The City of Lorain
200 West Erie Ave.
Lorain, OH 44052

Martin's Run Ecological Restoration Project

Feasibility Report

Funding Provided By:
Ohio Department of Natural Resources
Office of Coastal Management
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1.0 INTRODUCTION

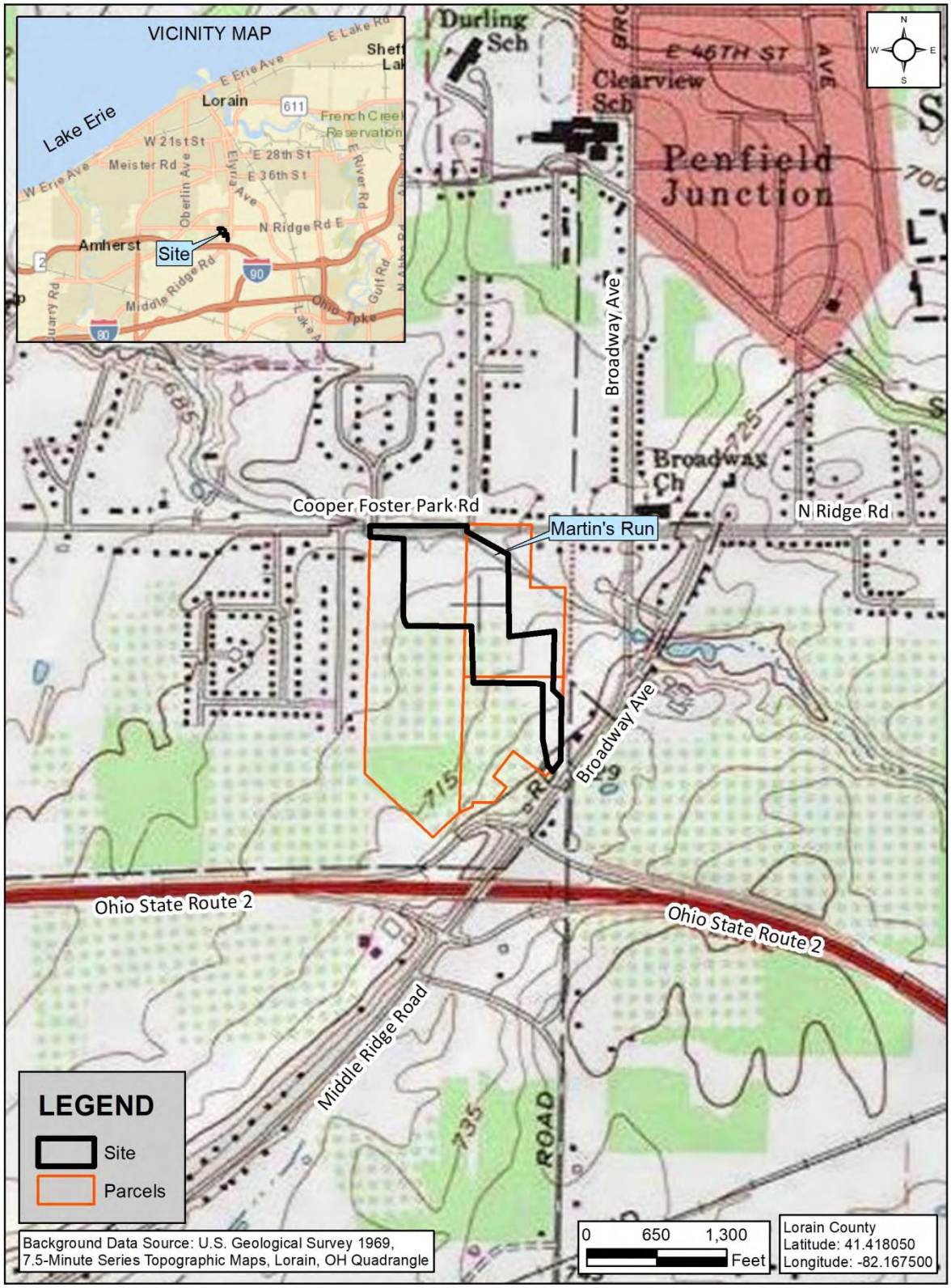
Martin Run (locally known as Martin's Run) lies within the City of Lorain and is a direct tributary to Lake Erie. The City desires to implement stream and wetland restoration along Martin's Run and engaged Coldwater Consulting, LLC (Coldwater) to provide site assessment investigations and conceptual alternatives. This Feasibility Report summarizes the site investigations and conceptual alternatives. The Site includes approximately 1,060 linear feet of Martin's Run flowing along Cooper Foster Park Road at the northern extent of the property from east to west. This reach of Martin's Run has been straightened and channelized in addition to receiving subsurface tile drainage from adjacent agricultural fields. The project site, shown on Figure 1, is located in Amherst Township in Lorain County, Ohio (latitude 41.418050, longitude -82.167500) on three privately-owned parcels totaling 57-acres. The proposed restoration would take place on 17.7 of the 57 acres (hereinafter referred to as the "Site"). Photographs of the Site are included in Appendix A.

The restoration project would involve the relocation of approximately 1,060 linear feet of the channelized and eroding Martin's Run to the central portion of the Site. The stream would be relocated away from Cooper Foster Park Road in order to restore floodplain connection and the riparian buffer, improve channel stability, decrease erosion and sedimentation, and improve overall water quality. Riparian wetland complexes would be constructed in the floodplain on both sides of the relocated channel. The project would incorporate best management practices for pollutant load reduction within the Lake Erie watershed, which is consistent with the Lake Erie Protection and Restoration Plan's recommended actions to address nonpoint source pollution in Lake Erie. Secondary benefits of the project would be the improvement of flood storage within the Martin's Run watershed.

This feasibility report was prepared by Coldwater Consulting, LLC. on behalf of the City of Lorain under award NA16NOS4190094 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, Department of Commerce, Ohio Department of Natural Resources, or the Office of Coastal Management.

This feasibility report summarizes the results of Coldwater's assessment of the Site and describes conceptual ecological restoration alternatives. Conceptual designs and cost estimates are presented in Section 3.

Figure 1: Site Location & Vicinity Map

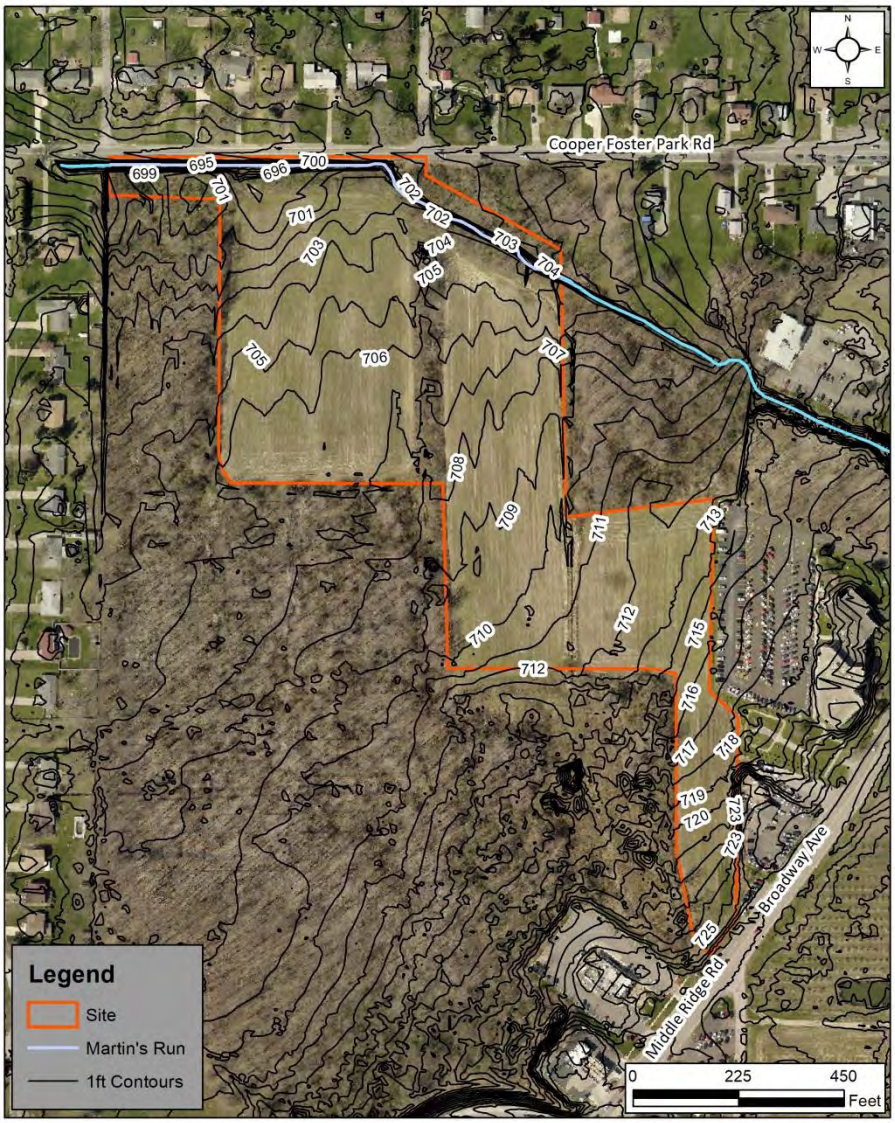


2.0 EXISTING CONDITIONS

2.1 Topography

A topographic survey was completed on the majority of the Site by K.E. McCartney & Associates, Inc. in 2018. The original survey limits were based on preliminary concepts and were supplemented by LiDAR data from Lorain County in the southern portion of the Site. The combined topography is shown on Figure 2. In general, the Site slopes to the northwest, with lower elevations to the northwest and higher elevations to the southeast. Surveyed elevations range from 693 feet to 728 feet above mean sea level (AMSL). Channel invert elevations of Martin's Run on the Site are 693 feet at the downstream (western) end and 703 feet at the upstream (eastern) end. A ten-foot elevation change over the course of the 1,060 linear feet of Martin's Run gives an approximate channel slope of 0.94%.

Figure 2: Topographic Map



2.2 Vegetation Communities

A breakdown of various habitats and land uses on the Site is shown in Figure 3 below and summarized in Table 1.

Figure 3: Vegetation Types

Table 1: Existing Land Use/Habitat Breakdown

Land Use/Habitat	Approximate Acreage within Site
Agricultural	12.7 ac
Hardwood Forest	3.0 ac
Scrub-Shrub	1.4 ac
Wetland	0.6 ac
Total	**17.7 ac**

Of the 17.7 acres, approximately 12.7 acres are in agricultural production, 3.0 acres are hardwood forest, 1.4 acres are scrub-shrub, and 0.6 acres are wetland. The existing Martin's Run channel is located within the northern forested area.

A tree survey was completed on the Site to document mature tree species over 8-inch DBH (diameter at breast height). Dominant tree species on-Site include pin oaks (*Quercus palustris*), black locust (*Robinia pseudoacacia*), elm (*Ulmus spp.*), sassafras (*Sassafras albidum*), and cottonwood (*Populus deltoides*). Forested areas and larger trees have been avoided to the maximum extent possible during conceptual alternative development.

Scrub-shrub areas are dominated by shrubs and include scattered tree saplings of the species listed above. Scrub-shrub is located around the borders of the wetlands, between forest and agricultural fields, and is dominated primarily by silky dogwood (*Cornus amomum*), blackberry (*Rhubus allegheniensis*), and multiflora rose (*Rosa multiflora*).

Wetlands on the Site make up approximately 0.6 acres and are typically located along borders between forest and cultivated land. Wetlands are of low to moderate quality and support common plant species. Wetland characteristics are further described in Section 2.4.2. Representative photographs are included in Appendix A.

2.3 Endangered Species

2.3.1 USFWS Coordination

Coldwater conducted a habitat assessment at the Site and coordinated with the U.S. Fish and Wildlife Service (USFWS) Ohio Ecological Services Field Office to determine the federally-listed species that must be considered for this project. The project lies within the range of five federally-listed species: red knot (rufa) (*Calidris canutus rufa* – threatened), Kirtland's warbler (*Dendroica kirtlandii* – endangered), piping plover (*Charadrius melodus* – endangered), Indiana bat (*Myotis sodalis* – endangered), and northern long-eared bat (*Myotis septentrionalis* – threatened). Although the bald eagle (*Haliaeethus leucocephalus*) is no longer protected under the federal Endangered Species Act, it remains protected

under the Bald and Golden Eagle Protection Act and was also considered during the habitat assessment. The USFWS response letter can be found in Appendix B.

Kirtland's warblers nest in young jack pine stands. No jack pine stands or other suitable habitat were observed during the habitat assessment; therefore, it is unlikely that Kirtland's warblers are nesting within the site. Due to the lack of suitable nesting habitat and the mobility of this species, USFWS concurred with Coldwater's opinion that the restoration project is unlikely to have an adverse effect on the Kirtland's warbler.

Piping plovers use wide, flat, open, sand or gravel beaches with very little grass or other vegetation. The red knot is present in Ohio during spring and fall migration. Migrating red knots require stopover habitats rich in easily digested foods, with thin or no shells like juvenile clams, mussels, and horseshoe crab eggs. Due to the project setting and lack of suitable habitat, USFWS concurred with Coldwater's opinion that the restoration project is unlikely to have an adverse effect on the piping plover or red knot.

No bald eagles or bald eagle nests were observed by Coldwater during the site assessment; therefore, this restoration project should not result in a take of this species.

The Site is currently a combination of agricultural and wooded land, but the majority of the potential project area will be situated over the cleared agricultural land. The wooded areas may contain potential habitat for listed bat species. Tree removal will be minimized to the maximum extent practicable for project construction; however, total avoidance of trees is not possible. To avoid potential impacts to the bat species, the USFWS recommended that any clearing activities be performed between October 1 and March 31, which is outside of the summer roosting season for these listed bat species, unless a survey for Indiana and northern long-eared bats is conducted to document their presence/absence on the Site.

In addition to comments on federally-listed species, the USFWS recommended that best management practices be used to minimize erosion, disturbed areas be mulched and revegetated, and that prevention of non-native, invasive plant establishment is critical in maintaining high quality habitats.

2.3.2 Ohio DNR Coordination

An environmental review request was submitted to the Ohio DNR to determine if any state-listed species are known to occur within or immediately adjacent to the Site. The Natural Heritage Database contained no records of state endangered, threatened, potentially threatened, or special interest plants or animals at or within a one-mile radius of the project area. The Ohio DNR response letter can be found in Appendix C and is summarized below.

The Site is located within the range of ten state-listed species that are not federally-listed: Ohio lamprey (*Ichthyomyzon bdellium* - endangered), lake sturgeon (*Acipenser fulvescens* - endangered), channel darter (*Percina copelandi* - threatened), American eel (*Anguilla rostrate* - threatened), bigmouth shiner (*Notropis dorsalis* - threatened), Blanding's turtle (*Emydoidea blandingii* - threatened), spotted turtle

(*Clemmys guttata* - threatened), sandhill crane (*Grus canadensis* - endangered), upland sandpiper (*Bartramia longicauda* - endangered), and northern harrier (*Circus cyaneus* - endangered).

The project is within the range of five state-listed fish: Ohio lamprey, lake sturgeon, channel darter, American eel, and bigmouth shiner. The Ohio DNR recommends no in-water work in perennial streams from April 15 to June 30 to reduce impacts to indigenous aquatic species and their habitat.

The project is within the range of two state-listed turtles: the Blanding's turtle and the spotted turtle. The Ohio DNR stated that due to the location, the type of habitat at the Site and in the vicinity, and the type of work proposed, the project is not likely to impact these species.

The project is within the range of the sandhill crane, primarily a wetland-dependent species. On their wintering grounds, they will utilize agricultural fields; however, they roost in shallow, standing water or moist bottomlands. The Ohio DNR recommends that construction be avoided in grassland, prairie, or wetland habitat during the species' nesting period of April 1 to September 1.

The project is within the range of the upland sandpiper, which nests in dry grasslands including native grasslands, seeded grasslands, grazed and ungrazed pasture, hayfields, and grassland established through the Conservation Reserve Program. It is recommended that construction be avoided in this habitat during the species' nesting period of April 15 to July 31.

The project is within the range of the northern harrier, a common migrant and winter species. Harriers hunt over grasslands. While nesting harriers are much rarer, they occasionally breed in large marshes in grasslands, often in loose colonies. Nests are built on the ground, often on top of a mound. Ohio DNR recommends that construction be avoided in this habitat during the nesting period of May 15 to August 1.

Ohio DNR's recommendations regarding species that are both state and federally-listed (Indiana bat, piping plover, and Kirtland's warbler) are consistent with those received from the USFWS.

In addition to comments on listed species, the Ohio DNR recommended that impacts to streams, wetlands and other water resources be avoided and minimized to the fullest extent possible, and that best management practices be utilized to minimize erosion and sedimentation. Additionally, the Ohio DNR stated that the local floodplain administrator should be contacted concerning any necessary floodplain permits or approvals.

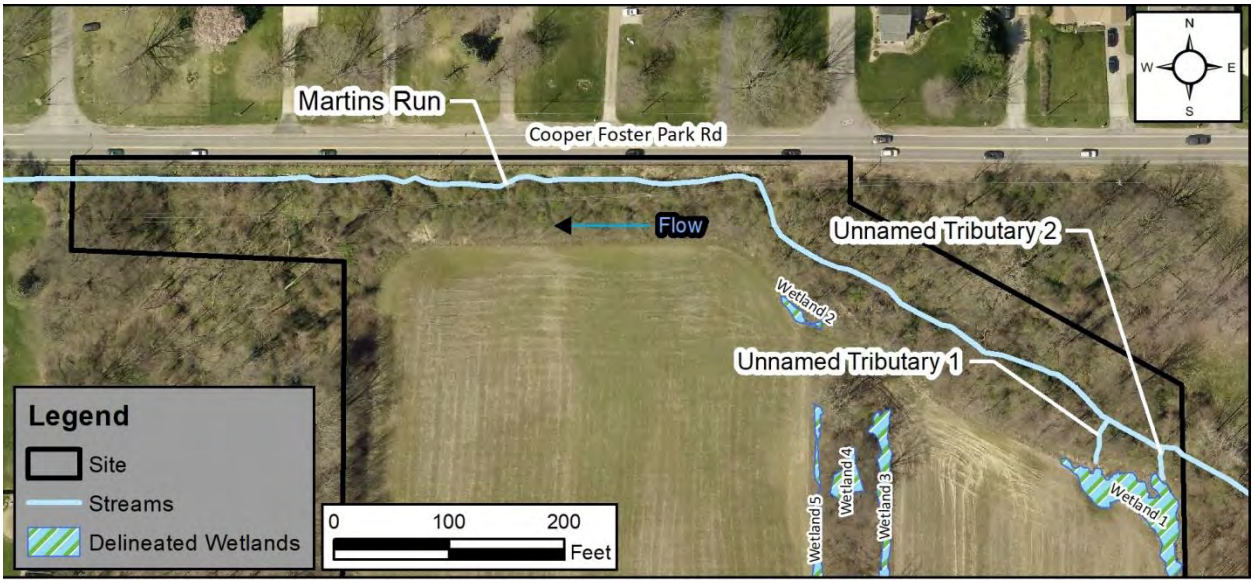
If seasonal avoidance recommendations cannot be followed, further coordination with the ODNR will be necessary, which may include a waiver request to allow construction during the above listed timeframes.

2.4 Surface Water Delineation

2.4.1 Streams

Martin's Run and two unnamed tributaries of Martin's Run occur on the Site, as shown below in Figure 4. Approximately 1,060 linear feet of Martin's Run is contained within the northern forested area on-Site. This area is dominated by pin oaks (*Quercus palustris*), black locust (*Robinia pseudoacacia*), elm (*Ulmus spp.*), sassafras (*Sassafras albidum*), and cottonwood (*Populus deltoides*). In-stream cover includes marginal overhanging vegetation as well as small amounts of rootmats, boulders, woody debris, and aquatic macrophytes. The stream has fair quality riffle/pool development. The stream is moderately entrenched with the streambanks being approximately 3 to 4 feet in height. Water depths at baseflow are 0.25 to 2 feet with moderate to fast velocities. The bankfull stage of the stream is approximately 1.3 feet. According to Ohio EPA, the designated aquatic life use for Martin's Run as warm water habitat (WWH) and monitoring data from 2015 at Tower Boulevard (approximately 1.5 miles downstream of the Site) indicates that the stream is in non-attainment of the WWH aquatic life use[1]. Further discussion into stream geomorphology and classification can be found in Section 2.6.

Figure 4: Martin's Run and Unnamed Tributaries



Coldwater staff performed a Qualitative Habitat Evaluation Index (QHEI) on Martin's Run, which scored 54.25 out of 100, corresponding to a habitat quality designation of "fair." Low scoring metrics include bank erosion, lack of riparian zone, and poor channel morphology. The completed QHEI is included in Appendix D.

[1] Ohio Environmental Protection Agency 2018 Integrated Water Quality Monitoring and Assessment Report, available online: https://oepa.maps.arcgis.com/apps/webappviewer/index.html?id=5df599f41fd241be8de26576ed4d6aae, accessed December 12, 2018.

Unnamed Tributaries 1 and 2 are located in the northeastern corner of the Site. Both streams are ephemeral and originate at tile outlets near the north edge of Wetland 1. Approximately 45 linear feet of Unnamed Tributary 1 occur between Wetland 1 and Martin's Run. Unnamed Tributary 1 scored 25 on the Headwater Habitat Evaluation Index (HHEI), which designates it as a Class I primary headwater stream. Approximately 30 linear feet of Unnamed tributary 2 occur between Wetland 1 and Martin's Run. Unnamed Tributary 2 scored 25 on the HHEI, which designates it as a Class I primary headwater stream. Completed HHEI forms for both unnamed tributaries are included in Appendix E.

Table 2: Stream Characteristics Summary

Stream ID	Designated Aquatic Life Habitat	Flow Regime	QHEI or HHEI Score	Approximate Length on Site (Feet)
Martin's Run	Warm Water Habitat (Non-Attaining)	Perennial	54.25 (QHEI)	1,060
Unnamed Tributary 1	Undesignated	Ephemeral	25 (HHEI)	45
Unnamed Tributary 2	Undesignated	Ephemeral	25 (HHEI)	30
Total				**1,135**

2.4.2 Wetlands

Coldwater performed a delineation on the Site in accordance with the *1987 Wetland Delineation Manual* and *Northcentral and Northeast Regional Supplement.* There are five existing, low- to moderate-quality wetlands on the Site covering approximately 0.57 acres as shown below in Figure 5 and summarized in Table 3. Completed Routine Wetland Determination forms are included in Appendix F. The Ohio Rapid Assessment Method (ORAM) Version 5.0 was used to categorize the existing wetlands, which are included in Appendix G.

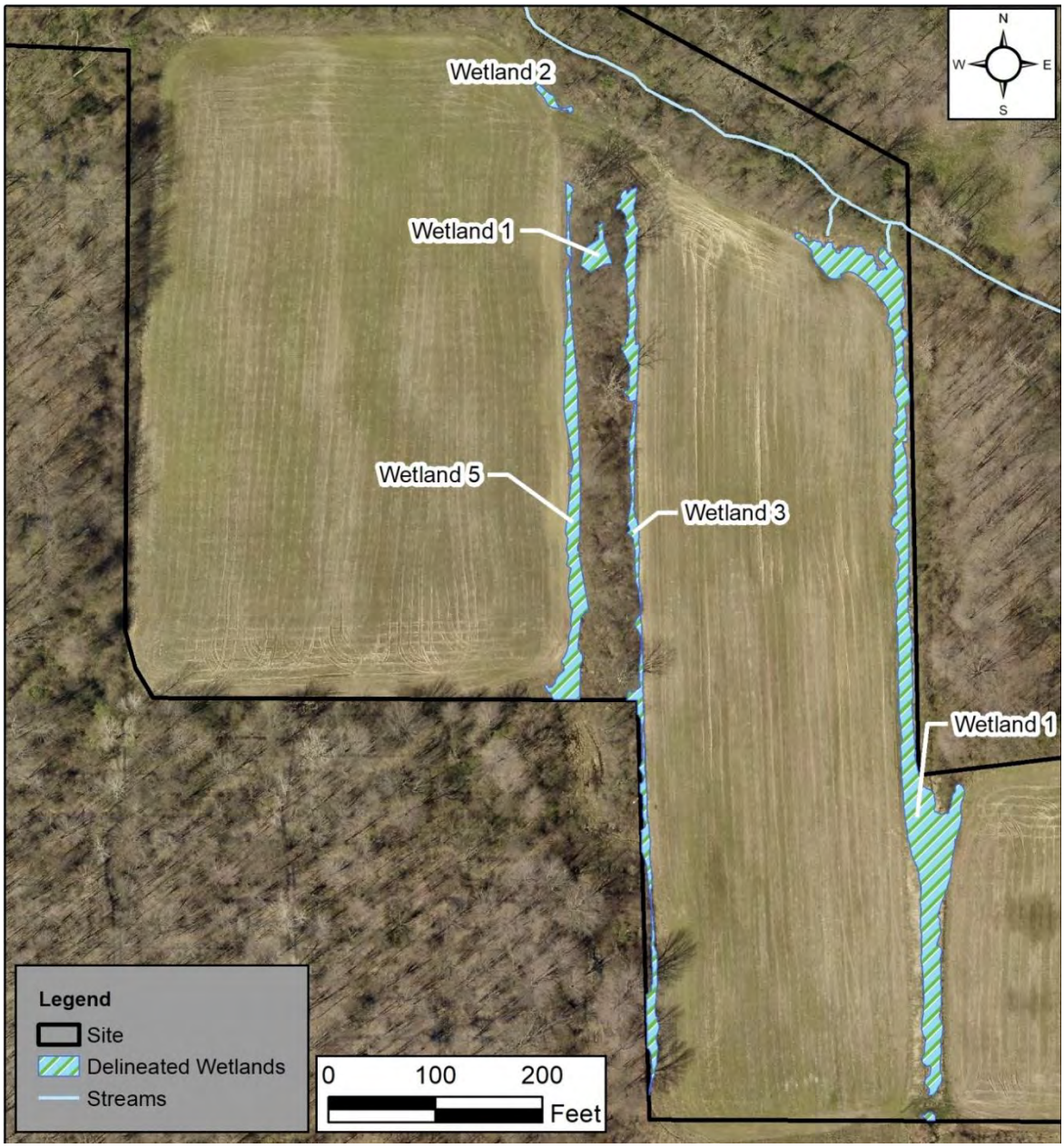
Wetland 1 is located within the eastern portion of the Site. Wetland 1 is a linear wetland totaling 0.34 acres. Wetland 1 supports emergent vegetation with approximately 75% coverage by reed canary grass (*Phalaris arundinacea)*, which is an invasive plant species. The sources of hydrology are precipitation and runoff from the south and adjacent agricultural fields. The wetland is drained by ephemeral Unnamed Tributaries 1 and 2. It is also likely partially drained by subsurface tile drainage. Recent farming disturbances have led to poor habitat and substrate disturbances, resulting in an ORAM score of 19.5. This rating designates Wetland 1 as a Category 1 wetland.

Wetland 2 is approximately 0.01 acres in size and is located in the northcentral portion of the Site, at the edge of agricultural field and wooded corridor along Martin's Run. Wetland 2 supports emergent vegetation and is dominated by reed canary grass (*Phalaris arundinacea)*, which is an invasive species.

Wetland 2 hydrology is provided by direct precipitation. This wetland has been routinely impacted by farming activities. The ORAM score for Wetland 2 is 17, which designates it as a Category 1 wetland.

Wetlands 3 and 5 are similar in nature. Both wetlands are linear, bordering the central forested strip of the Site, and are both 0.10 acres in size. They support emergent and scrub-shrub vegetation, with some forested vegetation present in Wetland 5. Precipitation is the sole source of hydrology and they are routinely impacted by farming activities. The ORAM scores for Wetlands 3 and 5 are 24.5 and 25, respectively, which designates both as Category 1 wetlands.

Figure 5: Wetland Map



Wetland 4 is located between Wetlands 3 and 5 and is 0.02 acres in size. This wetland supports forested vegetation, primarily pin oak (*Quercus palustris*) and green ash (*Fraxinus pennsylvanica*). Precipitation is the sole source of hydrology, and it appears to have recovered from historical tiling and/or ditching. Due to its lack of recent disturbance and moderate habitat, the ORAM score for Wetland 3 is 37.5, which designates it as a Modified Category 2 wetland.

Table 3: Wetland Characteristics Summary

Wetland ID	Vegetative Communities	ORAM Score	ORAM Category	Approximate Acreage within Site
Wetland 1	Emergent	19.5	Category 1	0.34 ac
Wetland 2	Emergent	17	Category 1	0.01 ac
Wetland 3	Emergent/Scrub-Shrub	24.5	Category 1	0.10 ac
Wetland 4	Forested	37.5	Modified 2	0.02 ac
Wetland 5	Scrub-Shrub/ Emergent/Forested	25	Category 1	0.10 ac
Total				**0.57 ac**

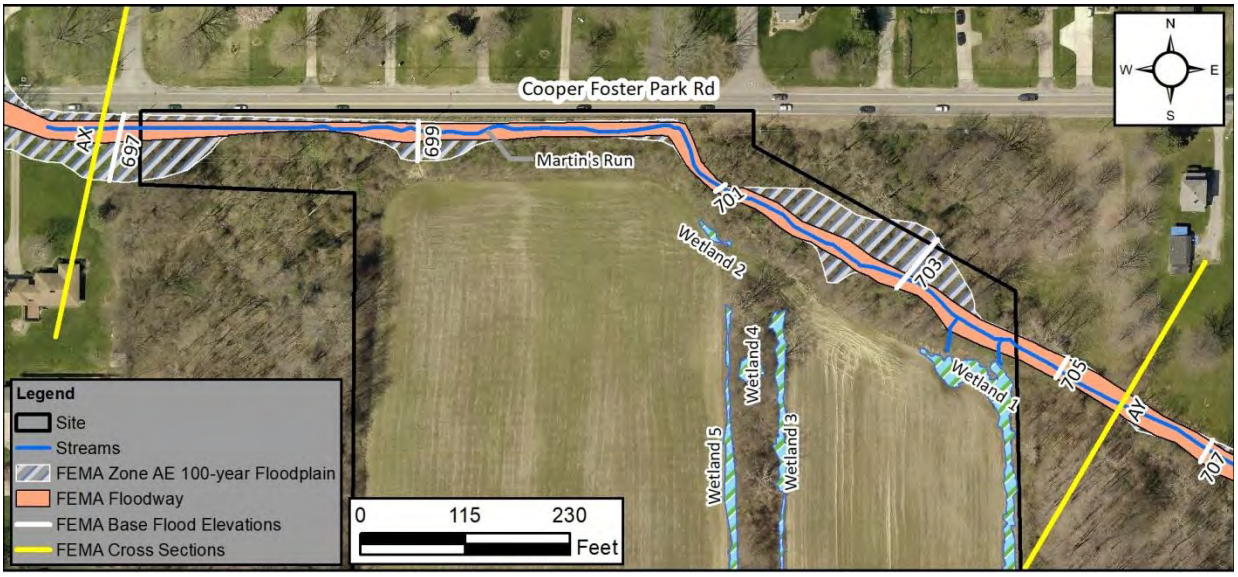
2.4.3 Subsurface Drainage

Evidence of collapsed tiles at the two Unnamed Tributaries indicates the presence of a tile drainage system on the Site. It is also likely that tiles are draining potential wetlands on-Site. While there is evidence of agricultural tile drainage, little is known about the system. A study investigating tile drainage is recommended and further discussed in Section 4.

2.5 Floodplains

The location of the 100-year floodplain was determined by reviewing the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) published in 2008 (Figure 6). A regulated floodway and 100-year floodplain (Zone AE) are present along Martin's Run. The 100-Year Flood Insurance Study (FIS) Base Flood Elevations on-Site range from approximately 697 to 704 feet above mean sea level (AMSL). As shown on Figure 6, the floodplain is strictly confined to the existing channel and indicative of the lack of connected floodplain.

Figure 6: FEMA Floodplain



2.6 Stream Geomorphology

Coldwater conducted a geomorphic assessment of Martin's Run, which included cross-sectional surveys, pebble counts, and bankfull determinations, which were supported by survey data and reference information. Martin's Run has a drainage area of 1.5 square miles. Approximately 1,060 linear feet of the stream are present on the Site. The stream has been straightened and channelized, leading to incision that has disconnected the channel from its adjacent floodplain. The subject reach of Martin's Run is of moderate gradient (approximately 1% slope) and supports fair riffle-pool development.

Identification of bankfull (channel-forming) stage is important for natural channel design. Bankfull discharges are generally understood to have a typical recurrence interval range of 1.0 to 3.0 years with a predominance of values occurring in the 1.2 to 1.8-year range[2]. Field indicators of bankfull stage include top of point bars, breaks in bank slopes, and the presence of certain riparian vegetative species. Because of the incised nature of the Martin's Run, bankfull stage is located within the channel, part-way up the stream bank. Reliable bankfull indicators for Martin's Run were sparse and consisted of breaks in bank slopes. Existing bankfull widths are approximately 16 feet, mean bankfull depth is approximately 1.3 feet, and bankfull cross sectional areas are approximately 21 square feet. Local reference reaches with similar slope and watershed area were not identified. Consequently, this data was compared to regional curve data available for Ohio, including Lake Erie tributaries[3], Bankfull Characteristics of Ohio

[2] United States Department of Agriculture, Natural Resources Conservation Service, National Engineering Handbook (NEH) Part 654: Stream Restoration Design, 210-VI-NEH, August 2007.
[3] Whiting, Peter, Northeast Ohio Regional Curves, Department of Geological Sciences, Case Western Reserve University, Unpublished Report to USGS, 2003.

Streams[4], and data from the Eastern United States[5]. This data is summarized below in Table 4. Bankfull widths and cross-sectional areas within Martin's Run are slightly less than the regional curve references would indicate for a 1.5 square mile watershed. Existing conditions modeling (Section 2.7) indicate that the bankfull recurrence interval is between a 6-month and 1-year, 24-hour storm event. The 9-month recurrence interval best matched the highest quality bankfull indicator observed.

Table 4: Existing Bankfull and Regional Curve Data

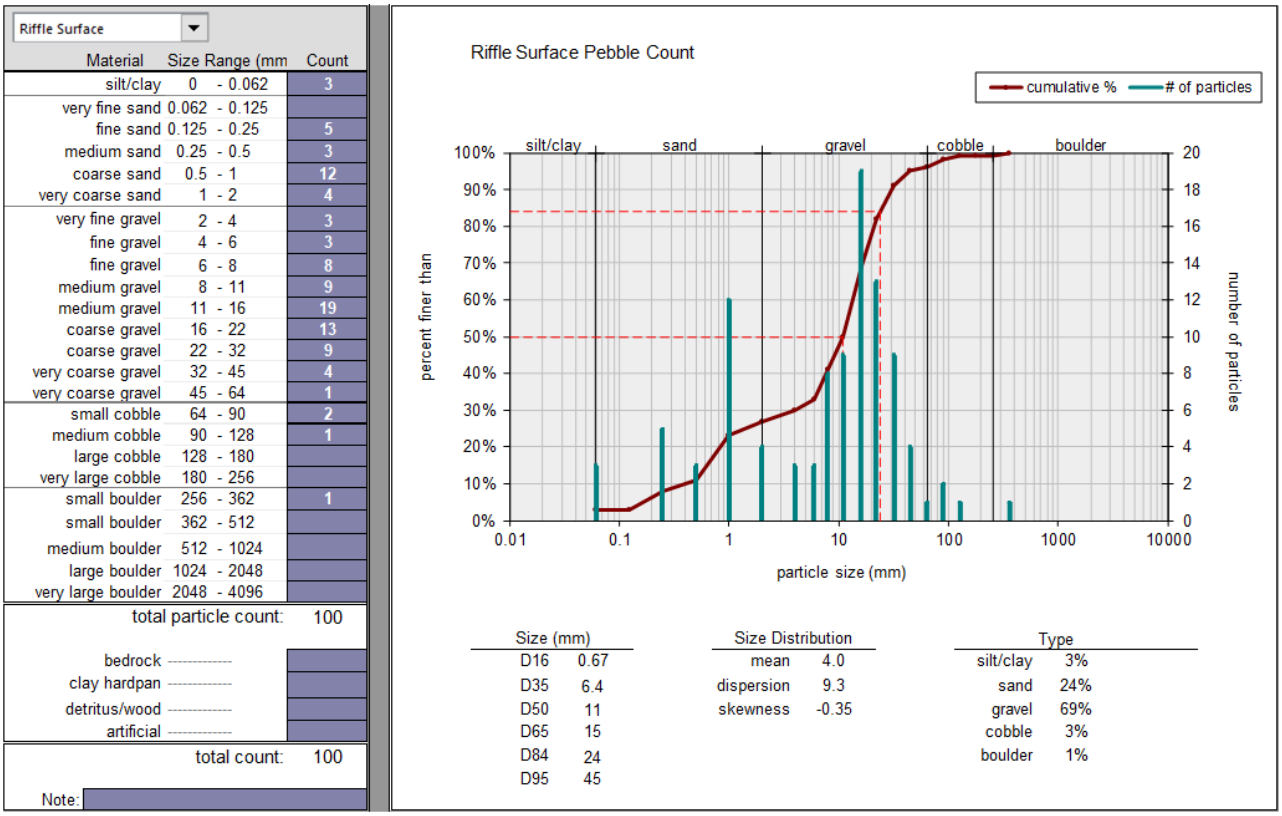
	x-sec area	width	mean depth
Martins Run (Existing Conditions)	**21**	**16**	**1.3**
Lake Erie (Dr. Whiting; ODNR 2003)	27	19	1.4
Bankfull Characteristics of Ohio Streams	35	21	1.7
Eastern United States (Dunne & Leopold 1978)	27	17	1.5

2.6.1 Stream Substrate

Substrate in the stream is varied by location. Upstream of the project reach where the highest quality riffles were located, a pebble count was conducted as part of the geomorphic assessment. This section of Martin's run is less channelized and is in a more natural state. The results are shown below in Figure 7. Bed material in the riffle cross-section was largely dominated by gravel, with a D_{50} of 11mm and a D_{84} of 24mm. This suggests that the existing stream is not readily moving materials larger than gravel during bankfull events.

[4] Sherwood, J.M., and Huitger, C.A., 2005, Bankfull characteristics of Ohio streams and their relation to peak stream- flows: U.S. Geological Survey Scientific Investigations Report 2005–5153, 38 p.
[5] Dunne, Thomas, and Leopold, L.B., 1978, Water in environmental planning: New York, W.H. Freeman and Company, 818 p.

Figure 7: Pebble Count Data



Riffle Surface

Material	Size Range (mm		Count
silt/clay	0	- 0.062	3
very fine sand	0.062	- 0.125	
fine sand	0.125	- 0.25	5
medium sand	0.25	- 0.5	3
coarse sand	0.5	- 1	12
very coarse sand	1	- 2	4
very fine gravel	2	- 4	3
fine gravel	4	- 6	3
fine gravel	6	- 8	8
medium gravel	8	- 11	9
medium gravel	11	- 16	19
coarse gravel	16	- 22	13
coarse gravel	22	- 32	9
very coarse gravel	32	- 45	4
very coarse gravel	45	- 64	1
small cobble	64	- 90	2
medium cobble	90	- 128	1
large cobble	128	- 180	
very large cobble	180	- 256	
small boulder	256	- 362	1
small boulder	362	- 512	
medium boulder	512	- 1024	
large boulder	1024	- 2048	
very large boulder	2048	- 4096	
total particle count:			100
bedrock			
clay hardpan			
detritus/wood			
artificial			
total count:			100

Note:

Size (mm)	
D16	0.67
D35	6.4
D50	11
D65	15
D84	24
D95	45

Size Distribution	
mean	4.0
dispersion	9.3
skewness	-0.35

Type	
silt/clay	3%
sand	24%
gravel	69%
cobble	3%
boulder	1%

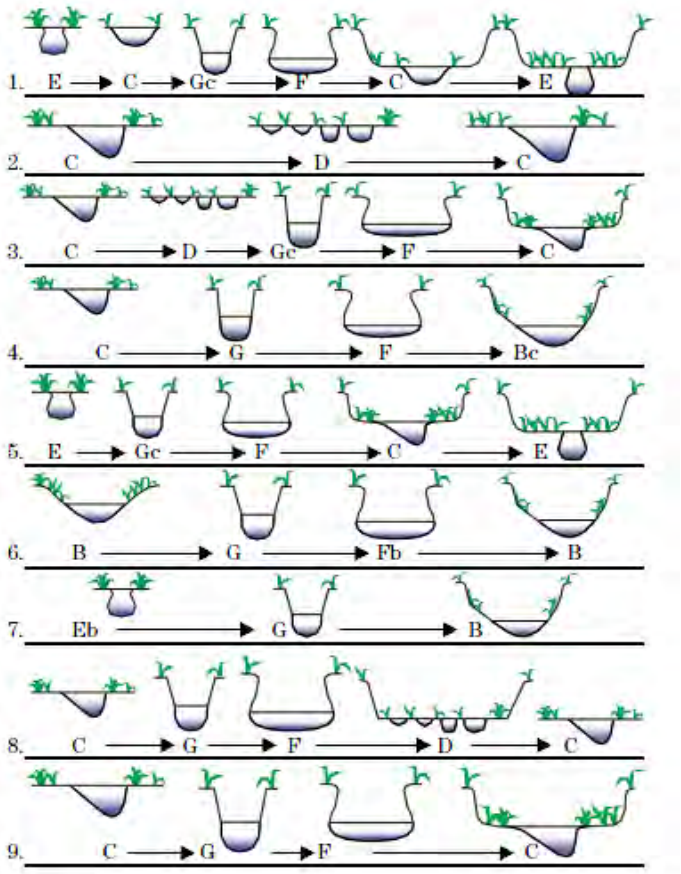
Bed material in the channelized reach includes higher percentages of cobbles and boulders due to material that has been placed along road to help protect against erosion. The larger substrate is predominantly artificially-placed materials as opposed to an indication of what is being transported by the stream. The channel has cut down deep enough in places to reach the shallow sandstone bedrock. Sand and silt, as well as some gravel compose the majority of the channel bed substrate.

2.6.2 Rosgen Stream Classification

The Rosgen stream classification system includes nine major stream types[6]. To determine Rosgen Level II stream classification, entrenchment and width/depth ratios must first be calculated. Width/Depth ratios within the existing channel are approximately 12 with entrenchment ratios above 2. This data suggests that the existing channel is a Type E or C but transitioning towards a Type G or F stream in the channelized reach. It is likely that the channel was naturally a Type E stream, as it is common for Type E streams to form in flat, forested areas. Channelization and development of the watershed has likely resulted in an entrenched Type E channel, especially in the downstream section of Martin's Run that runs west alongside Cooper Foster Park Road. Common stream type succession scenarios from the National Engineering Handbook, Part 654 are shown below in Figure 8.

[6] Rosgen, Dave, Applied River Morphology, Second Edition, Wildland Hydrology, 1996.

Figure 8: Stream Type Succession Scenarios



Martin's run could be represented by either Scenario 1 or 5. Both scenarios start as a Type E stream that erodes and down-cuts to a Type G, then widens to an unstable Type F. Martin's Run is likely in this stage of succession. If given enough time to recover, the stream will likely down-cut and widen its banks to a Type C before vegetation and deposition can result in a stable Type E.

The restoration design proposes the construction of a Type C channel. This is a more conservative approach compared to construction of a Type E channel, which is a deeper, narrower channel and less likely to remain stable in the short term following construction. The construction of a Type C channel will allow the stream to self-narrow through deposition as necessary to achieve equilibrium. The restoration of sinuosity in the channel will encourage those deposits to occur on the insides of bends as opposed to across the channel as has occurred in the stream in the past. Stream restoration alternatives are further discussed in Section 3.

2.7 Hydrological and Hydraulic Modeling

PCSWMM (Personal Computer Storm Water Management Model) modeling software was used to document existing conditions due to its ability to quantify floodplain wetland storage through the use of

conduits and nodes. To support the development of project alternatives, a hydrological and hydraulic analysis was conducted to define peak discharge rates and water surface elevations in the project reach for various flood events under existing conditions.

2.7.1 Hydrological Modeling

Rainfall temporal distributions that were developed by Dr.'s Philip De Groot, P.E. and Michael Menoes, P.E., of Hydrosphere Engineering were utilized to predict the peak flows for storms ranging from the 2-month to the 100-year recurrence interval. The De Groot rainfall temporal distributions are a derivation of the NRCS Type II, 24-hour temporal distribution and were used to more accurately predict peak flow rates for storms having lower average return periods and lower peak rainfall intensities.

Multiple rain gages were used to input the hydrological conditions of the watershed, consisting of 24-hour, 2, 4, 6, and 9-month and 1, 2, 5, 10, 50, and 100-year storm events, defined by the De Groot rainfall temporal distributions. Precipitation data was obtained from Bulletin-71 for storms ranging from the 2-month to the 9-month recurrence interval, and NOAA Atlas 14 for storms ranging from the 1-year to the 100-year recurrence interval. The Green-Ampt method[7] was used to model the infiltration conditions of the system.

A summary of the flows obtained from the PCSWMM model are shown in Table 5. The 10, 50, and 100-year flow rates recorded in the City of Lorain FIS Study have been included in the table for comparison.

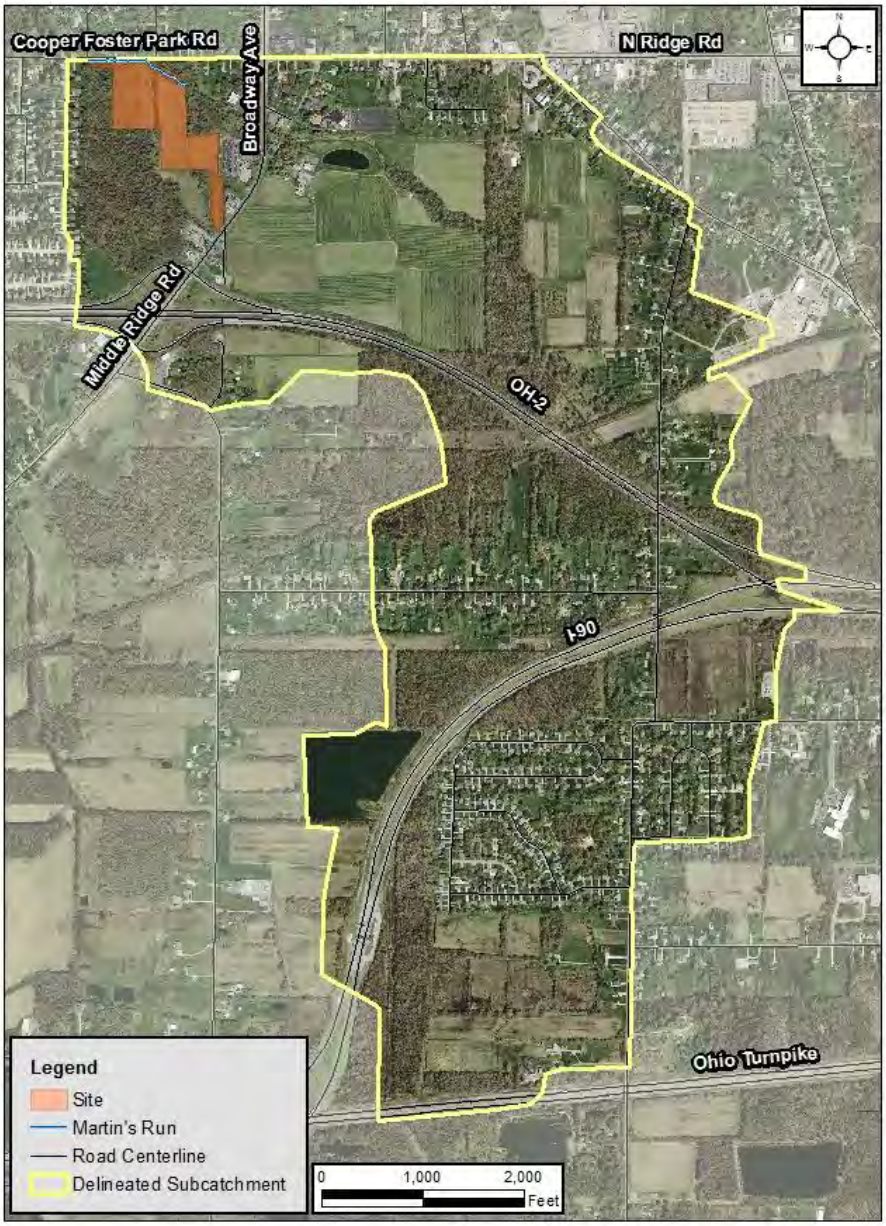
Table 5. Summary of Estimated Peak Flow Rates

	Peak Flow Upstream (cfs)	
Recurrence Interval	**PCSWMM**	**FIS**
2-month	25.01	-
4-month	35.02	-
6-month	42.24	-
9-month	50.57	-
1-year	54.55	-
2-year	95.27	-
5-year	141.6	-
10-year	194.35	347
25-year	242.92	-
50-year	324.52	527
100-year	412.62	605

[7] Green, W.H. and G. Ampt, Studies of Soil Physics, Part I – The Flow of Air and Water through Soils, 1911, J. Ag. Sci 4:1-24.

The peak flows at the upstream end of the project reach correspond with a drainage area of 997 acres, as delineated in the *City of Lorain Martin's Run Watershed Study*, prepared by CT Consultants in June 2006. Initially, the hydrology of the existing conditions model was defined according to the hydrographs provided in the detailed study. However, it was later determined that the rainfall distributions developed by Dr. Groot and Menoes provide a more realistic representation of the hydrology of the watershed, so the model was modified to incorporate the De Groot rainfall temporal distributions. The drainage area of the subcatchment identified in the *City of Lorain Martin's Run Watershed Study* was maintained, as illustrated in Figure 9.

Figure 9. Martin's Run Delineated Subcatchment

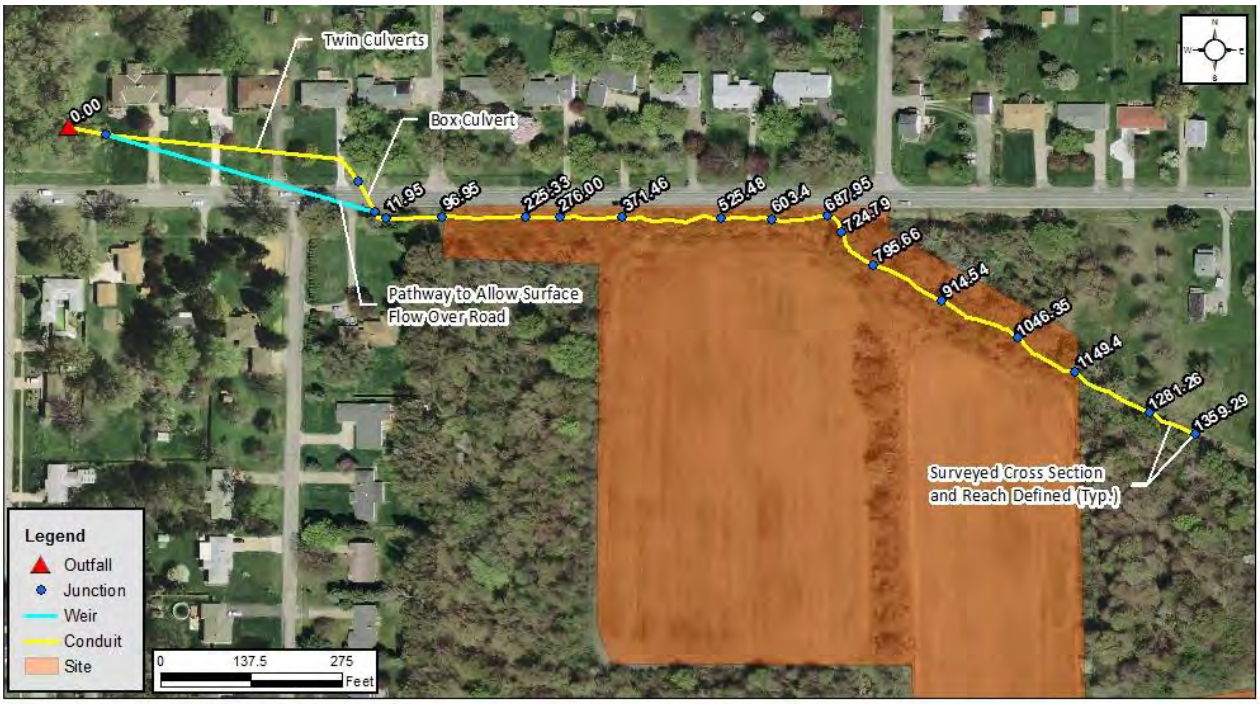


2.7.2 Hydraulic Modeling

Coldwater's hydraulic modeling was performed using PCSWMM with the existing conditions geometry based on a detailed cross-section survey performed by KEM in June 2018, along with Lorain County LiDAR data for overbank areas extending beyond the limits of the survey.

The geometry of the existing conditions model consists of conduits and junctions, modeled to represent 15 individual cross sections within the project area, through a series of open irregular natural channels defined by transect coordinates obtained from the 2018 survey. Additionally, the existing conditions model consists of two (2) culverts crossing Cooper Foster Park Road, with one additional cross section taken downstream of the culverts, outside of the project area. Cross-sections were located to pick up changes in channel geometry, in addition to the upstream face of the upstream-most culvert. Field measurements were collected to further define the culverts extending beyond the limits of the survey. Figure 10 illustrates the existing conditions model geometry.

Figure 10. Plan View of PCSWMM Geometry – Existing Conditions



Based on Coldwater's field observations of the project area, a uniform Manning's n-value of 0.035 was assigned to the channel to represent a homogenous substrate of small cobbles and gravel. Overbank regions were assigned a Manning's n-value of 0.1 to represent the heavily vegetated conditions of the surrounding area. Downstream of the culverts, the channel was assigned an n-value of 0.1 to represent the heavily vegetated conditions of the area, and the downstream overbank regions were assigned variable n-values to account for heavily vegetated regions (0.1) and maintained turf-grass lawns (0.035).

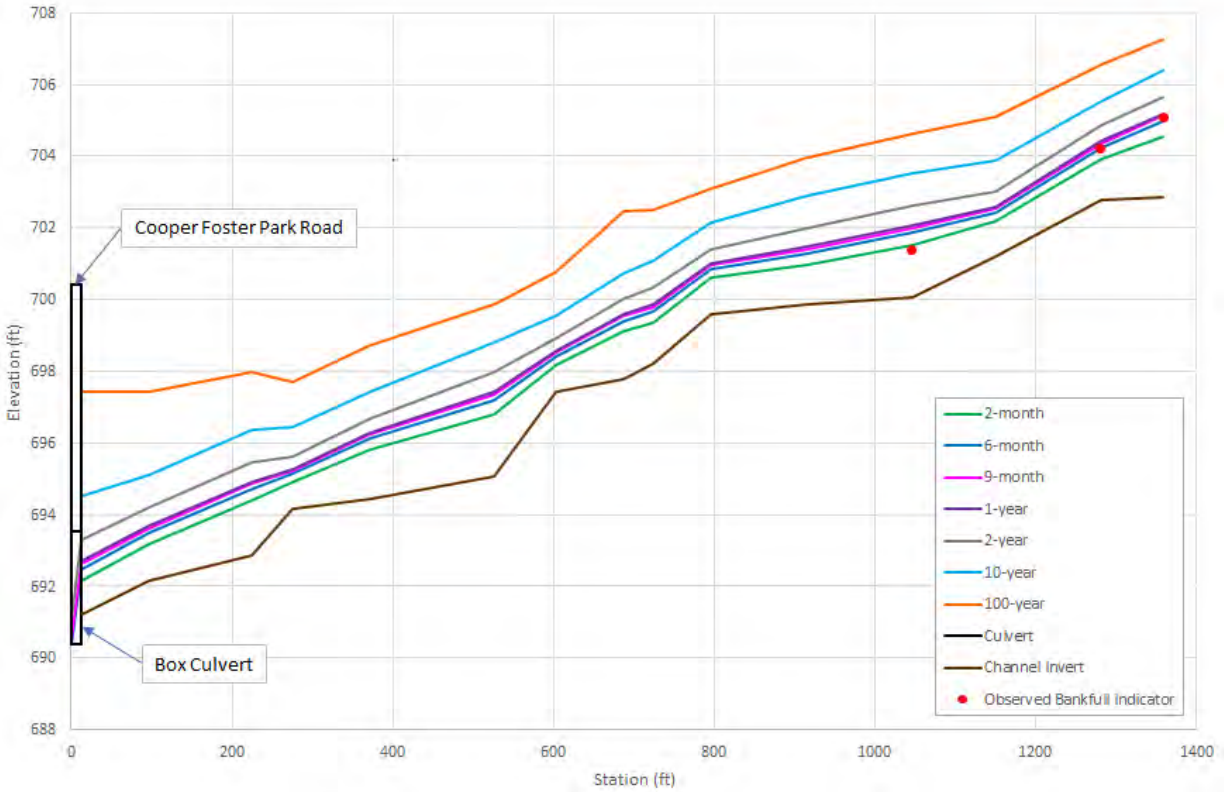
Three (3) bankfull indicators of varying quality were identified during the geomorphic assessment fieldwork and were used to evaluate the results of the model and to identify the flow rate of the bankfull storm event. The 24-hour, 9-month storm produces a water surface profile matching the best quality surveyed bankfull indicator, with a flow rate of 50.6 cfs at the upstream end of the project reach. Existing conditions water surface profiles for the project reach at selected flow rates and the surveyed bankfull indicators are presented in Table 6 and graphed in Figure 11. Proposed conditions hydraulic modeling results are discussed in Section 3.3

Table 6. Hydraulic Model Summary of Results – Existing Conditions

X-Section	Channel Invert	2-month		1-year		10-year		100-year		Observed Bankfull Indicator
		W.S. Elevation (ft)	Velocity (ft/s)	W.S. Elevation (ft)	Velocity (ft/s)	W.S. Elevation (ft)	Velocity (ft/s)	W.S. Elevation (ft)	Velocity (ft/s)	
0	688.2	690.01	2.1	690.59	2.57	691.91	3.78	692.87	4.79	
11.95	691.22	692.16	1.66	692.69	2.34	694.53	3.97	697.41	4	
96.95	692.15	693.19	3.82	693.69	4.75	695.12	6.21	697.43	6.33	
225.33	692.85	694.39	3.54	694.92	4.47	696.38	6.36	697.99	6.64	
276	694.15	694.93	2.56	695.27	3.61	696.44	5.61	697.69	6.52	
371.46	694.43	695.83	3.47	696.28	4.84	697.43	7.11	698.72	7.21	
525.48	695.08	696.78	2.95	697.42	3.89	698.81	5.97	699.88	6.8	
603.4	697.43	698.19	2.68	698.58	3.52	699.54	5.58	700.77	6.85	
687.95	697.77	699.12	4.52	699.59	5.83	700.75	8.3	702.46	9.33	
724.79	698.21	699.34	3.03	699.85	3.89	701.09	5.95	702.52	6.91	
795.66	699.58	700.61	3.82	701	4.68	702.13	6.84	703.08	7.56	
914.54	699.87	700.96	7.78	701.47	4.13	702.88	9.67	703.96	6.59	
1046.35	700.05	701.51	2.27	702.08	2.91	703.53	4.24	704.64	4.74	701.39
1149.4	701.2	702.17	2.38	702.6	3.15	703.86	4.67	705.1	5.25	
1281.26	702.78	703.9	3.96	704.42	4.85	705.55	6.62	706.57	7.32	704.2
1359.29	702.84	704.55	3.18	705.18	4.02	706.39	5.96	707.28	6.81	705.08*

* Highest quality bankfull indicator observed

Figure 11. Existing Conditions Water Surface Profiles

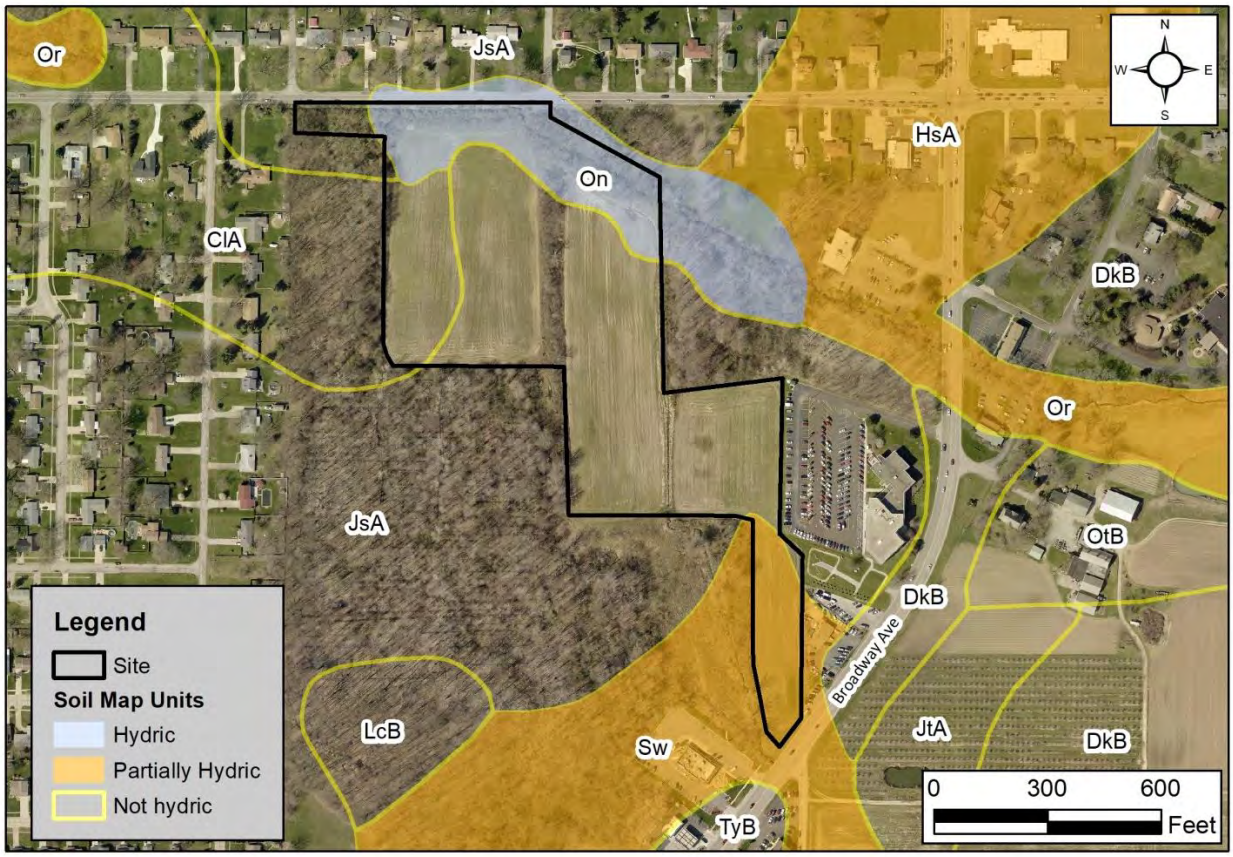


2.8 Geotechnical

2.8.1 Soil Types

The digital Soil Survey of Lorain County, Ohio was used to identify soil mapping units within the Site (Figure 12). Soils on the Site consist of Chili loam (ClA), Jimtown sandy loam (JsA), Olmsted loam (On), and Stafford fine sandy loam (Sw). The soils are listed as somewhat poorly drained to very poorly drained, with the exception of Chili loam being considered well drained (located on 12% of the Site). Olmstead loam, located along Martin's Run, is considered a hydric soil. Stafford fine sandy loam is non-hydric with hydric inclusions.

Figure 12: Soil Map



2.8.2 Soil Borings

GeoSci, Inc. completed soil borings at nine locations on the Site. Topsoil depth within borings averaged 12 inches. Subsurface soils consisted primarily of silty clay, sandy silty clay, and clayey silt with varying amounts of gravel and sandstone fragments. Bedrock was encountered at six of the nine borings and consisted of very soft to medium hard shale, sandstone, and siltstone. Samples were collected at all nine test boring locations and the team noted where bedrock and water were first encountered. Samples were sent to GeoSci's laboratory for further analysis. Specific soil classification and engineering parameters are documented in the report by GeoSci (Appendix H).

Boring depths ranged from 18.7 to 20 feet below existing grade. Bedrock elevations are higher near borings 1, 2, 3, 6, and 7. Based on a historic 1903 USGS map (see Figure 14 below), a tributary once ran through this area. It is possible that the higher bedrock ridges extend further south and east, with lower bedrock elevations at the former channel location east of boring 6. The locations of borings are shown on Figure 13 and boring results are shown on Table 7.

Figure 13: Boring and Monitoring Well Locations

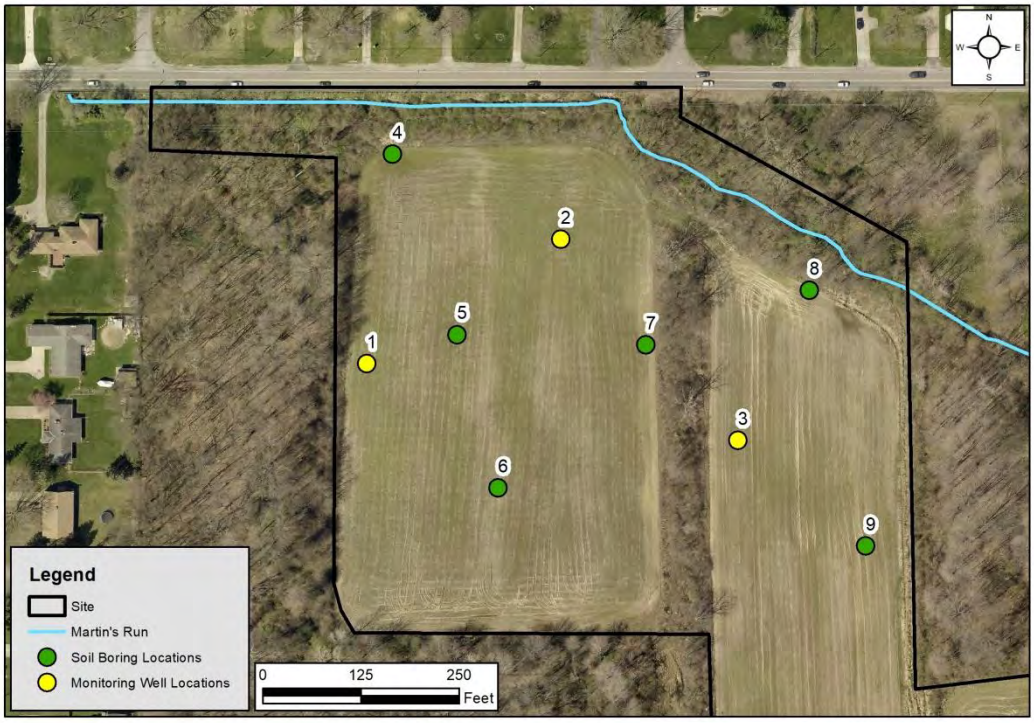
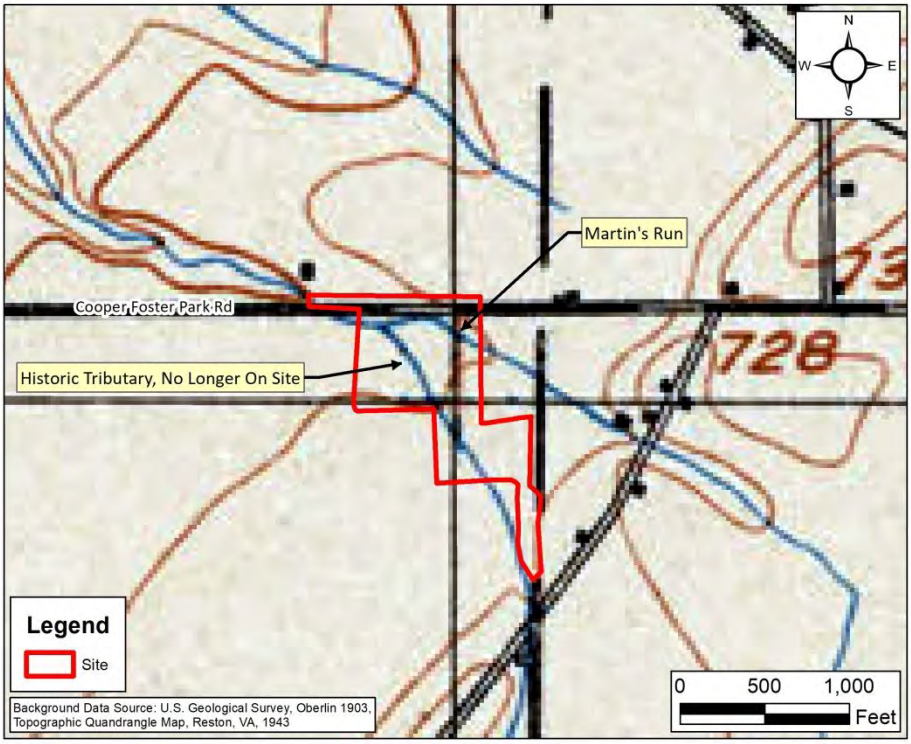


Table 7: Soil Boring Results

Well ID	Surface Elevation (ft)	Top Soil (ft)	Depth of Rock (ft)	Top of Rock Elevation
1	704.01	0.92	6.5	**697.51**
2	703.46	1.33	4.6	**698.86**
3	706.61	0.75	10.5	**696.11**
4	699.07	1.00	N/A	**Unknown**
5	704.52	1.00	12.5	**692.02**
6	705.83	1.17	9.5	**696.33**
7	705.03	1.00	5.5	**699.53**
8	704.56	1.00	N/A	**Unknown**
9	708.68	0.67	N/A	**Unknown**

Figure 14: Historic Topographic Map



Conceptual designs would call for excavation in areas with shallow bedrock. Rate of excavation could be limited by the equipment's ability to rip bedrock. GeoSci estimates that the top 2 to 3 feet of weathered sandstone may be rippable with conventional excavation equipment. Borings 1, 2, and 7 encountered rock at depths less than 6.5 feet. Three of the borings did not encounter bedrock before termination.

2.8.3 Groundwater

Of the 9 borings installed on-Site, only 3 borings encountered groundwater (borings 1, 2, and 3). Three groundwater monitoring wells were installed at the same locations as borings 1, 2, and 3. These groundwater wells were monitored by Coldwater staff during summer and fall of 2018. Results are shown below in Table 8.

Table 8: Groundwater Elevation

	Groundwater Elevation (ft)			Surface Elevation (ft)
WELL ID	**6/27/2018**	**7/9/2018**	**10/4/2018**	
1	702.35	703.1	702.38	704.01
2	700.63	701.63	700.76	703.46
3	704.86	704.03	704.86	706.61

Monitoring wells generally show groundwater to be within 3 feet of the surface. Conceptual design plans, further discussed in Section 3, will involve excavation deeper than groundwater elevations. Groundwater inputs will serve as a source of hydrology for planned wetland restoration but will need to be managed in order to ensure excessive standing water is not present within restored areas. To further evaluate and quantify anticipated groundwater inputs to the proposed channel and floodplain, additional groundwater investigation is recommended during detailed design. This investigation will likely involve a pump test to determine sustainable flow rates and estimate groundwater discharge volumes into the proposed excavation areas. Additional monitoring borings and monitoring well installations may be necessary to conduct this analysis.

2.9 Cultural Resources

The Ohio Historic Preservation Office (OHPO) Online Mapping System was consulted to determine whether any mapped cultural resources exist within or near the Site. This resource did not indicate the presence of any recorded cultural resources within the Site. Project and Site information was submitted to OHPO for their review. It is OHPO's opinion that the proposed project will not affect properties listed in or eligible for listing in the National Register of Historic Places. If the Site changes or new or additional properties are discovered during the project, the Ohio Historic Preservation Office should be notified. The response letter from OHPO is included in Appendix I.

3.0 ALTERNATIVES ANALYSIS

3.1 Rationale and Benefits

The primary purpose of the proposed project is to restore the Martin's Run stream channel, floodplain connectivity, adjacent wetlands, and riparian buffer; and to improve water quality. As discussed in Section 2.5, the stream is entrenched, channelized, and lacks floodplain connection. The western (downstream) portion of the stream on-Site flows along the road, where bank protection rock and concrete have been placed to prevent further erosion. Relocating the stream will be necessary to establish floodplain areas to the north of the channel and achieve project goals.

Floodplain areas would be established through excavation on both sides of the relocated channel. Wetlands will be restored within these areas along with native plantings to provide a forested riparian buffer in the long-term. Floodplain wetlands would treat sediment and nutrients from runoff and therefore improve Lake Erie water quality. The project would incorporate best management practices for pollutant load reduction and detention to reduce runoff rates within the Lake Erie watershed. These project functions are consistent with the Lake Erie Protection and Restoration Plan's recommended actions to address nonpoint source pollution in Lake Erie.

A secondary benefit of the project would be the improvement of flood storage. Reconnection of the stream to its floodplain would reduce flooding through detention. This will reduce peak flows following rain events, reducing flooding and bank stress in areas where floodplain connection is not possible.

3.2 Alternatives

Two alternatives have been developed for the project as shown in Figures 15 and 16. Under both alternatives, approximately 1,060 linear feet of Martin's Run will be relocated to the south in order to restore a natural, sinuous channel with connected floodplain. Floodplain connection and shading of the stream with riparian vegetation are critical to the long-term restoration of the stream. While some tree removal will be required to accomplish this, existing forested areas to the east and west will be avoided to the extent practicable. An extensive native planting plan will involve live stakes, trees, shrubs, and seed. Stream channel restoration will utilize natural channel design principles, including a bankfull floodplain bench, riffle-pool sequences, substrate placement, in-stream grade control structures, and natural erosion control products.

Floodplain wetlands proposed along the relocated channel will be comprised of a variety of wetland habitat types and vegetation communities which will include scrub-shrub and emergent wetland zones. Floodplain wetlands will be graded to include micro-topography and shallow pools designed to treat and filter storm water while providing a diversity of habitat types. Inlets at the east (upstream) end of each floodplain wetland and overflow structures/discharge pipes at the west (downstream ends) will provide the hydraulic connection with Martin's Run. Inlets will consist of a wide (greater than 50 feet), excavated entrances between the floodplain bench and the floodplain wetlands. This approach will minimize maintenance and promote an active connection between the stream channel and floodplain areas. Overflow structures will consist of a low-flow orifice and a higher elevation overflow.

Both alternatives will improve channel stability, decrease erosion and sedimentation, and improve overall water quality. The primary difference between the alternatives is the size of the southern floodplain restoration area. Because of channel invert elevations, the project is comprised primarily of excavation, most of which must be exported from the Site. The ability to adjust the size of the southern floodplain restoration area provides the City with flexibility to adjust final design to accommodate available funds for construction. If hauling costs become constraining, the southern boundary of the floodplain restoration area can be shifted to the north, reducing excavation while at the same time providing additional area for on-site disposal of excavated soils. The conceptual designs for Alternatives 1 and 2 are described below.

3.2.1 Alternative 1

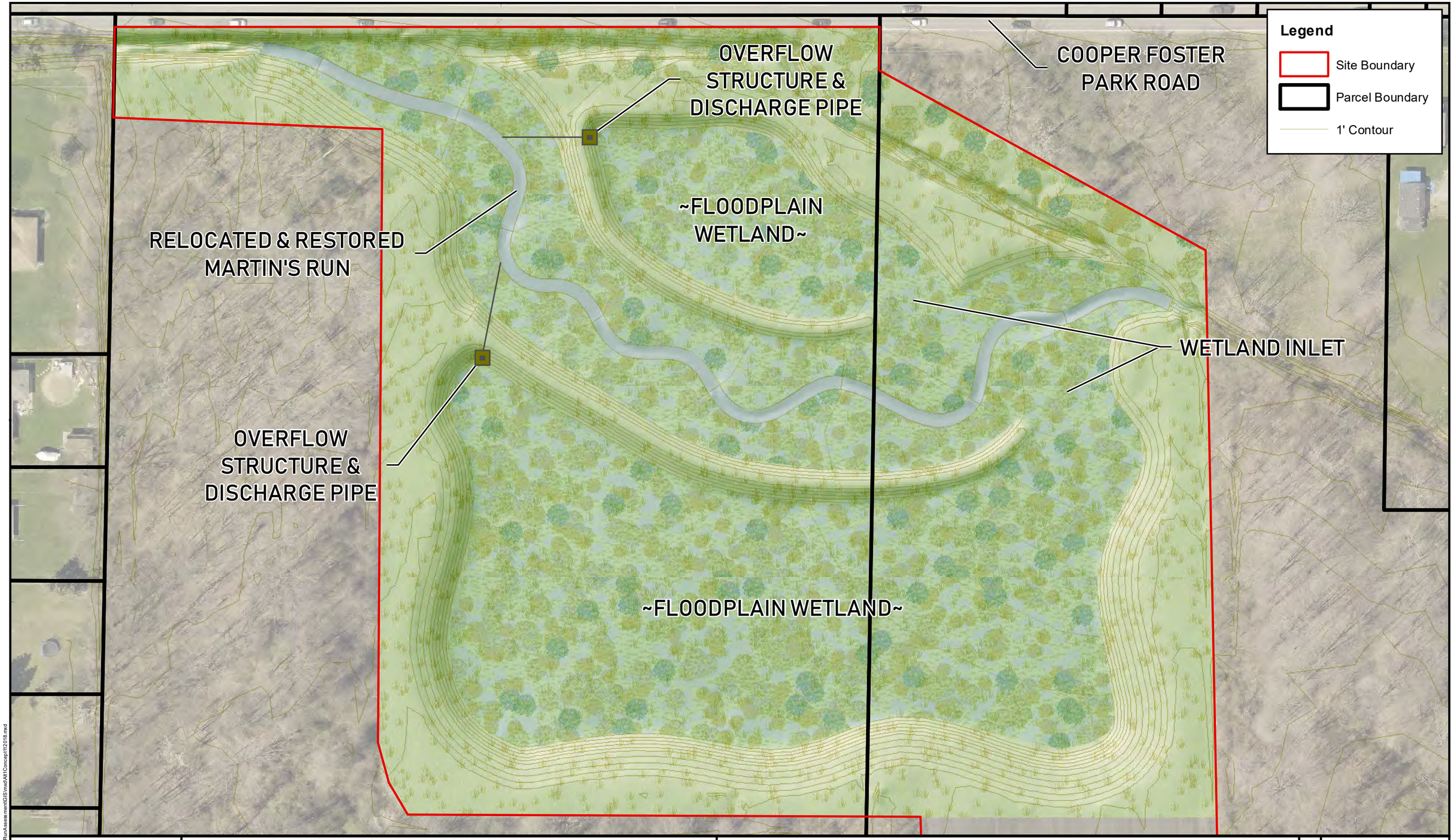
Alternative 1 is presented in Figure 15. Total floodplain wetland area to the north and south of the relocated/restored stream channel is 2 acres and 4 acres, respectively (6 acres total). Total estimated cost for Alternative 1 ranges from $2.1 to $2.5 million. The main factor contributing to cost is excavation and off-site disposal of excavated soil (see Appendix J for a full breakdown of conceptual construction cost estimates). Alternative 1 will require approximately 82,000 cubic yards of material to be excavated for channel and floodplain wetland construction. Modeling data based on peak flow rates during the 100-year storm event indicate that this design will result in 16 to 22 acre-feet of floodplain storage. Further optimization of the geometry, location, and invert elevations of the channel and floodplain features will be completed during the detailed design phase.

3.2.2 Alternative 2

Alternative 2 is presented in Figure 16. Alternative 2 maintains the same channel alignment as Alternative 1 and proposes a similar concept for reconnecting the channel to the proposed floodplain wetlands. Total floodplain wetland area to the north and south of the relocated/restored stream channel is 2 acres and 6 acres, respectively (8 acres total). The total estimated cost for Alternative 2 ranges from $3.1 and $3.7 million. Alternative 2 will require approximately 139,000 cubic yards of excavation. Modeling data for the 100-year storm event indicate that this design will result in 21 to 35 acre-feet of floodplain storage. As with Alternative 1, further optimization of the geometry, location, and invert elevations of the channel and floodplain features will be completed during the detailed design phase. Alternatives are summarized in Table 9 below.

Table 9: Alternatives Summary

	Alternative 1	Alternative 2
Stream Length Restored	1,060 feet	1,060 feet
Wetland Acreage	6 acres	8 acres
Flood Storage	16-22 acre-feet	21-35 acre-feet
Estimated Cost	$2.1-$2.5 million	$3.1-3.7 million



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MARTIN'S RUN ECOLOGICAL RESTORATION PROJECT

CITY OF LORAIN

FEASIBILITY REPORT
ALTERNATIVE 1

DECEMBER 2018

FIGURE 15

0 40 80 Feet

OVERFLOW STRUCTURE & DISCHARGE PIPE

COOPER FOSTER PARK ROAD

~FLOODPLAIN WETLAND~

RELOCATED & RESTORED MARTIN'S RUN

WETLAND INLET

OVERFLOW STRUCTURE & DISCHARGE PIPE

~FLOODPLAIN WETLAND~

BALDWIN BOULEVARD

Legend

- Site Boundary
- Parcel Boundary
- 1' Contour

T:\Projects\003_Lorain_City\021_MartinsRunAssessment\GIS\mxd\Alt2Concept1112018.mxd

COLDWATER CONSULTING, LLC

MARTIN'S RUN ECOLOGICAL RESTORATION PROJECT

CITY OF LORAIN

FEASIBILITY REPORT
ALTERNATIVE 2

DECEMBER 2018

FIGURE 16

0 62.5 125 Feet

3.3 Permitting

3.3.1 USACE Section 404 Nationwide Permit

The proposed alternatives will involve work within waters of the United States; therefore, authorization from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act will be required. Because the project impacts will be minor in nature and the project involves stream and wetland restoration activities that are designed to result in net increases in aquatic resource functions and services, the project is likely to meet the terms of Nationwide Permit 27, Aquatic Habitat Restoration, Establishment, and Enhancement Activities. Pre-construction notification will be submitted to USACE, Buffalo District for approval prior to construction.

3.3.2 Ohio EPA Construction Stormwater Permit

Coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity will be required in order to complete the proposed work. In order to obtain coverage under this permit, a Storm Water Pollution Prevention Plan (SWP3) must be developed for the construction site and a Notice of Intent (NOI) must be submitted to Ohio EPA. The SWP3 and NOI will be completed during the detailed design phase of the project.

3.3.3 City of Lorain Floodplain Development Permit

An application for a floodplain development permit is required for all development activities located within, partially within, or in contact with an identified special flood hazard area. An application will be submitted to the City Engineer prior to the commencement of construction.

3.3.4 City of Lorain Riparian and Wetland Setback Variance

The City of Lorain requires a 75-foot setback for watercourses draining an area between 0.5 square mile and 20 square miles. Category 1 wetlands have a defined 25-foot buffer and Category 2 wetlands have a defined 75-foot buffer. The City of Lorain requires a waiver for all construction activities within wetland and riparian setbacks. Portions of the proposed project will take place within these buffers and will require a waiver from the City. Because construction activities are for restoration purposes and disturbances will be temporary in nature, a setback waiver request is expected to be granted.

4.0 FUTURE CONSIDERATIONS

The goals of this feasibility report were to document existing conditions and provide conceptual alternatives for potential restoration along Martin's Run. While information obtained on the existing conditions was sufficient to produce two viable alternatives, more studies may be necessary to complete a final design. Geotechnical investigations revealed the presence of shallow bedrock and groundwater. Proposed excavation in both alternatives is in weathered bedrock and therefore is not expected to be an issue with constructability. Because borings were not drilled in the southern portion of the Alternative 2 floodplain, additional borings may be necessary to document bedrock depths in that area. Additional groundwater investigations should be conducted as part of the next phase of work to further evaluate and quantify groundwater inputs.

In addition, an investigation into the subsurface drainage system is recommended. Tiles were found on the Site and will most likely be encountered during excavation activities. The Lorain Soil and Water Conservation District drainage tile records should be reviewed, as well as other available historical information. On-site investigation of the tile drainage system may require the use of a closed circuit television (CCTV) camera inspection.

The City of Lorain will need to evaluate available funds for property acquisition and construction. The City also plans to apply for a Coastal Management Assistance Grant through the Office of Coastal Management to assist with the funding of the detailed design. The City will determine which alternative is financially viable in early 2019.

Martin's Run Ecological Restoration Project

Feasibility Report

Site Photographs

RECEIVED
Dec 18 2018
Office of Coastal Management

Project Number 003-021

PHOTOGRAPHIC LOG

Photo No. 1	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: View of field near potential construction entrance next to McDonalds parking lot. This field has been under cultivation for an extended period of time and was planted with soybean the previous growing season (2017).	

Photo No. 2	**Date:** 6/7/2018
Direction Photo Taken: South	
Description: Representative view of open field areas on the Site. The fields have been under cultivation for an extended period of time and were planted with soybean the previous growing season (2017).	

PHOTOGRAPHIC LOG

Photo No. 3	**Date:** 6/7/2018
Direction Photo Taken: West/Downstream	
Description: View of Martin's Run at proposed downstream tie-in. This stretch of the stream has been channelized along Cooper Foster Park Road.	

Photo No. 4	**Date:** 4/5/2018
Direction Photo Taken: East/Upstream	
Description: View of Martin's Run, channelized along Cooper Foster Park Road.	

PHOTOGRAPHIC LOG

Photo No. 5	**Date:** 6/7/2018
Direction Photo Taken: Down	
Description: View of Martin's Run substrate.	

Photo No. 6	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: View of Martin's Run at proposed downstream tie-in. Note proximity to Cooper Foster Park Road.	

PHOTOGRAPHIC LOG

Photo No. 7	**Date:** 6/7/2018
Direction Photo Taken: South/Upstream	
Description: View of small ephemeral tributary (Unnamed Tributary 1) to Martin's Run. The channel originates at a tile at the edge of the cultivated field.	

Photo No. 8	**Date:** 6/7/2018
Direction Photo Taken: South/Upstream	
Description: View of small ephemeral tributary (Unnamed Tributary 2) to Martin's Run. The channel originates at a tile at the edge of the cultivated field.	

PHOTOGRAPHIC LOG

Photo No. 9	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: View of Wetland 1 (Plot 1). This is a constructed drainage that developed into a linear emergent wetland (PEM). This drainage originates near the McDonalds parking lot, south of the Site. Invasive/non-native reed canary grass (Phalarus arundinacea) dominates approximately 75% of the total area of this wetland.	

Photo No. 10	**Date:** 6/7/2018
Direction Photo Taken: South	
Description: View of Wetland 1, linear wetland.	

PHOTOGRAPHIC LOG

Photo No. 11	**Date:** 6/7/2018
Direction Photo Taken: West	
Description: View of Wetland 1. Note how narrow the linear wetland is.	

Photo No. 12	**Date:** 6/7/2018
Direction Photo Taken: East	
Description: View of Wetland 1, along the eastern field.	

PHOTOGRAPHIC LOG

Photo No. 13	**Date:** 6/7/2018
Direction Photo Taken: South	
Description: Plot 2: Non-wetland plot east of Wetland 1.	

Photo No. 14	**Date:** 6/7/2018
Direction Photo Taken: Northwest	
Description: Plot 3: Non-wetland plot located in the northeastern portion of the site.	

PHOTOGRAPHIC LOG

Photo No. 15	**Date:** 6/7/2018
Direction Photo Taken: West	
Description: View of Wetland 2 (Plot 4). This is a small emergent wetland (PEM) at the edge of an agricultural field.	

Photo No. 16	**Date:** 6/7/2018
Direction Photo Taken: East	
Description: Wetland 2	

PHOTOGRAPHIC LOG

Photo No. 17	**Date:** 6/7/2018
Direction Photo Taken: South	
Description: View of Wetland 2 (Plot 4).	

Photo No. 18	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: Wetland 2	

PHOTOGRAPHIC LOG

Photo No. 19	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: Plot 5: Non-wetland plot southwest of Wetland 2.	

Photo No. 20	**Date:** 6/7/2018
Direction Photo Taken: North	
Description: Plot 6: Non-wetland plot in the northwestern portion of the site.	

PHOTOGRAPHIC LOG

Photo No. 21	Date: 6/7/2018
Direction Photo Taken: North	
Description: View of Wetland 3 (Plot 7). This is a mixed emergent/scrub-shrub wetland (PEM/SS).	

Photo No. 22	Date: 6/7/2018
Direction Photo Taken: South	
Description: Wetland 3	

PHOTOGRAPHIC LOG

Photo No. 23	Date: 6/7/2018
Direction Photo Taken: West	
Description: View of Wetland 3 (Plot 7)	

Photo No. 24	Date: 6/7/2018
Direction Photo Taken: East	
Description: Wetland 3	

PHOTOGRAPHIC LOG

Photo No. 25	Date: 6/7/2018
Direction Photo Taken: South	
Description: Plot 8: Non-wetland plot located east of Wetland 3.	

Photo No. 26	Date: 6/7/2018
Direction Photo Taken: East	
Description: Plot 10: Non-wetland plot located south of Wetland 4.	

PHOTOGRAPHIC LOG

Photo No. 27	Date: 6/7/2018
Direction Photo Taken: North	
Description: View of Wetland 4 (Plot 9). This is a small forested wetland (PFO) located within a linear wooded corridor.	

Photo No. 28	Date: 6/7/2018
Direction Photo Taken: South	
Description: Wetland 4	

PHOTOGRAPHIC LOG

Photo No. 29	Date: 6/7/2018
Direction Photo Taken: West	
Description: View of Wetland 4 (Plot 9)	

Photo No. 30	Date: 6/7/2018
Direction Photo Taken: East	
Description: Wetland 4	

PHOTOGRAPHIC LOG

Photo No. 31	Date: 6/7/2018
Direction Photo Taken: North	
Description: View of Wetland 5 (Plot 11). This is a mixed emergent/scrub-shrub/ forested wetland (PEM/ SS/PFO) located along the edge of an agricultural field.	

Photo No. 32	Date: 6/7/2018
Direction Photo Taken: South	
Description: Wetland 5	

PHOTOGRAPHIC LOG

Photo No. 33	Date: 6/7/2018
Direction Photo Taken: West	
Description: View of Wetland 5	

Photo No. 34	Date: 6/7/2018
Direction Photo Taken: East	
Description: Wetland 5	

PHOTOGRAPHIC LOG

Photo No.	Date:
35	6/7/2018

Direction Photo Taken:

South

Description:

Plot 12: Non-wetland plot west of Wetland 5

Martin's Run Ecological Restoration Project

Feasibility Report

USFWS Coordination Response Letter

COLDWATER CONSULTING, LLC

Project Number 003-021

Denise Marmer

From: susan_zimmermann@fws.gov on behalf of Ohio, FW3
Sent: Wednesday, October 17, 2018 10:32 AM
To: dmmarmer@coldwaterconsultants.com
Cc: nathan.reardon@dnr.state.oh.us; kate.parsons@dnr.state.oh.us
Subject: Martin's Run Restoration Project, Amherst Twp., Lorain Co. OH

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
Ecological Services Office
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / Fax (614) 416-8994

TAILS# 03E15000-2019-TA-0100

Dear Ms. Marmer,

We have received your recent correspondence requesting information about the subject proposal. There are no federal wilderness areas, wildlife refuges or designated critical habitat within the vicinity of the project area. The following comments and recommendations will assist you in fulfilling the requirements for consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA).

The U.S. Fish and Wildlife Service (Service) recommends that proposed developments avoid and minimize water quality impacts and impacts to high quality fish and wildlife habitat (e.g., forests, streams, wetlands). Additionally, natural buffers around streams and wetlands should be preserved to enhance beneficial functions. If streams or wetlands will be impacted, the Corps of Engineers should be contacted to determine whether a Clean Water Act section 404 permit is required. Best management practices should be used to minimize erosion, especially on slopes. All disturbed areas should be mulched and revegetated with native plant species. Prevention of non-native, invasive plant establishment is critical in maintaining high quality habitats.

FEDERALLY LISTED SPECIES COMMENTS: All projects in the State of Ohio lie within the range of the federally endangered **Indiana bat** (*Myotis sodalis*) and the federally threatened **northern long-eared bat** (*Myotis septentrionalis*). In Ohio, presence of the Indiana bat and northern long-eared bat is assumed wherever suitable habitat occurs unless a presence/absence survey has been performed to document absence. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches diameter at breast height (dbh) that have any exfoliating bark, cracks, crevices, hollows and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat. In the winter, Indiana bats and northern long-eared bats hibernate in caves and abandoned mines.

Should the proposed site contain trees ≥3 inches dbh, we recommend that trees be saved wherever possible. If any caves or abandoned mines may be disturbed, further coordination with this office is requested to determine if fall or spring portal surveys are warranted. If no caves or abandoned mines are present and trees ≥3 inches dbh cannot be avoided, we recommend that removal of any trees ≥3 inches dbh only occur between October 1 and March 31. Seasonal clearing is being recommended to avoid adverse effects to Indiana bats and northern long-eared bats. While incidental take of northern long-eared bats from most tree clearing is exempted by a 4(d) rule (see http://www.fws.gov/midwest/endangered/mammals/nleb/index.html), incidental take of Indiana bats is still prohibited without a project-specific exemption. Thus, seasonal clearing is recommended where Indiana bats are assumed present.

If implementation of this seasonal tree cutting recommendation is not possible, summer surveys may be conducted to document the presence or probable absence of Indiana bats within the project area during the summer. If a summer survey documents probable absence of Indiana bats, the 4(d) rule for the northern long-eared bat could be applied. Surveys must be conducted by an approved surveyor and be designed and conducted in coordination with the Endangered Species Coordinator for this office. Surveyors must have a valid federal permit. Please note that summer surveys may only be conducted between June 1 and August 15.

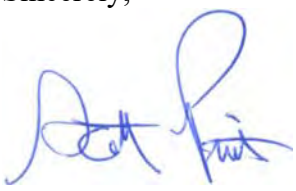
If there is a federal nexus for the project (e.g., federal funding provided, federal permits required to construct), no tree clearing should occur on any portion of the project area until consultation under section 7 of the ESA, between the Service and the federal action agency, is completed. We recommend that the federal action agency submit a determination of effects to this office, relative to the Indiana bat and northern long-eared bat, for our review and concurrence.

Due to the project type, size, and location, we do not anticipate adverse effects to any other federally endangered, threatened, proposed, or candidate species. Should the project design change, or during the term of this action, additional information on listed or proposed species or their critical habitat become available, or if new information reveals effects of the action that were not previously considered, consultation with the Service should be initiated to assess any potential impacts.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the ESA, and are consistent with the intent of the National Environmental Policy Act of 1969 and the Service's Mitigation Policy. This letter provides technical assistance only and does not serve as a completed section 7 consultation document. We recommend that the project be coordinated with the Ohio Department of Natural Resources due to the potential for the project to affect state listed species and/or state lands. Contact John Kessler, Environmental Services Administrator, at (614) 265-6621 or at john.kessler@dnr.state.oh.us.

If you have questions, or if we can be of further assistance in this matter, please contact our office at (614) 416-8993 or ohio@fws.gov.

Sincerely,



Scott Pruitt
Acting Field Office Supervisor

cc: Nathan Reardon, ODNR-DOW

Kate Parsons, ODNR-DOW

Martin's Run Ecological Restoration Project

Feasibility Report

ODNR Coordination Response Letter

COLDWATER CONSULTING, LLC

Project Number 003-021

Ohio Department of Natural Resources

JOHN R. KASICH, GOVERNOR JAMES ZEHRINGER, DIRECTOR

Office of Real Estate
Paul R. Baldridge, Chief
2045 Morse Road – Bldg. E-2
Columbus, OH 43229
Phone: (614) 265-6649
Fax: (614) 267-4764

November 13, 2018

Denise Marmer
Coldwater Consulting, LLC
46 West Columbus Street
Galena, Ohio 43021

Re: 18-1070; Martin's Run Ecological Restoration Project

Project: The proposed project involves the construction of a new meandering stream channel through the central portion of the site, and excavation of an active floodplain.

Location: The proposed project is located in Amhurst Township, Lorain County, Ohio.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced project. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Natural Heritage Database: The Natural Heritage Database has no records at or within a one-mile radius of the project area.

A review of the Ohio Natural Heritage Database indicates there are no other records of state endangered or threatened plants or animals within the project area. There are also no records of state potentially threatened plants, special interest or species of concern animals, or any federally listed species. In addition, we are unaware of any unique ecological sites, geologic features, animal assemblages, scenic rivers, state wildlife areas, state nature preserves, state or national parks, state or national forests, national wildlife refuges, or other protected natural areas within the project area. The review was performed on the project area you specified in your request as well as an additional one-mile radius. Records searched date from 1980.

Please note that Ohio has not been completely surveyed and we rely on receiving information from many sources. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Although all types of plant communities have been surveyed, we only maintain records on the highest quality areas.

Fish and Wildlife: The Division of Wildlife (DOW) has the following comments.

The DOW recommends that impacts to streams, wetlands and other water resources be avoided and minimized to the fullest extent possible, and that best management practices be utilized to minimize erosion and sedimentation.

The project is within the range of the Indiana bat (*Myotis sodalis*), a state endangered and federally endangered species. The following species of trees have relatively high value as potential Indiana bat roost trees to include: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), shingle oak (*Quercus imbricaria*), northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sassafras (*Sassafras albidum*), post oak (*Quercus stellata*), and white oak (*Quercus alba*). Indiana bat roost trees consists of trees that include dead and dying trees with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. However, Indiana bats are also dependent on the forest structure surrounding roost trees. If suitable habitat occurs within the project area, the DOW recommends trees be conserved. If suitable habitat occurs within the project area and trees must be cut, the DOW recommends cutting occur between October 1 and March 31. If suitable trees must be cut during the summer months, the DOW recommends a net survey be conducted between May 15 and August 15, prior to any cutting. Net surveys should incorporate either nine net nights per square 0.5 kilometer of project area, or four net nights per kilometer for linear projects. If no tree removal is proposed, this project is not likely to impact this species.

The project is within the range of the range of the Ohio lamprey (*Ichthyomyzon bdellium*), a state endangered fish, the lake sturgeon (*Acipenser fulvescens*), a state endangered fish and a federal species of concern, the channel darter (*Percina copelandi*), a state threatened fish, the American eel (*Anguilla rostrata*), a state threatened fish, and the bigmouth shiner (*Notropis dorsalis*), a state threatened fish. The DOW recommends no in-water work in perennial streams from April 15 to June 30 to reduce impacts to indigenous aquatic species and their habitat.

The project is within a county where current records exist for the Blanding's Turtle (*Emydoidea blandingii*), a state threatened species. This species inhabits marshes, ponds, lakes, streams, wet meadows, and swampy forests. Although essentially aquatic, the Blanding's turtle will travel over land as it moves from one wetland to the next. Due to the location, the type of habitat at the project site and within the vicinity of the project area, and the type of work proposed, this project is not likely to impact this species.

The project is within the range of the spotted turtle (*Clemmys guttata*), a state threatened species. This species prefers fens, bogs and marshes, but also is known to inhabit wet prairies, meadows, pond edges, wet woods, and the shallow sluggish waters of small streams and ditches. Due to the location, the type of habitat at the project site and within the vicinity of the project area, and the type of work proposed, this project is not likely to impact this species.

The project is within the range of the piping plover (*Charadrius melodus*), a state endangered and federally endangered bird; and the Kirtland's warbler (*Setophaga kirtlandii*), a state endangered and federally endangered bird. These species do not nest in the state but do utilize stopover habitat as they migrate through the region. Due to the location, and the type of work proposed, this project is not likely to impact these species.

The project is within the range of the sandhill crane (*Grus canadensis*), a state endangered species. Sandhill cranes are primarily a wetland-dependent species. On their wintering grounds, they will utilize agricultural fields; however, they roost in shallow, standing water or moist bottomlands. On breeding grounds they require a rather large tract of wet meadow, shallow marsh, or bog for nesting. If grassland, prairie, or wetland habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of April 1 to September 1. If this habitat will not be impacted, this project is not likely to have an impact on this species.

The project is within the range of the upland sandpiper (*Bartramia longicauda*), a state endangered bird. Nesting upland sandpipers utilize dry grasslands including native grasslands, seeded grasslands, grazed and ungrazed pasture, hayfields, and grasslands established through the Conservation Reserve Program (CRP). If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of April 15 to July 31. If this type of habitat will not be impacted, this project is not likely to impact this species.

The project is within the range of the northern harrier (*Circus cyaneus*), a state endangered bird. This is a common migrant and winter species. Nesters are much rarer, although they occasionally breed in large marshes and grasslands. Harriers often nest in loose colonies. The female builds a nest out of sticks on the ground, often on top of a mound. Harriers hunt over grasslands. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 15 to August 1. If this habitat will not be impacted, the project is not likely to impact this species.

Due to the potential of impacts to federally listed species, as well as to state listed species, we recommend that this project be coordinated with the U.S. Fish & Wildlife Service.

Water Resources: The Division of Water Resources has the following comment.

The local floodplain administrator should be contacted concerning the possible need for any floodplain permits or approvals for this project. Your local floodplain administrator contact information can be found at the website below.

http://water.ohiodnr.gov/portals/soilwater/pdf/floodplain/Floodplain%20Manager%20Community%20Contact%20List_8_16.pdf

ODNR appreciates the opportunity to provide these comments. Please contact John Kessler at (614) 265-6621 if you have questions about these comments or need additional information.

John Kessler
ODNR Office of Real Estate
2045 Morse Road, Building E-2
Columbus, Ohio 43229-6693
John.Kessler@dnr.state.oh.us

Martin's Run Ecological Restoration Project

Feasibility Report

QHEI Forms

Project Number 003-021

Ohio EPA — Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: FAIR 54.25

Stream & Location: MARTIN'S RUN **RM:** ___.__ **Date:** 03/15/18

Scorers Full Name & Affiliation: CHIP WENDT, COLDWATER CONSULTING, LLC

River Code: ___-___-___ **STORET #:** _____ **Lat./Long.:** (NAD 83 - decimal °) 41.4180 / 82.1615 ☐ Office verified location

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☐ BOULDER [9]	___	10	☐ ☐ DETRITUS [3]	___	___
☒ ☐ COBBLE [8]	50	30	☐ ☐ MUCK [2]	___	___
☐ ☒ GRAVEL [7]	10	50	☐ ☐ SILT [2]	5	___
☐ ☐ SAND [6]	10	___	☐ ☐ ARTIFICIAL [0]	___	___
☐ ☐ BEDROCK [5]	25	10	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☒ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☒ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☒ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☒ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☒ NORMAL [0]
- ☐ NONE [1]

Comments

Substrate: 17 (Maximum 20)

2] INSTREAM COVER
Indicate presence 0 to 3: **0**-Absent; **1**-Very small amounts or if more common of marginal quality; **2**-Moderate amounts, but not of highest quality or in small amounts of highest quality; **3**-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

- ___ UNDERCUT BANKS [1]
- 2 OVERHANGING VEGETATION [1]
- ___ SHALLOWS (IN SLOW WATER) [1]
- 1 ROOTMATS [1]
- ___ POOLS > 70cm [2]
- ___ ROOTWADS [1]
- 1 BOULDERS [1]
- ___ OXBOWS, BACKWATERS [1]
- 1 AQUATIC MACROPHYTES [1]
- 1 LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONE (Or 2 & average))
- ☐ EXTENSIVE >75% [11]
- ☒ MODERATE 25-75% [7]
- ☒ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 9

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☒ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☒ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☐ RECOVERING [3]
- ☒ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☒ MODERATE [2]
- ☐ LOW [1]

Comments

Channel Maximum 20: 8

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R	FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ NONE / LITTLE [3]	☒ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☐ WIDE > 50m [4]	☐ FOREST, SWAMP [3]	☐ CONSERVATION TILLAGE [1]
☒ MODERATE [2]	☐ MODERATE [2]	☒ MODERATE 10-50m [3]	☐ MODERATE 10-50m [3]	☐ SHRUB OR OLD FIELD [2]	☐ URBAN OR INDUSTRIAL [0]
☐ HEAVY / SEVERE [1]	☐ HEAVY / SEVERE [1]	☒ NARROW 5-10m [2]	☐ NARROW 5-10m [2]	☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ MINING / CONSTRUCTION [0]
		☐ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]	☐ FENCED PASTURE [1]	
		☐ NONE [0]	☒ NONE [0]	☒ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 3.75

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☒ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH (Check ONE (Or 2 & average))
- ☒ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY (Check ALL that apply)
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☒ FAST [1]
- ☒ MODERATE [1]
- ☒ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☒ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☒ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☒ STABLE (e.g., Cobble, Boulder) [2]
- ☒ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☒ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5.5

6] GRADIENT
(50 ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☒ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (1.22 mi²)

%POOL: 30 %GLIDE: 20 %RUN: 20 %RIFFLE: 30

Gradient Maximum 10: 4

EPA 4520 USED SURVEY DATA TO CALCULATE GRADIENT; EXCEEDS UPPER BOUND OF "VERY HIGH" GRADIENT CLASSIFICATION AND IS ASSIGNED A SCORE OF 4 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☒ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☒ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☒ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☒ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY

- ☒ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st pass: _____ cm

2nd: _____ cm

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☒ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

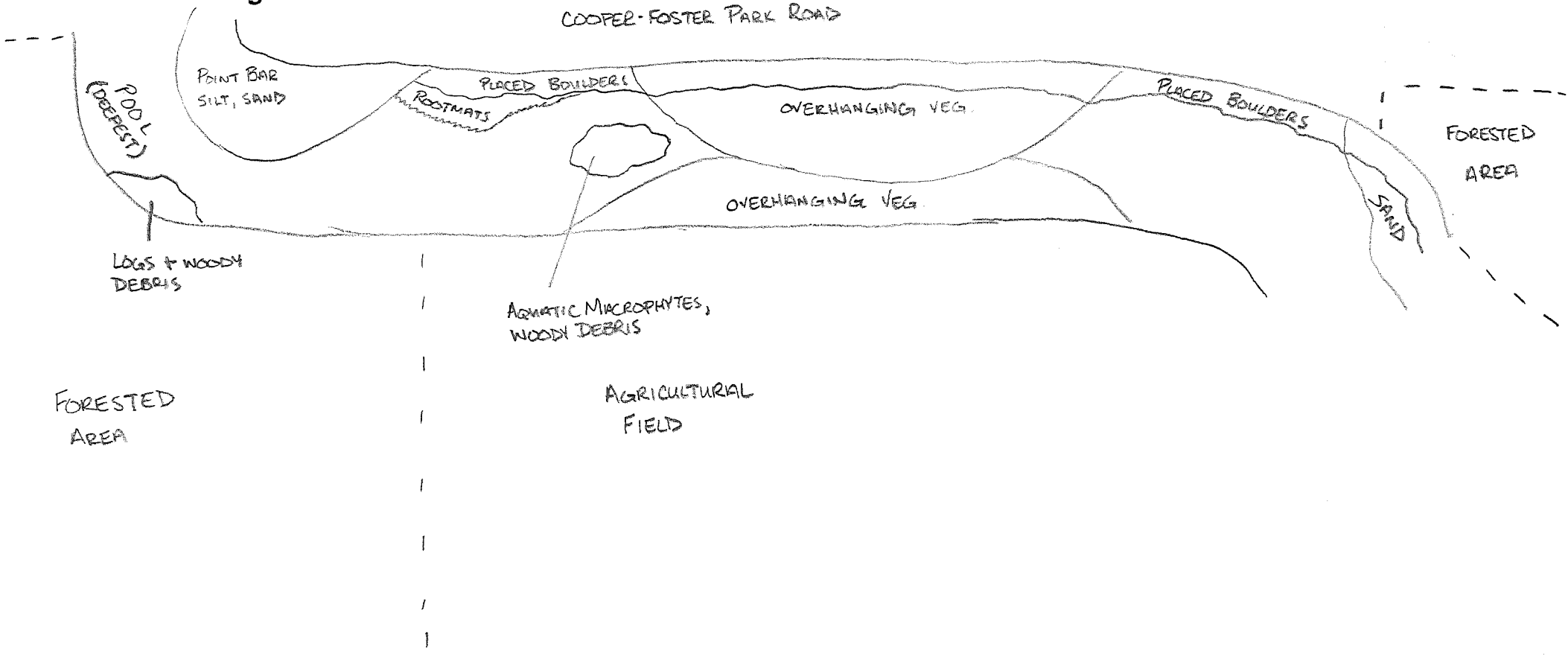
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



Martin's Run Ecological Restoration Project

Feasibility Report

HHEI Forms

COLDWATER CONSULTING, LLC

Project Number 003-021

Ohio EPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 25

SITE NAME/LOCATION Martins Run, Unnamed Tributary 1

SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) < 1mi²

LENGTH OF STREAM REACH (ft) 45 LAT. 82°9'57.50"W LONG. 41°25'2.38"N RIVER CODE _____ RIVER MILE _____

DATE 10/7 SCORER JMC COMMENTS Ephemeral flow

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☑ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.

TYPE		PERCENT	TYPE		PERCENT
☐ ☐	BLDR SLABS [16 pts]		☐ ☐	SILT [3 pt]	10
☐ ☐	BOULDER (>256 mm) [16 pts]		☐ ☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐ ☐	BEDROCK [16 pt]		☐ ☐	FINE DETRITUS [3 pts]	5
☑ ☐	COBBLE (65-256 mm) [12 pts]	15	☐ ☐	CLAY or HARDPAN [0 pt]	
☑ ☐	GRAVEL (2-64 mm) [9 pts]	50	☐ ☐	MUCK [0 pts]	
☐ ☑	SAND (<2 mm) [6 pts]	20	☐ ☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 15 (A) 15 (B) 5

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40

20

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☐	> 30 centimeters [20 pts]	☐	> 5 cm - 10 cm [15 pts]
☐	> 22.5 - 30 cm [30 pts]	☑	< 5 cm [5 pts]
☐	> 10 - 22.5 cm [25 pts]	☑	NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS _____ **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30

0

3. BANK FULL WIDTH (Measured as the average of 3-4 measurements) **(Check *ONLY* one box):**

☐	> 4.0 meters (> 13') [30 pts]	☐	> 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
☐	> 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]	☑	≤ 1.0 m (≤ 3' 3") [5 pts]
☐	> 1.5 m - 3.0 m (> 9' 7" - 4' 8") [20 pts]		

COMMENTS 3f7 **AVERAGE BANKFULL WIDTH (meters)** .9

Bankfull Width Max=30

5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☑	☑	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☐	Stream Flowing	☐	Moist Channel, isolated pools, no flow (Intermittent)
☐	Subsurface flow with isolated pools (Interstitial)	☑	Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check *ONLY* one box):

☑	None	☐	1.0	☐	2.0	☐	3.0
☐	0.5	☐	1.5	☐	2.5	☐	>3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☑ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

October 24, 2002 Revision

Trib 1

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - ☐ Yes ☑ No QHEI Score _____ (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: _____ Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name:_____ NRCS Soil Map Page:_____ NRCS Soil Map Stream Order _____

County: _____ Township / City:_____

MISCELLANEOUS

Base Flow Conditions? (Y/N):_____ Date of last precipitation:_____ Quantity:_____

Photograph Information: _____

Elevated Turbidity? (Y/N): _____ Canopy (% open): _____

Were samples collected for water chemistry? (Y/N): _____ (Note lab sample no. or id. and attach results) Lab Number:_____

Field Measures: Temp (°C)_____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N)_____ If not, please explain:_____

_____

Additional comments/description of pollution impacts:_____

_____

BIOTIC EVALUATION

Performed? (Y/N): _____ (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

Fish Observed? (Y/N)_____ Voucher? (Y/N)_____ Salamanders Observed? (Y/N)_____ Voucher? (Y/N)_____

Frogs or Tadpoles Observed? (Y/N)____ Voucher? (Y/N)____ Aquatic Macroinvertebrates Observed? (Y/N)____ Voucher? (Y/N)____

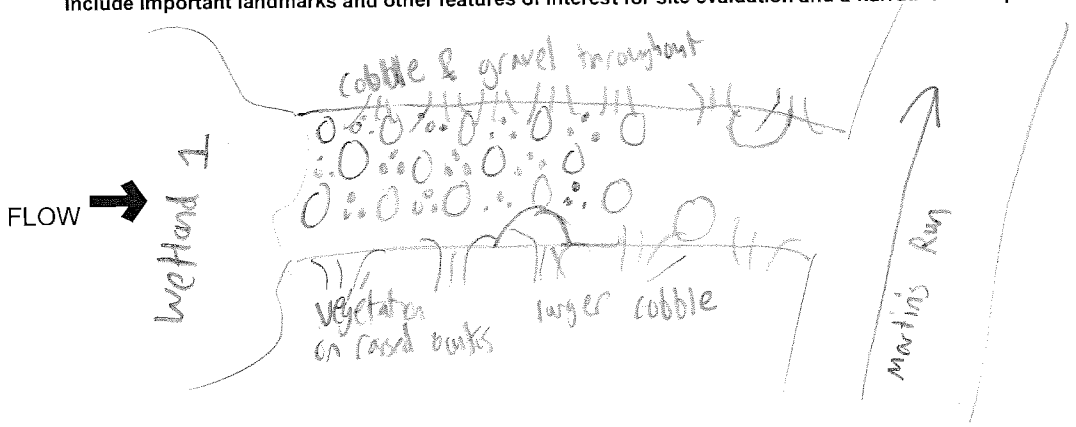
Comments Regarding Biology:_____

_____

_____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Ohio EPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : 25

SITE NAME/LOCATION Martins Run Unnamed Tributary 2,

SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) < 1 mi²

LENGTH OF STREAM REACH (ft) 30 LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE _____ SCORER JMC COMMENTS Ephemeral flow

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☑ RECENT OR NO RECOVERY

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.

TYPE		PERCENT	TYPE		PERCENT
☐ ☐	BLDR SLABS [16 pts]		☐ ☑	SILT [3 pt]	30
☐ ☐	BOULDER (>256 mm) [16 pts]		☐ ☐	LEAF PACK/WOODY DEBRIS [3 pts]	
☐ ☐	BEDROCK [16 pt]		☐ ☐	FINE DETRITUS [3 pts]	10
☑ ☐	COBBLE (65-256 mm) [12 pts]	30	☐ ☐	CLAY or HARDPAN [0 pt]	
☐ ☐	GRAVEL (2-64 mm) [9 pts]	15	☐ ☐	MUCK [0 pts]	
☐ ☐	SAND (<2 mm) [6 pts]	15	☐ ☐	ARTIFICIAL [3 pts]	

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock 30 (A) 15 (B) 5

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40: 20

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☐	> 30 centimeters [20 pts]	☐	> 5 cm - 10 cm [15 pts]
☐	> 22.5 - 30 cm [30 pts]	☐	< 5 cm [5 pts]
☐	> 10 - 22.5 cm [25 pts]	☑	NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS _____ **MAXIMUM POOL DEPTH (centimeters):** 0

Pool Depth Max = 30: 0

3. BANK FULL WIDTH (Measured as the average of 3-4 measurements) **(Check *ONLY* one box):**

☐	> 4.0 meters (> 13') [30 pts]	☐	> 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
☐	> 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]	☑	≤ 1.0 m (≤ 3' 3") [5 pts]
☐	> 1.5 m - 3.0 m (> 9' 7" - 4' 8") [20 pts]		

COMMENTS 3 ft **AVERAGE BANKFULL WIDTH (meters)** .9

Bankfull Width Max=30: 5

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☑	☑	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☑	☑	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☐	Stream Flowing	☐	Moist Channel, isolated pools, no flow (Intermittent)
☐	Subsurface flow with isolated pools (Interstitial)	☑	Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check *ONLY* one box):

☑	None	☐	1.0	☐	2.0	☐	3.0
☐	0.5	☐	1.5	☐	2.5	☐	>3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☑ Flat to Moderate ☑ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

Trib 2

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - ☐ Yes ☑ No QHEI Score _____ (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: _____ Distance from Evaluated Stream _____

☐ CWH Name: _____ Distance from Evaluated Stream _____

☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name:_____ NRCS Soil Map Page:_____ NRCS Soil Map Stream Order _____

County: _____ Township / City:_____

MISCELLANEOUS

Base Flow Conditions? (Y/N):_____ Date of last precipitation:_____ Quantity:_____

Photograph Information: _____

Elevated Turbidity? (Y/N): _____ Canopy (% open): _____

Were samples collected for water chemistry? (Y/N): _____ (Note lab sample no. or id. and attach results) Lab Number:_____

Field Measures: Temp (°C)_____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N)_____ If not, please explain:_____

Additional comments/description of pollution impacts:_____

BIOTIC EVALUATION

Performed? (Y/N): _____ (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

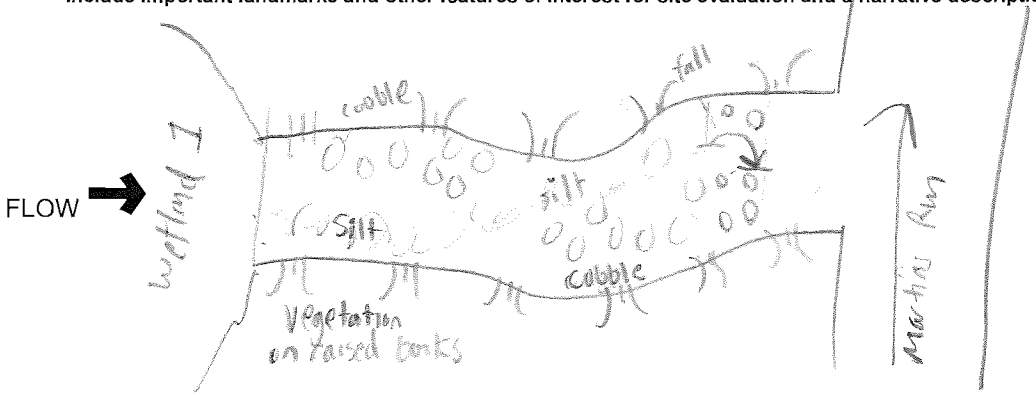
Fish Observed? (Y/N)_____ Voucher? (Y/N)_____ Salamanders Observed? (Y/N)_____ Voucher? (Y/N)_____

Frogs or Tadpoles Observed? (Y/N)_____ Voucher? (Y/N)_____ Aquatic Macroinvertebrates Observed? (Y/N)_____ Voucher? (Y/N)_____

Comments Regarding Biology:_____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location



Martin's Run Ecological Restoration Project

Feasibility Report

Routine Wetland Delineation Forms

COLDWATER CONSULTING, LLC

Project Number 003-021

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 1

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.415283 Long: -82.165628 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	Wetland 1

Remarks: (Explain alternative procedures here or in a separate report.)
constructed linear wetland, approximately 0.35 acre

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	X Drainage Patterns (B10)
X Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfind Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction I Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	X Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes X No ___	Depth (inches):	surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Herb Stratum (Plot size:)			
1 Phalaris arundinacea	25	Y	FACW
2 Leersia oryzoides	20	Y	OBL
3 Carex vulpinoidea	15	Y	OBL
4 Impatiens capensis	10		FACW
5 Lysimachia nummularia	10		FACW
6 Persicaria maculosa	10		FAC
7 Apocynum cannabinum	5		FAC
8 Cirsium arvense	1		FACU
9			
10			
11			
12			
	96 = Total Cover		
50% of total cover: 48.0	20% of total cover: 19.2		
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 3 (A)

Total Number of Dominant SpeciesAcross All Strata: 3 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	35 x1=	35
FACW species	45 x2=	90
FAC species	15 x3=	45
FACU species	1 x4=	4
UPL species	0 x5=	0
Column Totals:	96 (A)	174 (B)
Prevelance Index = B/A =		1.8

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0 [1]

_ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _

Remarks: (Include photo numbers here or on a separate sheet.)

Emergent Wetland (PEM). Overall the coverage of reed canary grass is 75%

SOIL Sampling Point: Plot 1

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8"	10YR 4/2	100					silt loam	
8-12"	10YR 4/2	85	10YR 5/6	15	C	M	silt loam	
12-20"	10YR 5/1	70	10YR 5/6	30	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 2

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.415283 Long: -82.16559 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes ___ No X	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes ___ No X	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Located at the edge of the field adjacent to linear Wetland 1

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover:		0.0
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:		0.0
Herb Stratum (Plot size:)			
1 Schedonorus arundinaceus	50	Y	FACU
2 Ambrosia artemisiifolia	20	Y	FACU
3 Lysimachia nummularia	10		FACW
4 Apocynum cannabinum	10		FAC
5 Allium canadense	5		FACU
6 Cirsium arvense	2		FACU
7 Rumex crispus	1		FAC
8 Trifolium pratense	1		FACU
9			
10			
11			
12			
	99 = Total Cover		
50% of total cover: 49.5	20% of total cover:		19.8
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:		0.0

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 0 (A)

Total Number of Dominant SpeciesAcross All Strata: 2 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 0.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	10	x2=	20
FAC species	11	x3=	33
FACU species	78	x4=	312
UPL species	0	x5=	0
Column Totals:	99 (A)		365 (B)
Prevelance Index = B/A =			3.7

Hydrophytic Vegetation Indicators:

_ 1 - Rapid Test for Hydrophytic Vegetation

_ 2 - Dominance Test is >50%

_ 3 - Prevalence Index is ≤3.0 [1]

_ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 2

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-13"	10YR 3/2	100					silt loam	
13-20"	10YR 4/2	80	10YR 5/6	20	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ **No X**

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 3

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417595 Long: -82.166542 Datum: NAD 83

Soil Map Unit Name: Olmsted loam, sandstone substratum (On) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes ___ No X	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes ___ No X	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Located in a low spot at the edge of a field

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1 Populus deltoides	10	Y	FAC
2 Fraxinus pennsylvanica	5	Y	FACW
3			
4			
5			
6			
7			
	15.00 = Total Cover		
50% of total cover: 7.5	20% of total cover:		3.0
Sapling/Shrub Stratum (Plot size:)			
1 Ulmus americana	25	Y	FACW
2 Acer saccharinum	10	Y	FACW
3 Cornus amomum	5		FACW
4			
5			
6			
7			
	40 = Total Cover		
50% of total cover: 20.0	20% of total cover:		8.0
Herb Stratum (Plot size:)			
1 Phalaris arundinacea	70	Y	FACW
2 Schedonorus arundinaceus	20		FACU
3 Lysimachia nummularia	10		FACW
4 Toxicodendron radicans	1		FAC
5			
6			
7			
8			
9			
10			
11			
12			
	101 = Total Cover		
50% of total cover: 50.5	20% of total cover:		20.2
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:		0.0

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 5 (A)

Total Number of Dominant SpeciesAcross All Strata: 5 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	125	x2=	250
FAC species	11	x3=	33
FACU species	20	x4=	80
UPL species	0	x5=	0
Column Totals:	156 (A)		363 (B)

Prevelance Index = B/A = 2.3

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0 [1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 3

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8"	10YR 3/2	100					silt loam	
8-20"	10YR 3/3	95	10YR 4/4	4	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ **No X**

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 4

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417762 Long: -82.166906 Datum: NAD 83

Soil Map Unit Name: Olmsted loam, sandstone substratum (On) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	Wetland 2

Remarks: (Explain alternative procedures here or in a separate report.)
Located in a small low spot at the edge of a field, 0.005 acre

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1 Quercus palustris	10	Y	FACW
2			
3			
4			
5			
6			
7			
	10.00 = Total Cover		
50% of total cover: 5.0	20% of total cover:	2.0	
Sapling/Shrub Stratum (Plot size:)			
1 Cornus amomum	5	Y	FACW
2			
3			
4			
5			
6			
7			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover:	1.0	
Herb Stratum (Plot size:)			
1 Phalaris arundinacea	70	Y	FACW
2 Lysimachia nummularia	20	Y	FACW
3 Impatiens capensis	2		FACW
4 Persicaria maculosa	1		FAC
5			
6			
7			
8			
9			
10			
11			
12			
	93 = Total Cover		
50% of total cover: 46.5	20% of total cover:	18.6	
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 4 (A)

Total Number of Dominant SpeciesAcross All Strata: 4 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	0 x1=	0
FACW species	107 x2=	214
FAC species	1 x3=	3
FACU species	0 x4=	0
UPL species	0 x5=	0
Column Totals:	108 (A)	217 (B)

Prevelance Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0 [1]

_ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _

Remarks: (Include photo numbers here or on a separate sheet.)

Emergent wetland (PEM).

SOIL Sampling Point: Plot 4

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8"	10 YR 4/2	96	10YR 4/6	2	C	M	silt loam	
8-20"	10YR 4/3	80	10YR 5/2	20	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 5

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417758 Long: -82.166922 Datum: NAD 83

Soil Map Unit Name: Olmsted loam, sandstone substratum (On) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
upland plot adjacent to Wetland 2

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 5

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Herb Stratum (Plot size:)			
1 Schedonorus arundinaceus	80	Y	FACU
2 Ambrosia artemisiifolia	5		FACU
3 Rumex crispus	5		FAC
4 Trifolium pratense	2		FACU
5 Allium canadense	2		FACU
6			
7			
8			
9			
10			
11			
12			
	94 = Total Cover		
50% of total cover: 47.0	20% of total cover: 18.8		
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 0 (A)

Total Number of Dominant SpeciesAcross All Strata: 1 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 0.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	0	x2=	0
FAC species	5	x3=	15
FACU species	89	x4=	356
UPL species	0	x5=	0
Column Totals:	94 (A)		371 (B)

Prevelance Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0 [1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes __ No x

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 5

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9"	10YR 3/3	100					silt loam	
9-20"	10YR 4/2	90	10YR 3/4	10	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 6

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Field Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417915 Long: -82.168087 Datum: NAD 83

Soil Map Unit Name: Olmsted loam, sandstone substratum (On) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation X , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes ___ No X	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
Plot 6 has been under clutivation for an extended period of time and was planted with Soybean the previous growing season. The area had yet to be planted this growing season at the time of the assessment. Weather conditions and precipitation the week prior were typical of the season.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Review of aerial Imagery was examined and saturation was visable at various periods. The plot location was situated within the historical saturation limits No saturation was present during the assessment.

VEGETATION (Five Strata) - Use scientific names of plants. Sampling Point: Plot 6

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	
Sapling/Shrub Stratum (Plot size: 15' Radius)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	
Herb Stratum (Plot size: 5' Radius)			
1 Phleum pratense	50	Y	FACU
2 Juncus tenuis	25	Y	FAC
3 Eleocharis obtusa	10		OBL
4 Festuca rubra	5		FACU
5 Rumex crispus	5		FAC
6 Ambrosia artemisiifolia	1		FACU
7			
8			
9			
10			
11			
12			
	96 = Total Cover		
50% of total cover: 48.0	20% of total cover:	19.2	
Woody Vine Stratum (Plot size: 30' Radius)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 1 (A)

Total Number of Dominant SpeciesAcross All Strata: 2 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 50.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x1=	10
FACW species	0	x2=	0
FAC species	30	x3=	90
FACU species	56	x4=	224
UPL species	0	x5=	0
Column Totals:	96 (A)		324 (B)
Prevelance Index = B/A =			3.4

Hydrophytic Vegetation Indicators:

1 - Rapid Test for Hydrophytic Vegetation

2 - Dominance Test is >50%

3 - Prevalence Index is ≤3.0 [1]

4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)
Soybean was planted the previous growing season.

SOIL Sampling Point: Plot 6

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9"	10YR 4/2	95	10YR 4/4	1	C	M	Silt loam	
9-20"	10YR 5/2	90	10YR 5/6	1	C	M	Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 7

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417026 Long: -82.166641 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	Wetland 3

Remarks: (Explain alternative procedures here or in a separate report.)
linear wetland along the edge of a field and a narrow wooded corridor, 0.1 acre

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Drainage Patterns (B10)
___ Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfind Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits B2)	X Oxidized Rhizospheres on Living Roots (C3)	X Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction I Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 7

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Sapling/Shrub Stratum (Plot size:)			
1 Ulmus americana	10	Y	FACW
2 Quercus palustris	10	Y	FACW
3 Populus deltoides	5	Y	FAC
4			
5			
6			
7			
	25 = Total Cover		
50% of total cover: 12.5	20% of total cover: 5.0		
Herb Stratum (Plot size:)			
1 Carex vulpinoidea	40	Y	OBL
2 Juncus effusus	35	Y	OBL
3 Scirpus atrovirens	10		OBL
4 Juncus tenuis	5		FAC
5 Rubus allegheniensis	5		FACU
6 Ulmus americana	2		FACW
7 Acer rubrum	1		FAC
8			
9			
10			
11			
12			
	98 = Total Cover		
50% of total cover: 49.0	20% of total cover: 19.6		
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 5 (A)

Total Number of Dominant SpeciesAcross All Strata: 5 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x1=	85
FACW species	22	x2=	44
FAC species	11	x3=	33
FACU species	5	x4=	20
UPL species	0	x5=	0
Column Totals:	123 (A)		182 (B)
Prevelance Index = B/A =			1.5

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0 [1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

Mixed - 60% emergent/40% scrub-shrub (PEM/SS)

SOIL Sampling Point: Plot 7

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9"	10YR 4/2	100					silt loam	
9-20"	10YR 5/2	60	10YR 5/6	40	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 8

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417026 Long: -82.166612 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes ___ No X	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
upland plot adjacent to Wetland 3

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 8

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		
Herb Stratum (Plot size:)			
1 Festuca rubra	40	Y	FACU
2 Allium canadense	20	Y	FACU
3 Ambrosia artemisiifolia	20	Y	FACU
4 Persicaria maculosa	2		FAC
5 Lotus corniculatus	1		FACU
6			
7			
8			
9			
10			
11			
12			
	83 = Total Cover		
50% of total cover: 41.5	20% of total cover: 16.6		
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 0 (A)

Total Number of Dominant SpeciesAcross All Strata: 3 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 0.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	0	x2=	0
FAC species	2	x3=	6
FACU species	81	x4=	324
UPL species	0	x5=	0
Column Totals:	83 (A)		330 (B)
Prevelance Index = B/A =			4.0

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0 [1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes __ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 8

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9"	10YR 4/3	100					silt loam	
9-20"	10YR 5/2	80	10YR 5/6	20	C	M	silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 9

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417404 Long: -82.166791 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	Wetland 4

Remarks: (Explain alternative procedures here or in a separate report.)
Approximately 0.01 acre

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	X Water-Stained Leaves (B9)	___ Aquatic Fauna (B13)
___ High Water Table (A2)	___ Marl Deposits (B15)	___ Hydrogen Sulfind Odor (C1)
___ Saturation (A3)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Presence of Reduced Iron (C4)
X Water Marks (B1)	___ Recent Iron Reduction I Tilled Soils (C6)	___ Thin Muck Surface (C7)
___ Sediment Deposits B2)	___ Other (Explain in Remarks)	
___ Drift Deposits (B3)		
___ Algal Mat or Crust (B4)		
___ Iron Deposits (B5)		
___ Inundation Visible on Aerial Imagery (B7)		
X Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 9

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1 Quercus palustris	95	Y	FACW
2			
3			
4			
5			
6			
7			
	95.00 = Total Cover		
50% of total cover: 47.5	20% of total cover:	19.0	
Sapling/Shrub Stratum (Plot size:)			
1 Fraxinus pennsylvanica	10	Y	FACW
2			
3			
4			
5			
6			
7			
	10 = Total Cover		
50% of total cover: 5.0	20% of total cover:	2.0	
Herb Stratum (Plot size:)			
1 Fraxinus pennsylvanica	15	Y	FACW
2 Toxicodendron radicans	1		FAC
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
	16 = Total Cover		
50% of total cover: 8.0	20% of total cover:	3.2	
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 3 (A)

Total Number of Dominant SpeciesAcross All Strata: 3 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	120	x2=	240
FAC species	1	x3=	3
FACU species	0	x4=	0
UPL species	0	x5=	0
Column Totals:	121 (A)		243 (B)
Prevelance Index = B/A =			2.0

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0 [1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No __

Remarks: (Include photo numbers here or on a separate sheet.)

Forested (PFO). Oaks range from 4 - 30" DBH; average 12" DBH

SOIL Sampling Point: Plot 9

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7"	10YR 3/2	95	10YR 4/6	5	C	M	silt loam	
7-20"	10YR 5/2	93	10YR 5/6	7	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 10

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.417331 Long: -82.166747 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** ___ **No** X
Wetland Hydrology Present?	Yes ___ No X	If yes, optional Wetand Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)
upland adjacent to Wetland 4

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 10

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	
Sapling/Shrub Stratum (Plot size:)			
1 Fraxinus pennsylvanica	40	Y	FACW
2 [Lonicera sp]	25	Y	FACU
3 Rosa multiflora	20	Y	FACU
4 Viburnum dentatum	5		FAC
5			
6			
7			
	90 = Total Cover		
50% of total cover: 45.0	20% of total cover:	18.0	
Herb Stratum (Plot size:)			
1 [Lonicera sp]	25	Y	FACU
2 Impatiens capensis	10	Y	FACW
3 Parthenocissus quinquefolia	10		FACU
4 Toxicodendron radicans	5		FAC
5 Fraxinus pennsylvanica	5		FACW
6 Rosa multiflora	2		FACU
7 Rubus allegheniensis	2		FACU
8			
9			
10			
11			
12			
	59 = Total Cover		
50% of total cover: 29.5	20% of total cover:	11.8	
Woody Vine Stratum (Plot size:)			
1 Vitis aestivalis	5	Y	FACU
2			
3			
4			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover:	1.0	

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 2 (A)

Total Number of Dominant SpeciesAcross All Strata: 6 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 33.3% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	55	x2=	110
FAC species	10	x3=	30
FACU species	89	x4=	356
UPL species	0	x5=	0
Column Totals:	154 (A)		496 (B)
Prevelance Index = B/A =			3.2

Hydrophytic Vegetation Indicators:

_ 1 - Rapid Test for Hydrophytic Vegetation

_ 2 - Dominance Test is >50%

_ 3 - Prevalence Index is ≤3.0 [1]

_ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 10

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6"	10YR 3/2	100					silt loam	
6-20"	10YR 4/2	90	10YR 4/4	10			silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 11

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.416641 Long: -82.166844 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**	
Hydric Soil Present?	Yes X No ___	**within a Wetland?**	**Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetand Site ID:	Wetland 5

Remarks: (Explain alternative procedures here or in a separate report.)
linear wetland located along the edge of a field and the west side of a narrow wooded corridor; 0.11 acre

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Drainage Patterns (B10)
X Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfind Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits B2)	X Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction I Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes X No ___	Depth (inches):	4"

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 11

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1 Quercus palustris	15	Y	FACW
2			
3			
4			
5			
6			
7			
	15.00 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3.0		
Sapling/Shrub Stratum (Plot size:)			
1 Frangula alnus	15	Y	FAC
2			
3			
4			
5			
6			
7			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3.0		
Herb Stratum (Plot size:)			
1 Juncus effusus	70	Y	OBL
2 Lysimachia nummularia	20	Y	FACW
3 Carex vulpinoidea	2		OBL
4 Scirpus atrovirens	2		OBL
5 Houstonia caerulea	1		FACU
6			
7			
8			
9			
10			
11			
12			
	95 = Total Cover		
50% of total cover: 47.5	20% of total cover: 19.0		
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover: 0.0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 4 (A)

Total Number of Dominant SpeciesAcross All Strata: 4 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 100.0% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	74 x1=	74
FACW species	35 x2=	70
FAC species	15 x3=	45
FACU species	1 x4=	4
UPL species	0 x5=	0
Column Totals:	125 (A)	193 (B)
Prevelance Index = B/A =		1.5

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0 [1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No

Remarks: (Include photo numbers here or on a separate sheet.)

Mixed: emergent 35%, scrub shrub 45%, and forested 20% (PEM/SS/PFO)

SOIL Sampling Point: Plot 11

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2"	10YR 3/2	98	10YR 4/4	2	C	M	silt	
2-20"	10YR 4/2	75	10YR 5/6	25%	C	M	clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Martin's Run Restoration Project City/County: Lorain Sampling Date: 6/7/2018

Applicant/Owner: City of Lorain State: OH Sampling Point: Plot 12

Investigator(s): John Shady, Chip Wendt Section,Township, Range: Amherst Township

Landform (hillslope, terrace, etc.): Local relief (concave,convex, none): Slope(%):

Subregion (LRR or MLRA): LRR R Lat: 41.416628 Long: -82.166875 Datum: NAD 83

Soil Map Unit Name: Jimstown sandy loam, 0-2 % slopes (JsA) NWI classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ___	**within a Wetland?** **Yes** ___ **No** X
Wetland Hydrology Present?	Yes X	No ___	If yes, optional Wetand Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
upland adjacent to Wetland 5

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfind Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction I Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants. Sampling Point: Plot 12

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1			
2			
3			
4			
5			
6			
7			
	0.00 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	
Sapling/Shrub Stratum (Plot size:)			
1			
2			
3			
4			
5			
6			
7			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	
Herb Stratum (Plot size:)			
1 Juncus tenuis	30	Y	FAC
2 Allium canadense	20	Y	FACU
3 Ambrosia artemisiifolia	20	Y	FACU
4 Phleum pratense	15		FACU
5 Apocynum cannabinum	10		FAC
6 Trifolium pratense	2		FACU
7			
8			
9			
10			
11			
12			
	97 = Total Cover		
50% of total cover: 48.5	20% of total cover:	19.4	
Woody Vine Stratum (Plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
50% of total cover: 0.0	20% of total cover:	0.0	

Dominance Test worksheet:

Number of Dominant Species That Are OBL,FACW, or FAC: 1 (A)

Total Number of Dominant SpeciesAcross All Strata: 3 (B)

Percent of Dominant Species That Are OBL,FACW, or FAC: 33.3% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	0	x2=	0
FAC species	40	x3=	120
FACU species	57	x4=	228
UPL species	0	x5=	0
Column Totals:	97 (A)		348 (B)
Prevelance Index = B/A =			3.6

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0 [1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous(non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes __ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: Plot 12

Profile Description: (Describe to the depth needed to docment the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4"	10YR 4/3	98	10YR 4/6	2	C	M	silt loam	
4-20"	10YR 5/2	60	10YR 4/6	40	C	M	silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matirx, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfinde (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm MuckyPeat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B))**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Martin's Run Ecological Restoration Project

Feasibility Report

Geotechnical Report

COLDWATER CONSULTING, LLC

Project Number 003-021

110 Blaze Industrial Pkwy.
Berea, Ohio 44017
Tel: 440-234-8985
www.geo-sci.com

April 30, 2018

Mr. Chip Wendt
Coldwater Consulting, LLC
Water Resources Specialist, CESSWI
3079 East Erie Avenue
Lorain, Ohio 44052

Re: Martin's Run Ecological Restoration Project
Cooper Foster Park Road
Lorain, Lorain County, Ohio
Geo-Sci Project No. 38030.11

Dear Mr. Wendt:

As per our proposal, Geo-Sci has completed the soil borings for the above-noted project. The results of the exploration including geotechnical parameters to be for the design of the proposed ecological restoration activities are included herewith.

Upon completion of the plans, it is recommended that Geo-Sci review the final design to verify that the geotechnical design recommendations have been properly implemented into the design of the proposed restoration. **Furthermore, it is recommended that the geotechnical engineer and/or representative be onsite during earthwork operations to observe field conditions at the time of construction.**

We appreciate the opportunity to work with you on this project. Should you have any questions or if we may be of further assistance, please contact us at (440) 234-8985.

Sincerely,

Geo-Sci, Inc.

Dorian Taran
Geotechnical Engineer

Reviewed By:

George W. Aboumrad, P.E.
President

Enclosure: Geotechnical Report

Table of Contents

APPENDICES

1. Project Description

Based upon the information provided, the project involves ecological restoration activities located adjacent (west) to 205 Cooper Foster Park Road in Lorain, Lorain County, Ohio, as depicted in the Figure 1 below:

Figure 1. Aerial Photograph

Note that the site is relatively flat and is currently used for agriculture purposes.

2. Field Investigation

A total of nine (9) test borings were drilled to approximate depths ranging from 18.7 to 20.0 feet each, below existing grade. In addition, three (3) monitoring wells were installed at the same location of borings B-1, B-2 and B-3. **It should be noted that periodic groundwater level readings of the monitoring wells were performed by Coldwater Consulting personnel.** The test boring locations were selected and field located jointly by Geo-Sci and Coldwater Consulting representatives. The generalized test boring locations are depicted on the attached Boring Location Plan (Appendix A). Test borings were advanced using 3-1/4 inch I.D. Hollow Stem Augers. Representative samples were collected using a standard two-inch O.D. and 1-3/8 inch I.D. split barrel sampler driven into the soil by means of a 140-pound hammer falling freely through a distance of 30 inches (Standard Penetration Test, ASTM D 1586). The groundwater levels at the test boring locations were measured at encounter and upon completion of the drilling operations. All samples were returned to Geo-Sci's laboratory in Berea, Ohio for further analysis. Individually typed test-boring logs are enclosed for your review. Please note that the sample depths shown on the boring logs are at the top of the sampling interval.

3. Laboratory Testing

Laboratory tests were performed on selected soil samples. Both classification and engineering property tests were performed to obtain various parameters for use in design and construction of the project. The table below provides a summary of the laboratory testing performed on select samples:

Table 1. Summary of Laboratory Testing

Test	ASTM	# of Tests
Moisture Content	D2216	48
Atterberg Limits	D4318	10
Grain Size Distribution	D422	10

Liquid limit, plasticity index and moisture content results are shown on the individually typed test-boring logs (Appendix B). The results of the grain size distributions are provided in Appendix C. The soil samples were classified in general accordance with the Unified Soil Classification System (USCS). Note that the visual descriptions provided on the logs are based upon an empirical Northeast Ohio nomenclature with the actual USCS symbol provided immediately after in parenthesis. Testing was performed in general accordance with the American Society for Testing Materials (ASTM) and other generally accepted methods.

4. Subsurface Conditions

The subsurface conditions are summarized in the table below:

Table 2. Summary of Subsurface Conditions

Test Boring	Boring Depths (ft)	Surface Cover	Top of Rock (ft)
B-1	18.7	11” Topsoil	6.5
B-2	20.0	16” Topsoil	4.6
B-3	20.0	9” Topsoil	10.5
B-4	20.0	12” Topsoil	N/A
B-5	20.0	12” Topsoil	12.5
B-6	20.0	14” Topsoil	9.5
B-7	20.0	12” Topsoil	5.5
B-8	19.0	12” Topsoil	N/A
B-9	19.5	8” Topsoil	N/A

In general, natural soils consisted primarily of brown, gray and red silty clay/sandy silty clay and clayey silt with varying amounts of gravel and sandstone fragments. These soils are classified in accordance with the USCS mostly as “CL”, “ML” and “CL-ML”. The relative consistency of the cohesive soils encountered, as determined by the SPT N-Value, ranged from “medium stiff” to “hard”. Very soft to medium hard shale, sandstone or siltstone bedrock was encountered below the natural soils to the termination depths in most of the borings.

Groundwater was encountered in some of the borings within the explored depths during drilling and upon completion of drilling operations.

Table 3. Groundwater

Test Boring	During Drilling Depth (ft)	At Completion Depth (ft)
B-1	11.0	11.0
B-2	10.5	3.5
B-3	10.5	7.5
B-4	None	None
B-5	12.5	None
B-6	None	None
B-7	11.5	17.0
B-8	None	None
B-9	None	None

For specific conditions at various depths, please refer to the enclosed test-boring logs (Appendix B). **It should also be noted that groundwater levels could fluctuate with seasonal changes.**

5. Summary

As noted above, the site is relatively flat and is currently used for agriculture purposes. It is our understanding that the project consists of ecological restoration that will involve stream and riparian restoration activities. Based on the subsurface conditions encountered, our subsequent analyses, and the assumption that conditions between and away from the test borings are similar to those encountered, the following geotechnical parameters were prepared and are presented below.

5.1. Geotechnical Parameters

Table 4. Geotechnical Design Parameters B-1

Geotechnical Design Parameters	Depth (feet)			
	0.0-3.0	3.0-6.5	6.5-15.0	15.0-18.7
Allowable Side Resistance f_{all}, (psf)	-----	200	500	250
Allowable End Resistance q_{all}, (psf)	-----	2500	4000	6000
Downward Friction (Compression), (psf)	-----	500	800	1100

Uplift Friction (Tension), (psf)	-----	400	600	850
Cohesion, (psf)	875	2000	-----	-----
Effective Unit Weight γ', (pcf)	105	110	52.6	62.4
Angle of Internal Friction, Degrees	0.0	15.0	20.0	35.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.658	0.426
Active Pressure Coefficient, K_a	1.000	0.589	0.490	0.271
Passive Pressure Coefficient, K_p	3.00	1.638	2.040	3.690
Undrained Shear Strength (psf)	1750	4000	-----	-----

Table 5. Geotechnical Design Parameters B-2

Geotechnical	**Depth (feet)**			
Design Parameters	**0.0-3.0**	**3.0-4.5**	**4.5-11.5**	**11.5-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	250	250	500
Allowable End Resistance q_{all}, (psf)	-----	2000	6000	4000
Downward Friction (Compression), (psf)	-----	500	1100	800
Uplift Friction (Tension), (psf)	-----	400	850	600
Cohesion, (psf)	250	1000	-----	-----
Effective Unit Weight γ', (pcf)	105	110	62.6	52.6
Angle of Internal Friction, Degrees	0.0	15.0	35.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.426	0.658
Active Pressure Coefficient, K_a	1.000	0.589	0.271	0.490
Passive Pressure Coefficient, K_p	3.00	1.638	3.690	2.040
Undrained Shear Strength (psf)	500	2000	-----	-----

Table 6. Geotechnical Design Parameters B-3

Geotechnical Design Parameters	Depth (feet)			
	0.0-3.0	**3.0-10.5**	**10.5-17.5**	**17.5-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	200	300	550
Allowable End Resistance q_{all}, (psf)	-----	2500	5000	4500
Downward Friction (Compression), (psf)	-----	500	1000	900
Uplift Friction (Tension), (psf)	-----	400	850	600
Cohesion, (psf)	750	2250	-----	-----
Effective Unit Weight γ', (pcf)	105	110	62.4	52.6
Angle of Internal Friction, Degrees	0.0	15.0	35.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.426	0.658
Active Pressure Coefficient, K_a	1.000	0.589	0.271	0.490
Passive Pressure Coefficient, K_p	3.00	1.638	3.690	2.040
Undrained Shear Strength (psf)	1500	4500	-----	-----

Table 7. Geotechnical Design Parameters B-4

Geotechnical Design Parameters	Depth (feet)		
	0.0-1.0	**1.0-6.5**	**6.5-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	300	400
Allowable End Resistance q_{all}, (psf)	-----	3000	4000
Downward Friction (Compression), (psf)	-----	1000	800
Uplift Friction (Tension), (psf)	-----	800	600
Cohesion, (psf)	-----	2125	1500
Effective Unit Weight γ', (pcf)	105	110	115

Angle of Internal Friction, Degrees	0.0	15.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.658
Active Pressure Coefficient, K_a	1.000	0.589	0.490
Passive Pressure Coefficient, K_p	3.00	1.683	2.040
Undrained Shear Strength (psf)	-----	4250	3000

Table 8. Geotechnical Design Parameters B-5

Geotechnical	**Depth (feet)**		
Design Parameters	**0.0-4.0**	**4.0-12.5**	**12.5-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	300	400
Allowable End Resistance q_{all}, (psf)	-----	3000	6000
Downward Friction (Compression), (psf)	-----	1250	1000
Uplift Friction (Tension), (psf)	-----	1000	800
Cohesion, (psf)	250	1500	-----
Effective Unit Weight γ', (pcf)	105	110	62.2
Angle of Internal Friction, Degrees	0.0	15.0	35.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.426
Active Pressure Coefficient, K_a	1.000	0.589	0.271
Passive Pressure Coefficient, K_p	3.00	1.638	3.690
Undrained Shear Strength (psf)	500	3000	-----

Table 9. Geotechnical Design Parameters B-6

Geotechnical	Depth (feet)				
Design Parameters	**0.0-3.0**	**3.0-5.5**	**5.5-8.0**	**8.0-9.5**	**9.5-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	250	300	400	500
Allowable End Resistance q_{all}, (psf)	-----	2500	3000	4000	5000
Downward Friction (Compression), (psf)	-----	500	600	800	1000
Uplift Friction (Tension), (psf)	-----	400	500	600	800
Cohesion, (psf)	0	2250	2250	2250	120
Effective Unit Weight γ', (pcf)	105	110	110	115	120
Angle of Internal Friction, Degrees	0.0	15.0	15.0	20.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.741	0.658	0.658
Active Pressure Coefficient, K_a	1.000	0.589	0.589	0.490	0.490
Passive Pressure Coefficient, K_p	3.00	1.638	1.638	2.040	2.040
Undrained Shear Strength (psf)	0	4500	4500	4500	-----

Table 10. Geotechnical Design Parameters B-7

Geotechnical	Depth (feet)			
Design Parameters	**0.0-3.0**	**3.0-5.5**	**5.5-11.0**	**11.0-20.0**
Allowable Side Resistance f_{all}, (psf)	-----	300	200	400
Allowable End Resistance q_{all}, (psf)	-----	2500	4500	3500
Downward Friction (Compression), (psf)	-----	500	750	1000
Uplift Friction (Tension), (psf)	-----	400	600	800
Cohesion, (psf)	1250	2250	-----	-----
Effective Unit Weight γ', (pcf)	105	110	62.6	62.6

Angle of Internal Friction, Degrees	0.0	15.0	35.0	25.0
At Rest Pressure Coefficient, K_o	0.700	0.741	0.426	0.577
Active Pressure Coefficient, K_a	1.000	0.589	0.271	0.406
Passive Pressure Coefficient, K_p	3.00	1.638	3.690	2.646
Undrained Shear Strength (psf)	2500	4500	-----	-----

Table 11. Geotechnical Design Parameters B-8

Geotechnical	**Depth (feet)**	
Design Parameters	**0.0-3.0**	**3.0-19.0**
Allowable Side Resistance f_{all}, (psf)	-----	400
Allowable End Resistance q_{all}, (psf)	-----	4000
Downward Friction (Compression), (psf)	-----	1000
Uplift Friction (Tension), (psf)	-----	800
Cohesion, (psf)	1000	2250
Effective Unit Weight γ', (pcf)	105	115
Angle of Internal Friction, Degrees	0.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.658
Active Pressure Coefficient, K_a	1.000	0.490
Passive Pressure Coefficient, K_p	3.00	2.040
Undrained Shear Strength (psf)	2000	4500

Table 12. Geotechnical Design Parameters B-9

Geotechnical	Depth (feet)	
Design Parameters	**0.0-3.0**	**3.0-19.5**
Allowable Side Resistance f_{all}, (psf)	-----	400
Allowable End Resistance q_{all}, (psf)	-----	4000
Downward Friction (Compression), (psf)	-----	1000
Uplift Friction (Tension), (psf)	-----	800
Cohesion, (psf)	1000	2250
Effective Unit Weight γ', (pcf)	105	115
Angle of Internal Friction, Degrees	0.0	20.0
At Rest Pressure Coefficient, K_o	0.700	0.658
Active Pressure Coefficient, K_a	1.000	0.490
Passive Pressure Coefficient, K_p	3.00	2.040
Undrained Shear Strength (psf)	2000	4500

6. Excavation Considerations

Based on the test boring results, the anticipated ecological restoration project will most likely require rock excavation, especially at areas where borings B-1, B-2 and B-7 were drilled. The area's weathered shale and sandstone rock formation was encountered at depths starting as shallow as 5 feet below the existing surface grades, as presented in Table 2. Therefore, some rock excavation will be anticipated within the proposed project area. The upper layers of weathered bedrock exhibited SPT N-Values ranging from about 50 blow counts per 12 inches to 50 blows per 2 inches penetration, which indicates moderate to hard rock consistency. Based on the field drilling operations, it is anticipated that the top 2 to 3 feet of the area's weathered sandstone formation may be rippable with conventional excavation equipment. However, where further excavation is required, the use of special equipment, such as rock splitting apparatus, pneumatic hammers and/or controlled blasting will most likely be necessary to facilitate rock removal. **It should be noted that due to confinement, rock excavation could be more challenging and the rippable depth using conventional equipment might be shallower than 2 to 3 feet.** The limits and characteristics of the rock formations should be defined by the contractor prior to bidding and construction.

Excavation into cohesionless, soft, and/or wet soils will require temporary shoring. Temporary shoring will also be required at places where the sidewalls exhibit instability. Therefore, lateral support or appropriate sloping of the trench sidewalls will be required at these locations to facilitate construction. As an option, the sidewalls may be cut at a slope of 2 Horizontal to 1 Vertical, or flatter. The site restrictions of the project may limit available lateral distance for construction of slopes to keep the excavation sidewalls stable. It is recommended that all excavated material be stockpiled at a minimum horizontal distance of 15 feet away from the edges of the excavation, or transported away from the site as excavation occurs.

Also, the contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavation) should in no case exceed those specified in local, state, or federal safety regulations, e.g. OSHA Health and Safety Standards for excavations, 29 CFR part 1926, or successor regulations. Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

7. Groundwater

It should be noted that the water levels reported are indications of conditions existing at the locations at the times of observations only. In order to determine accurately the average elevation of the true groundwater table, it is essential to install monitoring wells and take periodic groundwater level readings, especially during extended periods of wetness. However, the installation of additional monitoring wells was not included in Geo-Sci's scope of services for this project.

8. Construction Monitoring

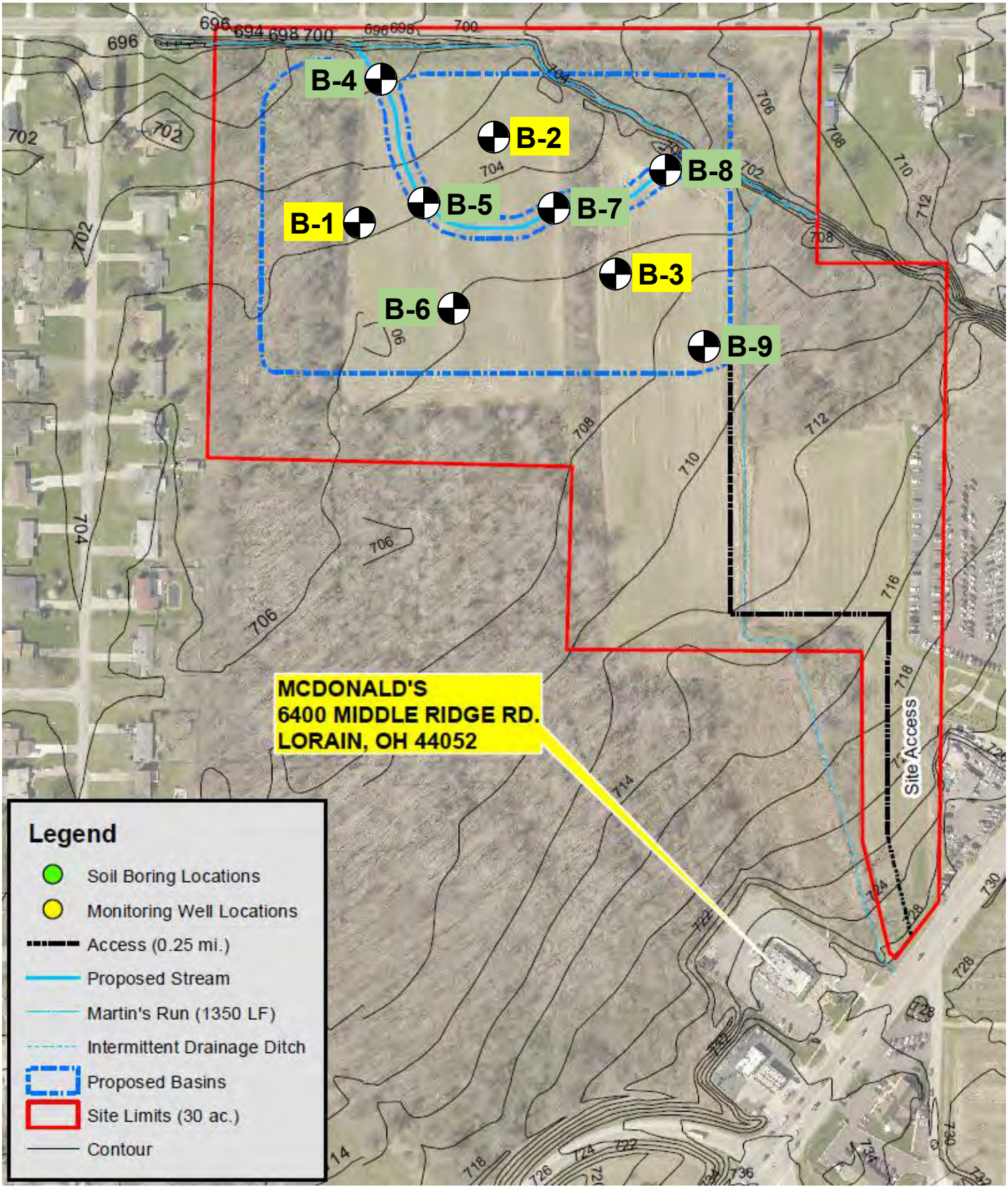
It is recommended that Geo-Sci be retained to review the project specifications regarding earthwork and the foundation system(s) prior to construction. In addition, it is also recommended that competent geotechnical personnel be present at the site during construction to examine the soil prior to placement of concrete, to verify subsurface conditions outlined in this report, and to make any changes deemed appropriate. If requested, Geo-Sci would welcome the opportunity to provide field monitoring services during construction.

9. Limitations

The preceding recommendations were based on the subsurface stratification observed at the location tested. Assumptions were made that this stratification is representative of that of the entire site. This assumption should be verified during excavation and, if changes occur, we should be notified so we may examine the conditions, review and revise our recommendations accordingly.

This report was completed using the professional standards currently applicable to the industry for the site and proposed construction described herein. Modifications in the plans should be brought to our attention so we may review and revise our recommendations accordingly.

Appendix A: Boring Location Plan



Boring Location Plan
Source: Coldwater Consulting, LLC

Geo-Sci, Inc.
110 Blaze Industrial Parkway
Berea, Ohio 44017
Telephone: 440-234-8985
Fax: 440-234-8940
www.geo-sci.com

Project: Martin's Run Ecological Restoration Project
Lorain, Lorain County, Ohio
Geo-Sci Project No: 38030.11
Client: Coldwater Consulting, LLC
Date: 04/30/2018

Appendix B: Boring Logs

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-01
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 18.7 ft
Water Depth: **At Encounter** 11 ft **At Completion** 11 ft **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	11" TOPSOIL								
	Medium stiff brown and gray SANDY SILTY CLAY, trace rock fragments, moist. (CL) Note: Layer of sand from 1.0 ft. to 1.6 ft.	1	1.0	2-2-3	5	14.2 16.0	27	10	N/A 1.75
	Very stiff brown and gray SILTY CLAY, trace sand, rock fragments, moist. (CL)	2	3.5	6-8-11	19	14.5			4.00
	Brown SHALE, very soft to soft, highly weathered. (SHALE)	3	6.0	18-50/5"	50/5"	9.6 10.4			N/A N/A
		4	8.5	50/5"	50/5"	7.5			N/A
	Gray SANDY SHALE, soft, highly weathered. (SHALE)	5	13.0	50/5"	50/5"				N/A
	Gray SANDSTONE, medium hard, weathered. (SANDSTONE)								
	Termination Depth @ 18.7 ft.	6	18.5	50/2"	50/2"				N/A

LOG OF BORING INDIVIDUAL SAMPLE DEPTHS 38030.GPJ GEO-SCI.GDT 4/17/18

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-02
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** 10.5 ft **At Completion** 3.5 ft **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	16" TOPSOIL								
	Soft brown and gray SANDY CLAY, trace gravel, wet. (CL)	1	1.0	1-1-2	3	23.6			1.00
						21.8			0.50
	Stiff brown and gray SILTY CLAY, some sand, wet. (CL)	2	3.5	2-6-50/2"	50/2"	21.7	35	15	2.00
	Brown turning to gray SANDSTONE, medium hard to soft, weathered. (SANDSTONE)								N/A
		3	6.0	50/4"	50/4"				N/A
		4	8.5	50/5"	50/5"				N/A
	Note: Color change to gray @ 10.5 ft.								
	Gray SHALE, soft to very soft, highly weathered. (SHALE)	5	13.5	26-50/5"	50/5"				N/A
		6	18.5	10-12-27	39				N/A
	Termination Depth @ 20 ft.								

LOG OF BORING INDIVIDUAL SAMPLE DEPTHS 38030.GPJ GEO-SCI.GDT 4/17/18

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-03
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** 10.5 ft **At Completion** 7.5 ft **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	9" TOPSOIL								
	Medium stiff brown and gray SILTY CLAY, some sand, wet. (CL)	1	1.0	1-2-3	5	26.0			1.50
	Very stiff red SILTY CLAY, trace sand, moist. (CL)	2	3.5	4-6-9	15	13.1			4.5+
		3	6.0	9-12-14	26	12.2	34	13	4.5+
		4	8.5	10-13-22	35	12.8			4.5+
	Gray SANDSTONE, medium hard, weathered. (SANDSTONE)	5	13.5	50/2'	50/2'				N/A
	Gray SHALE, very soft, severely weathered. (SHALE)	6	18.5	17-31-42	73				N/A
	Termination Depth @ 20 ft.								

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-04
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** None **At Completion** None **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	12" TOPSOIL								
	Medium stiff to stiff brown and gray SANDY SILTY CLAY, trace gravel, wet to moist. (CL-ML)	1	1.0	2-3-2	5	21.2			0.00
		2	3.5	2-4-6	10	13.5			4.5+
	Very stiff gray SILTY CLAY, little sand, trace rock fragments, moist. (CL)	3	6.0	7-9-10	19	13.3 13.2	25	6	4.25 4.5+
		4	8.5	6-10-11	21	10.4			4.5+
		5	13.5	6-9-11	20	17.0			4.5+
	Note: Dry cave-in @ 17.5 ft.	6	18.5	4-7-11	18	20.1			3.00
	Termination Depth @ 20 ft.								

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-05
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** 12.5 ft **At Completion** None **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
0	12" TOPSOIL								
	Medium stiff to stiff brown and gray SILTY CLAY, little to trace sand, wet to moist. (CL)	1	1.0	1-2-3	5	22.9			0.50
		2	3.5	3-8-11	19	17.6	30	10	3.00
5	Very stiff to hard brown and gray CLAYEY SILT, some sand, trace rock fragments, damp. (ML)					8.4			4.5+
		3	6.0	22-50/2"	50/2"	7.2			4.5+
		4	8.5	21-31-50/4"	50/4"	7.7			4.5+
10									
	Gray SILTSTONE, very soft, highly weathered. (SILTSTONE)	5	13.5	21-30-24	54				N/A
15									
	Note: Dry cave-in @ 16.8 ft.								
		6	18.5	28-30-35	65				N/A
20	Termination Depth @ 20 ft.								

LOG OF BORING INDIVIDUAL SAMPLE DEPTHS 38030.GPJ GEO-SCI.GDT 4/17/18

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-06
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** None **At Completion** None **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
0	14" TOPSOIL								
	Soft brown SANDY CLAY, little silt, moist. (CL)	1	1.0	1-2-2	4	14.9			0.00
	Stiff brown and gray SILTY CLAY, little sand, moist. (CL)	2	3.5	2-3-7	10	14.5			4.5+
5	Hard brown CLAYEY SILT, little sand, trace rock fragments, moist. (ML)	3	6.0	13-28-17	45	9.1			4.50
	Very stiff gray SILTY CLAY, trace gravel, damp. (CL)	4	8.5	7-11-18	29	12.0	33	14	4.5+
10	Gray SHALE, very soft, severely weathered. (SHALE)					9.9			4.5+
		5	13.5	9-17-20	37	9.5			N/A
15	Note: Dry cave-in @ 16.0 ft.								
		6	18.5	16-17-23	40	7.1			N/A
20	Termination Depth @ 20 ft.								

LOG OF BORING INDIVIDUAL SAMPLE DEPTHS 38030.GPJ GEO-SCI.GDT 4/17/18

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-07
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 20 ft
Water Depth: **At Encounter** 11.5 ft **At Completion** 17 ft **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	12" TOPSOIL								
	Medium stiff brown and gray SILTY CLAY, some sand, trace gravel, moist. (CL)	1	1.0	2-2-4	6	18.6			2.50
	Very stiff brown SILTY CLAY, some sand, trace gravel, moist. (CL)	2	3.5	5-8-10	18	13.2	28	9	4.5+
	Brown SANDSTONE, very soft to soft, highly weathered. (SANDSTONE)	3	6.0	26-50/6"	50/6"	6.5			N/A
		4	8.5	34-50/3"	50/3"	5.5			N/A
	Gray SILTSTONE, hard, weathered. (SILTSTONE)	5	13.5	50/1"	50/1"				N/A
	Gray SILTSTONE, with sand, very soft, severely weathered. (SILTSTONE)	6	18.5	12-18-20	38	10.1			N/A
	Termination Depth @ 20 ft.								

LOG OF BORING INDIVIDUAL SAMPLE DEPTHS 38030.GPJ GEO-SCI.GDT 4/17/18

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-08
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 19 ft
Water Depth: **At Encounter** None **At Completion** None **After** ____ **Hours** ____

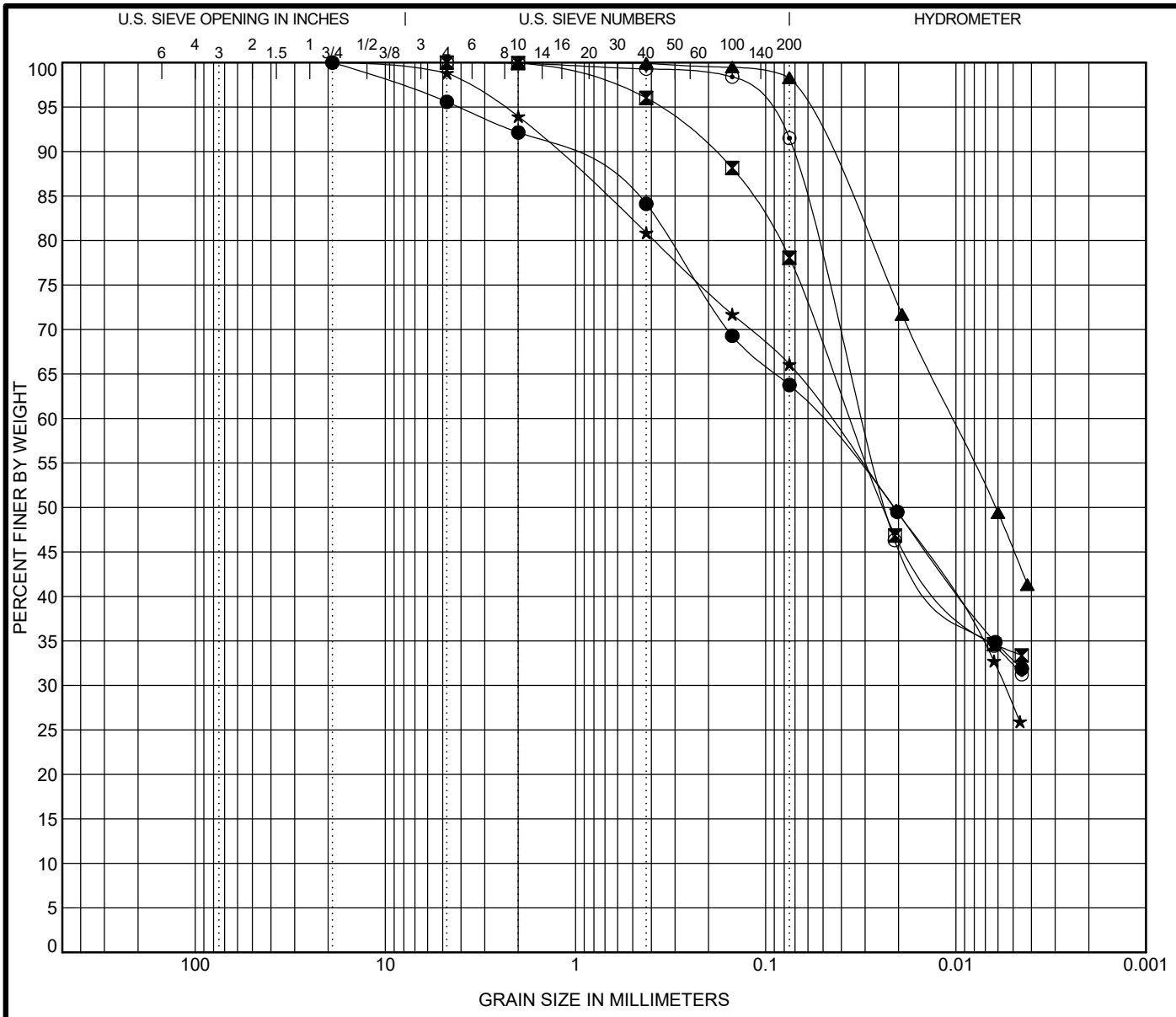
Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	12" TOPSOIL								
	Medium stiff brown SILTY CLAY, some sand, moist. (CL)	1	1.0	2-3-4	7	19.9			2.00
	Very stiff to hard red SILTY CLAY turning into shale, trace sand, damp. (CL)	2	3.5	5-10-15	25	13.7			4.5+
		3	6.0	10-16-25	41	10.5	32	12	4.5+
		4	8.5	14-18-27	45	7.0			4.5+
		5	13.5	15-35-38	73	6.9			4.5+
		6	18.5	50/6"	50/6"	4.8			4.5+
	Termination Depth @ 19 ft.								

LOG OF BORING

Project: Martin's Run Ecological Restoration Project
Boring No.: B-09
Location: Cooper Foster Park Road
Project No.: 38030.11
Lorain, Lorain County, Ohio
Elevation:
Client: Coldwater Consulting, LLC
Station & Offset:
Driller: Ohio TestBor, Inc.
Coordinates: not surveyed
Start Date: 3/16/18 **Completion Date:** 3/16/18 **Total Depth:** 19.5 ft
Water Depth: **At Encounter** None **At Completion** None **After** ____ **Hours** ____

Graphic Log	Description	Sample	Depth (ft.)	SPT blows / 6"	N-Value	% WC	LL	PI	Hand Pen Range
	8" TOPSOIL								
	Medium stiff red and brown SILTY CLAY, little sand, wet. (CL)	1	1.0	2-2-3	5	22.8	44	23	2.00
	Very stiff to hard red SILTY CLAY turning into shale, trace sand, damp. (CL)	2	3.5	5-8-10	18	11.6			4.5+
		3	6.0	25/1"	25/1"				N/A
		4	8.5	9-14-18	32	9.6	31	12	4.5+
		5	13.5	13-18-26	44	6.4			4.5+
		6	18.5	30-50/6"	50/6"	5.4			N/A
	Termination Depth @ 19.5 ft.								

Appendix C: Grain Size Distribution



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-01	S-1B	SANDY LEAN CLAY (CL)	27	17	10		
⊠	B-02	S-2A	LEAN CLAY with SAND (CL)	35	20	15		
▲	B-03	S-3	LEAN CLAY (CL)	34	21	13		
★	B-04	S-3A	SANDY SILTY CLAY (CL-ML)	25	19	6		
⊙	B-05	S-2A	LEAN CLAY (CL)	30	20	10		

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-01	S-1B	19	0.021			4.4	31.8	30.9	32.9
⊠	B-02	S-2A	4.75	0.024			0.0	21.9	44.3	33.8
▲	B-03	S-3	2	0.006			0.0	1.7	53.0	45.3
★	B-04	S-3A	19	0.021	0.006		1.2	32.7	38.4	27.7
⊙	B-05	S-2A	4.75	0.023			0.0	8.5	59.3	32.2

Geo-Sci Laboratory, Inc.
110 Blaze Industrial Pkwy.
Berea, OH 44017
Telephone: 440-234-8985
Fax:

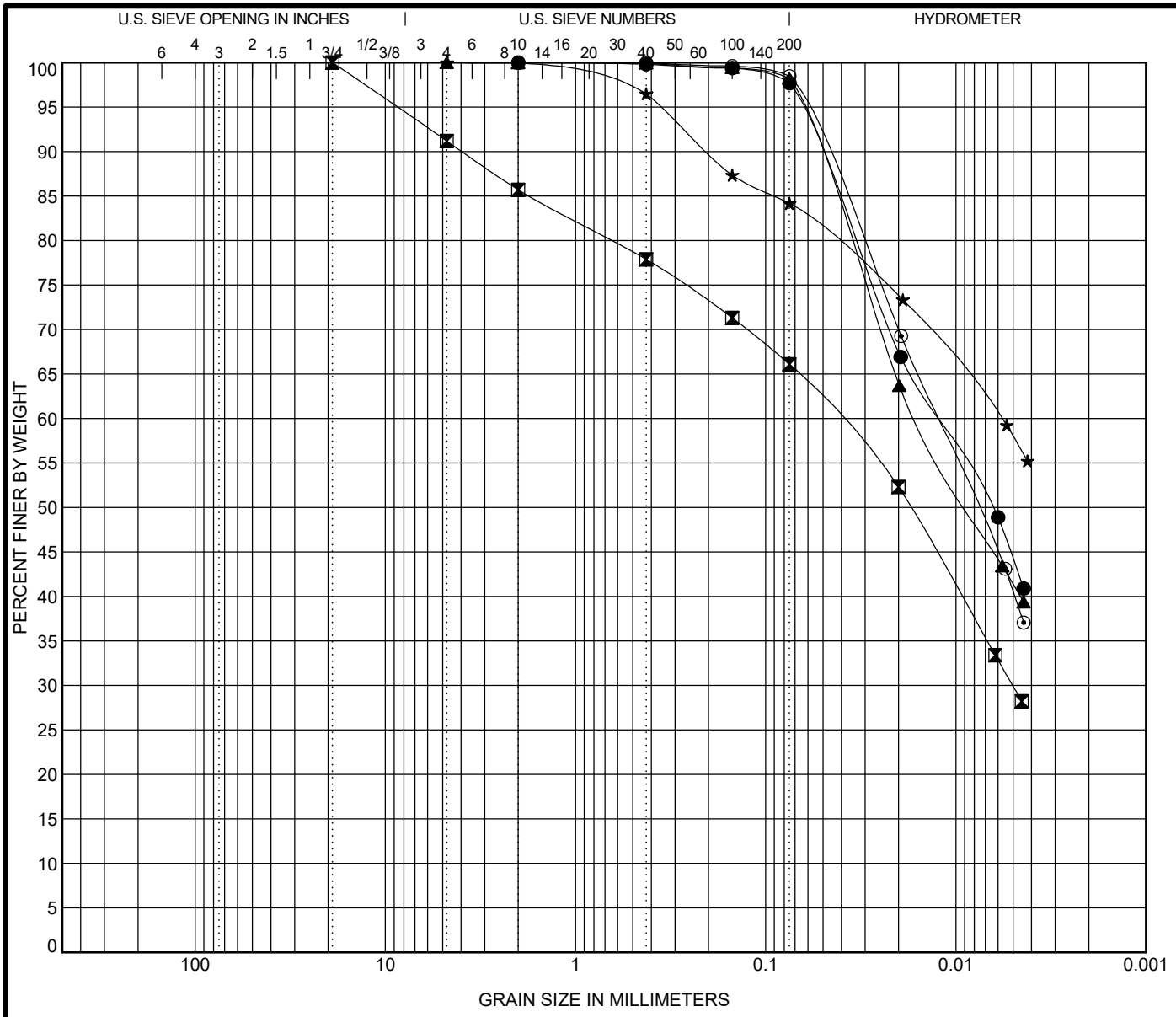
GRAIN SIZE DISTRIBUTION

Project: Martin's Run Ecological Restoration Project

Location: Cooper Foster Park Road, Lorain, Ohio

Number: 38030.11

US GRAIN SIZE 38030.GPJ GEO-SCI.GDT 4/2/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-06	S-4A	LEAN CLAY (CL)	33	19	14		
⊠	B-07	S-2	SANDY LEAN CLAY (CL)	28	19	9		
▲	B-08	S-3	LEAN CLAY (CL)	32	20	12		
★	B-09	S-1	LEAN CLAY with SAND (CL)	44	21	23		
⊙	B-09	S-4	LEAN CLAY (CL)	31	19	12		

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-06	S-4A	2	0.006			0.0	2.3	53.5	44.2
⊠	B-07	S-2	19	0.017	0.005		8.8	25.1	36.2	29.9
▲	B-08	S-3	4.75	0.009			0.0	1.8	56.8	41.4
★	B-09	S-1	4.75				0.0	15.8	26.2	58.0
⊙	B-09	S-4	2	0.008			0.0	1.5	57.9	40.5

Geo-Sci Laboratory, Inc.
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Berea, OH 44017
Telephone: 440-234-8985
Fax:

GRAIN SIZE DISTRIBUTION

Project: Martin's Run Ecological Restoration Project

Location: Cooper Foster Park Road, Lorain, Ohio

Number: 38030.11

US GRAIN SIZE 38030.GPJ GEO-SCI.GDT 4/2/18

Martin's Run Ecological Restoration Project

Feasibility Report

Ohio Historic Preservation Office Response

Project Number 003-021

OHIO HISTORY CONNECTION

In reply refer to
2017-LOR-37546

February 1, 2017

Kathryn L. Golden
City of Lorain, Department of Engineering
200 West Erie Avenue, 4th Floor
Lorain, Ohio 44052

Dear Ms. Golden:

Re: Martins Run Ecological Restoration, Lorain, Lorain County, Ohio

This is in response to correspondence, received on January 13, 2017, regarding the proposed wetland restoration at the above location in Lorain County, Ohio. My comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

Based on the information submitted, it is my opinion that the proposed action will not affect properties listed in or eligible for listing in the National Register of Historic Places. No further coordination with this office is necessary, unless the project changes or unless new or additional historic properties are discovered during implementation of this project. Should this happen, this office should be notified as required by 36 CFR 800.13.

If you have any questions regarding this matter, please call me, at (614) 298-2000. Thank you for your cooperation.

Sincerely,

Nathan J. Young, Project Reviews Manager
Resource Protection and Review

Xc: ODNR, Office of Coastal Management, CMA Grant Program, 105 West Shoreline Drive, Sandusky, Ohio 44870

Martin's Run Ecological Restoration Project

Feasibility Report

Conceptual Construction Cost Estimates

Project Number 003-021

Martin's Run Stream and Wetland Restoration: Conceptual Construction Cost Estimate - Alternative 1					
Item No.	**Description**	**Estimated Quantities**	**Unit**	**Unit Cost**	**Total Cost ($)**
1	Mobilization and Demobilization	1	LS	$113,000.00	$ 113,000.00
2	Surveying	1	LS	$52,000.00	$ 52,000.00
3	Compaction Testing	1	LS	$7,700.00	$ 7,700.00
4	Permanent Project Sign	1	EA	$2,400.00	$ 2,400.00
5	Temporary Construction Entrance	1	EA	$9,000.00	$ 9,000.00
6	Temporary Stream Crossing	1	EA	$5,000.00	$ 5,000.00
7	Sediment / Erosion Control	1	LS	$22,000.00	$ 22,000.00
8	Topsoil Stripping, Stockpiling, & Spreading	6,900	CY	$13.00	$ 89,700.00
9	Excavation, Export, Stockpile	82,100	CY	$16.00	$ 1,313,600.00
10	Rounded Channel Rock	717	TN	$56.00	$ 40,133.33
11	Rounded Riffle Boulders	28	TN	$180.00	$ 5,062.50
12	Bank Protection Rock	239	TN	$65.00	$ 15,527.78
13	Wetland Seed	4	AC	$4,000.00	$ 16,000.00
14	Riparian Seed	2.5	AC	$4,900.00	$ 12,250.00
15	Upland Seed	5.0	AC	$5,400.00	$ 27,000.00
16	Type A Erosion Control Blanket	8,700	SY	$7.00	$ 60,900.00
17	Type B Erosion Control Blanket	12,100	SY	$3.00	$ 36,300.00
18	Turf Reinforcement Matting	700	SY	$6.00	$ 4,200.00
19	Live Stakes	1,800	EA	$10.00	$ 18,000.00
20	Shrubs	1,200	EA	$31.00	$ 37,200.00
21	Trees (Imported)	360	EA	$390.00	$ 140,400.00
22	Tree Guards	360	EA	$12.00	$ 4,320.00
23	Basin Drain Piping, 12" PVC	150	LF	$46.00	$ 6,900.00
24	Basin Outlet Structures	2	EA	$2,200.00	$ 4,400.00
25	Anti-Seep Collars	2	EA	$510.00	$ 1,020.00
26	Flared End Sections	2	EA	$530.00	$ 1,060.00
27	Management of Water	1	LS	$15,000.00	$ 15,000.00
	SUBTOTAL				**$ 2,100,000.00**
	Planning Level Contingency - 20%				$ 400,000.00
	TOTAL				**$ 2,500,000.00**

**It should be noted that the above is only an engineer's opinion of probable construction costs for the site and no guarantee is made to the accuracy or completeness thereof. Since actual construction costs will be determined by contractor bidding, and the time at which the bid is submitted, which is outside of our control, we cannot make a guarantee that the final construction costs will not vary from the numbers presented.*

***Costs do not include property acquisition, permanent access/easements, construction access/easements, design, permitting, or construction administration.*

COLDWATER CONSULTING, LLC

Martin's Run Stream and Wetland Restoration: Conceptual Construction Cost Estimate - Alternative 2					
Item No.	**Description**	**Estimated Quantities**	**Unit**	**Unit Cost**	**Total Cost ($)**
1	Mobilization and Demobilization	1	LS	$113,000.00	$ 113,000.00
2	Surveying	1	LS	$52,000.00	$ 52,000.00
3	Compaction Testing	1	LS	$7,700.00	$ 7,700.00
4	Permanent Project Sign	1	EA	$2,400.00	$ 2,400.00
5	Temporary Construction Entrance	1	EA	$9,000.00	$ 9,000.00
6	Temporary Stream Crossing	1	EA	$5,000.00	$ 5,000.00
7	Sediment / Erosion Control	1	LS	$22,000.00	$ 22,000.00
8	Topsoil Stripping, Stockpiling, & Spreading	10,500	CY	$13.00	$ 136,500.00
9	Excavation, Export, Stockpile	138,500	CY	$16.00	$ 2,216,000.00
10	Rounded Channel Rock	717	TN	$56.00	$ 40,133.33
11	Rounded Riffle Boulders	28	TN	$180.00	$ 5,062.50
12	Bank Protection Rock	239	TN	$65.00	$ 15,527.78
13	Wetland Seed	6	AC	$4,000.00	$ 24,000.00
14	Riparian Seed	2.5	AC	$4,900.00	$ 12,250.00
15	Upland Seed	4.5	AC	$5,400.00	$ 24,300.00
16	Type A Erosion Control Blanket	8,700	SY	$7.00	$ 60,900.00
17	Type B Erosion Control Blanket	19,360	SY	$3.00	$ 58,080.00
18	Turf Reinforcement Matting	700	SY	$6.00	$ 4,200.00
19	Live Stakes	2,000	EA	$10.00	$ 20,000.00
20	Shrubs	1,700	EA	$31.00	$ 52,700.00
21	Trees (Imported)	480	EA	$390.00	$ 187,200.00
22	Tree Guards	480	EA	$12.00	$ 5,760.00
23	Basin Drain Piping, 12" PVC	150	LF	$46.00	$ 6,900.00
24	Basin Outlet Structures	2	EA	$2,200.00	$ 4,400.00
25	Anti-Seep Collars	2	EA	$510.00	$ 1,020.00
26	Flared End Sections	2	EA	$530.00	$ 1,060.00
27	Management of Water	1	LS	$15,000.00	$ 15,000.00
	SUBTOTAL				**$ 3,100,000.00**
	Planning Level Contingency - 20%				$ 600,000.00
	TOTAL				**$ 3,700,000.00**

**It should be noted that the above is only an engineer's opinion of probable construction costs for the site and no guarantee is made to the accuracy or completeness thereof. Since actual construction costs will be determined by contractor bidding, and the time at which the bid is submitted, which is outside of our control, we cannot make a guarantee that the final construction costs will not vary from the numbers presented.*

***Costs do not include property acquisition, permanent access/easements, construction access/easements, design, permitting, or construction administration.*