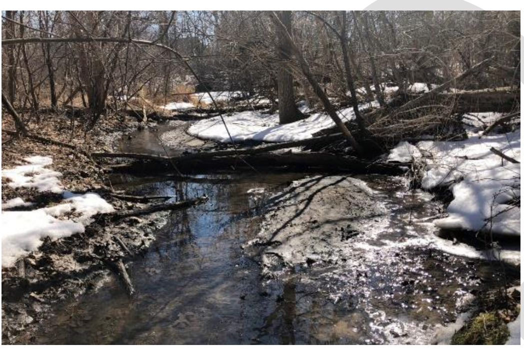
Newport Creek Area Drainage Study

FOR THE CITY OF ANN ARBOR

Draft: October 4, 2021
HRC Job No. 20200315



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SECTION 1.0 — INTRODUCTION

1.1 OVERVIEW

The Newport Creek Area is a 0.95 square mile (606 acres) drainage area of an unnamed tributary to the Huron River. Located in both the City of Ann Arbor (the City) and the Charter Township of Ann Arbor (the Township), residents have registered streambank erosion and flooding concerns over the past several years. As part of the City's Capital Improvement Plan (CIP) process, the City has asked Hubbell, Roth & Clark, Inc. (HRC) to undertake a drainage study of the area.

This study included five main components:

- Assessment of Newport Creek
- Assessment of stormwater basins within the drainage district
- County Drain establishment requirements
- Hydraulic modeling
- Assistance with public engagement

This report is intended to summarize the creekshed hydrology, streambank erosion, stormwater basin performance, and flooding issues and also highlight potential areas for improvement.

The City may seek to petition the Washtenaw County Water Resource Commissioner's Office (the County) to make the approximately 3 miles of the tributary into a legally established County Drain. This requires a delineation of the drainage district, preparation of a route and course description, and identification of the easement requirements, which are all noted herein.

SECTION 2.0 — FINDINGS

2.1 NEWPORT CREEK ASSESSMENT

In March 2021, HRC performed a field inspection of Newport Creek from the Huron River to the upper extent of the open channel near M-14 (Figure 1). Newport Creek consists of two branches (east and west) that join to create the main stem of the creek just north of Bird Road. The west branch is larger (~1.43 mi) than the east branch (~1.0 mi) and was considered the main channel throughout the study. The upstream portion of both branches (south of M-14) are entirely enclosed in storm drains. The west branch becomes an open channel just south of the M-14 eastbound onramp while the east branch begins at the discharge point of the water softening plant pond outlet just north of M-14.

The west branch, east branch, and main stem total roughly 3.20 miles of stream. However, approximately 620 feet of the main stem is enclosed in an existing 66" reinforced concrete pipe storm drain between Lowell Road and Holyoke Lane.

Using ArcGIS Collector, a mobile data collection application, the baseline assessment determined the existing conditions of the open channel and specifically evaluated:

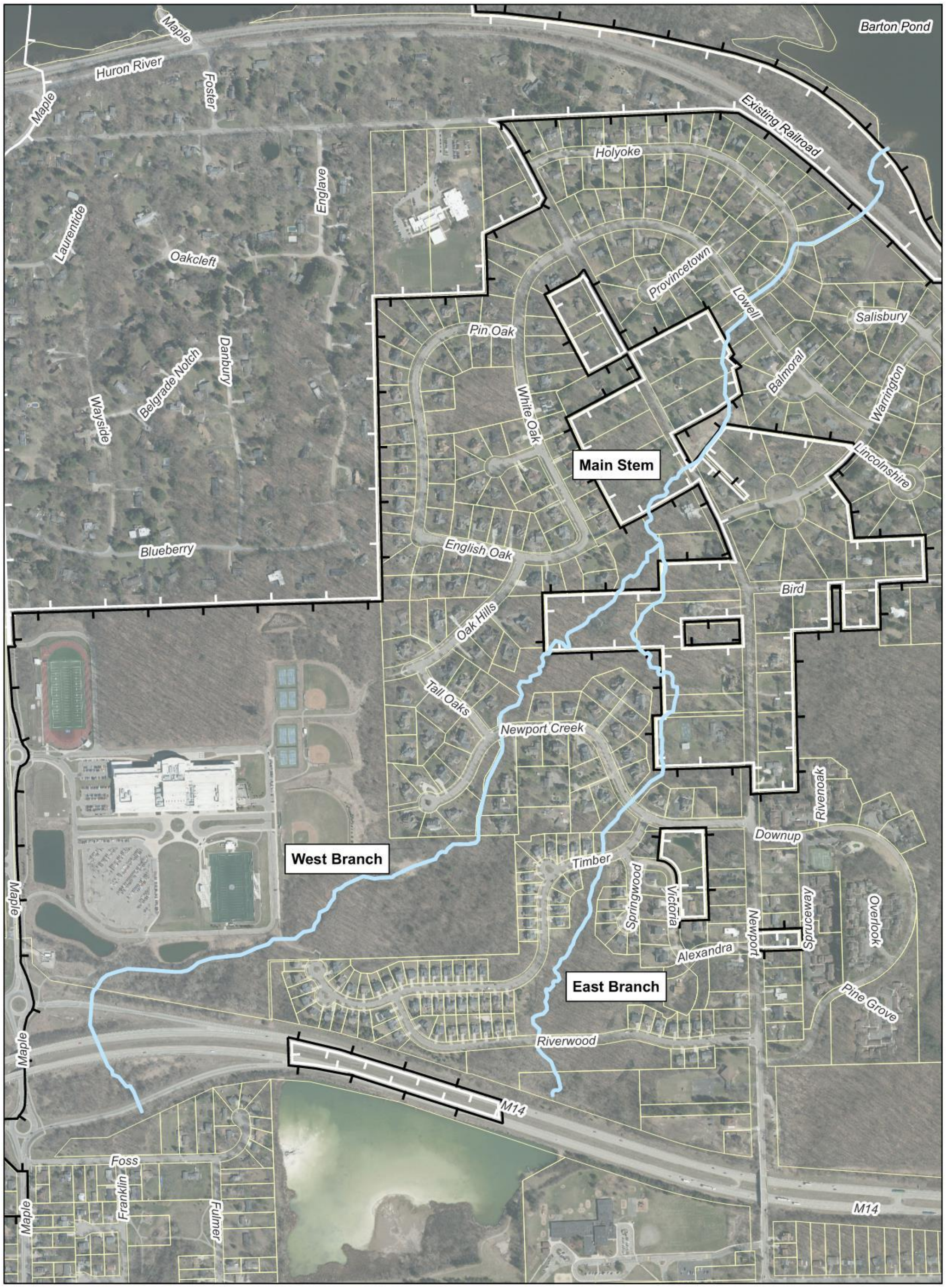
- Streambank/slope conditions
- Encroachments
- Obstructions
- Sedimentation

Those parameters were given severity scores of minor, moderate, or severe to denote the extent of any one issue. As part of the field inspection, HRC also identified and evaluated the existing condition (good, fair, or poor) of the following features:

- Bridges
- Outlets
- Inlets
- Culverts

All severity and condition scores were assessed qualitatively; no measurements or survey data was collected. Overall, Newport Creek is in fair condition with impacts reflecting those typically found on an urban stream or drain. Throughout the 3.2 miles of assessment, streambank erosion, log jams, sedimentation, and excessive vegetation were noted. The specific locations of the inspection results and detailed condition reports of the creek are included in Appendix A.

Figure 1. Extent of the Newport Creek Drainage Study.



CITY OF ANN ARBOR MICHIGAN

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SHEET TITLE: Drainage Study Extent Map

PROJECT TITLE: Newport Drain Evaluation

Legend
- Newport Creek
- City of Ann Arbor
- Ann Arbor Township
- Parcels

HRC JOB NO. 20200315

PAGE:

DATE: 6/18/2021

AUTHOR: spetriello

N

0 125 250 500 Feet

Streambank Conditions

As part of the stream assessment, particular attention was paid to the streambank conditions and severity of erosion. In the ArcCollector mobile application, the left and right banks were evaluated independently. Therefore, the 3.2 miles of stream (16,872 feet) actually generated twice that in assessment length (33,744 feet of banks). All streambank data presented in this report uses the total assessment length when detailing percentages.

Throughout the 3.2 miles of stream assessment (Huron River to M-14), just over 7,500 feet of eroding banks were identified on both sides of the channel. This equates to roughly 22.4% of the streambanks (Table 1). Eroding banks are a common occurrence in urban streams given the surrounding circumstances (increased impervious surfaces, flashy flows from stormwater, encroachments from development and adjacent property owners, culvert installations, etc.). These areas are evenly spread throughout the system where the total erosion of each section ranges from 20-25% and thereby each contributes 5-10% of the total erosion within the entire stream (Table 1).

Table 1. Erosion within the three sections of Newport Creek.

Section	Total Length (ft)	Both Banks (ft)	Left and Right Bank Total Erosion (ft)	Total Erosion (%) of the Entire Stream	Total Erosion (%) of the Section
Main Stem	4,081	8,162	1,695	5.0%	20.8%
West Branch	7,537	15,074	3,210	9.5%	21.3%
East Branch	5,254	10,508	2,660	7.9%	25.3%
TOTAL		*33,744*	*7,565*	*22.4%*	

When examined closer, almost half of the eroding streambanks were considered severe (Table 2). Erosion condition scores were a qualitative assessment, generally determined by both the height and the level of exposed, unvegetated streambanks. Measurements were not taken to classify these categories, but the HRC team has experience with stream assessments, and the field personnel were calibrated to each other. Figure 2 shows examples of the difference in erosion severity seen along Newport Creek. Of the eroding banks, over 85% were considered either severe or moderate (Table 2). Therefore, while the total percentage (22.4%) of eroding streambanks within the system is not particularly surprising, the severity of the eroding areas should be noted for additional consideration. Table 3 further details the erosion severity within each section of Newport Creek. While each section has roughly the same percentage of eroding banks (20-25%), the erosion severity can differ quite a bit.

Table 2. Erosion severity along the entire assessed length of Newport Creek (33,744 ft).

Erosion Severity	Left Bank Erosion (ft)	Right Bank Erosion (ft)	Total Erosion (ft)	Total Erosion (%) of the Entire Stream	% of Total Erosion
Minor	530	570	1,100	3.3%	14.5%
Moderate	1,370	1,355	2,725	8.1%	36.0%
Severe	2,035	1,705	3,740	11.1%	49.5%
TOTAL	*3,935*	*3,630*	*7,565*	*22.4%*	*100.0%*

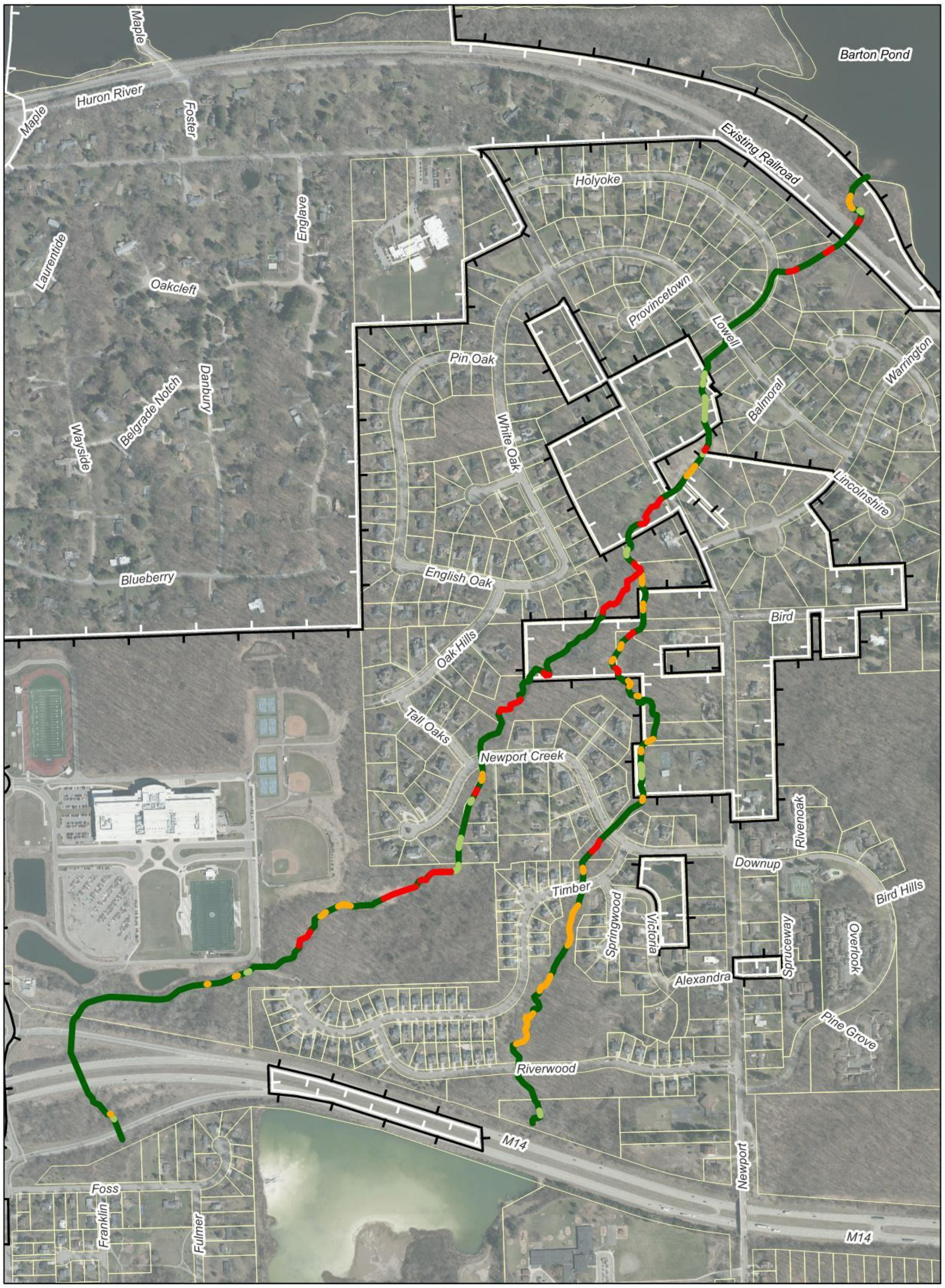
Figure 2. Examples of erosion severity seen along Newport Creek.

Table 3. Erosion severity within each section of Newport Creek.

Section	Total Length (ft)	Both Banks (ft)	Left and Right Bank Erosion (ft)	Total Erosion (%) of Each Section
Main Stem	***4,081***	***8,162***	***1,695***	**20.8%**
Minor			475	5.8%
Moderate			300	3.7%
Severe			920	11.3%
West Branch	***7,537***	***15,074***	***3,210***	**21.3%**
Minor			345	2.3%
Moderate			335	2.2%
Severe			2,530	16.8%
East Branch	***5,254***	***10,508***	***2,660***	**25.3%**
Minor			280	2.7%
Moderate			2,090	19.9%
Severe			290	2.8%
TOTAL	***16,872***	***33,744***	***7,565***	***22.4%***

It should be noted that not all erosion is bad. Streams and rivers are constantly moving and adjusting their pattern, but when they are placed in an urban environment, expected to stay in one spot, and tied to certain pinch points (culverts, bridge crossings, property boundaries, etc,), the extent of erosion can become an increased concern. The erosion seen along Newport Creek is not unique to the area or to similar systems, but that also does not mean that there are not areas for improvement. It is also important to consider the system as a whole and not immediately rush out to all of the severely eroded sections in Figure 3 and attempt to stabilize the stream. Without a comprehensive, engineered design, any small-scale remedy would likely act as a band-aid rather than a long-term solution. The goal for any streambank stabilization work should take the entire hydrologic system into account, otherwise it will likely just shift the problem to another location with the watershed.

Figure 3. The severity of erosion throughout the entire Newport Creek assessment area.



	SHEET TITLE: Erosion Severity Map	Legend	HRC JOB NO. 20200315	PAGE:
CITY OF ANN ARBOR MICHIGAN		Erosion Severity: Good, Minor, Moderate, Severe; City of Ann Arbor; Ann Arbor Township; Parcels	DATE: 3/23/2021	AUTHOR: spetriello
HRC HUBBELL, ROTH & CLARK, INC CONSULTING ENGINEERS SINCE 1915	PROJECT TITLE: Newport Drain Evaluation		N	0 125 250 500 Feet

Encroachments

Within the project scope area, Huron River to M-14, encroachment and access issues were not discovered. Typical encroachments and/or access issues would generally involve structures such as garages, playsets, fences, etc.

Obstructions

The blockages noted in the stream during the site walk were caused by either sedimentation, log jams or fallen trees, excessive vegetation, or other miscellaneous materials (trash). Excessive vegetation is considered an obstruction along the streambanks, but the other blockages that occurred within the stream were assessed for their rough blockage length (Table 4). Log jams and sedimentation were the most common obstructions, 38% and 36% respectively, but fallen trees accounted for the greatest percentage of the total length of blockages (80%). Although Newport Creek is surrounded by residential land use, its immediate riparian area is mostly wooded. Therefore, it should not be surprising that the creek has log jams, fallen trees, and areas of excessive vegetation. From a habitat perspective, a certain amount of woody debris within the stream and the adjacent riparian area is beneficial to both aquatic and terrestrial organisms. However, if that debris becomes excessive to the point where it acts as a dam and prevents sufficient flow of water, additional issues can start to arise. Fallen trees and log jams can cause the stream to look for alternative routes around the blockage, create erosion, and cause sedimentation.

Table 4. Newport Creek obstructions and blockage length.

Blockage	Occurrences	% of Total Occurrences	Blockage Length	% of Total Blockage Length
Fallen Tree	27	19.0%	5,610	80.1%
Log Jam	54	38.0%	555	7.9%
Non-Vegetative Debris	10	7.0%	44	0.6%
Sediment	51	36.0%	798	11.4%
TOTAL	*142*	*100.0%*	*7,007*	*100.0%*

Also noted throughout the creek were other barriers (weir, check dams, failed culvert crossing) that range in their influence and impact to the movement of water throughout the system (Figure 4).

Figure 4. Additional barriers found in Newport Creek.

Sedimentation

As mentioned previously, sedimentation was noted as a type of obstruction when performing the stream inspection. Similar to the streambank condition erosion assessments, sedimentation was categorized by severity on a qualitative basis. Severity was determined by both the amount of sediment in the stream and its impact to the functioning of the creek. Figure 5 shows an example of each sediment severity classification found in Newport Creek. Given the extent of erosion along the creek, it is reasonable to also find sediment deposition. Just as erosion is a natural element of streams, sediment deposition is also a natural process. However, this deposition can become problematic when it starts to impact the functionality of the natural system and movement of water through it. Sediment only physically impacted roughly 5% of the length of Newport Creek and the majority of that was considered minor or moderate, 36% and 38% respectively (Table 5). This indicates that although there is a fair amount of erosion occurring throughout the system, the sediment is being transported and mostly deposited into the Huron River. A natural, self-sustaining system would balance the amount of erosion and sediment deposition. It would appear that Newport Creek has a sediment deficit, but this would have to be confirmed from actual quantitative analyses.

Figure 5. Sediment severity within the entire assessed length of Newport Creek (16,873 ft).

Sediment Severity	Length of Blockage (ft)	Total % of Newport Creek	Total % of all Sediment Blockage
Minor	289	1.7%	36.2%
Moderate	304	1.8%	38.1%
Severe	205	1.2%	25.7%
TOTAL	*798*	*4.7%*	*100.0%*

Figure 5. Examples of sediment severity seen within Newport Creek.

2.2 STORMWATER BASIN ASSESSMENTS

To understand the entire Newport Creek drainage system, HRC was asked to evaluate the private stormwater basins within the district. Stormwater basins are used to slow the rate of stormwater runoff from impervious surfaces into natural features, like streams, rivers, lakes, etc. and promote infiltration and filtering. Depending on their design intent, they can also be used to provide flood control and improve water quality. Stormwater basins can be split into two different types: detention and retention. Detention basins are designed to completely drain the collected water within a certain period of time to make the designed volume available for the next storm event. This volume is calculated using the County's post-construction standards at the time of design. Retention basins are intended to hold a permanent pool of water and their outlet structure is placed above this desired elevation.

There are seventeen (17) private stormwater basins within the Newport Creek drainage area (Figure 6 and Table 6.). Each basin was visually assessed to determine its condition and potential maintenance needs or recommendations necessary to restore the facilities to their designed capacity. The City provided HRC with design plans for each basin which were used as the basis for evaluation. No field measurements were taken during the assessments to determine capacity impacts, these were strictly visual evaluations.

<u>Survey 123</u>

HRC used the ArcGIS Survey 123 app to collect data from each basin through a series of predefined questions. The collection form was originally developed under a separate project with the City. The Survey 123 form contained a sequence of questions that covered the following topics:

- Basin safety
- Forebay details
- Overall basin details
- Basin Inlets
- Overflow structures
- Water quality
- Conclusions/recommendations

Each section provided ample opportunities to take and link photographs of specific features. Within the above topics, the following issues were assessed:

- Erosion
- Blockages
- Sedimentation
- Vegetation
- Structure Conditions

Reports for each basin were formatted to display the most critical information and corresponding pictures. Those reports can be found in Appendix B.

Figure 6. Stormwater basins within the Newport Creek drainage district.

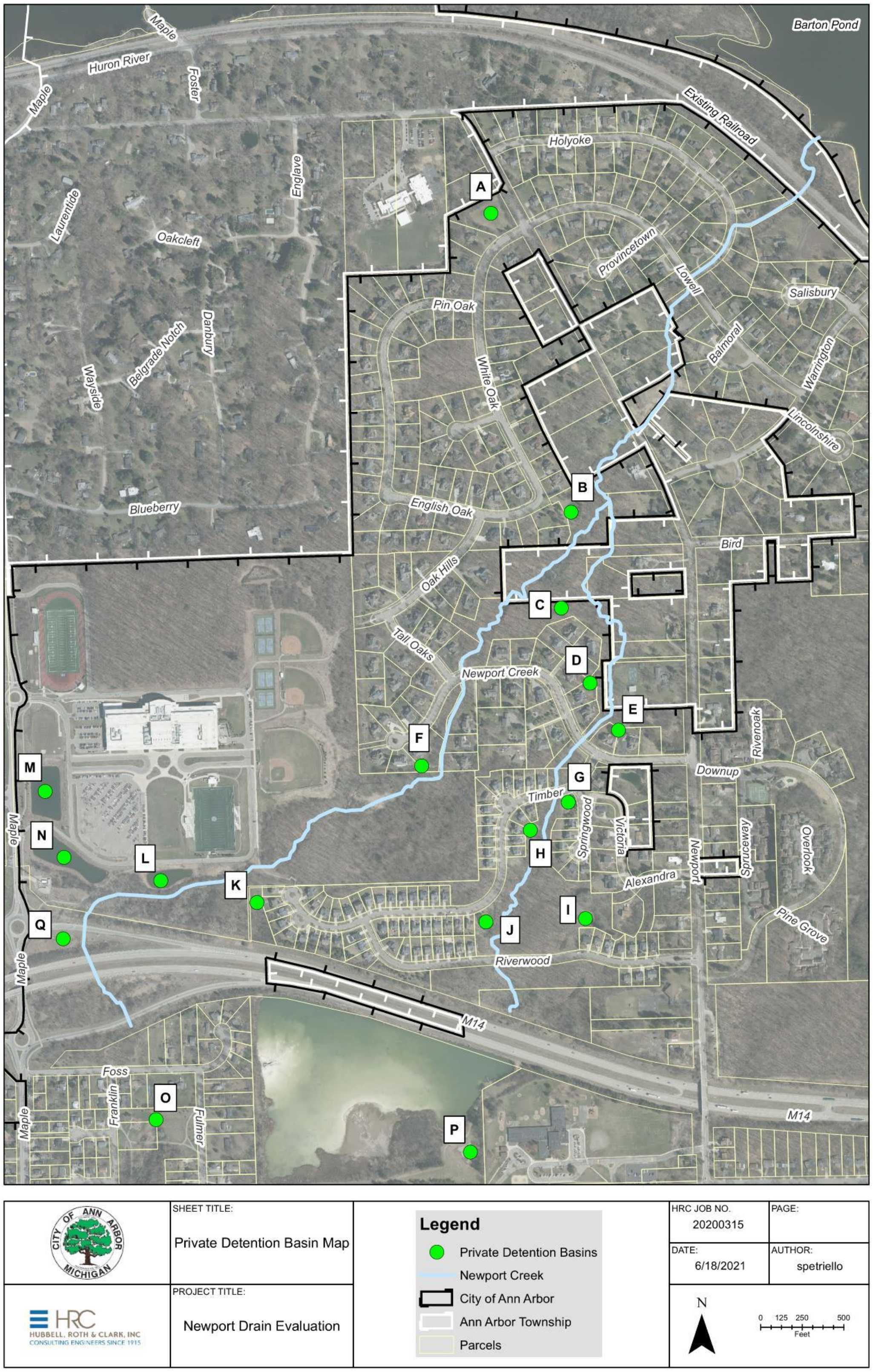


Table 6. Private detention basins assessed within the Newport Creek drainage area.

Basin ID	A2 Facility ID	Site Address
A2PB_A	93-50326	White Oak Newport
A2PB_B	93-50325	White Oak
A2PB_C	93-50323	Newport Creek Pond 3
A2PB_D	93-50322	Newport Creek Pond 2
A2PB_E	93-50321	Newport Creek Pond 1
A2PB_F	93-50324	Newport Creek Pond 4
A2PB_G	93-90331	Riverwood Pond 4
A2PB_H	93-90330	Riverwood Pond 5
A2PB_I	93-90327	Riverwood Pond 3
A2PB_J	93-90329	Riverwood Pond 2
A2PB_K	93-90328	Riverwood Pond 1
A2PB_L	93-050341	Skyline High School Pond D
A2PB_M	93-050339	Skyline High School Pond B
A2PB_N	93-050340	Skyline High School Pond C
A2PB_O	91-51889	Foss Street Park
A2PB_P	93-50439	N Cooley Rd
A2PB_Q	93-50435	MDOT ROW near Skyline

Current Basin Conditions

Of the seventeen (17) basins assessed, twelve (12; 70%) are residential and five (5; 30%) are institutional (schools, parks, etc.); but all are private. Therefore, any follow-up regarding maintenance or recommendations made from these assessments falls solely on the owner(s) of the detention basins. Separately, the City is evaluating a mechanism to enforce their legal authority to require maintenance and upkeep on a case-by-case basis. Roughly twelve (12) of the basins were indicated to have impacted storage volumes, ranging from slight to significant, and eleven (11) were recommended for immediate maintenance while all but one (1) basin were suggested for follow-up in the near future. Only two (2) of the seventeen (17) basins have a forebay, which acts as a sediment trap to collect debris prior to entering the basin, and one (1) of those was recommended for maintenance. The estimated impact to capacity for both the basins and the forebays were visual and not determined by survey measurements. Five (5) of the basins did not have an accurate or readable plan that matched the field conditions. None of the assessed basins had Maintenance Agreements available for review by HRC. However, this does not mean that they do not exist.

The most common maintenance issue seen throughout the pilot study was excessive vegetation that has likely decreased a basin's original design capacity. Several basins also showed some sediment accumulation. The most common issues encountered included:

- Excessive vegetation (Figure 7)
- Excessive sediment in both basins and/or their inlet structures (Figure 8)
- Plans did not match the constructed basins (Figure 9)
- Presence of invasive species (Figure 10)

Tables 7, 8 and 9 summarize the most noteworthy basin parameters, indicate how many of the basins are affected, the corresponding percentage, and then identifies which basins are included in those statistics. These tables should act as a way to navigate through the individual reports (Appendix B) to find additional details and photos of interest.

Figure 7. Excessive vegetation.

Figure 8. Excessive sediment.

Figure 9. Plan and constructed basin do not match.

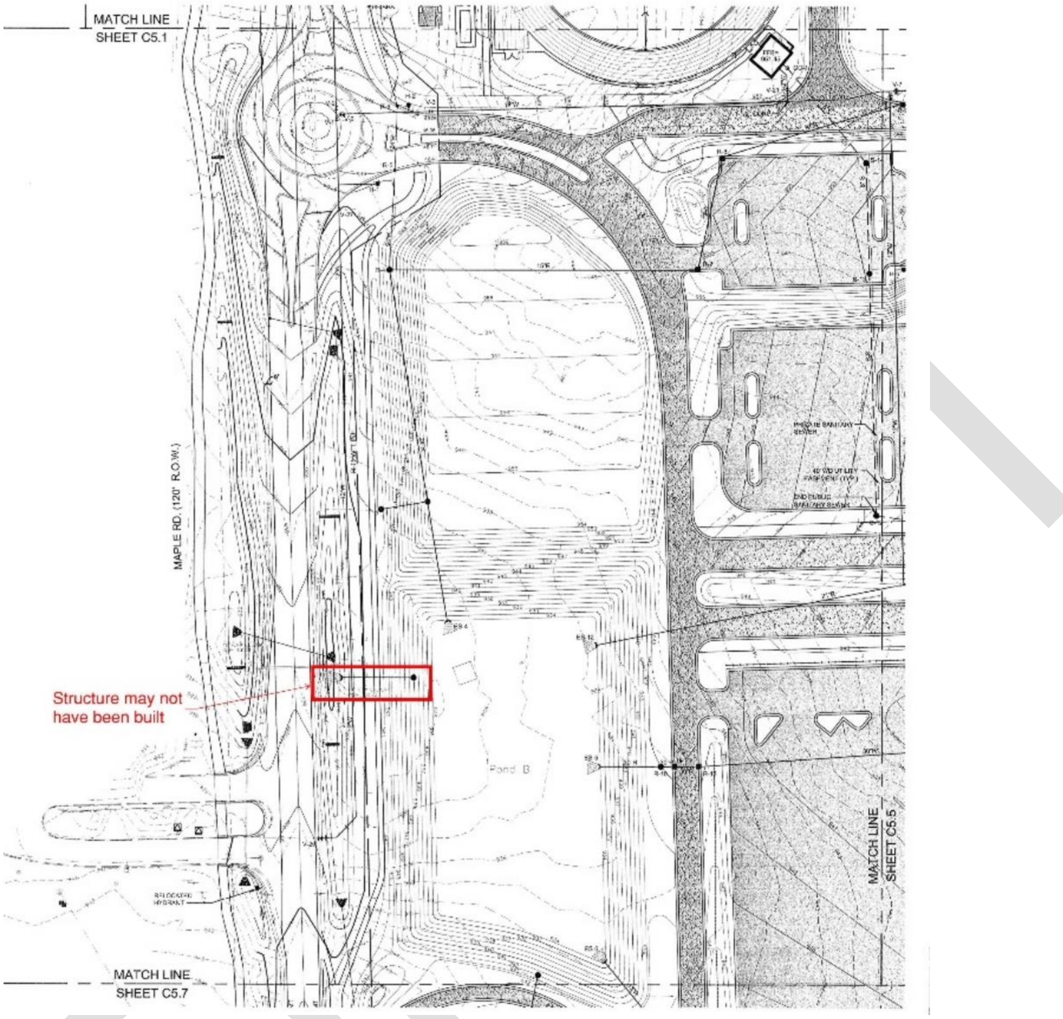


Figure 10. Invasive species (Phragmites).

Table 7. Basin features summary.

Basin Parameter	Basins Affected: Total	Basins Affected: %	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Sediment Accumulation	10	58.8%				X	X		X	X	X				X	X	X	X	X
Vegetation Accumulation	14	82.4%			X	X	X	X	X	X	X	X	X	X		X	X	X	X
Invasives	4	23.5%									X			X		X		X	
Basin Blockages	4	23.5%			X												X	X	X
Basin Storage Impacted	12	70.6%			X	X	X	X	X	X	X	X	X				X	X	X
Storage Impacted: Slight	7				X	X	X		X	X			X				X		
Storage Impacted: Moderate	4							X			X	X							X
Storage Impacted: Significant	1																	X	
Evidence of Flooding	1	5.9%															X		
Overall Basin Erosion	3	17.6%							X						X	X			
Erosion Severity: Mild	2								X						X				
Erosion Severity: Moderate	1															X			
Erosion Severity: Severe	0																		
Buffer Around Pond	0	0.0%																	
Maintenance Needed	11	64.7%			X	X			X	X	X	X	X	X			X	X	X
City Follow Up Recommended	16	94.1%		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Recommendations																			
Remove Excessive Vegetation	13	76.5%		X	X	X	X	X	X	X	X	X	X		X		X		X
Remove Excessive Sediment	7	41.2%		X		X			X	X					X			X	X
Compare Existing and Designed Basin	7	41.2%			X		X	X						X	X	X	X		
Clean Inlet/Outlet Pipes	4	23.5%				X	X		X								X		
Remove Invasive Species	3	17.6%									X			X				X	
Other	3	17.6%					X		X									X	

Table 8. Basin characteristics.

Basin Parameter	Basins Affected: Total	Basins Affected: %	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Land Use: Institutional	5	29.4%												X	X	X		X	X
Land Use: Residential	12	70.6%	X	X	X	X	X	X	X	X	X	X	X				X		
Basin Type: Dry	11	64.7%	X	X	X	X	X	X		X	X	X	X						X
Basin Type: Wet	6	35.3%							X					X	X	X	X	X	
Plan Inaccurate or Unreadable	5	29.4%		X	X		X	X								X			
Fence around pond	1	5.9%																X	

Table 9. Basin overflow summary.

Basin Parameter	Basins Affected: Total	Basins Affected: %	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Overflow Structure	14	82.4%		X	X	X	X	X	X	X	X	X	X		X	X		X	X
Overflow Structure Condition: Good	12	85.7%		X	X	X		X		X	X	X	X		X	X		X	X
Overflow Structure Condition: Fair	1	7.1%							X										
Overflow Structure Condition: Poor	1	7.1%					X												
Overflow Structure Blockages	0	0.0%																	
Overflow Structure Erosion	0	0.0%																	
Emergency Overflow	7	41.2%			X			X		X				X		X		X	X
Emergency Overflow Condition: Good	4	57.1%			X			X		X								X	
Emergency Overflow Condition: Fair	3	42.9%												X		X			X

Opportunities for Detention

As part of the study, HRC examined any available public parcel within the drainage area and determined opportunities for detention to aid in the reduction of water quantity impacts and to also improve water quality. This began with a desktop analysis to narrow down potential improvement areas by landowner (City, Homeowner Association (HOA), vacant lots, other public entities, etc.). Those areas were then categorized into potential improvement opportunities which included:

- Expanding upon existing wetlands
- Increasing instream storage and connection to floodplains
- Creating new offline detention

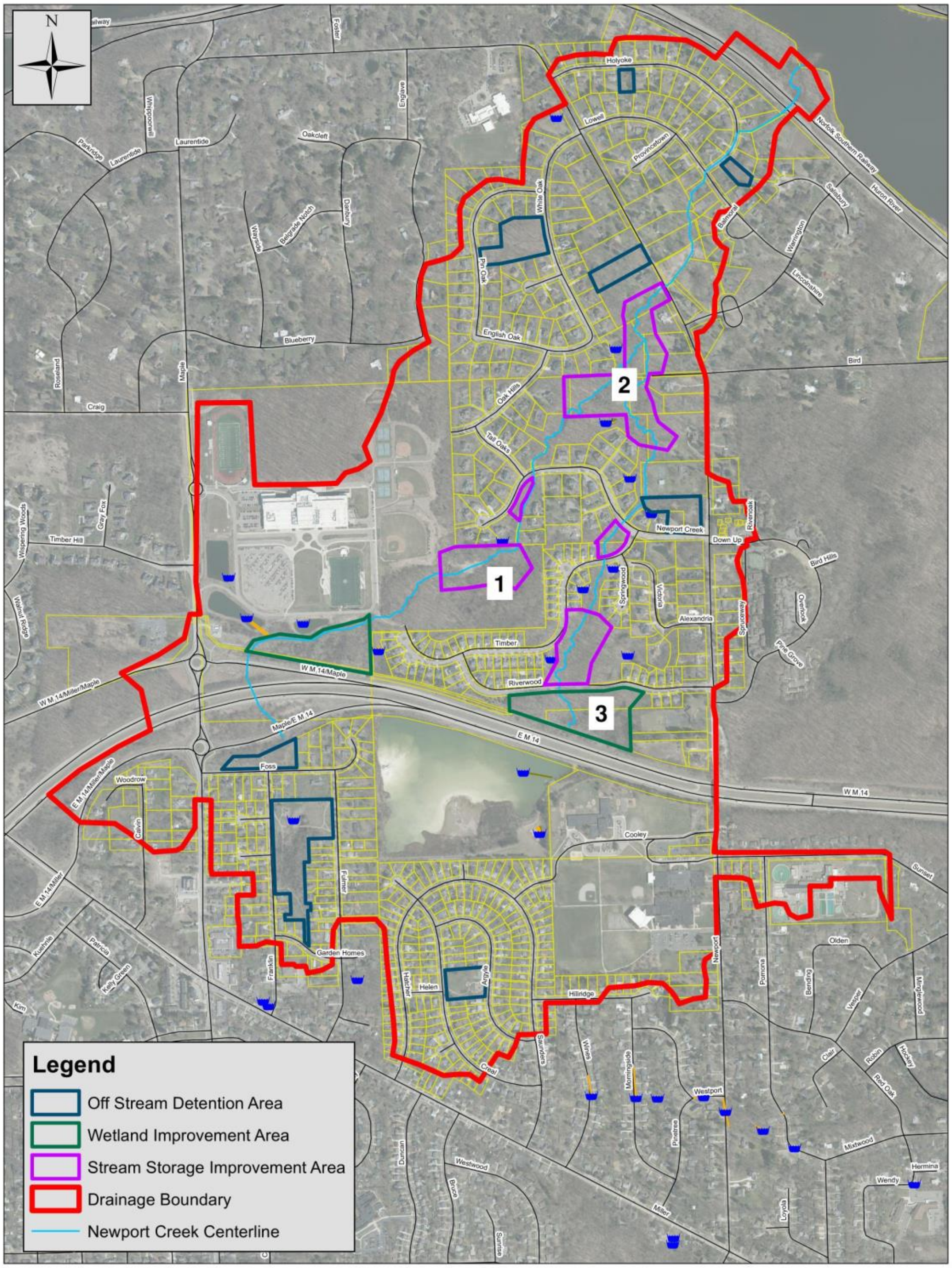
These areas are shown in Figure 11. After ruling out several of the small, isolated areas, the most plausible options were field verified and either eliminated or prioritized based on:

- Practicality (space, elevations, location within the watershed)
- Amount of disturbance (tree removal, earth grading)
- Potential return on investment (estimated cost/additional water stored)

Based on these parameters, HRC believes that any potential new storage areas are most likely to succeed in the following locations (as labeled on Figure 11 and further discussed in Section 3.2):

1. Open field, owned by Ann Arbor Public Schools
    - Potential new, offline detention basin storage area OR a shallow wetland complex
2. Confluence of the East and West branches, owned by Newport Hills Condo Association
    - Potential 2-stage constructed channel with connection to the floodplain for in-stream storage
3. Expand upon the existing wetland, owned by Ann Arbor Public Schools and Riverwood HOA
    - Potential water control structure to hold back additional water and create wetland habitat

Figure 11. Opportunities for new detention within the Newport Creek drainage area.



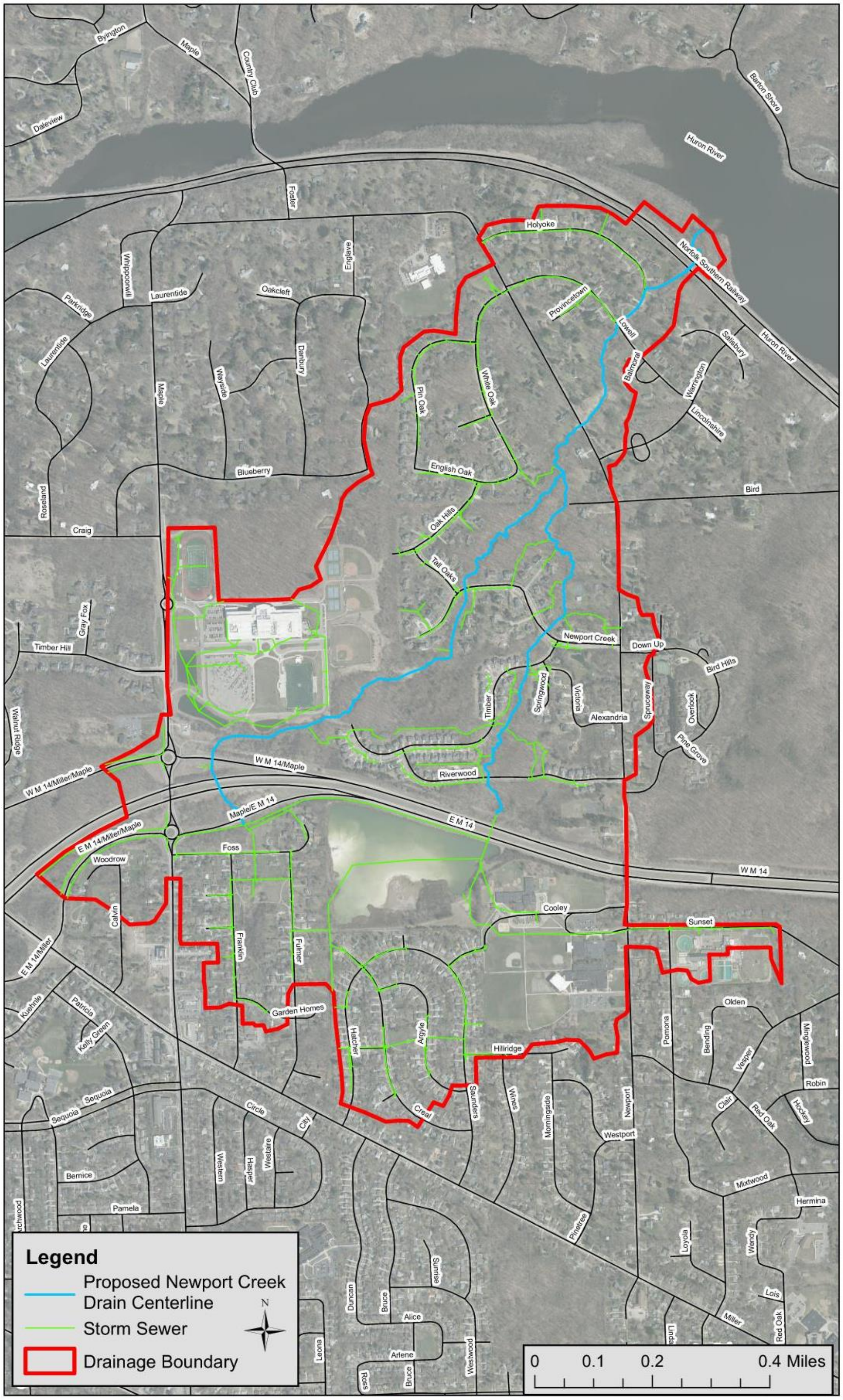
2.3 COUNTY DRAIN ESTABLISHMENT REQUIREMENTS

In its current state, Newport Creek remains waters of the State that is located on private properties. Therefore, all drainage and flooding issues directly related to Newport Creek can only be addressed by the private residents. If Newport Creek were to become a County Drain under the Drain Code, the County would have jurisdiction over parts, or all, of Newport Creek, depending on what easements can be acquired. As a County Drain, the maintenance and management would fall on the County and all improvements would be handled by assessments to the residents, road entities, communities, and the City's Stormwater Utility Fund. In order for Newport Creek to become a County Drain, the City would first need to petition the County. This would start a chain of events that need to take place before the creek can become a County Drain. Some of those events include the following: define the drainage district, determine the route and course, and identify easement requirements.

Drainage District

A Drainage District is determined by the entire area that drains to a single downstream point. For the Newport Creek area, the downstream point is the creek's outlet to Barton Pond and the Huron River. In a natural, undisturbed system, the landscape topography determines a drainage or watershed boundary. However, in a developed area, the storm drain system, along with the topography, must also be considered. Figure 12 outlines the drainage boundary for Newport Creek. It encompasses all land and stormwater that drains into the creek and leaves the system at its confluence with Barton Pond.

Figure 12. Proposed Newport Creek Drain Drainage District.



<u>Route and Course</u>

HRC identified, surveyed, and described the existing route and course for Newport Creek as part of this study (Appendix C). The route and course description and exhibit define the centerline of the existing stream. Most of Newport Creek is a single channel system except for the area between Skyline High School and Newport Creek Drive (Figure 13). This area has multiple channels, no clearly defined main channel, and has been cited by several residents to experience regular flooding. If Newport Creek becomes a County Drain, this area would need to be further investigated. HRC's surveyed route and course determined the main channel within this braided system to be the southernmost braid. This was established based on where the channel likely was or should be rather than where most of the water is currently going. It is likely that as a County Drain, this area would need to be clearly defined. This stretch was also indicated as an area with high potential for new stormwater detention, either as an offline basin or as a shallow wetland complex (Figure 11). If a project were to proceed, this route and course could be amended to correlate with the improvements.

Figure 13. Braided area of Newport Creek.

Easement Requirements

Permanent easements are required for any County Drain to allow for proper maintenance and operations. HRC recommends easements for the following:

- 100 feet along the drain (50 feet on either side of the centerline)
- Over any newly created detention areas
- Access to and along the Drain
- Temporary construction access

Any trees that are not removed for construction access or Drain improvements may stay within the easement if future maintenance access can still be achieved. If residents along the Drain do not agree to grant the necessary easements, condemnation may be necessary, and all associated costs will be borne to the drainage district.

2.4 HYDRAULIC MODELING

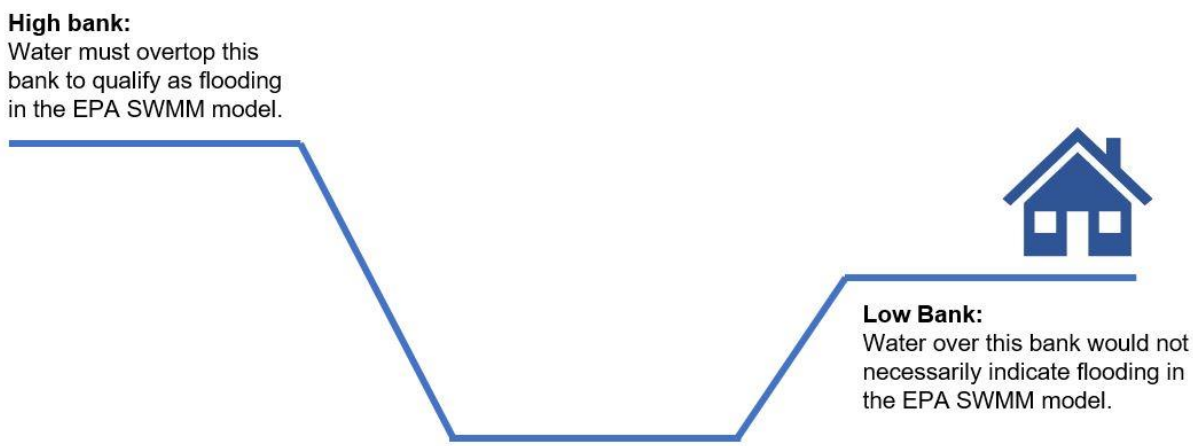
The City provided HRC with a stormwater drainage model to further analyze the Newport Creek drainage system. The model was developed using the United States Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) v5.0.018. It uses the existing stormwater system within the Newport Creek drainage boundary to simulate reactions to rainfall events over a period of time. It models the subsequent runoff and potential flooding while taking factors such as evaporation and infiltration into account. The model uses data such as pipe/channel size, invert elevations, and structure type to simulate the hydraulics of the system. Using both topographic information and stormwater pipe inputs, the Newport Drainage boundary was determined to be 0.95 square miles (Figure 12).

Certain sections of the model were visually verified in the field and determined to be accurate representations of Newport Creek. No additional survey data was obtained. HRC ran the model to check the system for any flooding after a 2-year, 10-year, 50-year, and 100-year storm event. The results of the model showed no flooding up to a 100-year storm. However, this contradicts what several residents have described and documented on their own properties, particularly in the downstream portion of Newport Creek. HRC evaluated the model to determine the cause of the contradiction. After analyzing cross sections along the creek in those areas with known flooding, it was determined that the EPA SWMM model applies the highest bank elevation as the indicator for flooding. In situations along the drain where there are differing bank elevations, the model does not report flooding until it overtops the higher bank (Figure 14). The model will need to be adjusted to report flooding at the low bank elevation.

Field inspections during the creek assessment identified pinch points along the drain. The most obvious pinch point in the system was noticed between Huron River Drive and the culverts under the railroad near the outlet at Barton Pond. The railroad culvert is almost entirely filled with sediment, a condition which is not accounted for in the EPA SWMM model. This is an additional reason the model does not show flooding where flooding is known to occur. To address the railroad culvert that is filled with sediment, MDOT will need to be involved in further communications.

HRC also manipulated the model to estimate how an additional 3 acre-feet (130,680 cubic feet) of stormwater storage at the downstream end of Newport Creek would affect the peak flows. This hypothetical volume was determined by a very rough estimate of the available open area between Skyline High School and Newport Creek Drive (area “1” in Figure 11). The model predicts that an additional 3 acre-feet of storage will decrease the 10-year peak flow by 8%. This experiment did not consider land availability or detention basin construction feasibility, it was merely used as an exercise to determine what kind of impact additional detention might have on peak flows.

Figure 14. Flooding bank elevations in the EPA SWMM model.



2.5 PUBLIC ENGAGEMENT

The Newport Creek Drainage Study was developed as a result of several requests made to the City for support regarding flooding and streambank erosion. To help inform and engage those within the drainage area, the City mailed postcards to all residents and invited everyone to attend the following public meetings:

- Coffee Hour: Project Introduction
  - February 16, 2021 – 9 AM
  - February 17, 2021 – 12 PM
  - February 18, 2021 – 7 PM
- Coffee Hour: Project Update
  - June 16, 2021 – 12 PM
  - June 16, 2021 – 7 PM
- Coffee Hour: Project Final Report
  - September 15, 2021 – 12 PM
  - September 15, 2021 – 7 PM

The meetings generated quality discussions and residents were given the opportunity to ask questions, bring up specific concerns, and contribute their input into the scope of the project. The City and HRC tried to address as many of the topics and interests that were brought up in these meetings as possible; either through the field data collected, the recommendations presented, or the resources provided. All public engagement materials can be found in Appendix E.

SECTION 3.0 — RECOMMENDATIONS

3.1 SHORT TERM RECOMMENDATIONS

Newport Creek is waters of the State, therefore the City and the County are limited on what can be implemented or undertaken as an outcome of this study. Any immediate physical actions would fall on the landowners and residents along Newport Creek. HRC recommends the following items:

Private Stormwater Basin Cleanout

Several of the stormwater basins within the Newport Creek drainage area were assessed and recommended for maintenance, see Section 2.2. Removing excess vegetation and sediment will increase the storage capacity of several impacted basins. This will allow more water to be detained during rain events and help reduce the peak flow into Newport Creek. However, while this may help reduce the frequency of flooding, this is unlikely to solve all flooding concerns. HRC recommends locating the Maintenance Agreements for each of the basin's which could help determine a follow up protocol based on the outcome of these evaluations. If there are not Maintenance Agreements, the City could mail a notice to the HOAs or private owners with information on the existing conditions of their basin(s) and suggestions for maintenance.

Cost estimate: $20,000/basin

Low-Cost Landowner Opportunities

Individual landowners can also help reduce peak flows through the installation of rain gardens, the disconnection of downspouts to the storm system, or removing blockages in the creek or floodplain. Rain gardens are depressed areas that collect stormwater, similar to stormwater basins, without any structural components. Not only can they help reduce runoff and flooding, rain gardens also aid in the removal of pollutants from stormwater, recharge groundwater, and provide habitat and food for wildlife. Rain gardens should be built on soils with sufficient drainage so that water is absorbed, infiltrated, and not left standing. While rain gardens greatly improve water quality, one or even several new rain gardens in the Newport Creek drainage area will not reduce flooding impacts. For more local information regarding rain gardens and associated costs, please visit the following websites:

- https://www.a2gov.org/departments/systems-planning/planning-areas/water-resources/stormwater/Pages/Rain-gardens-.aspx
- https://www.washtenaw.org/647/Rain-Gardens
- https://www.a2gov.org/departments/Parks-Recreation/GIVE365/Pages/Raingardens.aspx

Cost estimate: $5,000/rain garden

Disconnecting downspouts from the storm system and directing them toward a rain garden or the lawn will also aid in improving water quality and decreasing peak flows into Newport Creek. Again, it would take a number of disconnected downspouts to make a measurable impact and reduce flooding, but that does not negate the benefits of improved water quality through pollutant and sediment removal.

Cost estimate: $100/disconnected downspout

Blockages in the creek were seen throughout various portions of the study area. Major blockages can create pinch points, cause the creek to seek alternative routes, and result in both erosion and sedimentation. If there are minor blockages within the creek, residents would be encouraged to remove them. However, larger blockages that are holding the grade or slope of the creek, such as the weir and failed culvert crossing shown in Figure 4, should not be removed without an engineered consultation and design and may require EGLE permits. Removing these larger blockages without a replacement for grade control will cause a head cut to migrate up the channel and exacerbate streambank erosion issues.

Cost estimate: $5,000/blockage (average)

City Petition Process

The City should begin the process of transforming Newport Creek into a County Drain by petitioning the County. This will set off a series of events that are required to make the creek a legally established County Drain (refer to Section 2.3).

3.2 LONG TERM RECOMMENDATIONS

To enact lasting change within the drainage area, there are several possible long-term options to undertake.

Streambank Stabilization

Streambank stabilization measures can be employed where the banks of Newport Creek are experiencing erosion. These measures can range from planting vegetation to armoring the streambank with rock or stone. However, it should be advised that streambanks with more than just minor erosion likely will not stabilize themselves with vegetation alone. More severe erosion is a symptom of a larger problem that should be addressed with qualified licensed engineers and contractors. It is important that any remedy is not merely a band-aid that either will not last or shifts the problem to another location within the creek. Figure 14 shows a potential streambank stabilization method. Permits will be required by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to do any work on the creek. There are some fast-track and less onerous permit processes for homeowners or projects that require less work. These would fall under the General or Minor permit categories for bioengineering streambanks (https://www.michigan.gov/egle/0,9429,7-135-3313_71520_24403-539378--,00.html).

Figure 15. Vegetated reinforcd soil slope system (VRSS).

Large scale streambank stabilization efforts can completely change the local landscape and aesthetic. It involves large equipment, access to, from, and along the creek, and time for vegetation to establish. The construction phase can be startling when the normal visual is a dense wooded riparian area, such as the case for much of Newport Creek.

Cost estimate: $300-400/linear foot

Add New Stormwater Storage

The addition of new stormwater storage areas could help reduce downstream flooding by either diverting or temporarily holding back water during storm events. As previously mentioned, the following areas were identified as having the most potential and being most likely to succeed:

1. Open field between Skyline High School and Newport Creek Drive
   - Potential offline detention basin storage area
     i. Create a diversion from the creek into a detention basin that would hold and eventually release water back into the creek further downstream.
     ii. An open area already exists in this location, but further tree removal would occur depending on the construction access route and the ultimate size of the basin.
     iii. This option and location have the potential to provide the most storage.
     iv. Cost estimate: $3-5/sqft
   - Potential shallow wetland complex
     i. Use the existing flat and open area to create a shallow wetland complex that will increase infiltration and retain additional flood waters.
     ii. A braided system would likely remain in effect during rain events, but the main channel will be defined, and berms will help control the spread of flood waters.
     iii. Cost estimate: $4-6/sqft
2. Confluence of the East and West branches
   - Potential 2-stage constructed channel
     i. Restore this section of the stream and connect it to the surrounding floodplain for in-stream storage; flooding will intentionally increase in this area, but the surrounding residences are much higher in elevation.
     ii. The west branch, just south of the confluence, lies entirely on HOA property. Numerous trees will be lost during construction.
     iii. A 2-stage channel is commonly used to address streambank stabilization and erosion concerns (this location was rated severe) but can also provide some in-stream storage through a larger cross-sectional area and additional storage via access to its floodplain.
     iv. Cost estimate: $300-400/linear foot
3. Riverwood Nature Area between Riverwood Drive and M-14
   - Potential expansion of the existing wetland
     i. Install a water control structure to hold back additional water and create wetland habitat.
     ii. Berms would be used to control the spread of flood waters and some trees will be lost during construction and/or water inundation.
     iii. Cost estimate: $5/sqft

Address Pinch Points

The downstream end of Newport Creek goes through a noticeable pinch point between Huron River Drive and the railroad culverts before entering Barton Pond and the Huron River (Figure 16). The box culvert under the railroad is roughly 90% full of sediment. In order to address this area, Michigan Department of Transportation (MDOT) will need to be notified and involved in any adjustments. Floodplain culverts have been shown to help alleviate flood flows because they area set at a higher elevation and are only used when water rises during high flow events (Figure 17). They allow another avenue for water to pass through rather than forcing it to back up until it naturally dissipates. It is anticipated that any project involving the railroad and its culverts will have to be a collaborative effort between the City and MDOT. In order to avoid additional restrictions with easements, it would likely be more effective to ask MDOT to take the lead even if the City provides the funding.

Cost estimate: $250,000 (Not including MDOT costs)

Figure 16. Culverts under Huron River Drive and the railroad.

Figure 17. Floodplain culverts set at a higher elevation for flood flows.

A summary of potential CIP projects and their cost estimates are shown in Table 10.

Table 10. Potential CIP project cost summary.

Potential Project	Quantity	Unit	Unit Price	Total Estimate
Skyline New Detention	50,000	SQFT	$ 5	$ 250,000
Skyline Wetland Complex	50,000	SQFT	$ 8	$ 400,000
Streambank Stabilization/2-Stage Channel (entire creek)	15,000	FT	$ 400	$ 6,000,000
Streambank Stabilization/2-Stage Channel (West branch, south of the confluence)	350	FT	$ 400	$ 140,000
Riverwood Wetland	50,000	SQFT	$ 5	$ 250,000
Pinch points	2	FP Culvert	$ 125,000	$ 250,000
Does not include easement acquisition costs				

SECTION 4.0 — CONCLUSIONS

4.1 SUMMARY

The Newport Creek Area Drainage Study assessed the existing conditions of the creek, stormwater basins, and hydraulic modeling. A route and course was surveyed and described and several recommendations and opportunities for additional detention were suggested. In general, Newport Creek is in fair condition. It exemplifies the characteristics seen in many urban streams: areas of erosion, sedimentation, sporadic blockages, etc. The stormwater basins are also in fair condition and represent similar maintenance issues observed throughout the City: the accumulation of vegetation and sediment and contradictory basin plans with those built. This study represents the first step toward real, achievable solutions.

The stormwater features assessed as a part of this study are either privately owned or waters of the State. Therefore, the City cannot commit funds to streambank stabilization efforts, existing basin maintenance, the creation of new detention areas, etc. If Newport Creek becomes a County Drain, there will be an assessment and residents, road entities, communities, and the City's Stormwater Utility Fund will be charged a certain amount, proportionate to their benefit, for any work done to the Drain. This would include both the City and Township residents who fall within the district of whatever portions of the creek become a Drain.

Ultimately, the City will determine what, if any, projects will be added to the Capital Improvement Plan (CIP). The CIP is prioritized by the most need and paid for by the Stormwater Utility. Therefore, any project for the Newport Creek area will be evaluated against other stormwater needs across the City. This could take several years to accomplish.

Regardless of the path(s) taken to resolve and prevent further erosion and flooding, it is important to have a coordinated effort that will address the source of the problem rather than a temporary solution that will only act as a band-aid and ultimately shift the issue to another location within the watershed. Unfortunately, coordinated efforts often take the involvement of more people and therefore more time to achieve. However, the tradeoff should be a long-term, stable solution.

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