



Lake Erie
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LAKE ERIE PROTECTION FUND (LEPF) SG-515-2017

“BRANDYWINE CREEK WATERSHED MODELING STUDY”

ABSTRACT

By: Bradley Kosco P.E., P.S., Hudson City Engineer *BK* Date: February 21, 2019

The City of Hudson's Brandywine Creek Watershed Modeling study was partially funded by the Lake Erie Protection Fund (LEPF). The LEPF is supported by tax-deductible donations and voluntary contributions of Ohioans and who purchase a Lake Erie license plate featuring the Marblehead lighthouse, Toledo Harbor lighthouse, or the Lake Erie life preserver. More information on the Lake Erie Protection Fund can be found at:

www.lakeerie.ohio.gov

The Brandywine Creek Watershed Study was developed to analyze existing watershed issues including erosion, sediment, floodplain management, and storm management problems that affect the Brandywine Creek & Brandywine Creek Tributary watersheds in Hudson, other downstream communities, and the Cuyahoga River.

The study was completed in conjunction with the North East Ohio Regional Sewer District's (NEORS) Cuyahoga River South Stormwater Master Plan that identified regional storm water problems and recommend solutions, including a prioritized list of construction and maintenance projects. The NEORS Master Plan was also developed to provide inspection/maintenance schedules, policy recommendations, and the rationale for recommendations.

The City of Hudson contracted with NEORS's engineering consultant, CDM Smith, Inc. to expand the NEORS Master Plan and hydraulic model to include study and evaluation of local, Hudson-specific areas of concern within the Brandywine Creek watershed.

The local study developed and ranked solutions to identified problems including “preservation” practices/projects that restore the storm water system like riparian area protection, debris/sediment removal or infrastructure maintenance strategies and “enhancement” projects that increase the function of the storm water system like flood plain creation, property acquisition, increased storage and new storm conveyance systems.

The study recommendations will be used by NEORS and the City of Hudson to identify and budget the improvements that provide the most beneficial environmental and flood mitigation impacts to Brandywine Creek and Cuyahoga River watersheds.

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LAKE ERIE PROTECTION FUND (LEPF) SG-515-2017
“BRANDYWINE CREEK WATERSHED MODELING STUDY”

TECHNICAL REPORT

By: Bradley Kosco P.E., P.S., Hudson City Engineer *BK* Date: February 21, 2019

The City of Hudson’s Brandywine Creek Watershed Modeling study was partially funded by the Lake Erie Protection Fund (LEPF). The LEPF is supported by tax-deductible donations and voluntary contributions of Ohioans and who purchase a Lake Erie license plate featuring the Marblehead lighthouse, Toledo Harbor lighthouse, or the Lake Erie life preserver. More information on the Lake Erie Protection Fund can be found at:

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A copy of the Final City of Hudson Community Report for the Brandywine Creek Watershed Study is attached to this technical report summary. A copy of NEORS’s Cuyahoga River South Watershed Study will be available via NEORS once the study has been completed in Spring, 2019.

Study Activities and Timeline

In 2017, the North East Ohio Regional Sewer District (NEORS) began the Cuyahoga River South Stormwater Master Plan to help identify regional (drainage area greater than 300 acres) storm water problems and recommend solutions, including a prioritized list of construction and maintenance projects. The plan was to also develop NEORS’s inspection/maintenance schedules, policy recommendations, and the rationale for the recommendations.

The City of Hudson contracted with NEORS’s engineering consultant, CDM Smith, Inc. to expand the NEORS Master Plan and hydraulic model to include study and evaluation of local (drainage area less than 300 acres), Hudson-specific areas of concern within Brandywine Creek watershed.

The Hudson portion of the watershed study was completed in January 2019 and submitted to the City of Hudson. City of Hudson staff presented the study and results to Hudson City Council on February 12, 2019 and recommended implementation of select projects within the City’s upcoming 2020-2025 budgeting cycle. The full NEORS Stormwater Master Plan is anticipated to be completed later in 2019.

Study Goals and Development

CDM Smith first began building the new study and hydrologic/hydraulic (H&H) model by meeting with the City to identify problem areas of concern, collecting available records (GIS, plans, existing aerial survey, previous studies, City/NEORS field inspections, surface and soil types, etc.) and inputting the data into EPA’s SWMM modeling software along with historical rainfall data for the region. Model results were compared to stream/rainfall gauge data and recorded field observations. The model was then calibrated used for proposed improvement analysis.

Each chapter of the study reviewed the Project Area's storm water assets including the main creek branch, transportation crossings, storage features and nearby buildings that could be affected by the storm water system.

The analysis also included 22 specific areas of concern identified by City staff. A summary of the 22 areas along with the study page number where the analysis of that area can be found is shown below:

City of Hudson Problem ID	Location	SWMP Project Area ID	Page Number
Regional Stormwater System Problems addressed by Cuyahoga River South Stormwater Master Plan			
1	Colony Park Detention Ponds	BRPA16	49
2	Ravenna Street Culvert (1) at 270 Ravenna Street	BRPA16	49
3	Barlow Community Center (40 S. Oviatt Street) Upper Lake	BRPA14	41
4	Barlow Community Center Lower Lake	BRPA14	41
5	Brandywine Creek Trib., west of Fire Station at 41 S. Oviatt Street	BRPA14	41
7	Ravenna Street Culvert (2) at 34 Ravenna Street.	BRPA14	41
15	W. Streetsboro Road (SR 303) Culvert/ Bridge	BRPA14	41
16	Owen Brown Street Culvert/Bridge	BRPA13	44
18	Brandywine Creek behind Blackberry Drive	BRPA11	29
19	Hudson Hills/Winston Manor Retention Pond near 9 Blackberry Drive	BRPA11	29
20	Private property flooding at 6956 Post Lane	BRPA11	29
21	Future Valley View/OTIC Regional Storage Pond	BRPA18	57
22	Pine Lake	BRPA09	21
Local Stormwater System Problems addressed by Cuyahoga River South Stormwater Master Plan			
8	Behind Rosewood Grill building, 36 E. Streetsboro Road	BRPA17	53
9	49 E. Streetsboro Street	BRPA17	53
10	74 Church Street	BRPA17	53
11	73 Division Street	BRPA17	53
12	2 Ellsworth Court	BRPA17	53
13	Hudson Middle School, 77 N. Oviatt Street	BRPA17	53
6	Storm Sewer behind HPP Electric Substation at 95 S. Main Street	BRPA14	41
14	S. Main Street (SR 91) Culvert/ Bridge	BRPA14	41
17	Norfolk Southern Railroad Culvert	BRPA15	45

Solutions to identified problems were separated into two categories:

- (a) Baseline Measures to Preserve/Restore Stream Function: Certain measures that are recommended for systemwide implementation to preserve/restore existing stream function, without which the existing hydraulic, geomorphic, or biological stream function would degrade, and the effectiveness of the structural recommendations be compromised. Solutions include practices/projects that preserve/restore the storm water system like riparian area protection, debris/sediment removal.

Study Results

A summary of the project priority ranking, score and estimated cost is provided on p. 67 of the report and copied below. Individual project cost estimates are provided in Appendix B of the study.

Appendix C provides “Project Definition Statements” which are a summary of each project area and includes a map, identified assets, found problems, recommended solutions and cost estimates.

Table 18 Project Area Priorities and Sequencing for the City of Hudson

Priority	Project Area ID	Project Area Name	Project Benefit Score	Suggested Sequencing and Duration of Recommended Project(s)	Estimated Construction Cost
1	BRPA12	Upper Brandywine	85	1. Acquire three residential properties and restore floodplain.	\$1,865,000
2	BRPA18	Upper Brandywine	83	1. Expand floodplain and naturalize channel/riparian area.	\$2,691,000
3	BRPA15	Local System	81	1. Install storm sewer along Morse Road, integrated with planned development, from railroad crossing to floodplain north of Owen Brown Street	\$457,000
4	BRPA09	Mainstem	75	1. Replace Ingleside Dr. crossing 2. Restore stream within footprint of Pine Lake and install in-stream weir in existing embankment to maximize storage	\$3,643,000
5	BRPA10	Upper Brandywine	73	1. Install offline detention facility in vacant parcel northeast of RR.	\$2,177,000
6	BRPA07	North Branch 2	60	1. Stabilize E. Hines Hill Rd. crossing abutment 2. Stabilize channel upstream of Norfolk Southern Railroad crossing 3. Replace failing crossing, install orifice plate/in-stream weir to increase floodplain/wetland detention, 4. Restore storage in existing detention basin 5. Add 2-stage channel with sinuosity.	\$6,387,000
7	BRPA17	Local System	56	1. Install basins at Hudson Middle School and Rosewood Grill.	\$1,628,000
8	BRPA16	Mainstem	17	1. Increase detention storage in two Colony Park basins 2. Build new basin upstream of Barlow upper lake.	\$3,827,000
9	BRPA11	Upper Brandywine	10	1. Relocate driveway/remove existing crossing 2. Convert existing basin to WQ basin and stabilize streambanks	\$1,146,000
10	BRPA13	Mainstem	2	1. Increase floodplain storage downstream of Owen Brown St. 2. Replace Owen Brown St. crossing 3. Add bank stabilization and microhabitat features to enhance habitat and stability while not diminishing conveyance capacity	\$2,655,000
11	BRPA14	Mainstem	-2	1. Stabilize streambanks to protect BTUs 2. Replace Ravenna St. crossing 3. Increase storage of Barlow upper lake and install operational control to regulate lake levels 4. Install storm sewer to redirect flow south of railroad to wetland in Veterans Park 5. Install detention west of Hudson Fire Department	\$1,823,000
City of Hudson – Project Area Priorities and Sequencing: Total Estimated Construction Cost					\$28,299,000