, tree logs, debris, and obstructions were identified in the creek as well as pictures taken during the field investigations. Due to the conceptual planning level of this study, the mapping scale was increased from 1"=100' to 1"=200' scale. A total of 45 GIS panels were created along the entire length of Wolf Creek and its tributaries. Appendix B includes all the GIS strip maps for the project.

Photo inserts were created on the strip maps using select photographs taken during the field investigation during the week of March 16, 2015. These photos convey more heavily impacted areas of the stream. A CD containing all photographs taken during the field investigation are provided in Appendix C.

Permitting Requirements



Regulatory permitting concerns including wetland, floodplain, USACE, and Ohio EPA have been evaluated and are summarized below:

a) FEMA - The majority of the Wolf Creek tributary area is located in FEMA designated Zone AE with floodway. As a result, all excavation within the ditches and all sediment spread along the banks will require a Special Flood Hazard Development from the County's Floodplain Manager. Since the proposed work is in a FEMA Zone AE with a floodway, a hydraulic analysis (HEC-RAS model) of the corridor will be required to evaluate any changes in base flood heights so as not to

impact other properties upstream or downstream of the proposed improvements. This includes an evaluation of the Tuscarawas River as well. An inset of the Tuscarawas floodplain at the Wolf Creek confluence is provided above.

b) Ohio EPA NPDES – This project would disturb more than 5 acres and maintenance projects that disturb more than 5 acres are subject to the Construction and Post-Construction BMP requirements of Ohio EPA's NPDES General Construction permit. Water quantity and quality controls will be required as well. While the additional regulatory burden is cumbersome, the use of post-construction BMPs along the corridor can be used to decrease flooding impacts in an area that is frequently impacted. The cost to meet this regulatory requirement will depend on hydraulic and hydrologic modeling results that will direct the number and type of treatment that is required.

c) Section 401/404 Permits (USACE/EPA) – ms consultants coordinated with the U.S. Army Corps of Engineers (USACE) in regards to the 401/404 permitting. USACE mentioned that since Wolf Creek is not a "Section 10" stream, the excavation of accumulated sediment would likely not require a Section 404 permit, as long as the excavated material is disposed of in a location that is above the Ordinary High Water Mark of the stream channel. However, stream stabilization of more than 500 feet would require an Individual Section 404 permit and a Section 401 Water Quality Certification unless waived by the USACE. Also, the USACE indicated that it is not likely that mitigation would be required for stabilization impacts greater than 500 linear feet.

Also, in 2014, USEPA and USACE released a new rule redefining "Waters of the U.S." This new rule broadens the number of county maintained ditches requiring CWA Section 404 federal permits. A ditch would be considered jurisdictional if the ditch has a bed, bank, and ordinary high water mark (OHWM) and flows directly into a "water of the U.S.". Additional time and budget will be required to meet the requirements of the Section 404/401 permits.

Additional Considerations

a) Confluence conditions of the Tuscarawas River with Wolf Creek, including sediment and debris jams and backwater flow condition were reviewed. Debris and sediment were observed at the mouth of Wolf Creek. Additional significant sedimentation was identified approximately 600 feet northeast of the mouth. Quantities have been included in the conceptual cost estimate for removal of the debris and sediment; however, a more detailed study is recommended to assess the feasibility and cost effectiveness of dredging in this area.

Also, referring to FEMA Map 39153C0188E, there is substantial floodway and floodplain around the confluence of the Tuscarawas River and Wolf Creek; however, the railroad crossing just west of the confluence serves as a dam preventing flow from the Tuscarawas back into Wolf Creek. Any work completed within the Wolf Creek Tributary area will need to be analyzed to identify adverse impacts caused by increases in flood flows downstream. Details regarding the modeling effort are explained in the permitting section above.

b) A major cost of any dredging project is the disposal of spoils. One common way to address spoil removal and to decrease project costs is by leaving the spoils on the edge of the bank. However, one disadvantage is when water gets over the banks during a flooding event, it will not drain back into the stream when the floodwaters recede. Unit costs for excavation and

spreading of soil is estimated at $20 per cubic yard. Unit costs for excavation and hauling the materials offsite is estimated at $30 per cubic yard. Costs were provided for excavation and spreading of soil when the dredge location would allow for materials to be better graded into the site (farm fields, rural areas, etc.). In urban areas and other areas where leaving the spoils would be detrimental to the landscape, pricing was provided to haul the dredged material offsite.

c) Another item of concern of dredged material is with regard to waste disposal of dredged material especially near manufacturing/industrial facilities and agricultural properties. The conceptual cost estimate assumes that 20% of the material removed from the streams near manufacturing/industrial facilities will be characterized as potentially regulated waste. All waste disposal activities will have to follow Federal, State, and local requirements. At this time, there are no regulations regarding the removal of sediment from areas adjacent to agricultural properties.

d) ms consultants performed a field visit and made several observations of the Barberton Reservoir to consider sedimentation downstream of the reservoir. Appendix C includes the pictures of the Barberton Reservoir area during field visit on May 28th 2015. It was noted during the field visit that there was debris and sediment immediately downstream of the dam.

Conceptual Cost Estimate

Based on our review of site conditions, we have developed a conceptual cost estimate for the rehabilitation of Wolf Creek and its tributaries (approximately 22 miles of ditch length). A spreadsheet of the construction cost summary for all tributaries bid as one project and individual summaries for each tributary area is included in Appendix D. The cost estimating was done both as a whole watershed cost and as a per ditch cost. The lump sum bid items in the per ditch cost were modified from the whole watershed cost based on economies of scale. Example: the larger the project, the fewer times mobilization would be required.

PROPOSED SCOPE OF SERVICES
HYDROLOGIC AND HYDRAULIC MODELING
WOLF CREEK AND TRIBUTARIES

Summit County has requested a scope of work for conducting hydrologic and hydraulic (H&H) modeling of Wolf Creek and its tributaries and portions of Hudson Run and the Tuscarawas River in Summit County. The hydrologic and hydraulic model will enable the County to make informed decisions based on the following information:

a) Changes in flow from the improved Wolf Creek watershed to the Tuscarawas River and other downstream areas.

b) Determine pinch points along the Wolf Creek and its tributaries based on current conditions.

c) Develop and analyze the impact of conceptual flood control alternatives on Wolf Creek and its major tributaries upstream of confluence with Tuscarawas River including restoring past floodplains to predevelopment location and size, the addition of green infrastructure within the watershed, inline detention, and high-flow stream diversions and spillways.

ms consultants inc. proposes that the hydrologic and hydraulic model be developed for Wolf Creek watershed within the county limits which includes the Wolf Creek and tributaries and the Tuscarawas River from confluence with Hudson Run to Van Buren Road downstream. Hudson Run will be studied from the confluence with Tuscarawas River downstream to Lake Dorothy upstream.

Hydrologic and Hydraulic models can be developed in steady or un-steady states. Steady-state models use peak discharges from the hydrologic analysis and a downstream boundary condition to determine peak water surface elevations for various recurrence intervals. Unsteady state models use hydrographs and upstream boundary conditions to route the flows and determine the water surface elevations at various locations that vary with time. Unsteady models are very useful in areas where there are large storage areas in the floodplain that provide a significant attenuation of the flood wave and also when modeling dams/inline weirs that regulates discharges downstream. ms consultants has vast experience with both steady and un-steady state models and will develop the appropriate methodologies for the Wolf Creek watershed in consultation with the County.

Data Collection/Coordination

Data collection/Coordination task will include the following tasks:

a) Obtaining any previous H&H studies for the study streams, including coordination with the USGS on the H&H study of Pigeon Creek and tributaries.

b) Coordination with ODNR on flood control structures on major lakes/reservoirs within the watershed

c) Coordination with the SCEO to obtain engineering plans for stream crossings.

Hydrologic Modeling

A rainfall-runoff model using U.S. Army Corps of Engineers (USACE) HEC-HMS software will be

developed for the Wolf Creek watershed to determine peak discharges and hydrographs at several locations along the project's streams. All inputs required by the rainfall-runoff model will be developed which include rainfall data, time of concentration, curve numbers, and reach routing. All major reservoirs providing flood control such as the Barberton Reservoir, Columbia Lake and Lake Dorothy will be included in the HEC-HMS model to model flood storage and peak attenuation. HEC-HMS model will be calibrated using available data from the USGS and other stream gage sources.

Flood Frequency Analysis will be conducted to determine peak discharges for the Tuscarawas River downstream of its confluence with Wolf Creek using available USGS Gages.

Field Survey

The ms survey team will obtain cross sections of Wolf Creek and its tributaries within Summit County. Cross sections will be collected every 300 feet along Wolf Creek and Pigeon Creek, and every 500 feet on its tributaries. We will attempt to recreate the cross sections from the 1930 Wolf Creek Drainage plans. Each section will be top of bank to top of bank plus 10 feet each side. The horizontal datum will be NAD 1983 (2011) reference frame and the Coordinate System will be Ohio State Plane, North Zone. The vertical datum will be North American Vertical Datum of 1988. Both horizontal and vertical control will be established from a VRS/GPS Survey.

In addition, the ms survey team will also perform cross-sections on Hudson Run from Wolf Creek to the second upstream reservoir and along the Tuscarawas River from the confluence of Wolf Creek to S. Van Buren Avenue. The cross sections will be at an interval of 300 feet. Hudson Run is approximately 12,500 l.f. and Tuscarawas River is approximately 6,400 l.f.

At roadway crossings, an additional upstream and downstream cross section will be collected from top of bank to top of bank. The roadway sections will also record the structure/culvert location, the low chord elevation, and deck information.

The outlet structures for the Barberton Reservoir, Lake Dorothy, and Columbia Lake will also be surveyed which includes the principle spillway, emergency spillway, and any other lake appurtenant structures.

Hydraulic Modeling

Hydraulic Models will be developed using USACE HEC-RAS software. Cross-sectional geometry and structural geometry will be obtained from stream survey. Manning's n values and other required parameters will be developed as required by HEC-RAS. An existing conditions model and a proposed conditions models based on the proposed 1930s cross-sections will be developed to determine changes in flood elevations and the impact of the proposed improvements on downstream structures. HEC-RAS model will be calibrated using available data from the USGS and other stream gage sources.

Flood Mitigation Alternatives

ms consultants will analyze up to four various forms of flood control alternatives to exhibit the impact they will have on decreasing flows and flood peaks on areas downstream of the improved Wolf Creek. Example alternatives include restoring past floodplains to predevelopment location and size, recreating wetlands, the addition of green infrastructure within the watershed, inline detention, and high-flow stream diversions and spillways. A cost estimate for each alternative shall be provided. A cost/benefit matrix will be developed to qualify and quantify the proposed solutions. Detailed design will not be completed for the various alternatives.

Proposed Fee for Field Survey and H&H Work

Based on assumptions made in the above Scope of Work, we propose a not to exceed, lump sum budget of Three Hundred Ninety Seven Thousand, Six Hundred and Fifteen Dollars ($397,615.00) for this assignment. All invoicing will be completed on a monthly basis, using the attached 2015 rate schedule.

Please note that the above proposal does not include the civil work associated with the creation of a construction bid set, such as the 1930 Wolf Creek Drainage plans.

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ms consultants, inc.
SUMMIT COUNTY ENGINEER
DRAINAGE ENGINEERING SERVICES
HOURLY RATE SCHEDULE 2015

Name	2015 Hourly Rate
Project Director	$79.42
Project Manager	$59.57
Sr. Environmental Engineer	$61.13
Sr. Planner	$47.03
Sr. Environmental Specialist	$57.48
Planner VI	$43.89
Engineer VI - Environmental	$43.89
Engineer VI - Environmental Specialist	$43.89
Graduate - Planner	$29.26
Graduate - Environmental	$28.74
Graduate - Environmental Specialist	$28.22
Sr. CAD Technician	$31.35
CAD Technician	$24.66
Clerical	$21.95
Registered Surveyor	$47.03
Sr. Field Technician	$30.83
Field Technician	$25.71
Sr. Construction Administrator	$53.30
Construction Administrator	$45.46

The above rates do not include overhead and profit factors. All non-exempt employees have overtime rates of 1.5 times their normal billing rate. These rates expire December 31, 2015.

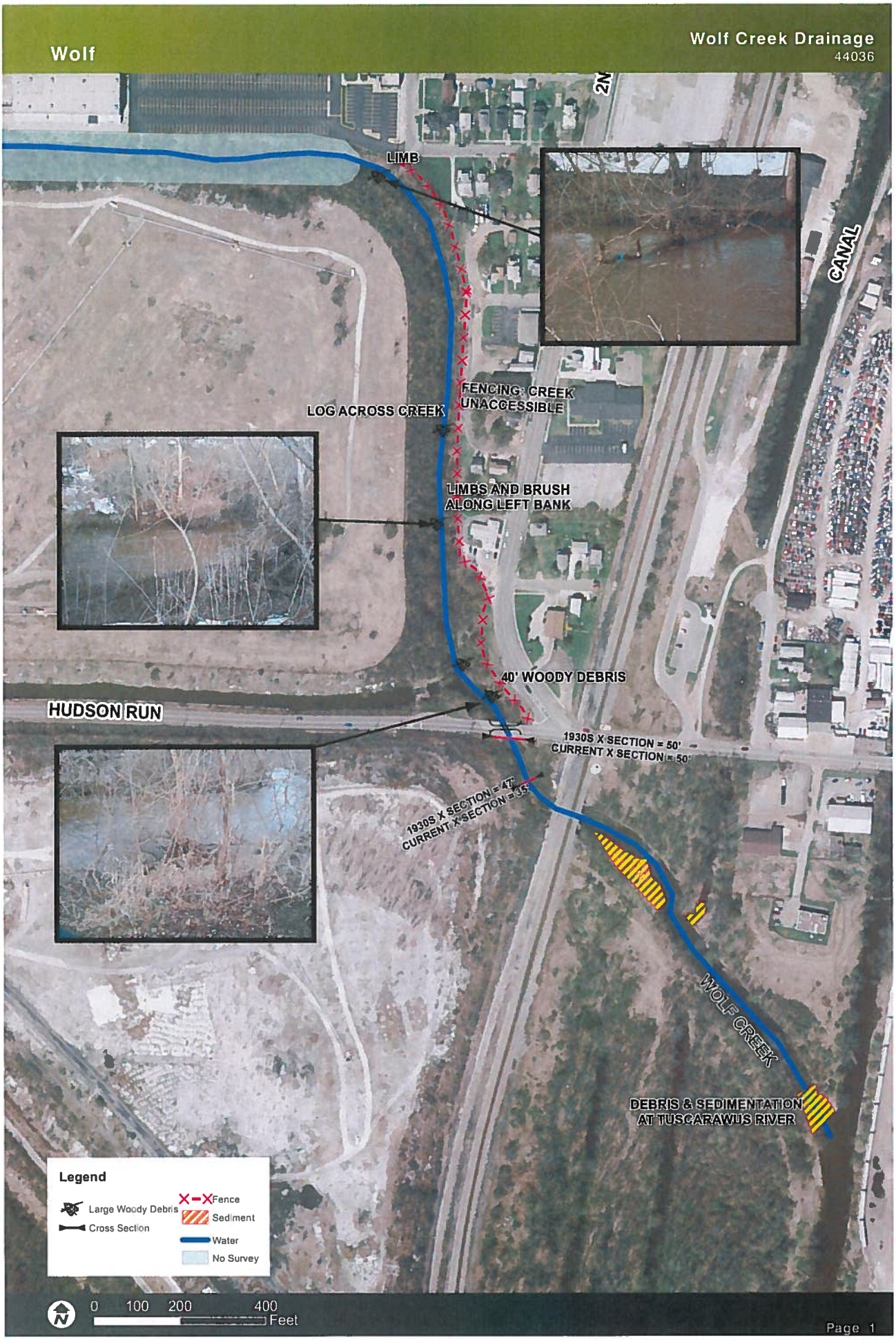
2015 FAR/AASHTO Overhead Rate = 167.50
Fee: 12%

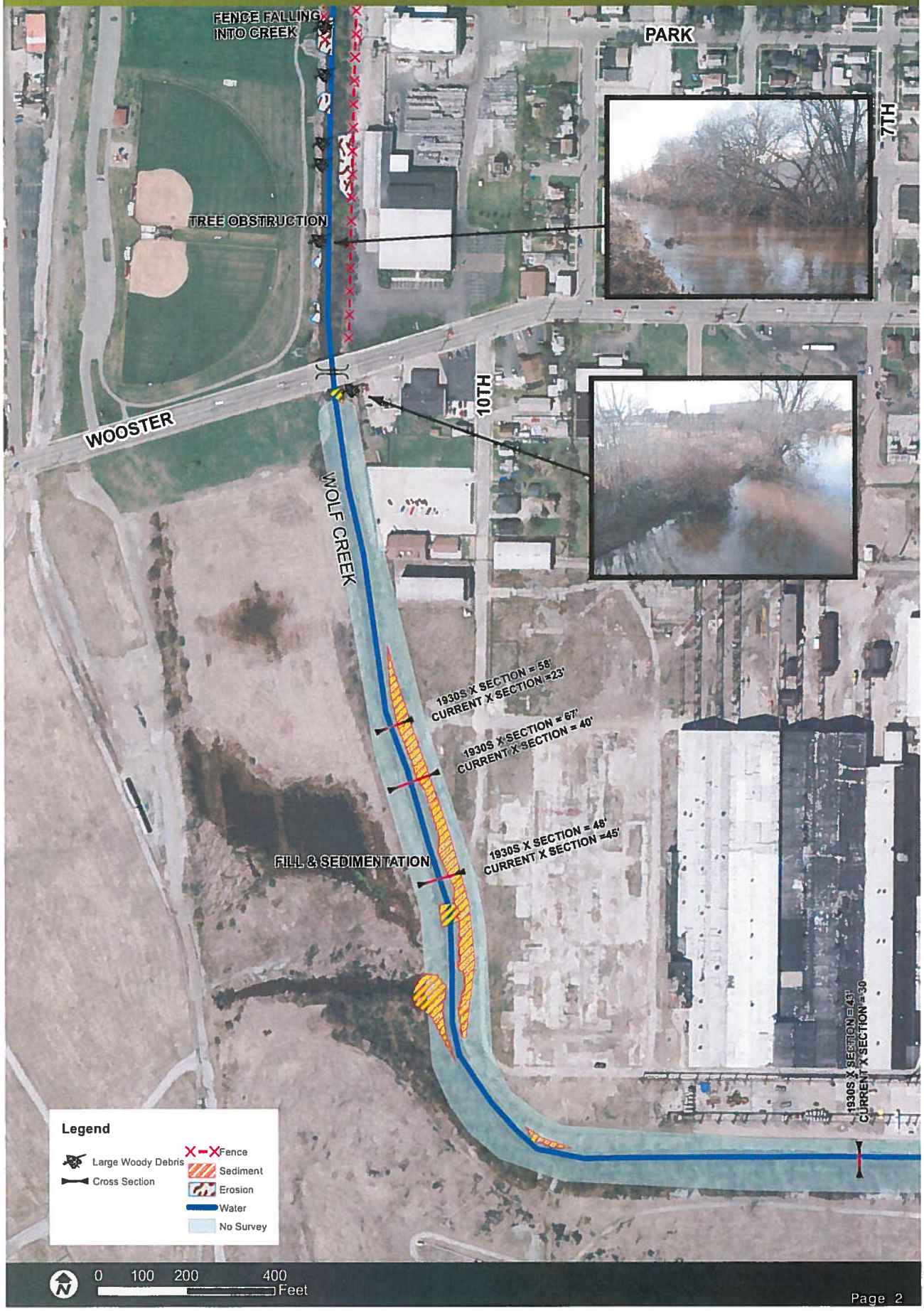
APPENDIX B

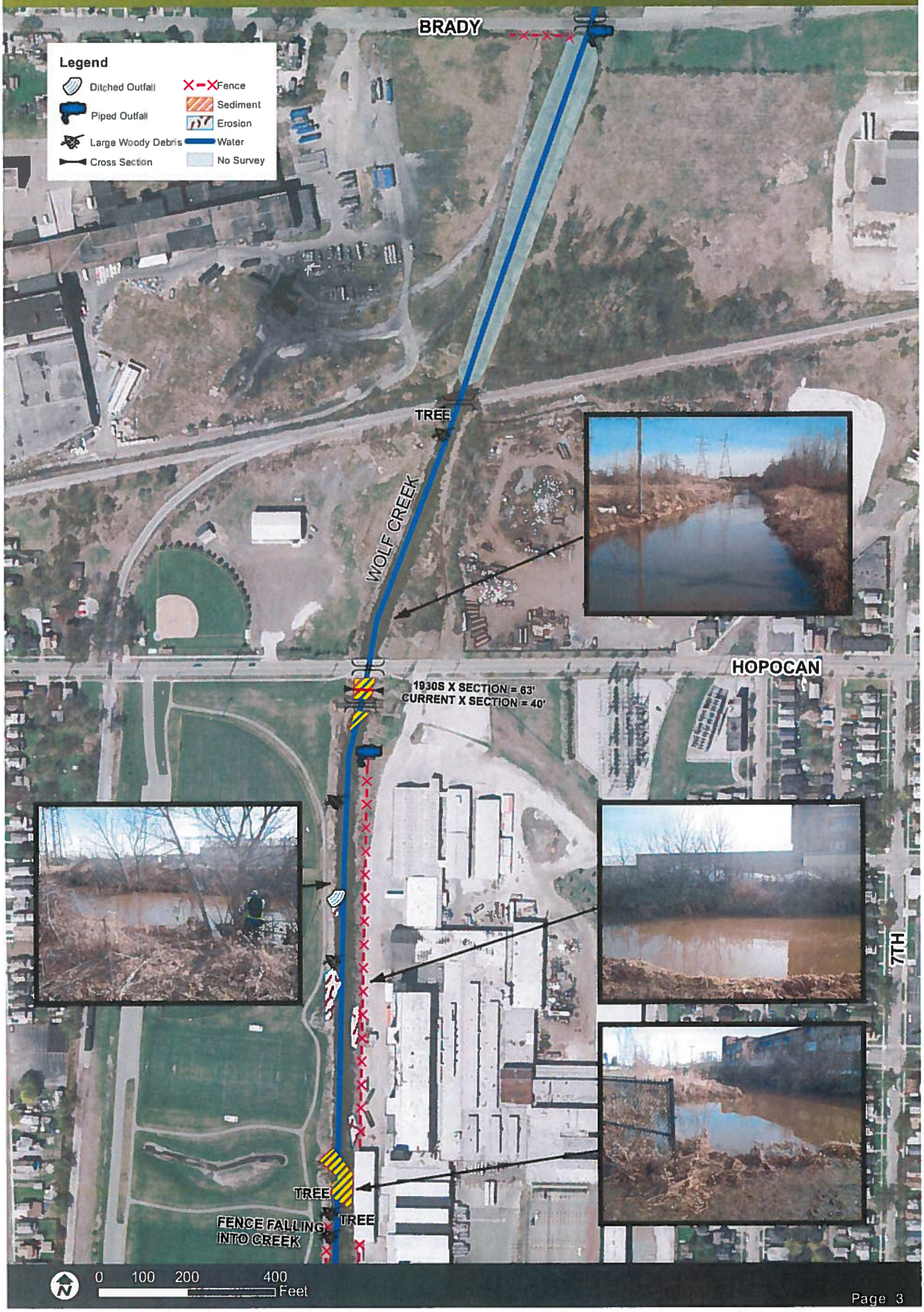
GIS STRIP MAPS

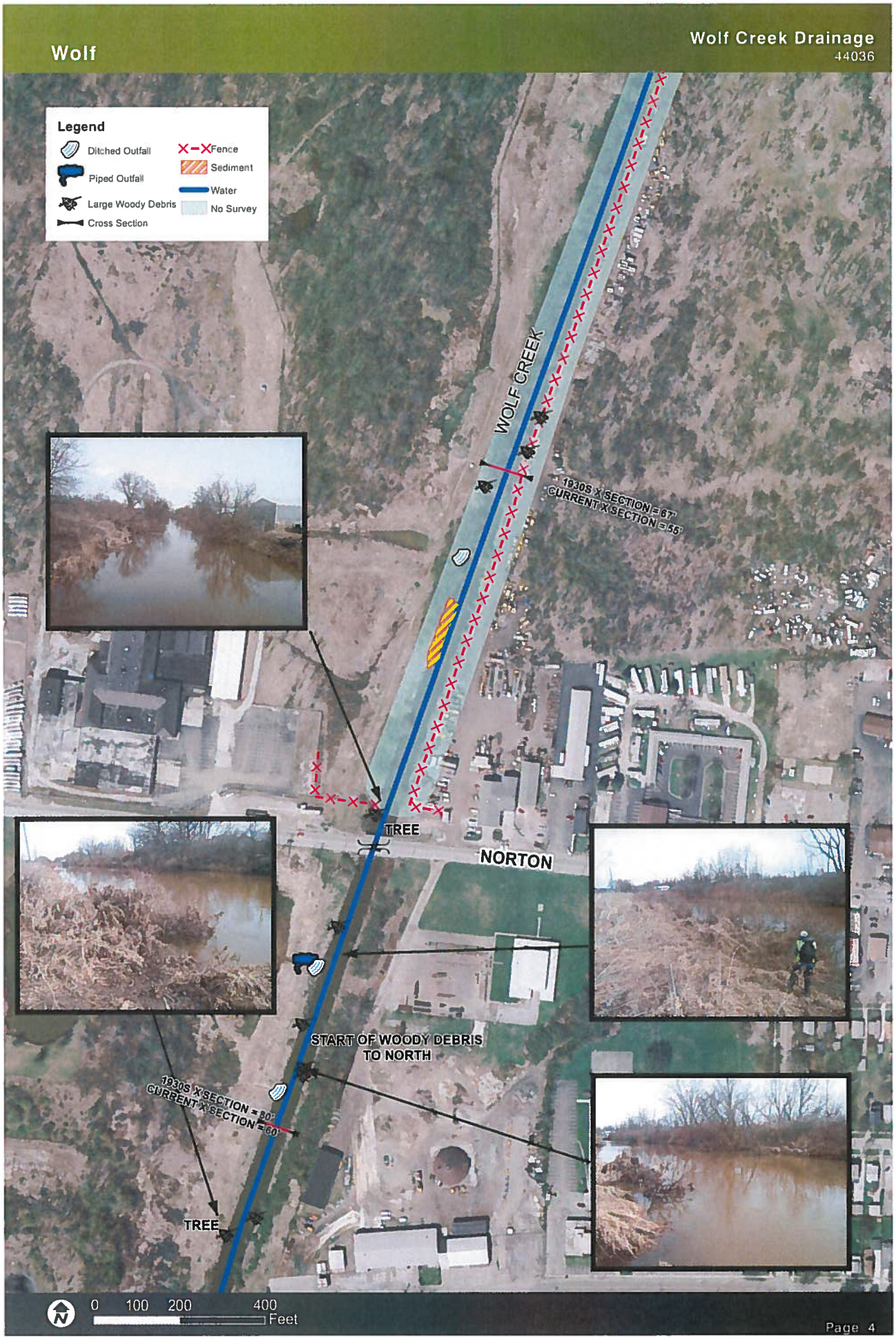
Wolf

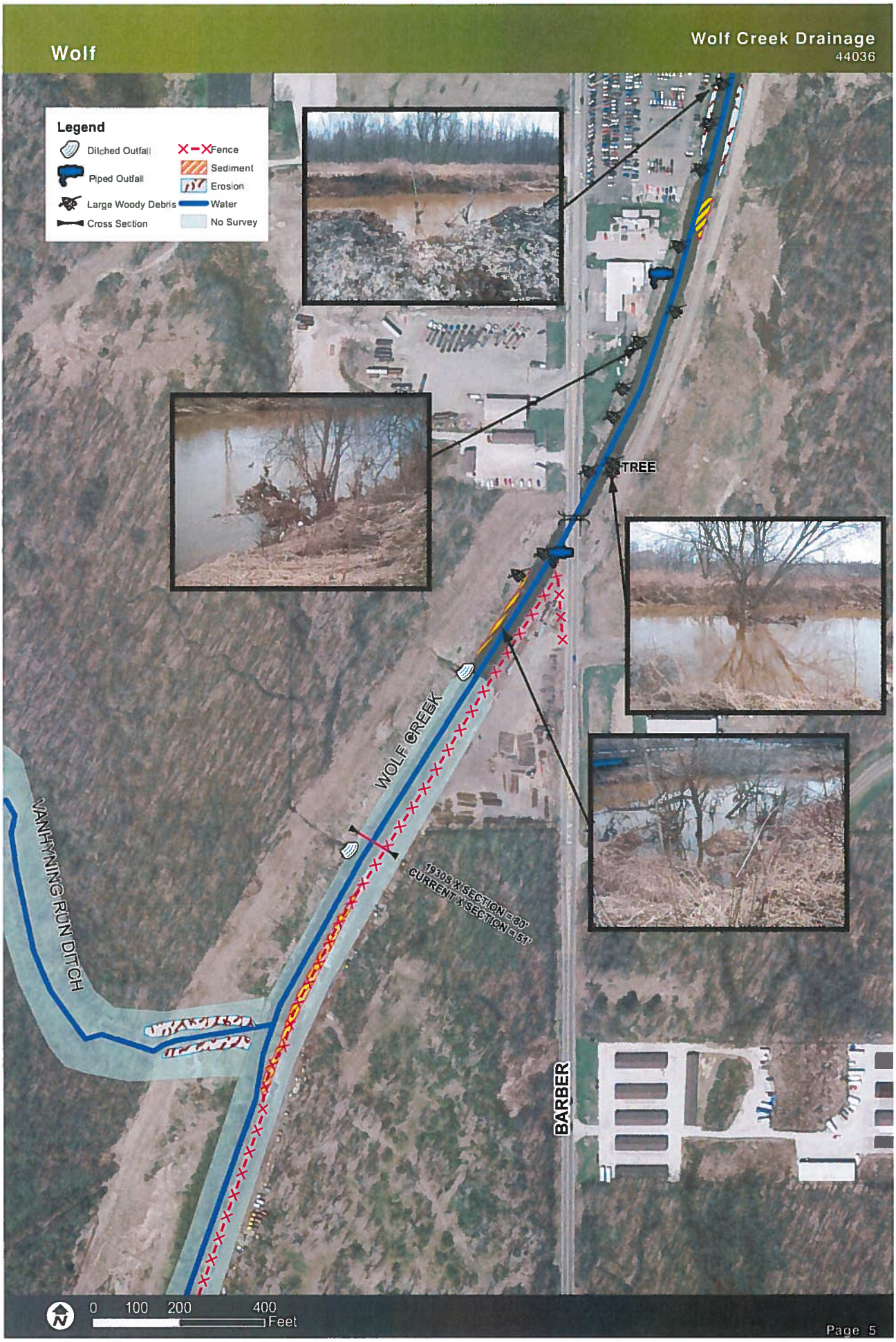
Wolf Creek Drainage
44036

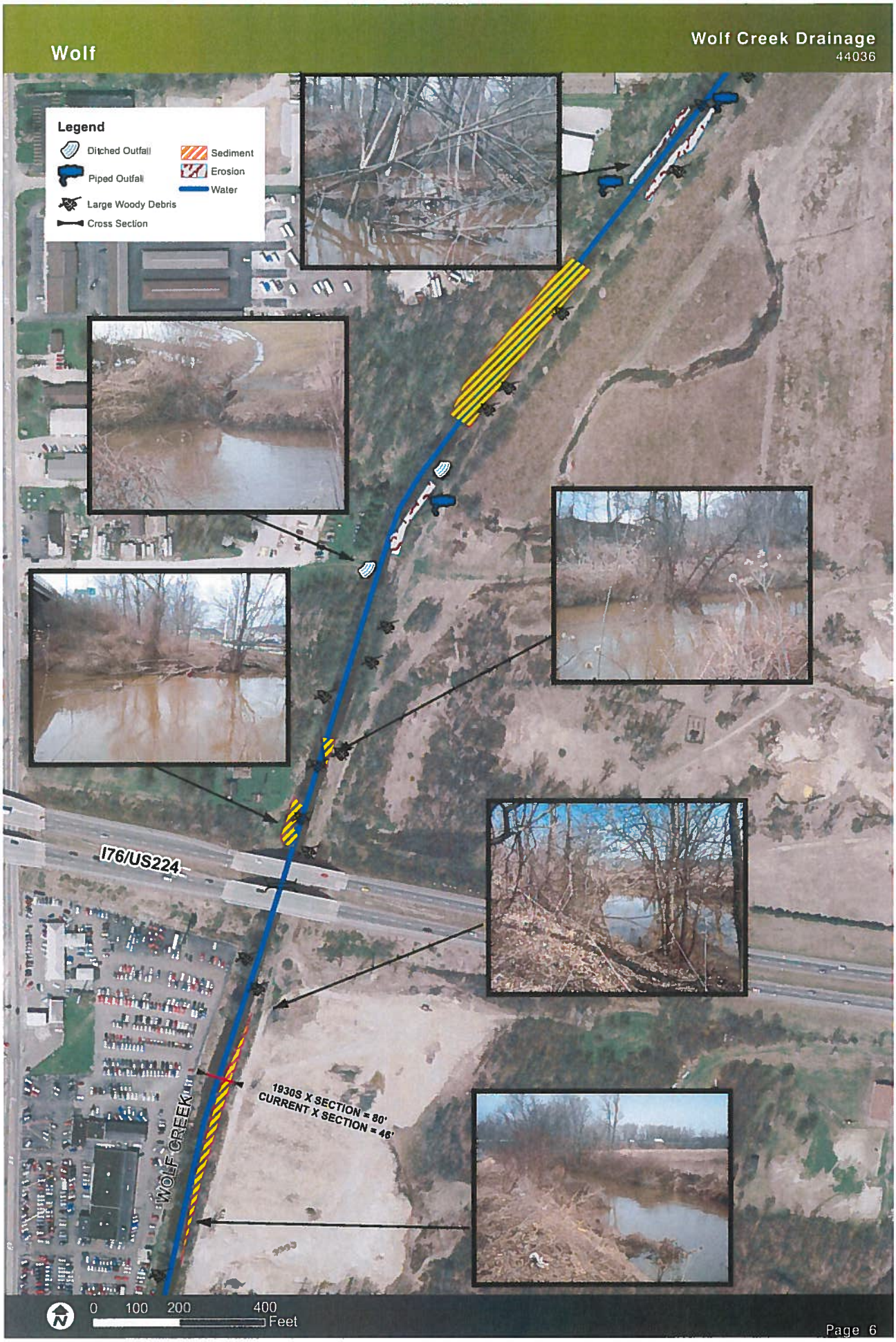


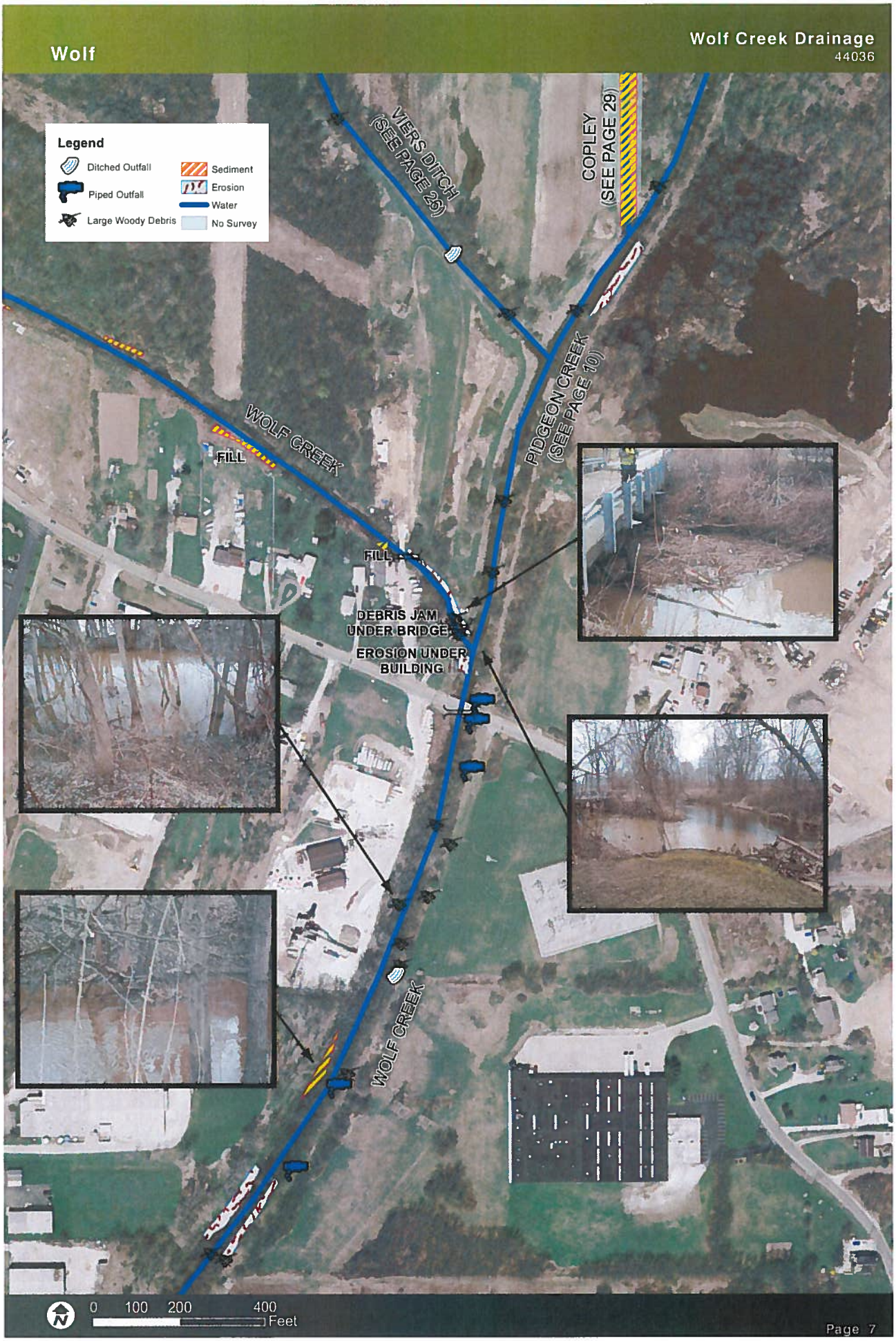












Wolf Creek Drainage
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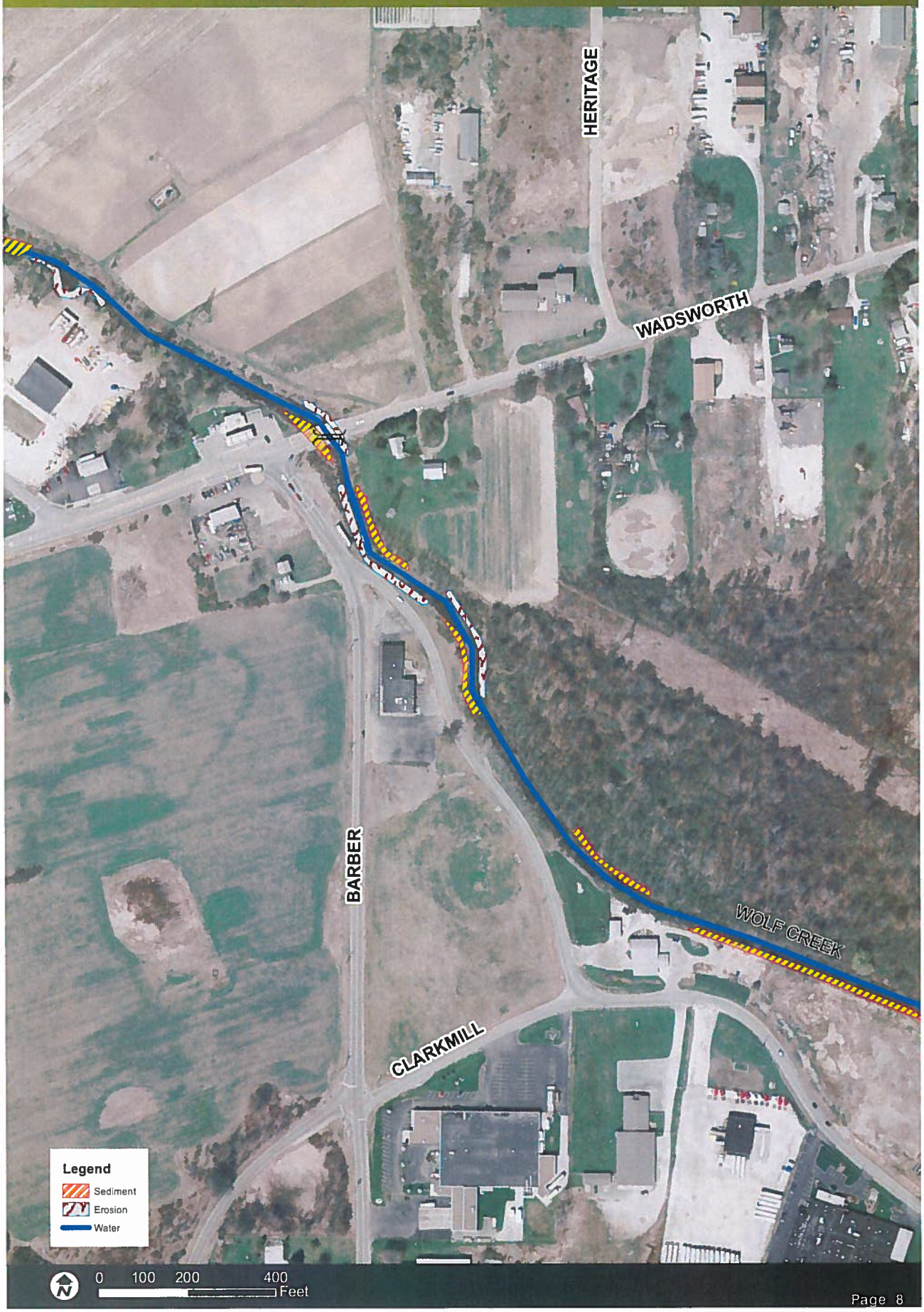
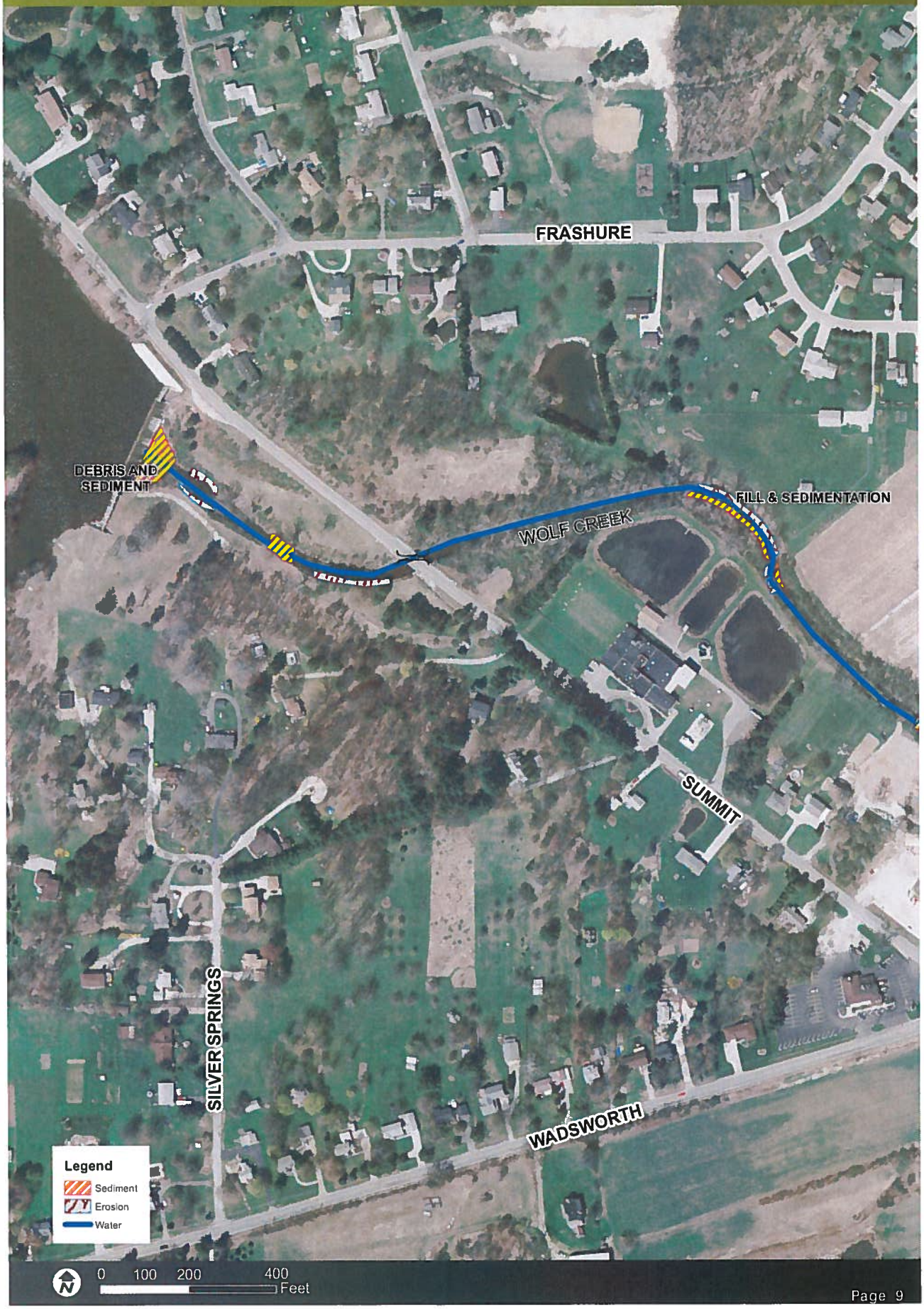
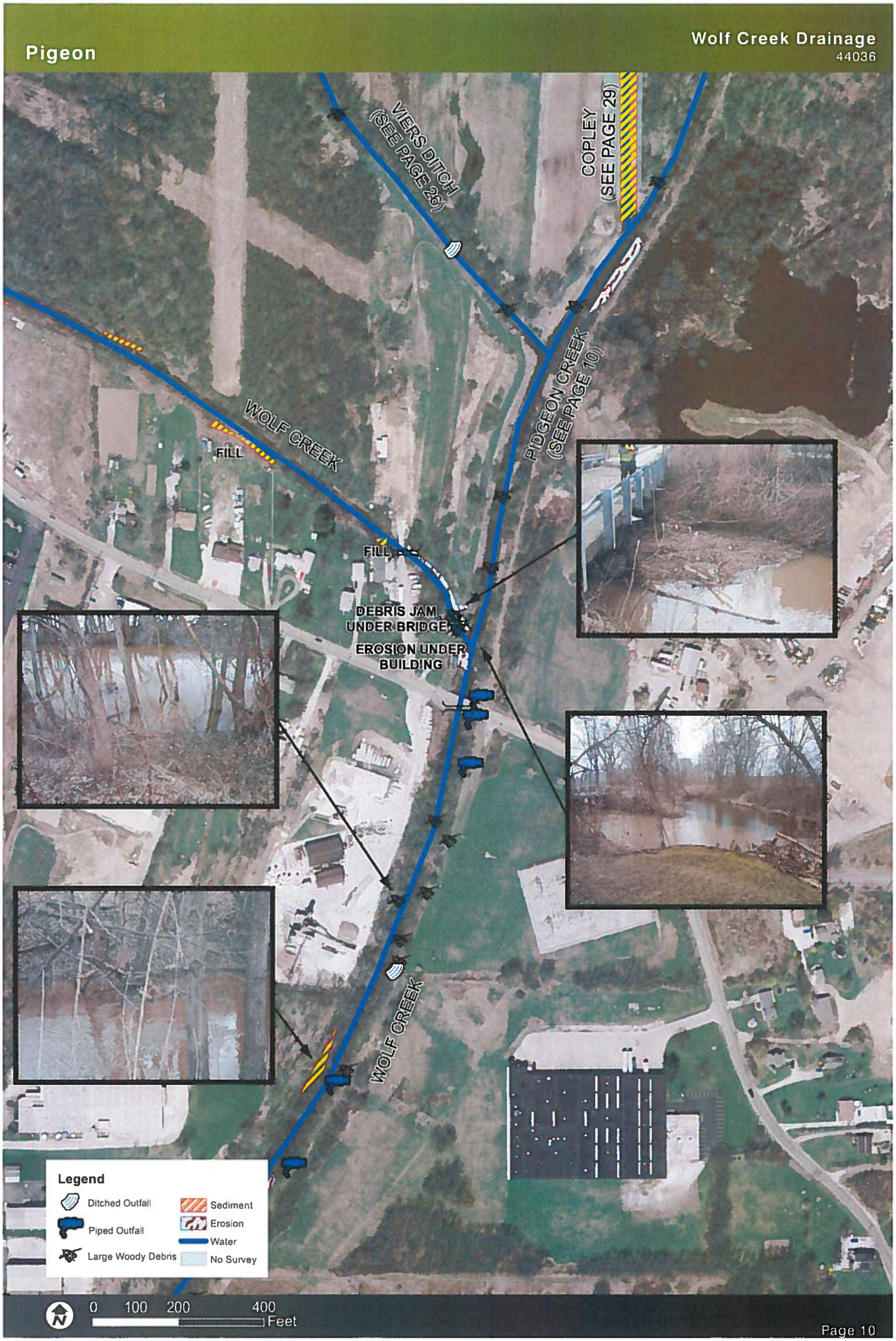
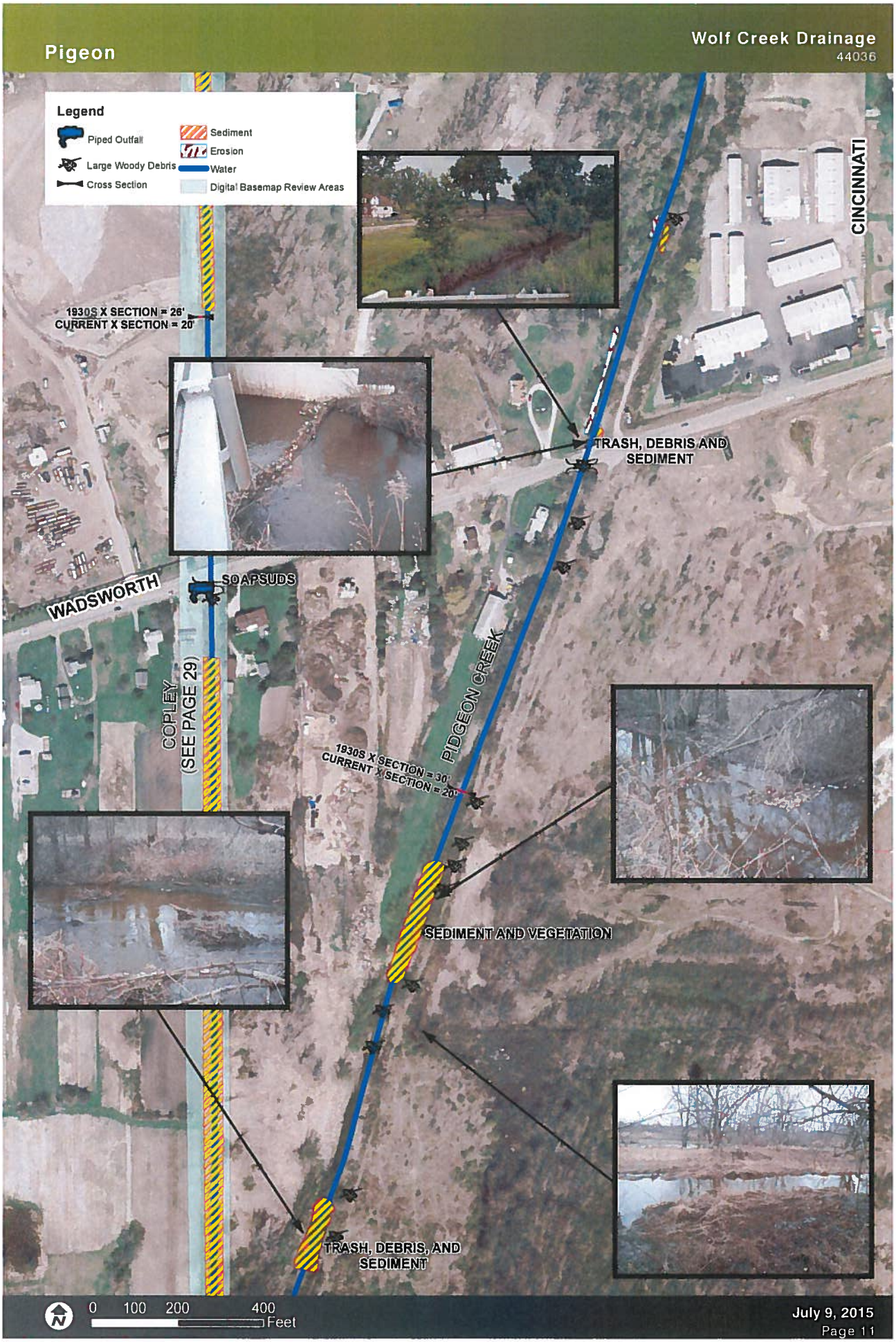
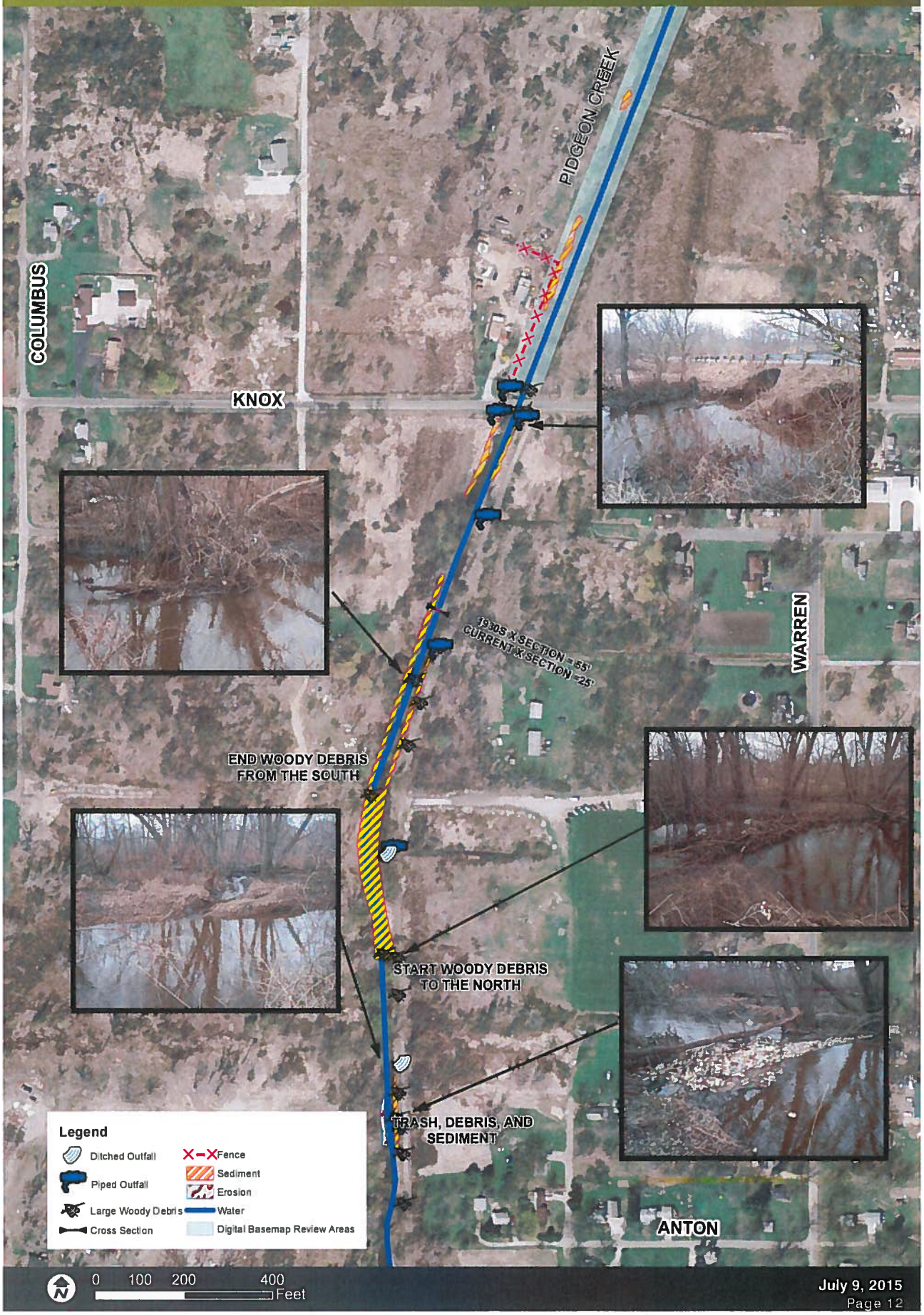
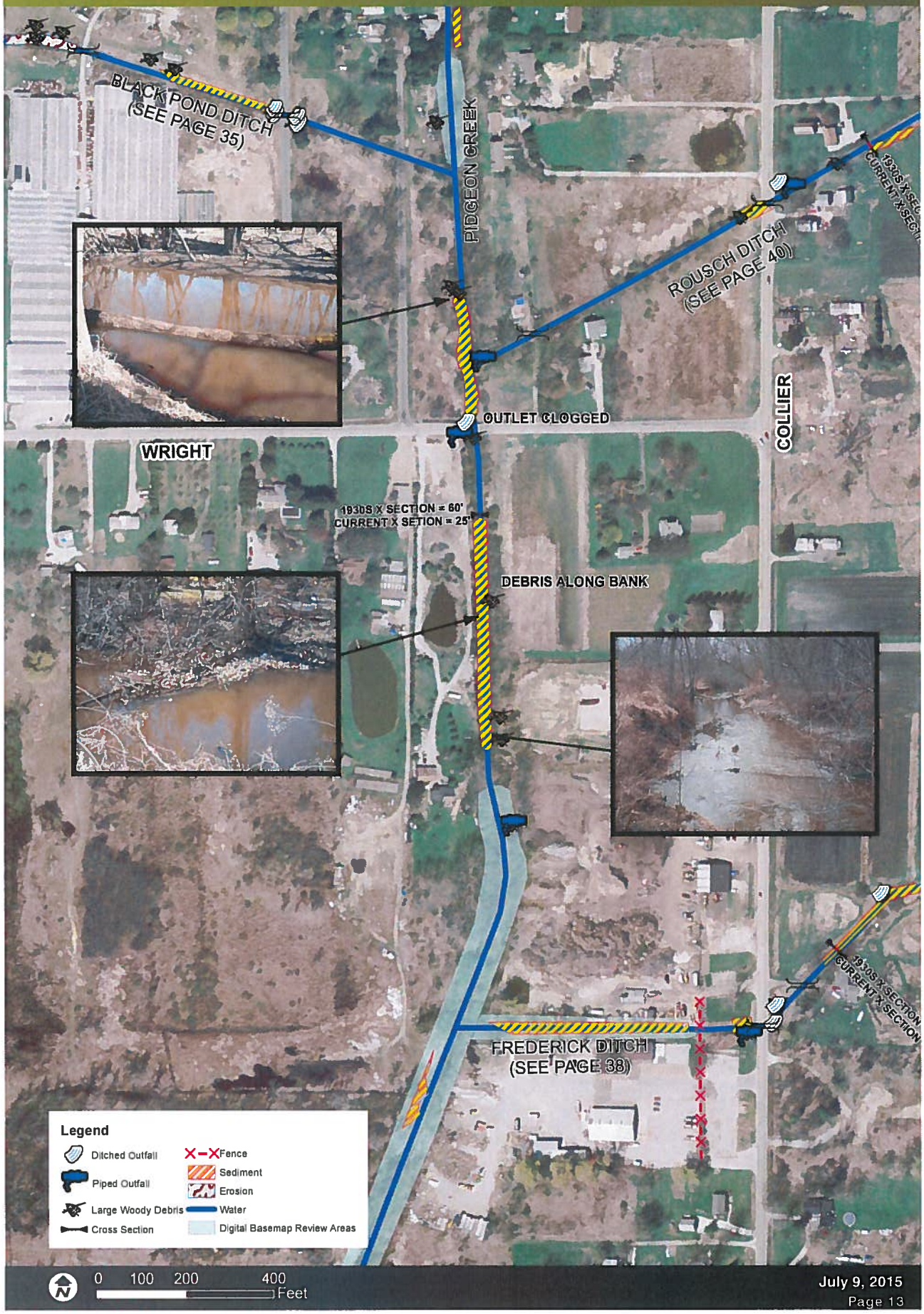


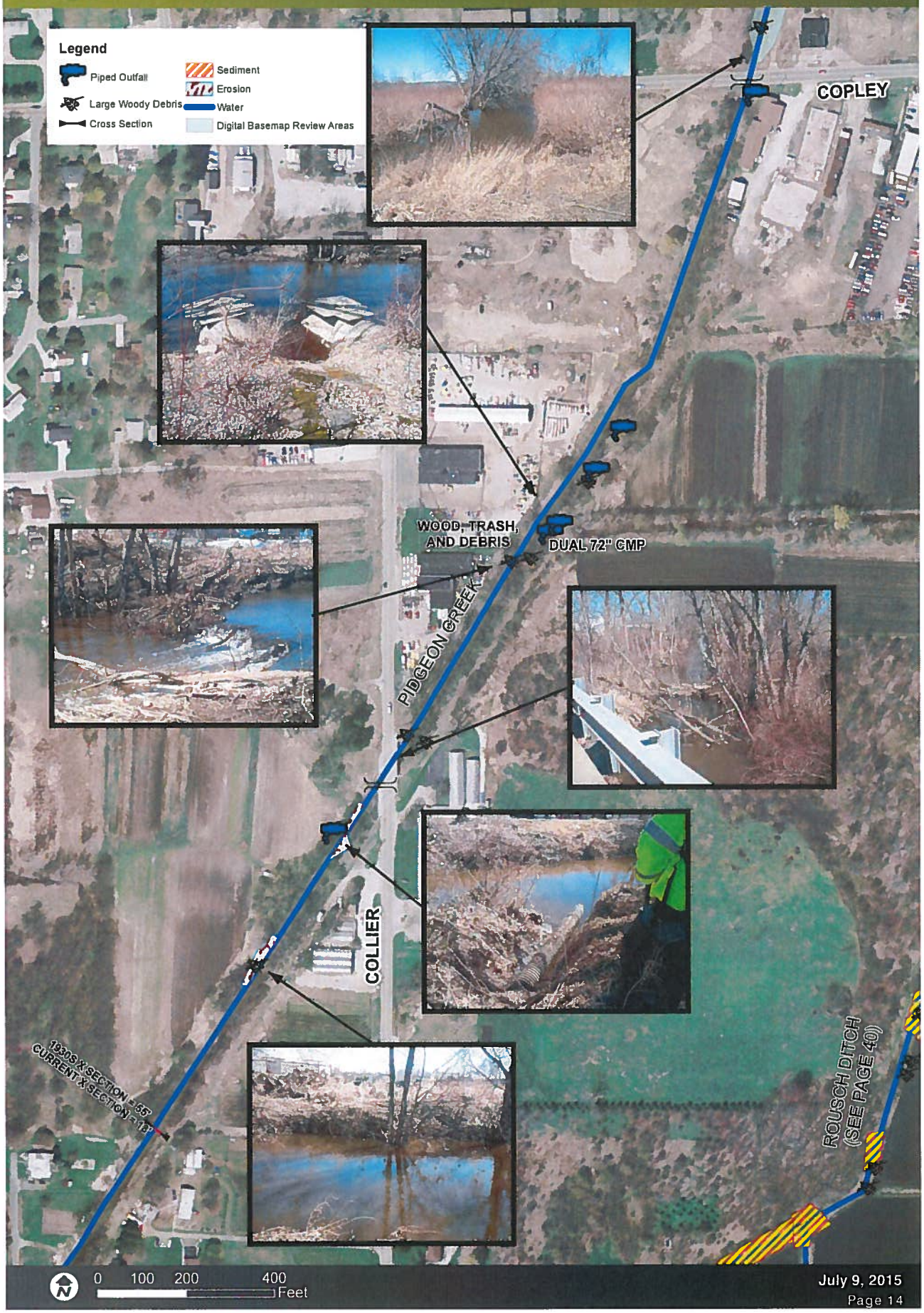


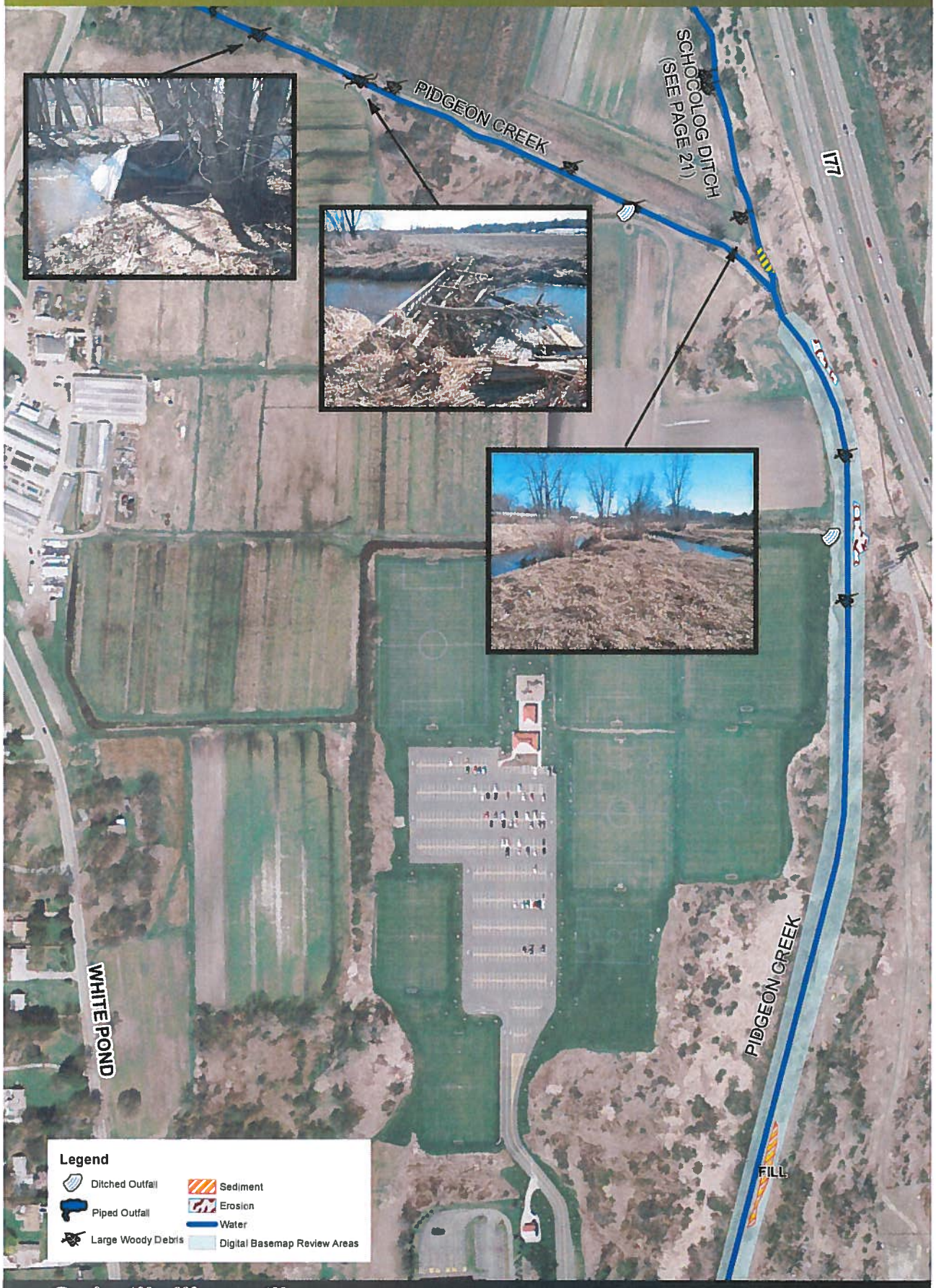


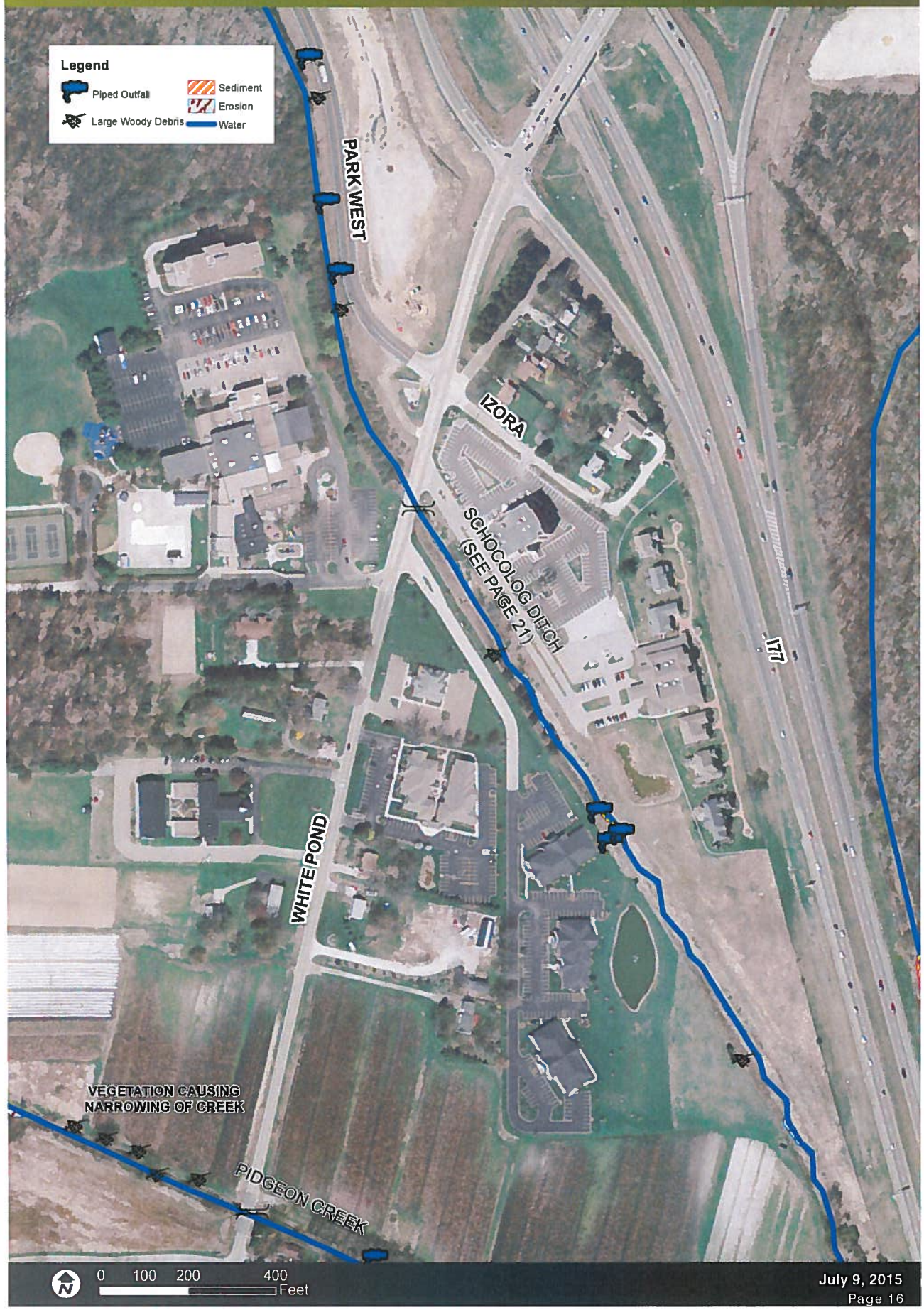


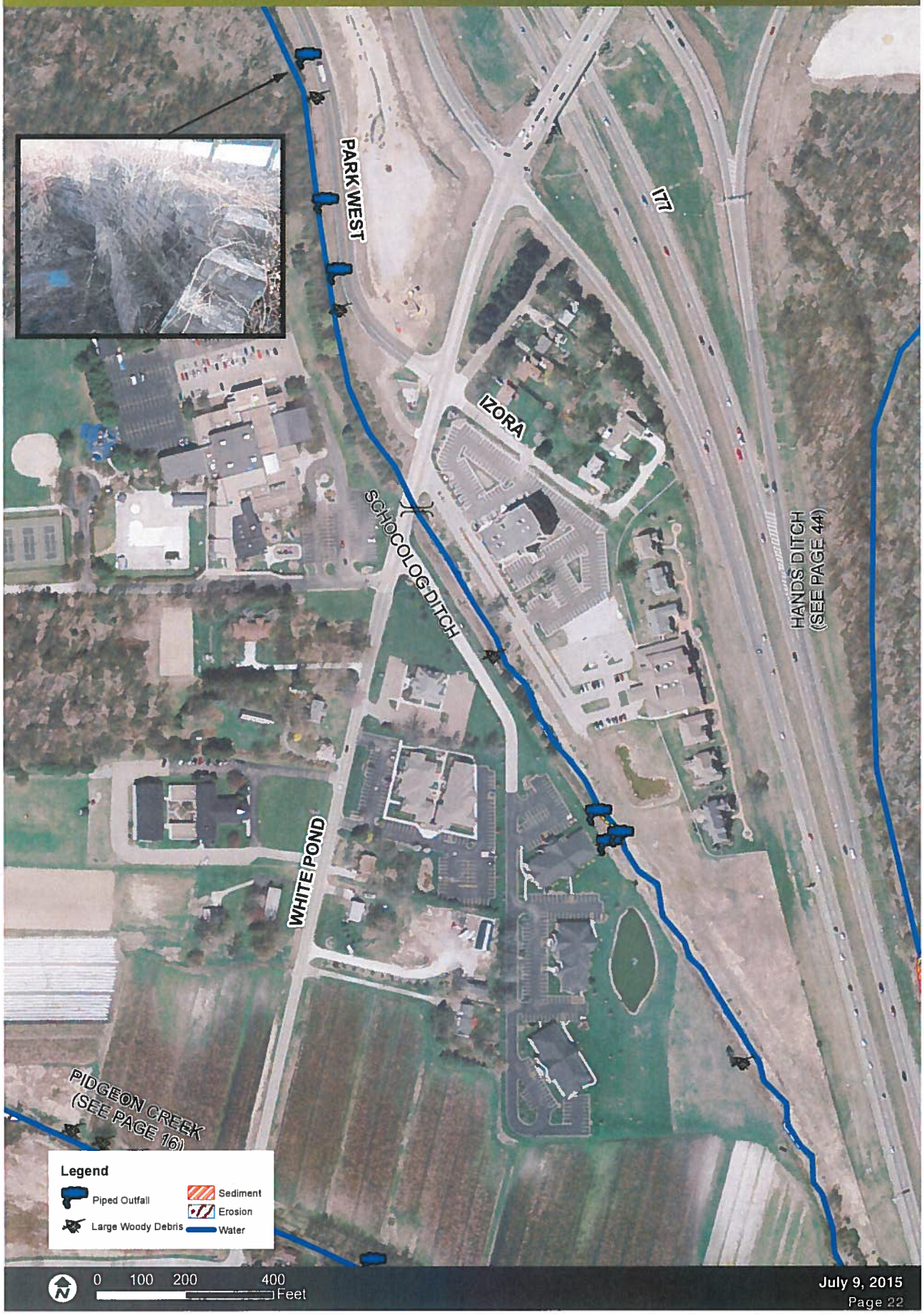


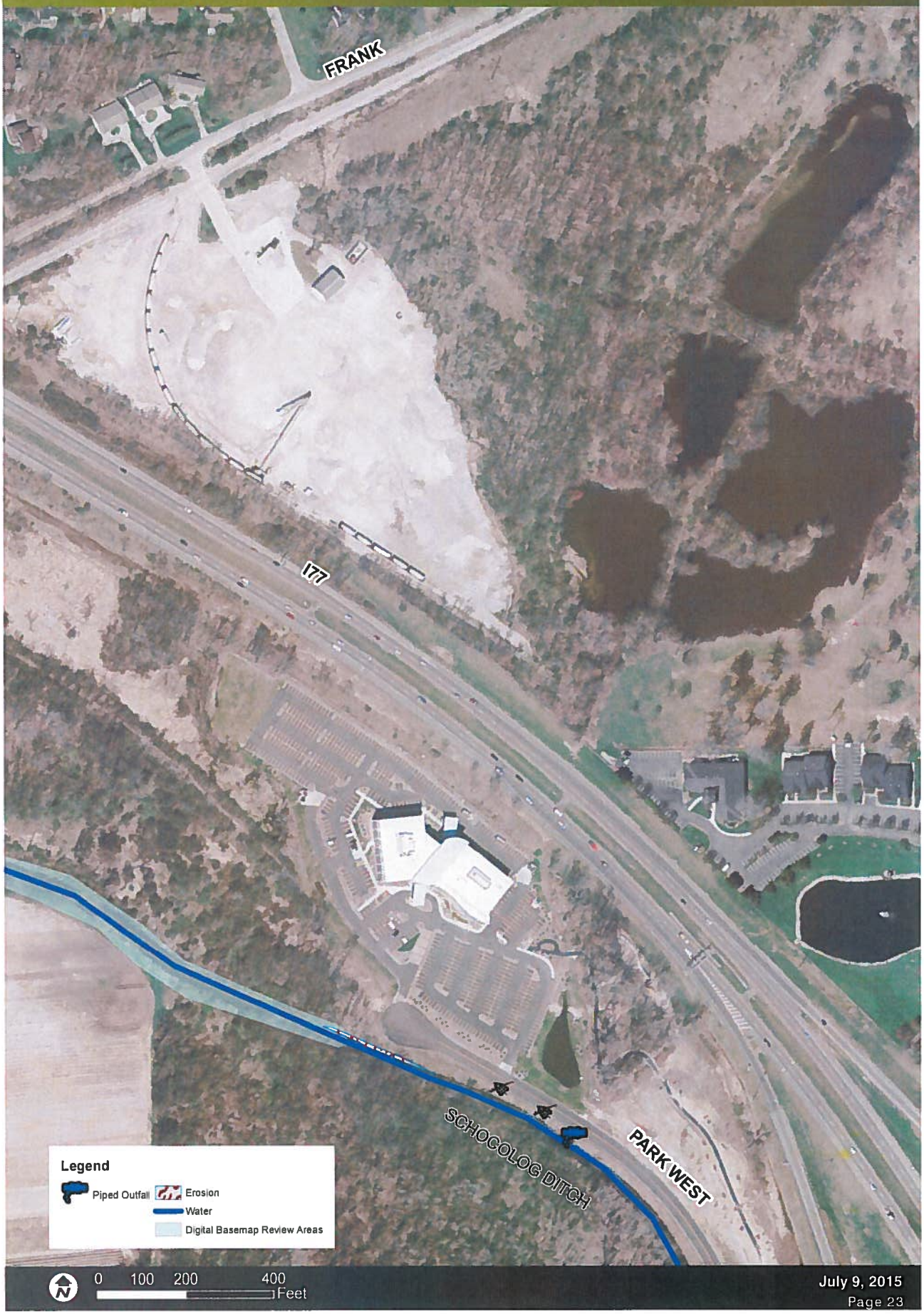


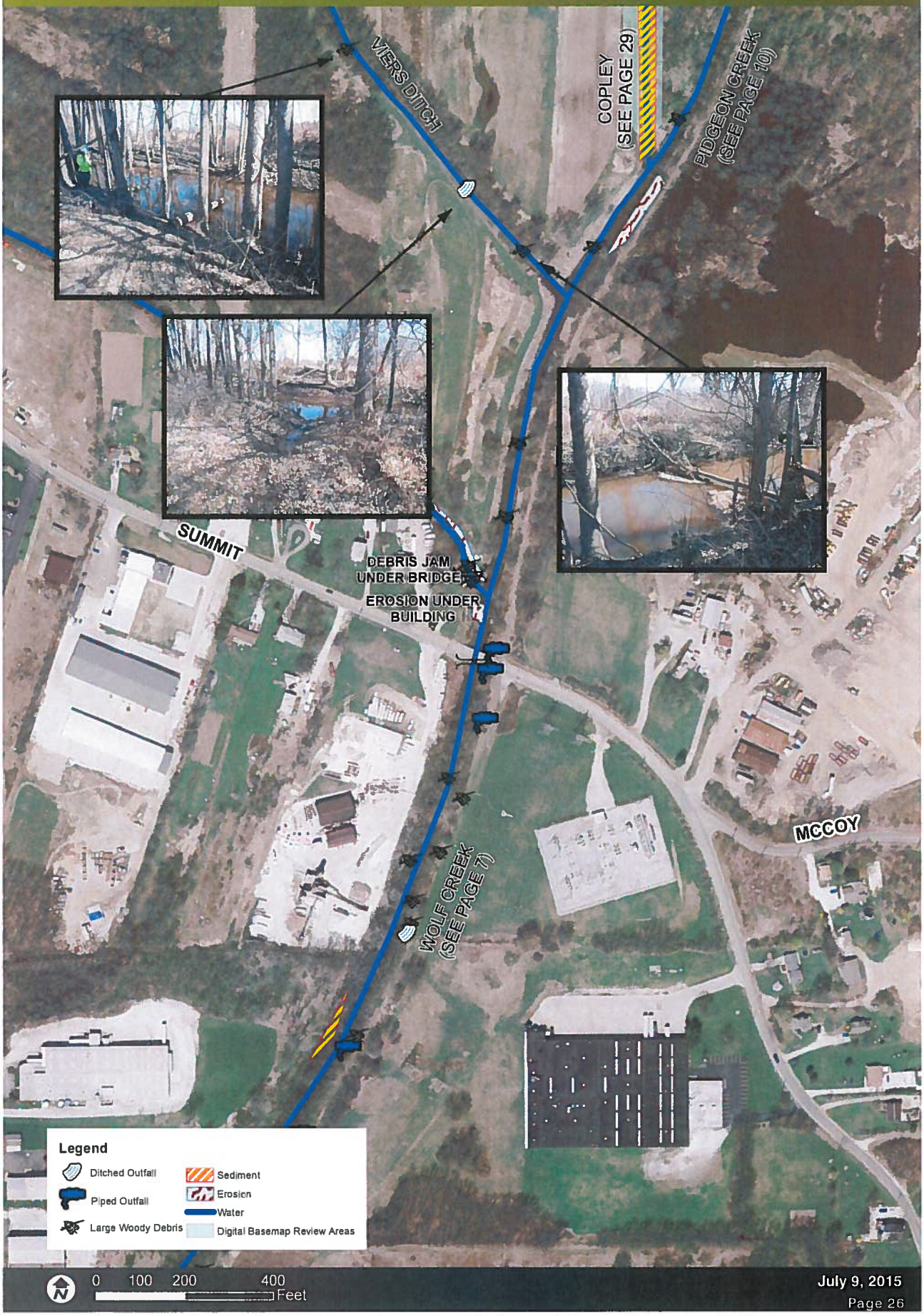


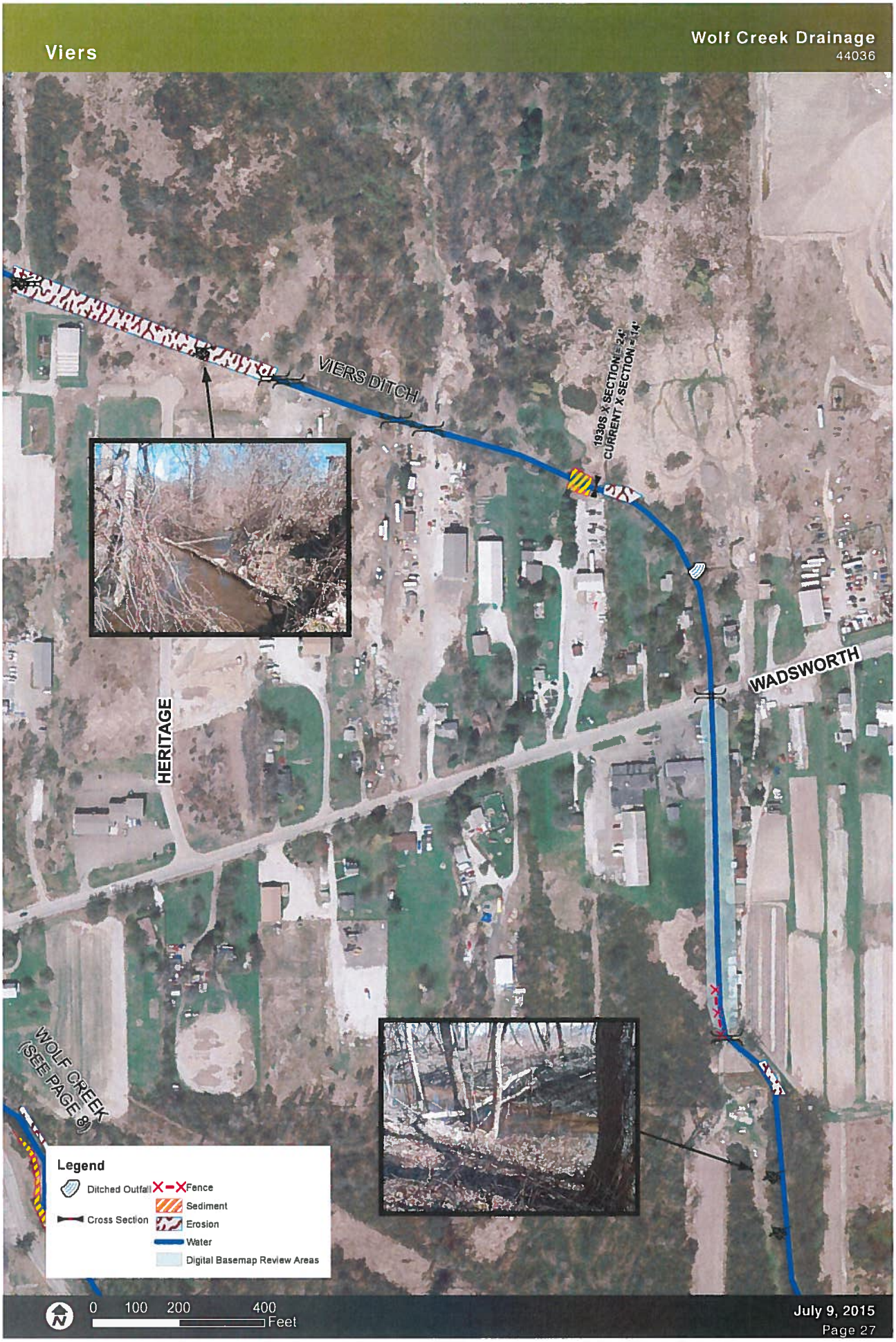


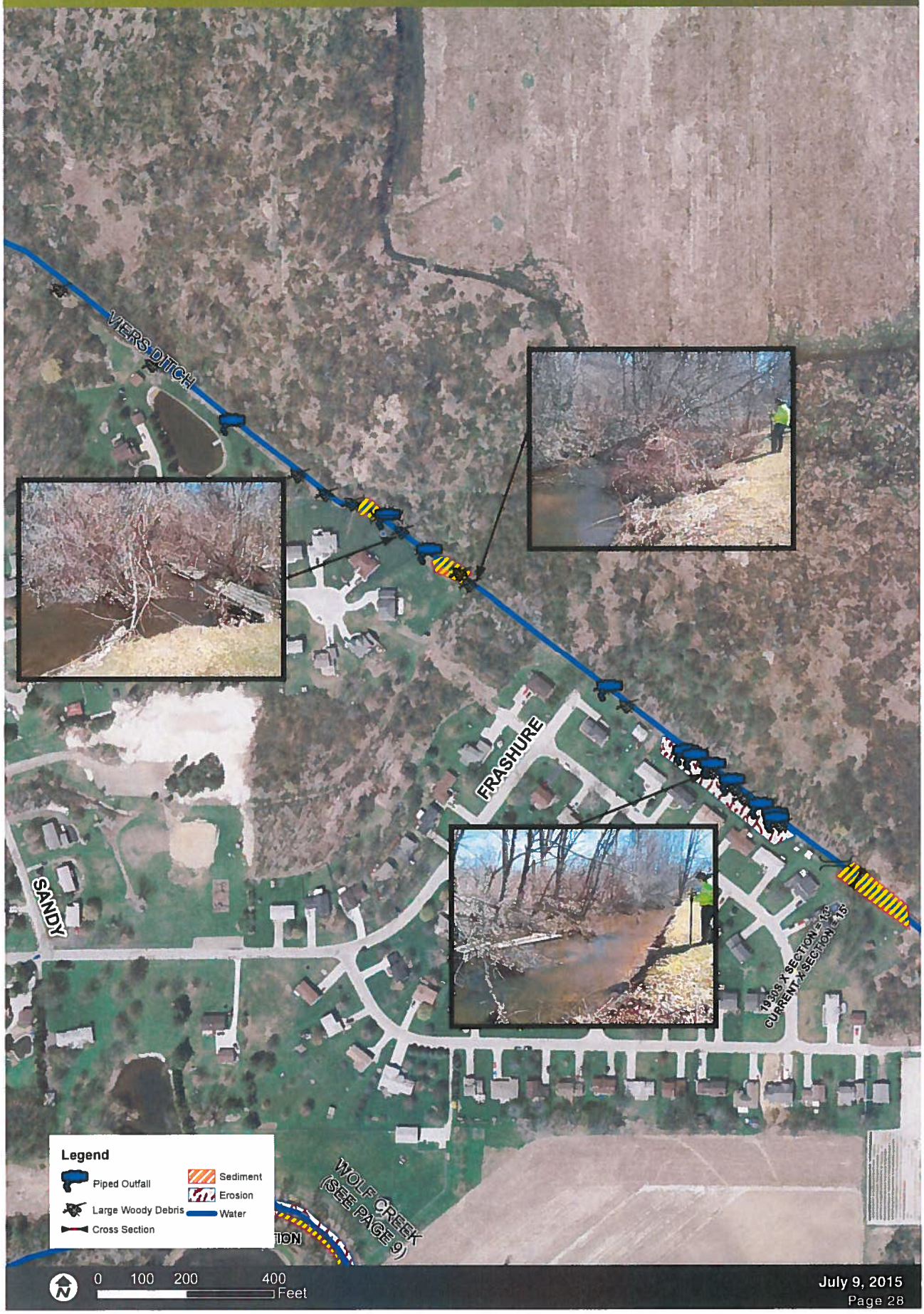


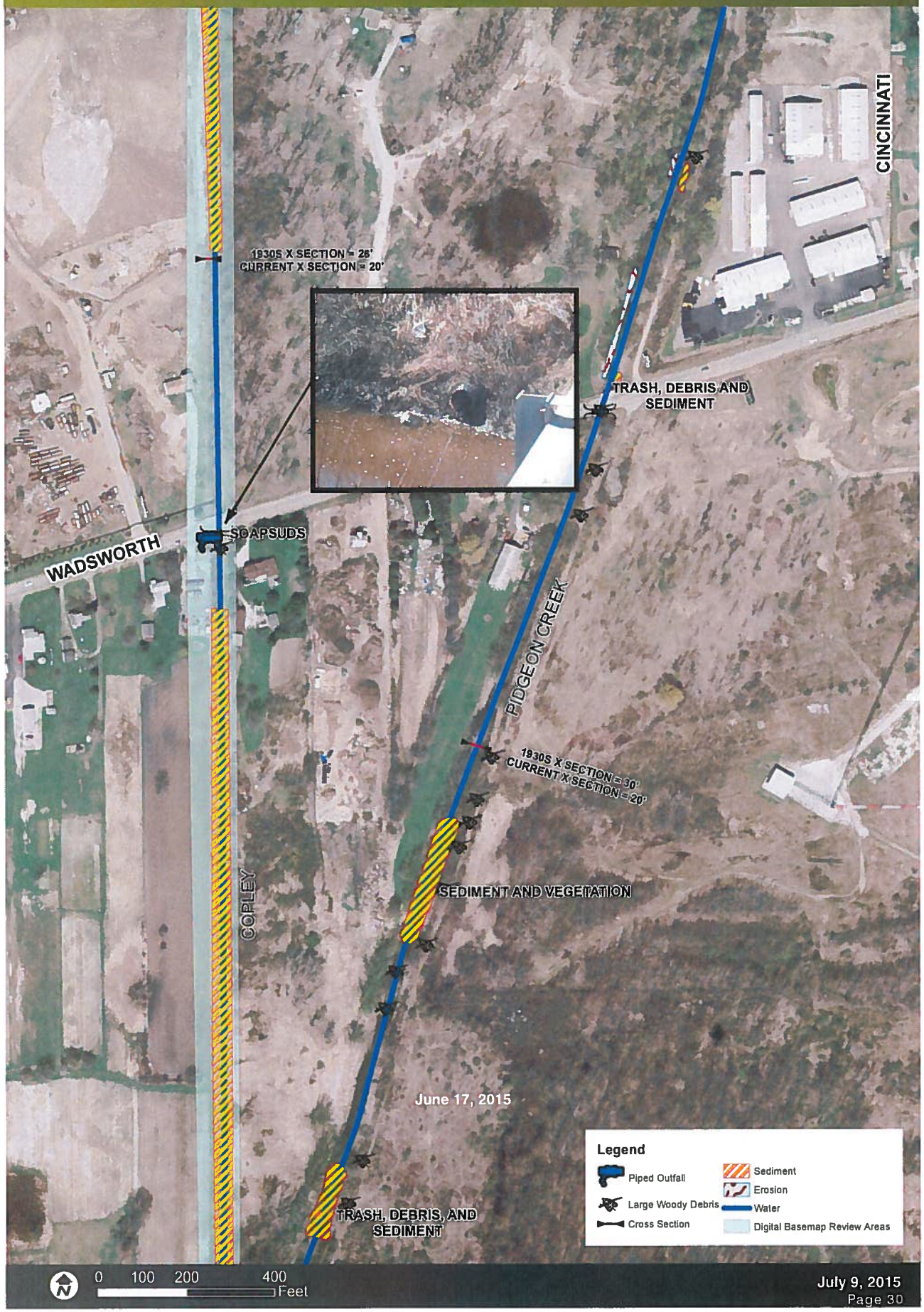


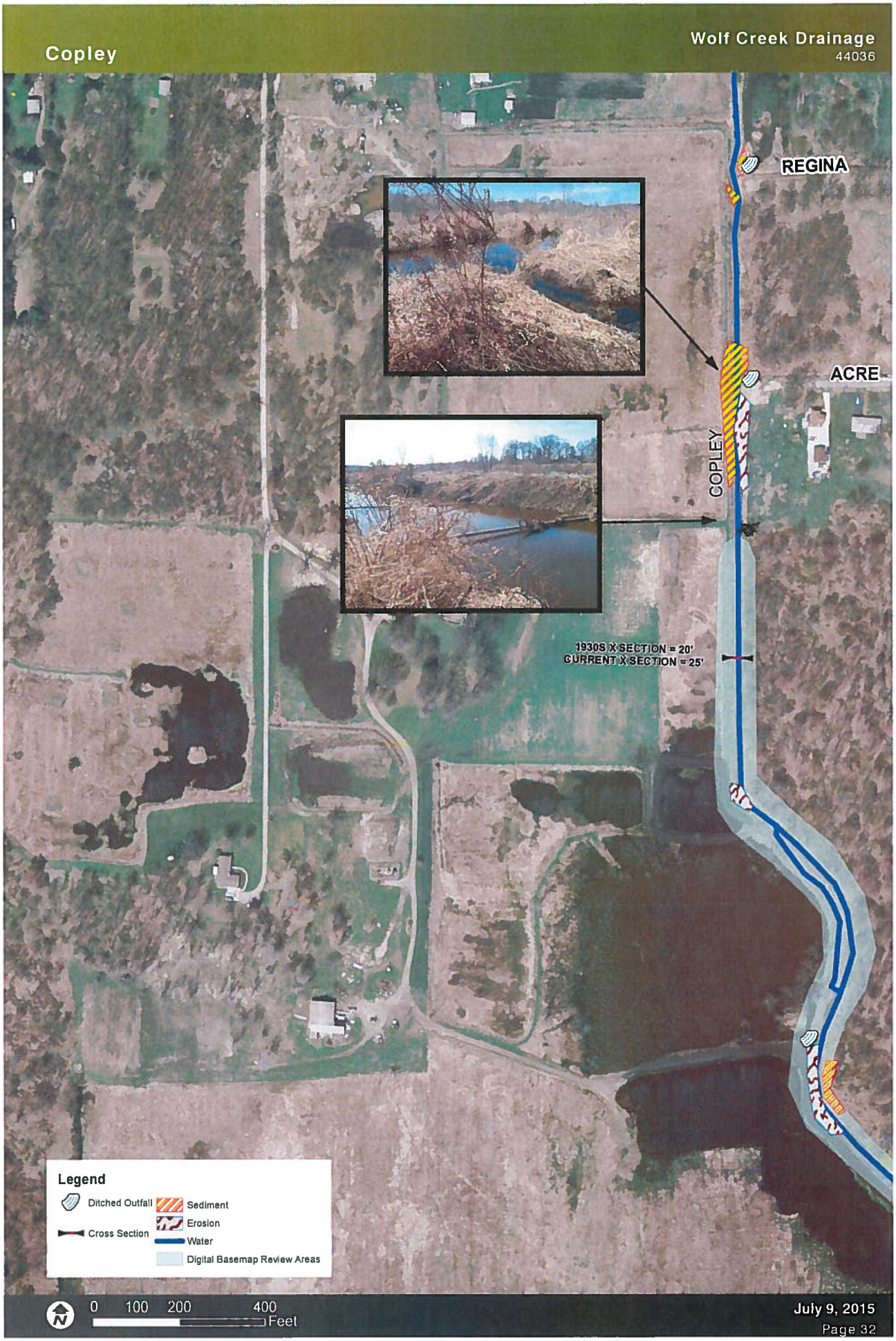


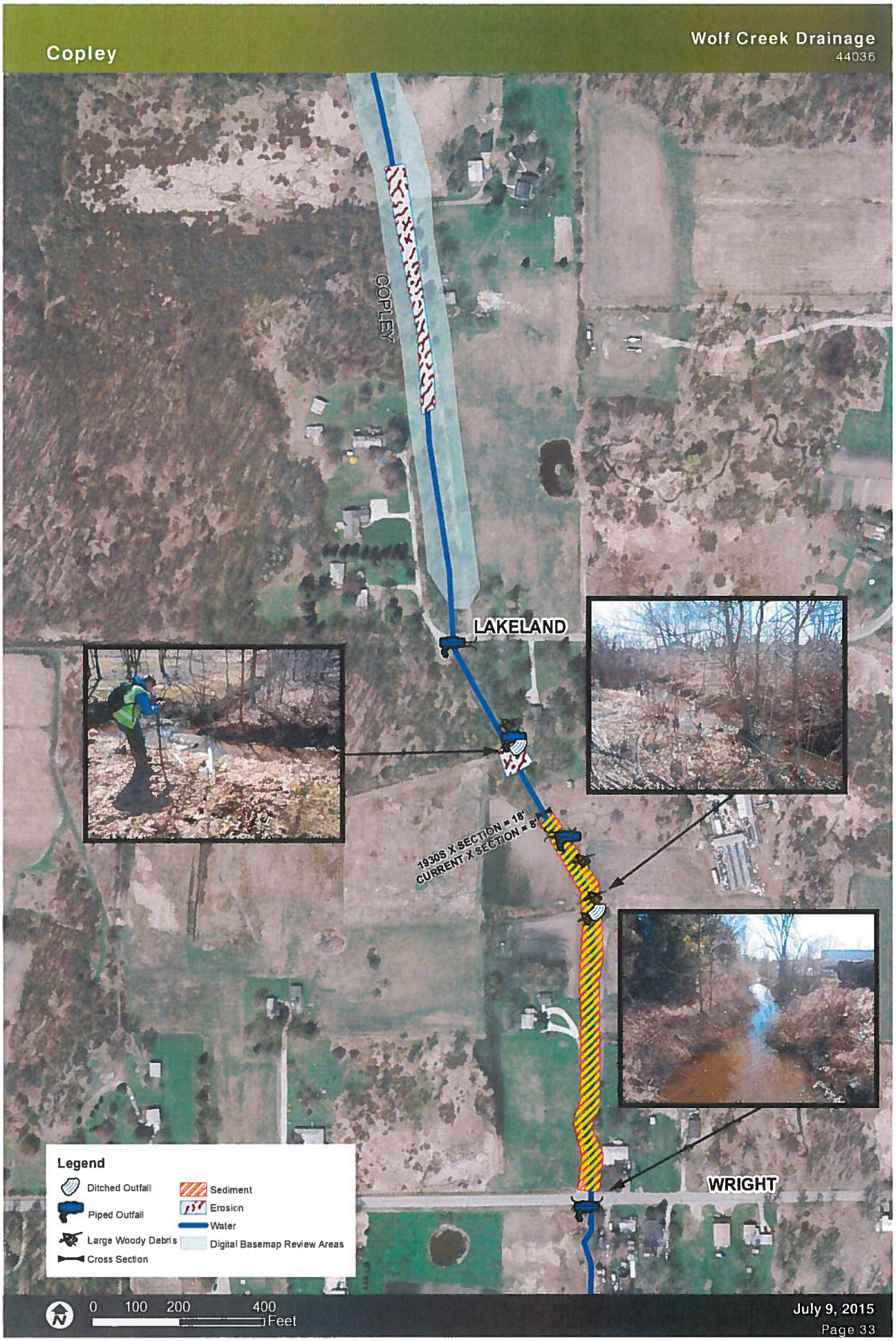


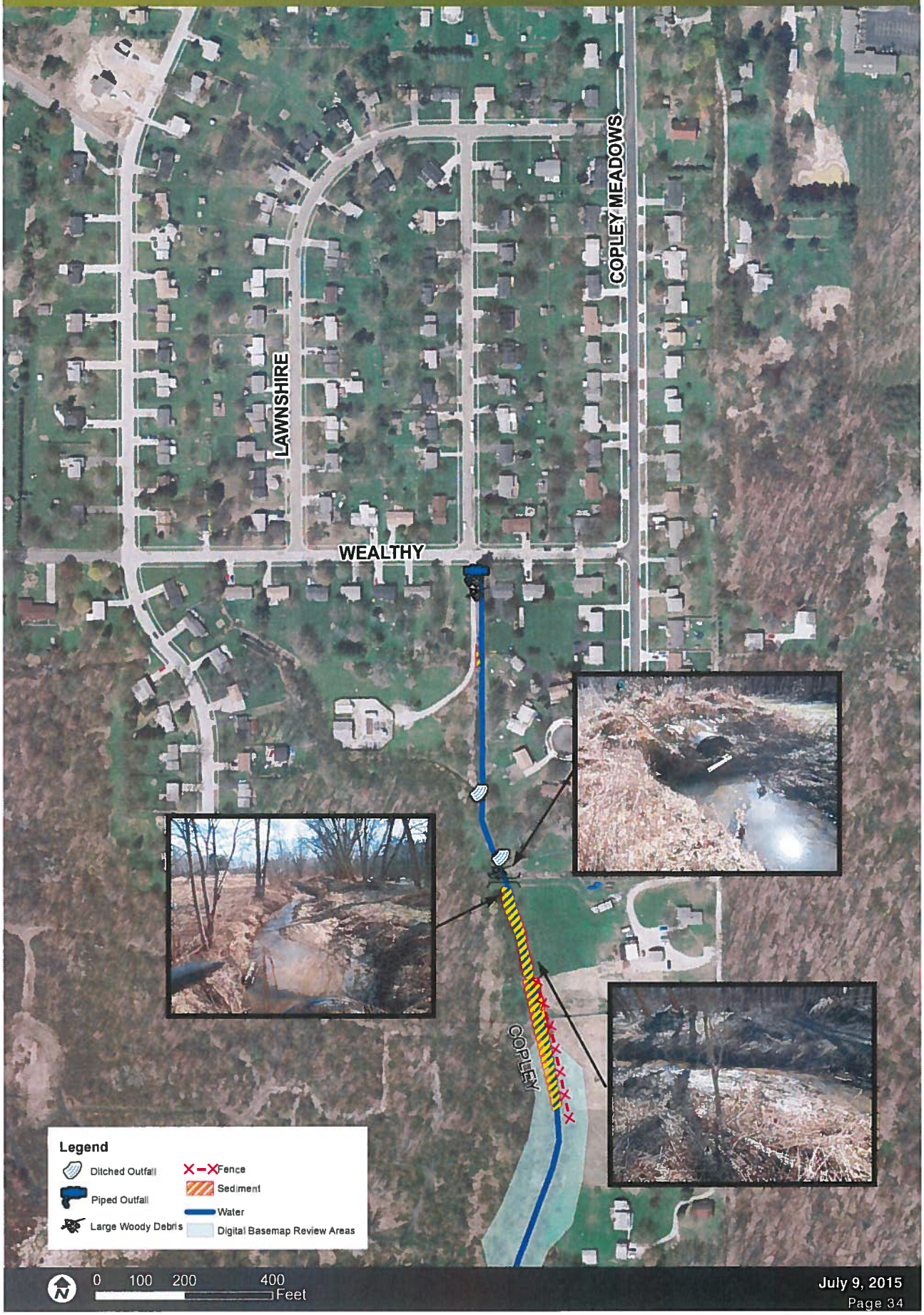


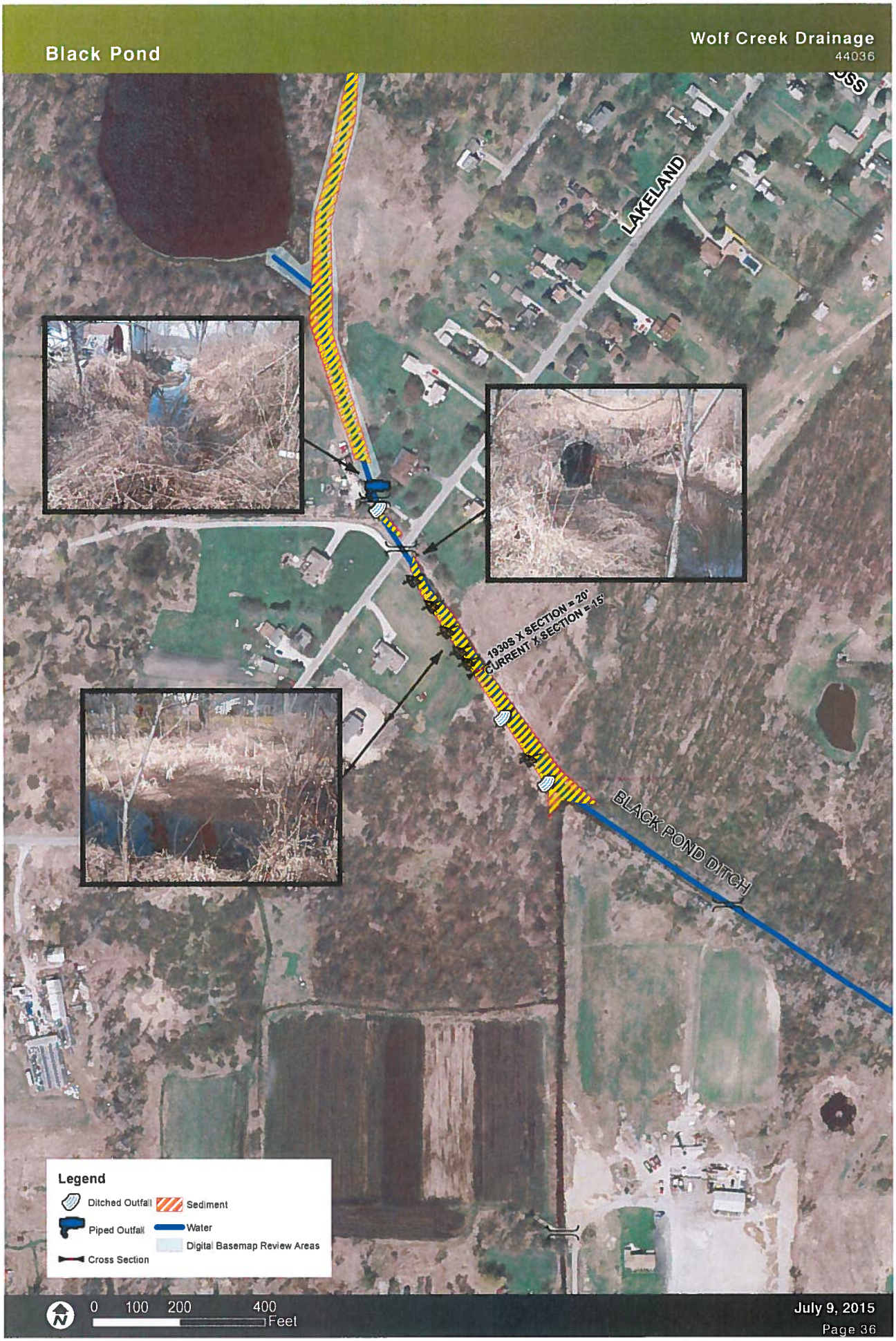


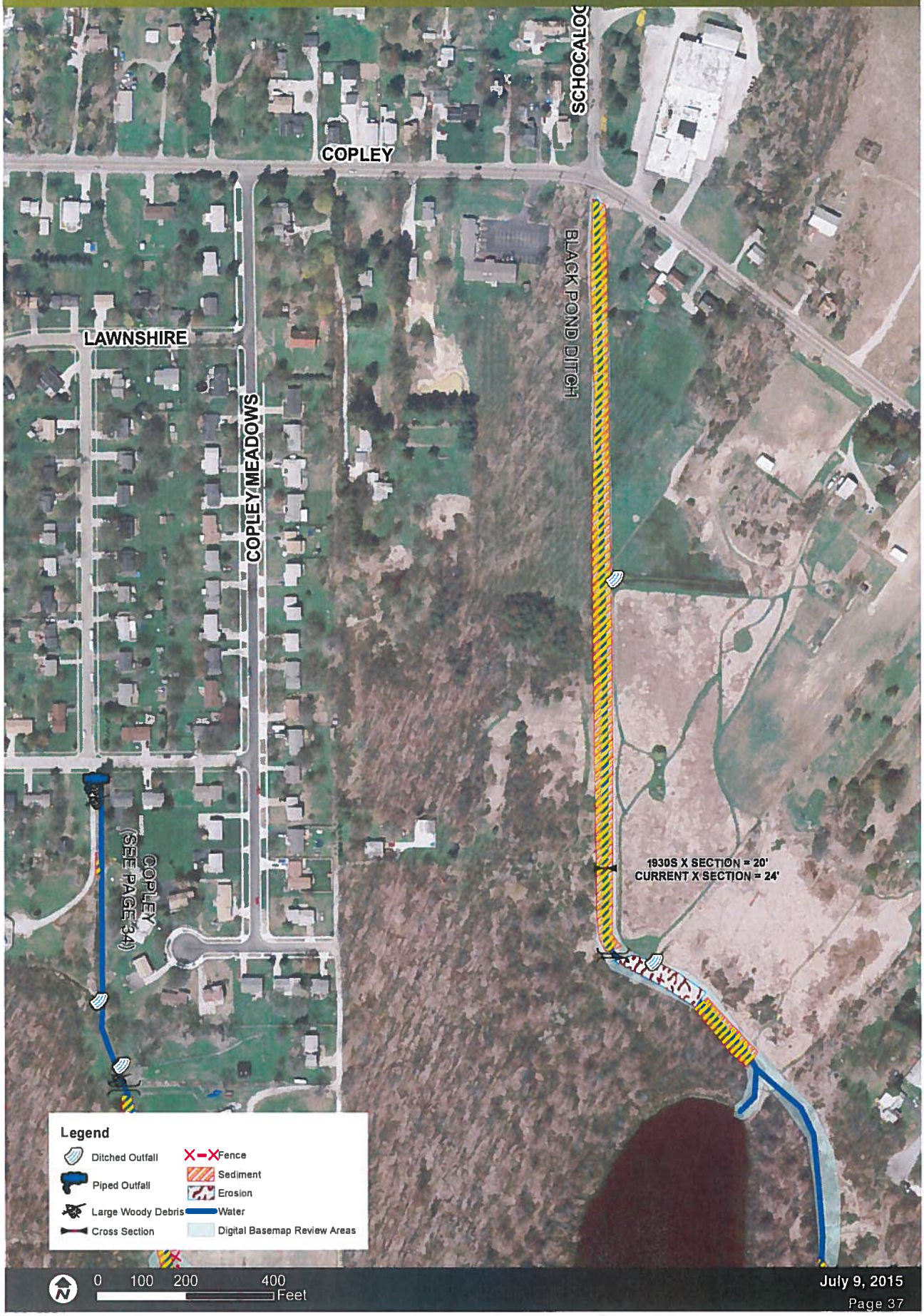


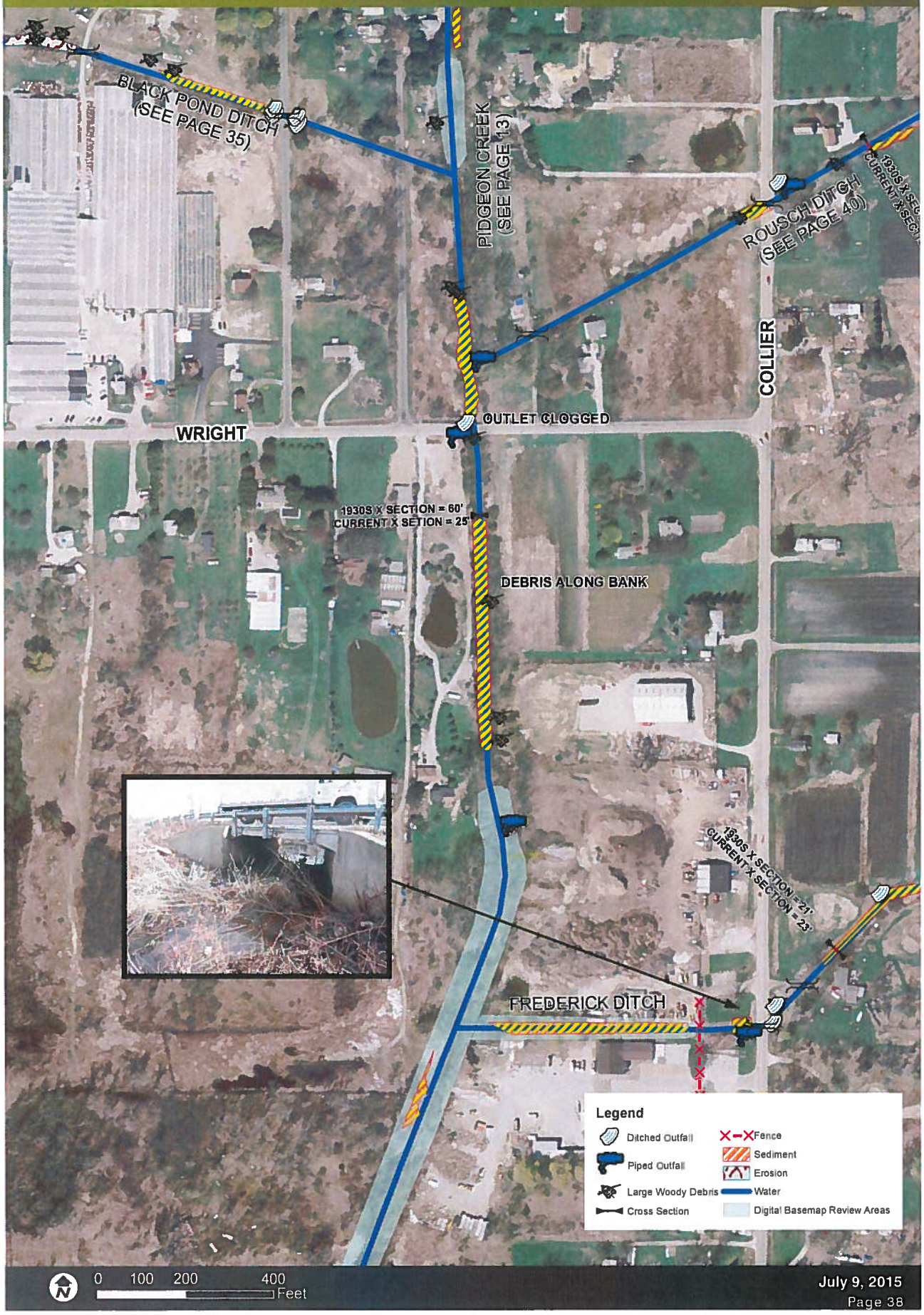


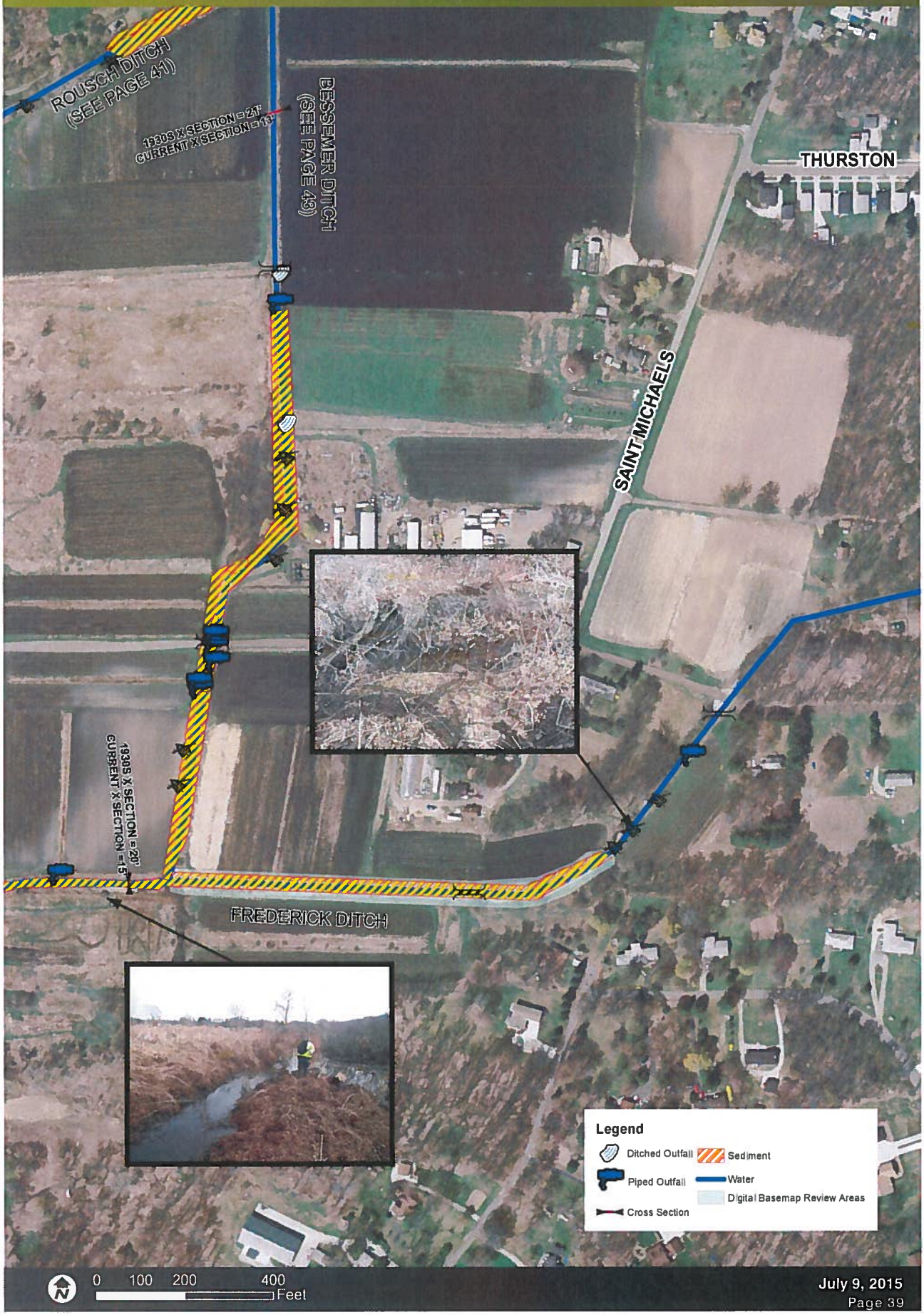


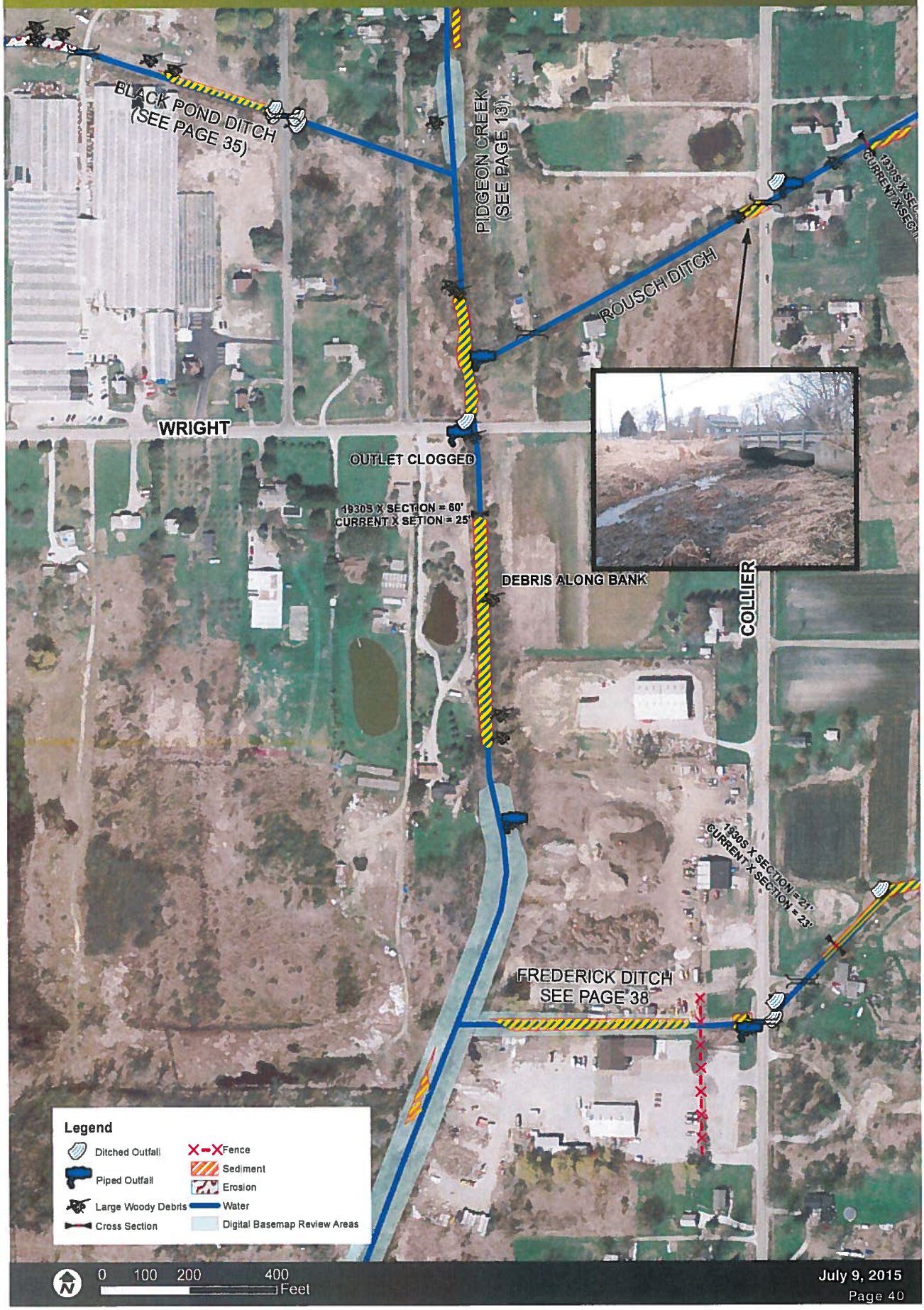


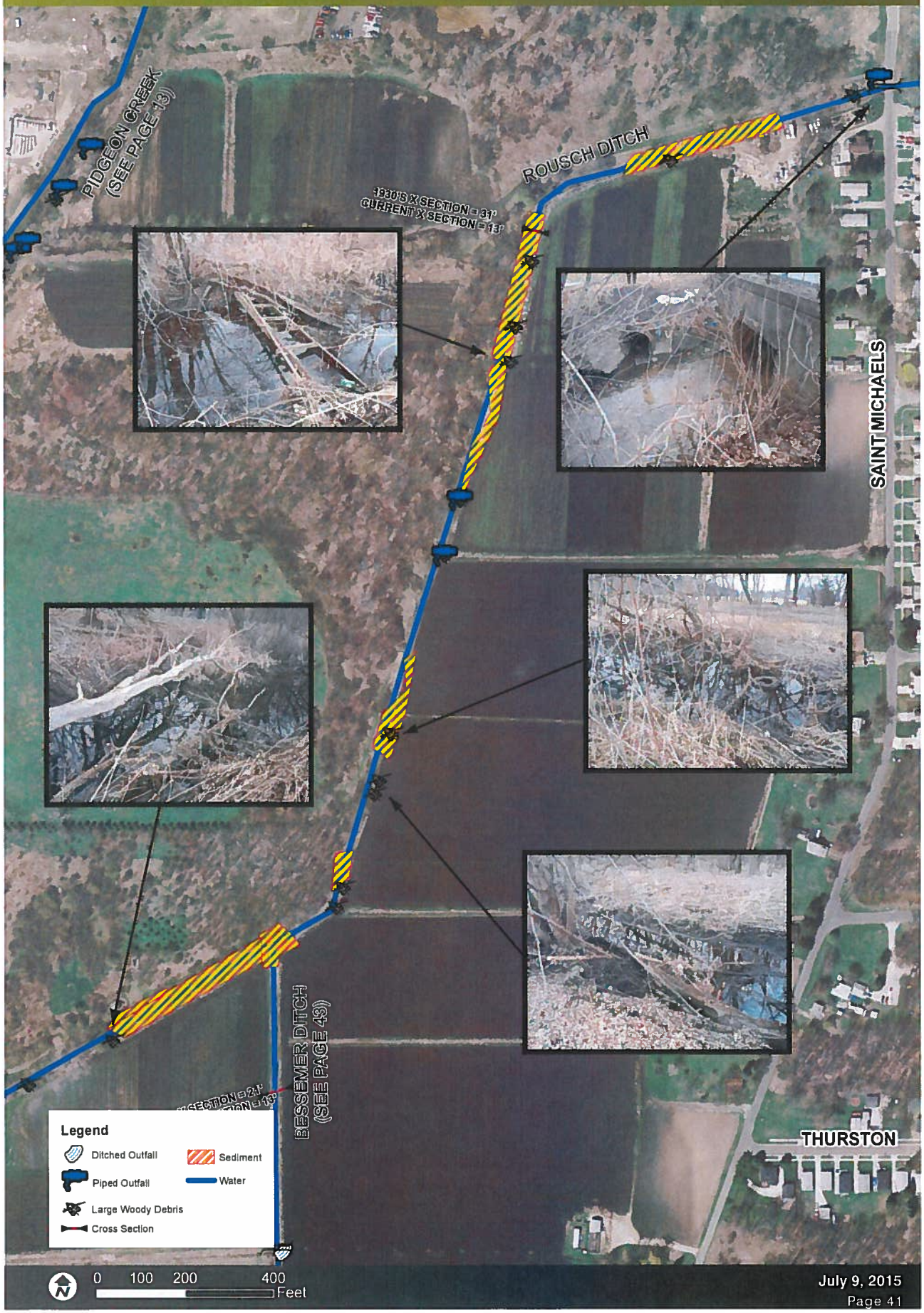


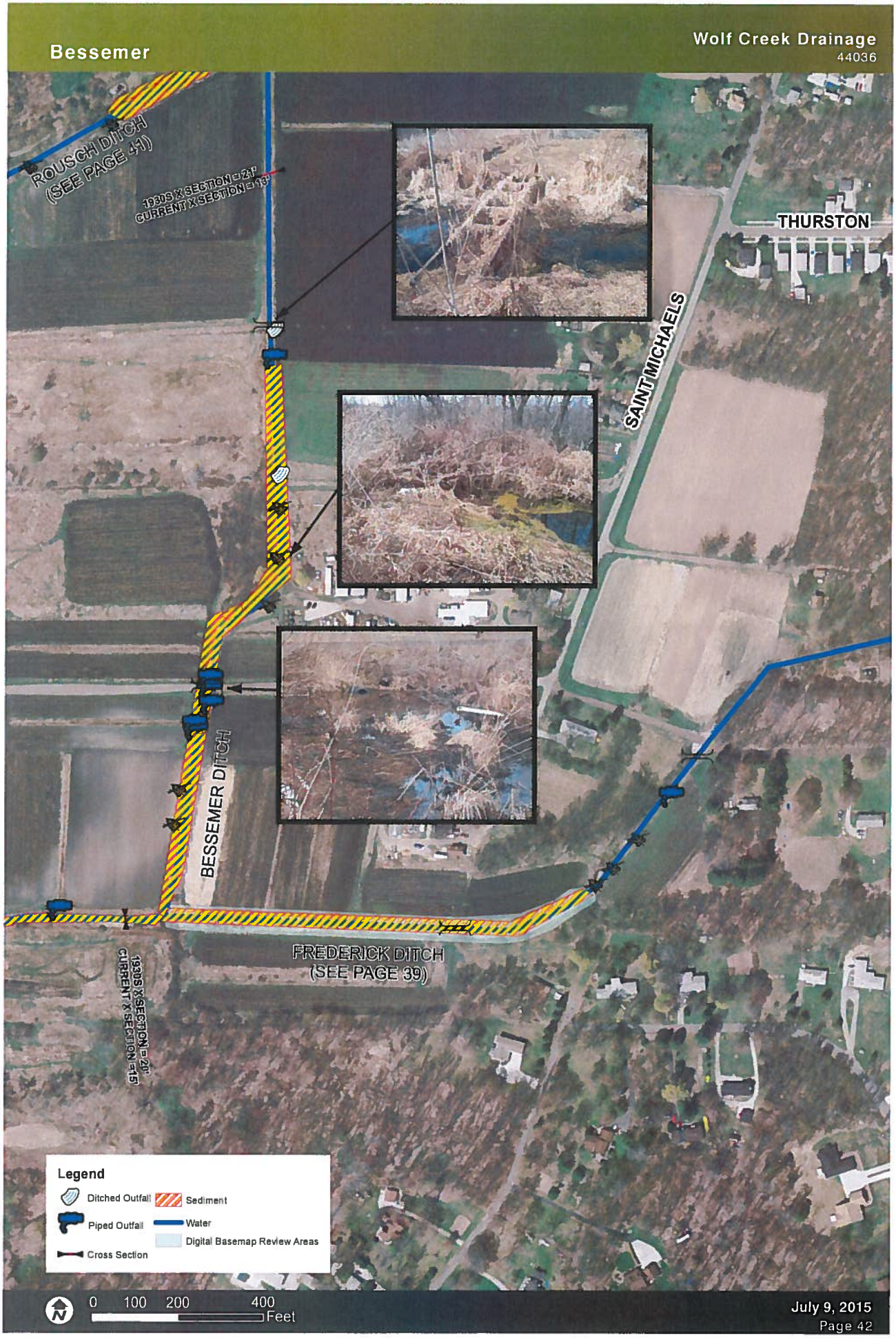




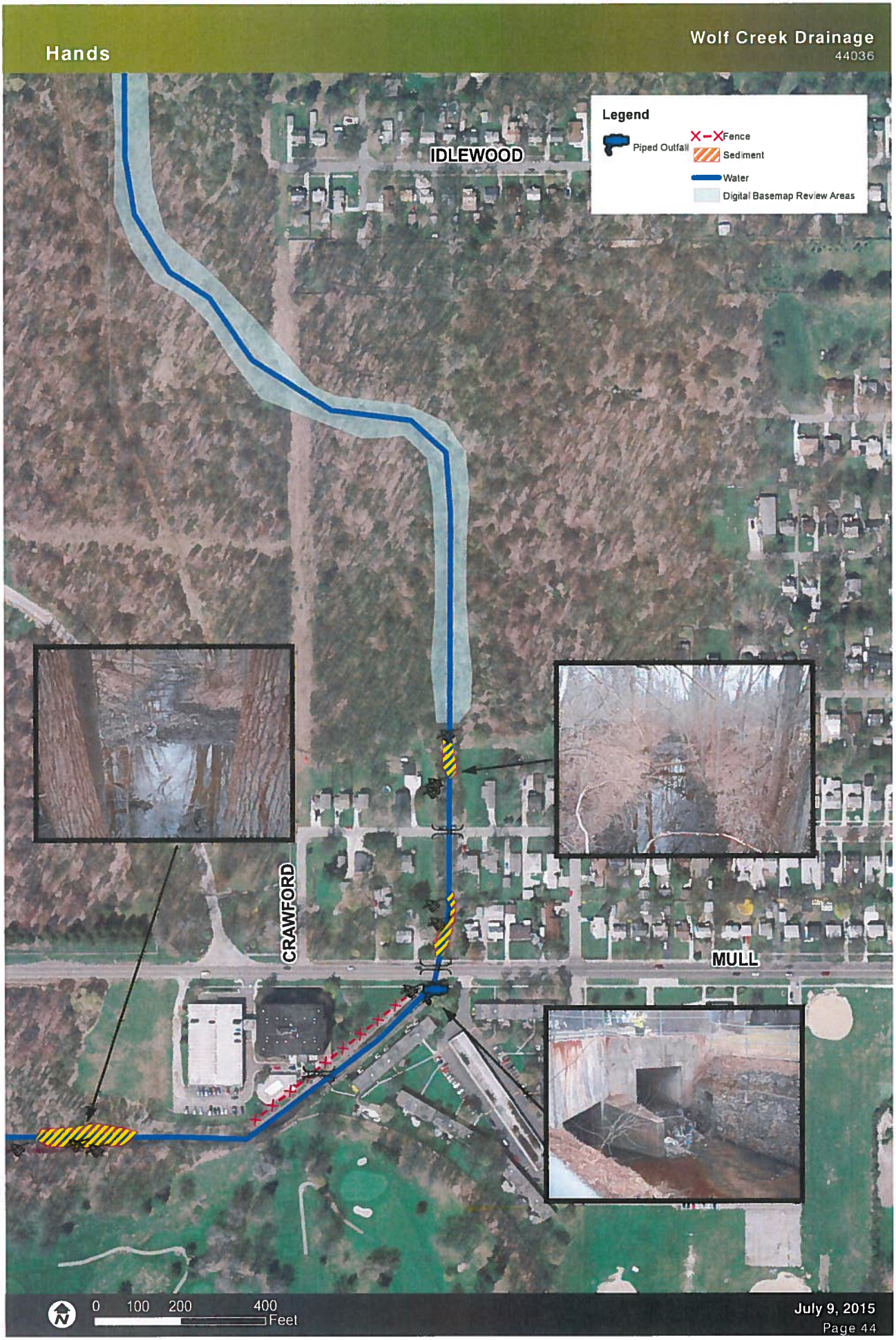






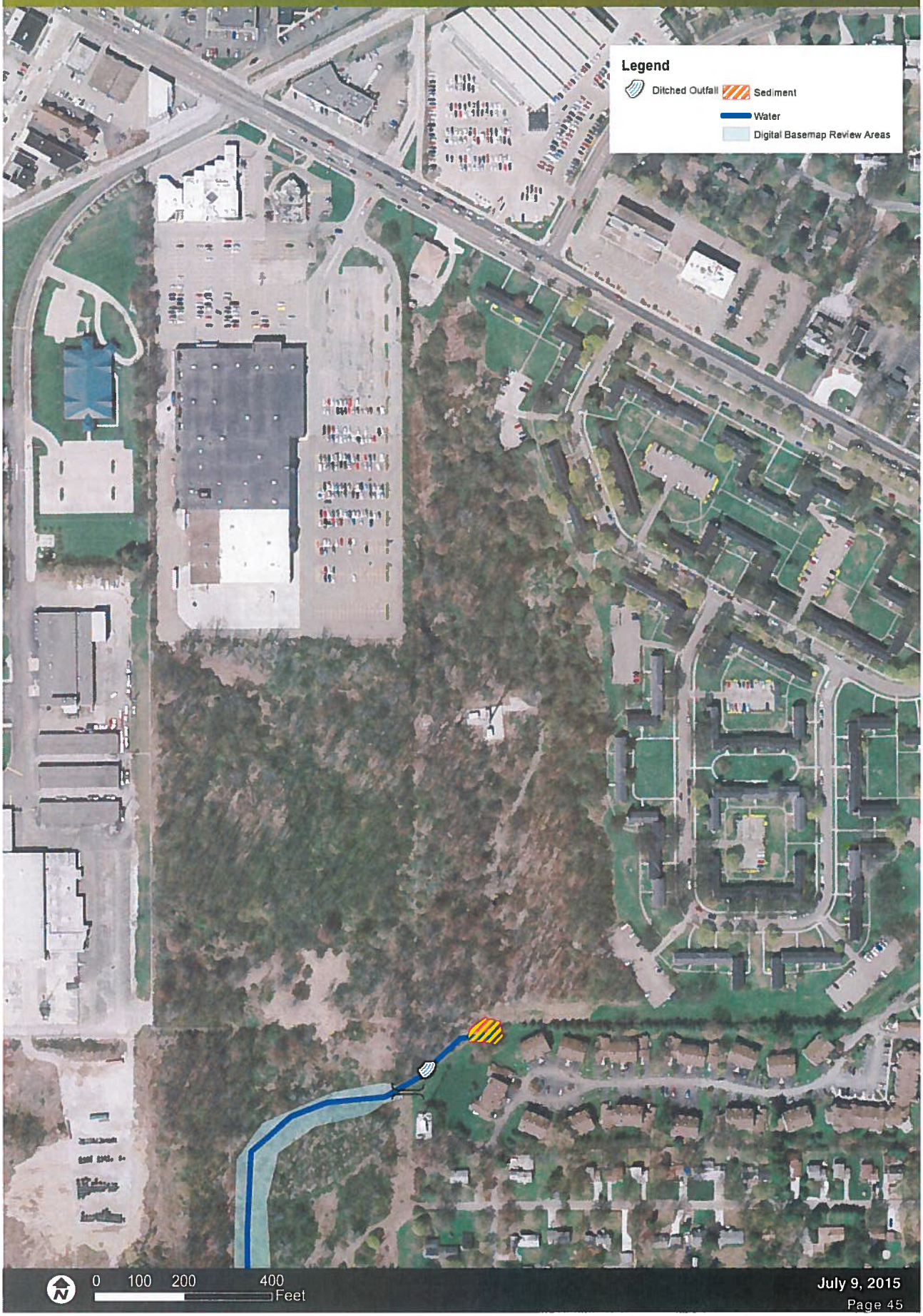


Wolf Creek Drainage
44036

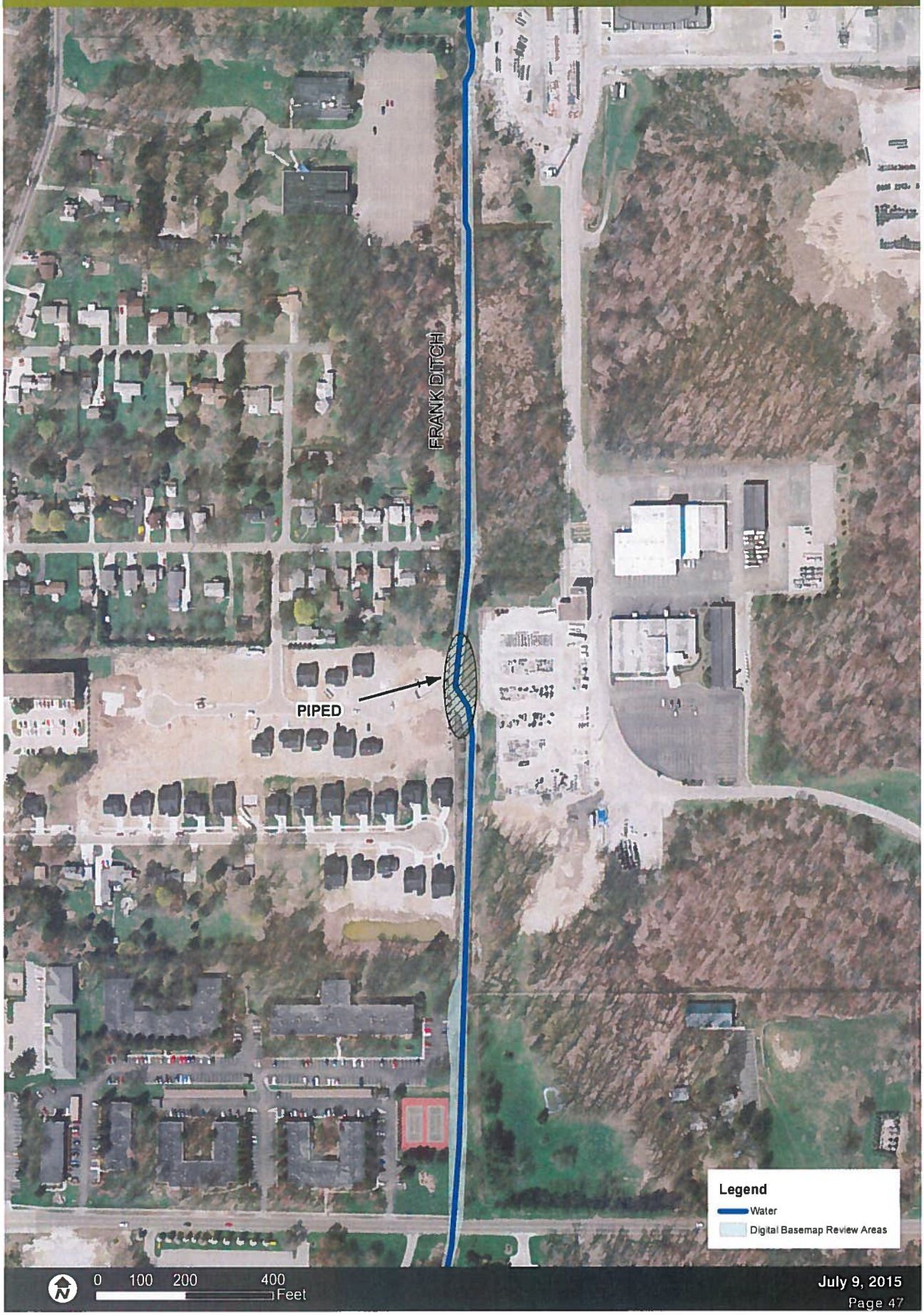


July 9, 2015

Wolf Creek Drainage
44036



July 9, 2015



Wolf Creek Drainage

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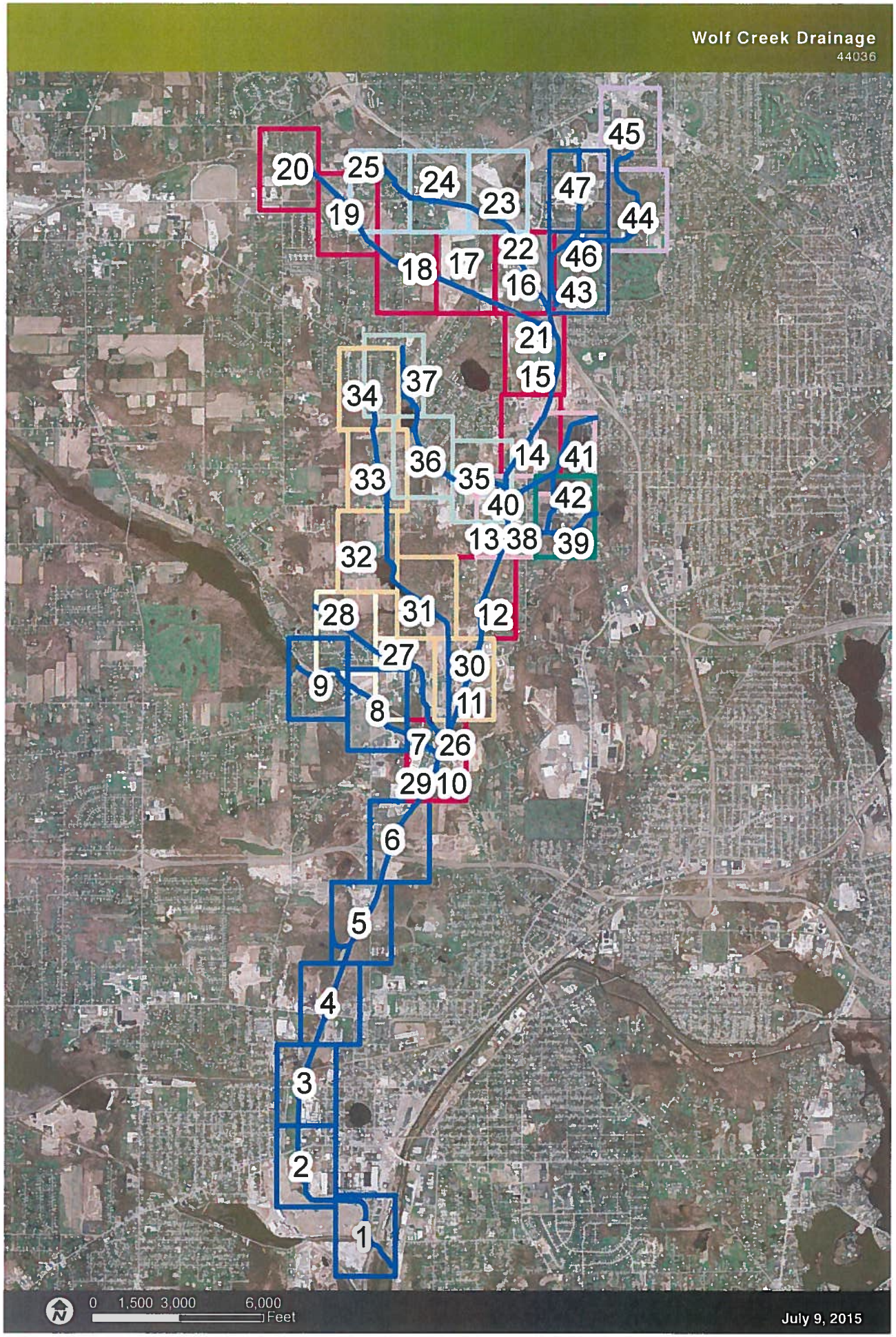

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APPENDIX C

FULL-SIZED FIELD INVESTIGATION PICTURES CAN BE VIEWED ON THE SUMMIT COUNTY ENGINEER'S WEBSITE

APPENDIX D

CONCEPTUAL GRADE COST ESTIMATE

WOLF CREEK REHABILITATION

CONCEPTUAL COST SUMMARY FOR ALL TRIBUTARIES BID AS ONE PROJECT

June 17, 2015

ITEM/SHEET	Total	Unit	Unit Cost	Total Cost
Mobilization	1	LS	$50,000	$50,000
Excavation and spreading	333,962	CY	$20	$6,679,233
Excavation and hauled offsite	163,049	CY	$30	$4,891,485
Excavation hauled offsite (hazardous)*	7,351	CY	$60	$441,060
Clearing and Grubbing	44	ACRE	$6,000	$265,034
Removal of Structures and Obstructions	213	EA	$500	$106,500
Removal of Structures and Obstructions (volume)	9,348	CY	$10	$93,481
Fence Removed and Replaced	1,550	LF	$5	$7,750
Clean under Bridges and Culverts	69	EA	$1,500	$103,500
Seeding and Mulching	207,876	SY	$0.50	$103,938
Construction Layout Stakes	1	LS	$45,000	$45,000
Bank Stabilization**	14,535	LF	$120	$1,744,200
20% CONTIGENCY				$2,906,236
TOTAL CONSTRUCTION COST				$17,437,417

ENGINEERING & SURVEY	$2,092,490
CONSTRUCTION ADMINISTRATION/INSPECTION	$4,359,354
REGULATORY[H]	$150,000
CONCEPTUAL PROJECT COST ESTIMATE	$24,039,262

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

[H] Includes Permitting fees and effort for USACE 401/404 Individual and FEMA No-Rise Certificate

WATERSHED	WOLF CREEK												
ITEM/SHEET	1	2	3	4	5	6	7	8	9	Total	Unit	Unit Cost	Total Cost
Mobilization										1	LS	$50,000	$50,000
Excavation and spreading	0	0	0	14393	12741	13900	35981	2753	38127	117,895	CY	$20	$2,357,899
Excavation and hauled offsite	5900	12726	10781	0	14696	35893	3756	0	0	83,751	CY	$30	$2,512,543
Excavation hauled offsite (hazardous)*	1475	3181	2695	0	0	0	0	0	0	7,351	CY	$60	$441,060
Clearing and Grubbing	1.5	1.4	1.2	0.1	0.7	0.4	1.4	0.7	0.9	8.3	ACRE	$6,000	$49,725
Removal of Structures and Obstructions	5	6	6	10	13	16	11	0	0	67	EA	$500	$33,500
Removal of Structures and Obstructions (volume)	1481	0	0	0	0	0	0	0	0	1,481	CY	$10	$14,815
Fence Removed and Replaced	1000	100	150	100	0	0	0	0	0	1,350	LF	$5	$6,750
Clean under Bridges and Culverts	2	1	4	1	1	2	3	1	1	16	EA	$1,500	$24,000
Seeding and Mulching	3289	7000	5778	3222	3278	1722	6667	5778	4444	41,178	SY	$0.50	$20,589
Construction Layout Stakes	0	0	0	0	0	0	0	0	0	1	LS	$10,000	$10,000
Bank Stabilization**	0	275	330	0	450	680	800	1015	703	4,253	LF	$120	$510,360
20% CONTIGENCY													$1,206,248
TOTAL CONSTRUCTION COST													$7,237,489

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	PIGEON CREEK														
ITEM/SHEET	10	11	12	13	14	15	16	17	18	19	20	Total	Unit	Unit Cost	Total Cost
Mobilization												1	LS	$50,000	$50,000
Excavation and spreading	14,500	18,913	18,004	18,723	14,815	33,600	2,240	2,933	2,108	2,933	2,371	131,141	CY	$20	$2,622,810
Excavation and hauled offsite	0	11,761	479	1,093	8,889	0	0	0	1,459	2,119	0	25,799	CY	$30	$773,983
Excavation hauled offsite (hazardous)*	0	0	0	0	0	0	0	0	0	0	0	0	CY	$60	$0
Clearing and Grubbing	0.1	1.3	1.3	1.2	1.5	1.7	0.4	1.0	1.0	1.4	0.7	11.5	ACRE	$6,000	$69,270
Removal of Structures and Obstructions	4	13	13	7	7	8	0	0	7	10	2	71	EA	$500	$35,500
Removal of Structures and Obstructions (volume)	0	0	0	0	0	0	1,852	1,852	0	0	0	3,704	CY	$10	$37,037
Fence Removed and Replaced	0	0	0	0	0	0	0	0	0	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	0	1	1	1	2	0	1	0	1	3	3	13	EA	$1,500	$19,500
Seeding and Mulching	667	6,333	6,222	5,778	7,111	8,000	1,867	4,889	4,889	6,889	3,233	55,878	SY	$0.50	$27,939
Construction Layout Stakes	0	0	0	0	0	0	0	0	0	0	0	1	LS	$10,000	$10,000
Bank Stabilization**	220	300	100	0	260	250	0	200	0	700	0	2,030	LF	$120	$243,600
20% CONTIGENCY															$777,928
TOTAL CONSTRUCTION COST															$4,667,567

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	SCHOLOLOG CREEK								
ITEM/SHEET	21	22	23	24	25	Total	Unit	Unit Cost	Total Cost
Mobilization						1	LS	$25,000	$25,000
Excavation and spreading	3,111	2,644	4,741	9,049	1,111	20,656	CY	$25	$516,400
Excavation and hauled offsite	0	2,022	5,333	0	2,073	9,429	CY	$35	$329,998
Excavation hauled offsite (hazardous)*	0	0	0	0	0	0	CY	$60	$0
Clearing and Grubbing	0.3	1.4	0.8	0.9	0.6	4.0	ACRE	$6,000	$23,939
Removal of Structures and Obstructions	3	4	2	0	3	12	EA	$500	$6,000
Removal of Structures and Obstructions (volume)	0	0	0	0	0	0	CY	$10	$0
Fence Removed and Replaced	0	0	0	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	0	1	0	1	3	5	EA	$1,500	$7,500
Seeding and Mulching	1,333	6,667	378	4,467	3,067	15,911	SY	$0.50	$7,956
Construction Layout Stakes	0	0	0	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	0	250	0	0	250	LF	$120	$30,000
20% CONTIGENCY									$190,359
TOTAL CONSTRUCTION COST									$1,142,152

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	VIERS						
ITEM/SHEET	26	27	28	Total	Unit	Unit Cost	Total Cost
Mobilization				1	LS	$25,000	$25,000
Excavation and spreading	1,244	0	0	1,244	CY	$35	$43,556
Excavation and hauled offsite	0	4,741	4,444	9,185	CY	$40	$367,407
Excavation hauled offsite (hazardous)*	0	0	0	0	CY	$60	$0
Clearing and Grubbing	0.4	1.5	1.1	2.9	ACRE	$6,000	$17,593
Removal of Structures and Obstructions	2	4	9	15	EA	$500	$7,500
Removal of Structures and Obstructions (volume)	0	0	2,593	2,593	CY	$10	$25,926
Fence Removed and Replaced	0	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	0	7	1	8	EA	$1,500	$12,000
Seeding and Mulching	1,867	7,111	5,333	14,311	SY	$0.50	$7,156
Construction Layout Stakes	0	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	1,400	350	1,750	LF	$120	$210,000
20% CONTIGENCY							$144,228
TOTAL CONSTRUCTION COST							$865,365

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	COPLEY									
ITEM/SHEET	29	30	31	32	33	34	Total	Unit	Unit Cost	Total Cost
Mobilization							1	LS	$25,000	$25,000
Excavation and spreading	1,856	9,823	1,671	2,922	0	0	16,272	CY	$20	$325,440
Excavation and hauled offsite	0	289	0	0	8,446	2,617	11,351	CY	$30	$340,532
Excavation hauled offsite (hazardous)*	0	0	0	0	0	0	0	CY	$60	$0
Clearing and Grubbing	0.2	1.2	1.2	1.2	1.3	0.7	5.8	ACRE	$6,000	$34,848
Removal of Structures and Obstructions	0	1	1	1	4	3	10	EA	$500	$5,000
Removal of Structures and Obstructions (volume)	0	0	0	0	0	0	0	CY	$10	$0
Fence Removed and Replaced	0	0	0	0	0	100	100	LF	$5	$500
Clean under Bridges and Culverts	0	1	1	0	3	1	6	EA	$1,500	$9,000
Seeding and Mulching	778	6,000	5,778	5,844	6,222	3,489	28,111	SY	$0.50	$14,056
Construction Layout Stakes	0	0	0	0	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	0	3,300	500	1,212	0	5,012	LF	$120	$601,440
20% CONTIGENCY										$272,163
TOTAL CONSTRUCTION COST										$1,632,980

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	BLACK POND						
ITEM/SHEET	35	36	37	Total	Unit	Unit Cost	Total Cost
Mobilization				1	LS	$25,000	$25,000
Excavation and spreading	2,074	2,370	5,556	10,000	CY	$25	$250,000
Excavation and hauled offsite	3,437	5,630	0	9,067	CY	$35	$317,333
Excavation hauled offsite (hazardous)*	0	0	0	0	CY	$60	$0
Clearing and Grubbing	0.9	1.2	1.1	3.2	ACRE	$6,000	$19,449
Removal of Structures and Obstructions	0	1	0	1	EA	$500	$500
Removal of Structures and Obstructions (volume)	741	830	0	1,570	CY	$10	$15,704
Fence Removed and Replaced	0	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	3	3	1	7	EA	$1,500	$10,500
Seeding and Mulching	4,133	6,000	1,852	11,985	SY	$0.50	$5,993
Construction Layout Stakes	0	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	240	0	400	640	LF	$120	$76,800
20% CONTIGENCY							$145,256
TOTAL CONSTRUCTION COST							$871,534

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	FREDERICK					
ITEM/SHEET	38	39	Total	Unit	Unit Cost	Total Cost
Mobilization			1	LS	$25,000	$25,000
Excavation and spreading	0	5,044	5,044	CY	$35	$176,556
Excavation and hauled offsite	4,299	0	4,299	CY	$40	$171,947
Excavation hauled offsite (hazardous)*	0	0	0	CY	$60	$0
Clearing and Grubbing	0.5	1.0	1.6	ACRE	$6,000	$9,328
Removal of Structures and Obstructions	0	3	3	EA	$500	$1,500
Removal of Structures and Obstructions (volume)	0	0	0	CY	$10	$0
Fence Removed and Replaced	100	0	100	LF	$5	$500
Clean under Bridges and Culverts	2	2	4	EA	$1,500	$6,000
Seeding and Mulching	2,480	5,044	7,524	SY	$0.50	$3,762
Construction Layout Stakes	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	0	0	LF	$120	$0
20% CONTIGENCY						$79,918
TOTAL CONSTRUCTION COST						$479,511

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	ROUSCH					
ITEM/SHEET	40	41	Total	Unit	Unit Cost	Total Cost
Mobilization			1	LS	$25,000	$25,000
Excavation and spreading	1,944	6,444	8,389	CY	$35	$293,611
Excavation and hauled offsite	4,167	667	4,833	CY	$40	$193,333
Excavation hauled offsite (hazardous)*	0	0	0	CY	$60	$0
Clearing and Grubbing	0.6	1.5	2.0	ACRE	$6,000	$12,121
Removal of Structures and Obstructions	2	12	14	EA	$500	$7,000
Removal of Structures and Obstructions (volume)	0	0	0	CY	$10	$0
Fence Removed and Replaced	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	2	1	3	EA	$1,500	$4,500
Seeding and Mulching	2,667	7,111	9,778	SY	$0.50	$4,889
Construction Layout Stakes	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	0	0	LF	$120	$0
20% CONTIGENCY						$109,091
TOTAL CONSTRUCTION COST						$654,545

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	BESSEMER				
ITEM/SHEET	42	Total	Unit	Unit Cost	Total Cost
Mobilization		1	LS	$25,000	$25,000
Excavation and spreading	5,172	5,172	CY	$35	$181,028
Excavation and hauled offsite	817	817	CY	$40	$32,667
Excavation hauled offsite (hazardous)*	0	0	CY	$60	$0
Clearing and Grubbing	1.0	1.0	ACRE	$6,000	$6,061
Removal of Structures and Obstructions	5	5	EA	$500	$2,500
Removal of Structures and Obstructions (volume)	0	0	CY	$10	$0
Fence Removed and Replaced	0	0	LF	$5	$0
Clean under Bridges and Culverts	2	2	EA	$1,500	$3,000
Seeding and Mulching	4,889	4,889	SY	$0.50	$2,444
Construction Layout Stakes	0	1	LS	$5,000	$5,000
Bank Stabilization**	0	0	LF	$120	$0
20% CONTIGENCY					$51,540
TOTAL CONSTRUCTION COST					$309,239

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.

WATERSHED	HANDS						
ITEM/SHEET	43	44	45	Total	Unit	Unit Cost	Total Cost
Mobilization				1	LS	$25,000	$25,000
Excavation and spreading	10,556	6,222	1,370	18,148	CY	$25	$453,704
Excavation and hauled offsite	0	4,148	370	4,519	CY	$35	$158,148
Excavation hauled offsite (hazardous)*	0	0	0	0	CY	$60	$0
Clearing and Grubbing	1.7	1.6	0.4	3.8	ACRE	$6,000	$22,700
Removal of Structures and Obstructions	6	9	0	15	EA	$500	$7,500
Removal of Structures and Obstructions (volume)	0	0	0	0	CY	$10	$0
Fence Removed and Replaced	0	0	0	0	LF	$5	$0
Clean under Bridges and Culverts	1	3	1	5	EA	$1,500	$7,500
Seeding and Mulching	8,444	7,778	2,089	18,311	SY	$0.50	$9,156
Construction Layout Stakes	0	0	0	1	LS	$5,000	$5,000
Bank Stabilization**	600	0	0	600	LF	$120	$72,000
20% CONTIGENCY							$152,141
TOTAL CONSTRUCTION COST							$912,849

*hazardous quantity assumed 20% of total disposal

**Includes toe protection, bank shaping, and establishment of vegetation

*** Lump Sum Bid Items (Mobilization and Construction Layout Stakes) were broken out if each tributary area was a separate project.