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November 17, 2017

City of Columbus, Division of Sewerage & Drainage
Attn: Mr. Greg Fedner, P.E.
Private Development Section Manager
910 Dublin Road
Columbus, Ohio 43215

Subject: Columbus Regional Airport Authority Consolidated Rent-A-Car Facility
Type III Variance from Stormwater Drainage Manual

Dear Mr. Fedner,

On behalf of the Columbus Regional Airport Authority (CRAA), EMH&T is submitting an application for a Type III variance from the City of Columbus Stormwater Drainage Manual for the proposed CRAA Consolidated Rent-A-Car Facility (ConRAC) project.

The proposed development sites include a 52-foot-wide (1.16-acre) Stream Corridor Protection Zone (SCPZ) along Mason Run, which flows northwest to southeast for 574 linear feet through the project area. The proposed development includes the relocation of Mason Run, which will result in direct impacts to 574 linear feet of the existing stream channel. CRAA is seeking a Type III variance for approval of the proposed relocation and enclosure.

The mitigation plan developed for and included as part of this variance application utilizes 574 linear feet of stream mitigation previously completed by CRAA along Big Run at Walnut Woods Metro Park. This site (previously known as the Eastside Nursery) was developed by CRAA as a pooled stream and wetland mitigation site. The proposed mitigation provides significant ecological benefits to the Scioto River watershed, as compared to the existing habitat of Mason Run within the project area.

In addition, CRAA would like to note that mitigation for the proposed impacts will also be provided in conjunction with the Individual 404/401 Permit for the project, which is currently under review by the U.S. Army Corps of Engineers and Ohio EPA. In association with that permit, CRAA has committed to purchasing at least 574 linear feet of in-lieu fee stream credit from the Stream + Wetlands Foundation. Per the requirements of the in-lieu fee program, this mitigation will consist of high quality stream restoration and/or enhancement to be provided within the same watershed as the impacts (05060001 – Upper Scioto River). CRAA is not requesting the City consider this as mitigation for the purposes of the variance application. However, combined with the mitigation credit proposed at Walnut Woods, the in-lieu fee credit ensures that the requested impacts will be mitigated at a minimum 2:1 ratio.

The following information is provided in support of the application:

- Project Name: CRAA Consolidated Rent-A-Car Facility
- Address, PID, Site Disturbance and Total Site Area:
  Address: 4370 International Gateway, Columbus, OH 43219
  PID: 010-096157-00
  Site Disturbance: 21.54 acres
  Total Site Area: 21.54 acres
  Total Franklin County Auditor Parcel Area: 1,244.54 acres
- Primary (Owner) Contact:
  Columbus Regional Airport Authority
  Attn: Ragan Fallang, Senior Project Manager
  4800 International Gateway, Columbus OH 43219
  (614) 239-5017
  rfallang@columbusairports.com

Additional information pertaining to the requested variance is included in the enclosed application document. Two hardcopies with CD have been provided. Please contact me with any questions you may have at (614) 775-4523, or by email at hdardinger@emht.com.

Sincerely,

Heather L Dardinger

Heather L. Dardinger
Senior Environmental Scientist

C: Ragan Fallang, Columbus Regional Airport Authority

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CRAA CONSOLIDATED RENTAL CAR FACILITY

City of Columbus SWDM Type III Variance Application

Columbus Regional Airport Authority

November 17, 2017

TABLE OF CONTENTS

1.0 INTRODUCTION

The following report provides information pertaining to a requested variance from the City of Columbus Stormwater Drainage Manual (the Manual) for the proposed Columbus Regional Airport Authority's (CRAA) Consolidated Rent-A-Car Facility (ConRAC) project. More than 580,000 passengers complete approximately 2 million rental car transactions each year at the John Glenn Columbus International Airport (CMH). There are eight rental car brands operating out of the existing bottom two floors of the long-term parking garage at CMH. In order to meet current needs and anticipated demands for rental vehicles, CRAA will be constructing a state-of-the-art ConRAC facility. This project is essential to support the expansion of CMH, and the overall growth of the City of Columbus and central Ohio region.

The proposed ConRAC is located on an approximately 1,245-acre parcel (Franklin County Parcel ID 010-096157-00) located at 4370 International Gateway (refer to Figure 1). The 21.54-acre project site is located between the eastbound and westbound lanes of International Gateway. The site currently includes the airport's cell phone parking lot, Dollar remote lot and Hertz remote lots, and is composed of existing parking lots, roadways and open space. Mason Run bisects the western portion of the site, flowing northwest to southeast between the eastbound and westbound lanes of International Gateway.

This site was chosen by CRAA due to its location across eastbound International Gateway from the future location of the new terminal, which will facilitate a high level of customer service. Based on future planning, a ground transportation center will be directly east of the ConRAC site and aligned with a future sky bridge that will connect to the center of the future terminal. A future public parking garage will be located east of the ground transportation center. The site will allow rental car traffic to exit in-bound International Gateway prior to encountering the future terminal and thus reduce curbside congestion. Fuel trucks and service vehicles will also be able to avoid passing directly in front of the terminal. Customer and service vehicle traffic will exit the facility to the north and join westbound International Gateway. The proximity of the north runway will restrict the height of the ConRAC facility.

The proposed ConRAC project will relocate rental car operations from two levels within the existing terminal parking garage and exclusive-use service areas to a new consolidated facility. The project consists of construction of a four-level rental car ready/return garage, connected customer service building, and a three-level maintenance and fueling facility for the rental car operations, referred to as a Quick Turnaround (QTA) Facility. The QTA facility will provide vehicle cleaning, fueling, washing and light maintenance of rental cars. The QTA will have overhead bridge connections to corresponding levels of the ready/return garage with helix ramps to the garage located between the two buildings. The project will also include construction of associated surface parking lots and stormwater facilities.

The project will accommodate existing and projected future demand for public parking and relocate rental car operations to a central and convenient location, consistent with long-term airfield development plans. In conjunction with the proposed development, CRAA is seeking a Type III variance for direct impacts to Mason Run stream channel and associated Stream Corridor Protection Zone (SCPZ).

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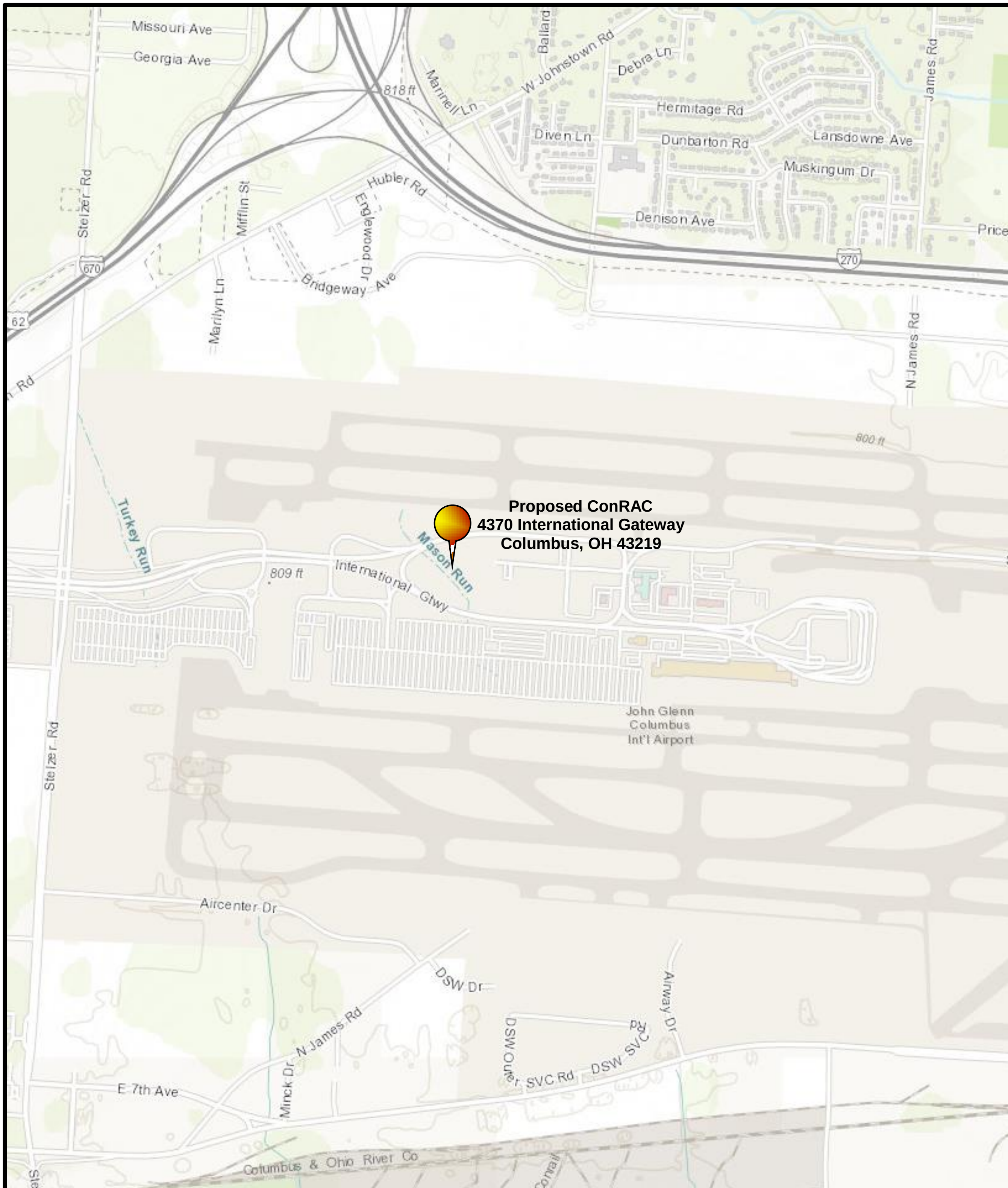

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CITY OF COLUMBUS, FRANKLIN COUNTY, OHIO

Stream Impact Location Map
Figure 1

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2.0 PROJECT REQUIREMENTS

The ConRAC project was developed through a detailed evaluation of rental car transaction data at CMH. The transactional data was collected from each rental car agency in the form of a survey to track hourly rental and return activities for each hour of each day for the entire year of 2015 for each of their rental car brands. The data for each rental car brand was examined to find its unique pattern of rentals and returns. Columbus is a business driven market with high volumes of rentals on Monday and Tuesday mornings with relatively few returns during those same periods. As a result, there is a need for a large amount of weekend vehicle storage as the cars used by business travelers early in the week are returned and are not used by leisure travelers on the weekend. This pattern of a large number of Monday and Tuesday rentals with few returns also dictated that the number of vehicle processing stations at the QTA would be determined by the flow of returning cars late in the week rather than the need to process a large number of returned cars on Monday. The number of rental car transactions was projected into the future using airport supplied growth projections. Future milestone dates were based on the anticipated date for the opening of the new terminal and the date for achieving the ultimate design capacity of the facility.

Through a series of planning workshops with the rental car industry and CRAA, the preferred facility layout was then developed. Five key factors were considered in the programming level design of the project:

1. Customer service
2. Operational efficiencies
3. Efficient use of available funds
4. Flexibility for future modifications
5. Level competitive playing field across the rental car industry

Based upon the rental car industries projected transactions and the five key design factors defined above, the total programming needs for ConRAC are defined as follows.

Table 1: ConRAC Project Needs

Component	Units	Proposed Project
Customer Service Area		
Counters Positions	positions	48
CSA Total Square Footage	sq. ft.	34,935
Ready/Return Spaces		
Ready Spaces	spaces	1,002
Return Spaces	spaces	794
Daily Storage spaces	spaces	1,570
Total Facility Capacity	spaces	3,366
Ready/Return Total Square Footage	sq. ft.	991,464
QTA		
Fueling Nozzles	positions	35
Car Wash Bays	bays	6
Maintenance Bays	bays	6
QTA Total Square Footage	sq. ft.	106,473
CONRAC Total Square Footage	sq. ft.	**1,132,872**

2.1 FAA Part 77 Airspace Analysis

The location and height of the proposed ConRAC is influenced by the aviation surfaces defined by existing Runway 10L/28R. The aviation criteria are defined in FAA Advisory Circular 150/5300-13 Airport Design and Federal Aviation Regulations (FAR) Part 77 Objections Affecting Navigable Airspace. The surfaces include the Runway Protection Zone (RPZ), the Approach Surface, the Horizontal Surface, and the Transitional Surface.

Additionally, per FAA Order 6480.4A, the Air Traffic Control Tower (ATCT) Line of Sight (LOS) from the ATCT cab must allow an unobstructed view of all controlled movement areas. This includes all runways, taxiways and any other landing areas and of air traffic in the vicinity of the airport. The top of structure height shall not exceed 886'-0" MSL at the northeastern most corner of the building to be in compliant with this FAA Order.

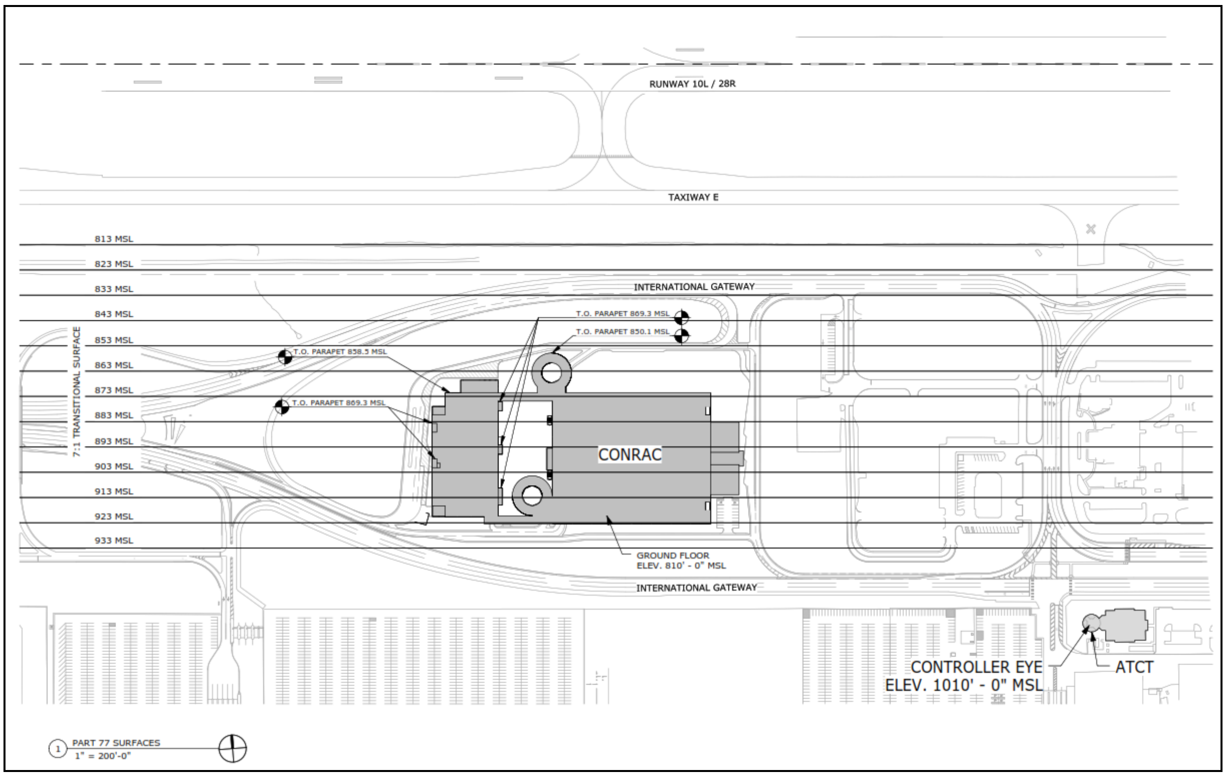

Figure 2: Part 77 Surfaces (Prepared by: TranSystems, 2017)

3.0 TYPE III VARIANCE (STREAM PROTECTION)

The Stream Corridor Protection Zone (SCPZ) consists of the stream channel and the adjacent riparian area. Its purpose is to allow the natural, lateral movement of the stream, provide sufficient area for flood conveyance, protect water quality, and prevent structures from being impacted by natural streambank erosion. A SCPZ is present along Mason Run at the proposed ConRAC project site. The preferred development plan will directly impact the Mason Run channel and the associated SCPZ.

Accordingly, CRAA is requesting a variance from Section 1.3.2 and 1.3.3 of the Manual for the ConRAC project, specifically a variance allowing for the relocation of Mason Run and the placement of fill and excavation within the existing stream channel and SCPZ.

3.1 Proposed SCPZ Impacts

As shown on Exhibit Sheet 1, Mason Run has a tributary area of 39.98 acres (0.062 square mile) within the project site. Accordingly, based upon the criteria provided in the Manual, Mason Run has a SCPZ width of 52 feet. Under the Preferred Alternative, discussed below, the proposed area of impact within the SCPZ is 0.85 acre (refer to Exhibit Sheet 2) and includes 574 linear feet of direct channel impacts. As further discussed below, the proposed impacts to the channel and the SCPZ allows for construction of the preferred building layout and necessary stormwater management facilities for the ConRAC.

3.2 Existing Conditions

The project site currently includes the airport's cell phone lot, Dollar remote lot and Hertz remote lot, and is composed of existing parking lots, roadways and open space. Mason Run bisects the western portion of the site, flowing northwest to southeast between the east and westbound lanes of International Gateway. South of eastbound International Gateway, Mason Run has been culverted for approximately a mile as part of previous development of the airport terminal and runway.

Within the project site, there is 574 linear feet of open channel of Mason Run. The channel exhibits intermittent flow, with no riffle/pool development. The channel exhibits evidence of previous modification/channelization. The substrate is primarily clay/hardpan and leaf pack. The existing forested riparian corridor along Mason Run is extremely narrow, averaging less than 15 feet wide. Beyond this narrow forested strip, the riparian corridor consists of maintained lawn (refer to Photographs).

A Headwater Habitat Evaluation Index (HHEI) assessment was performed on Mason Run within the proposed project reach. The HHEI metric is applicable to streams with a watershed area less than one square mile and maximum pool depths less than 40 centimeters, both of which apply to Mason Run. The stream segment received an HHEI score of 41, which indicates that within the project site Mason Run is a Modified Class II Primary Headwater Habitat (PHWH) stream. A Qualitative Habitat Evaluation Index (QHEI) assessment was also performed to facilitate comparison to the proposed mitigation site (refer to Section 4.4). The QHEI resulted in a score of 23, indicative of 'very poor' stream habitat. The HHEI and QHEI dataforms are provided in Appendix A.

Based upon the field observations and HHEI/QHEI assessment, Mason Run exhibits very poor stream health and very low functionality. The stream channel primarily serves to convey roadside drainage and overland stormwater flow from the surrounding airport property and International Gateway. At the point it flows off the proposed project site, it is then culverted for nearly a mile before daylighting at East Fifth Avenue. The open channel beyond East Fifth Avenue remains highly urbanized and channelized through the Defense Supply Center and south through Whitehall to its confluence with Big Walnut Creek. Sampling conducted by Ohio EPA in 2000 indicated fair to poor biological communities throughout Mason Run and declining resource quality.

3.3 Site Development Alternatives

3.3.1 Proposed Conditions / Preferred Alternative

Under the Preferred Alternative (Exhibit Sheet 2), the customer service building and ready/return garage will be located along the east side of the site. The QTA will be connected to the garage by overhead bridges, with helix ramps to the garage placed between the two buildings. This building layout is driven by the required program square footage requirements and the vertical constraints imposed by the Part 77 airspace analysis, as described in Section 2. In the Preferred Alternative, the Mason Run stream channel will be removed and replaced with a dry detention basin. This will result in **574 linear feet of channel impacts and 0.85 acre of SCPZ impacts**. The upstream flow that routes through Mason Run will be conveyed through the detention basin and will enter back into the existing storm sewer at the north side of eastbound International Gateway.

The layout of ConRAC in the preferred option meets the project's square footage requirements, and also allows for the ability for future growth and expansion, along with allowing for internal reallocation of space due to shifts in market share while still being compliant with the vertical constraints previously described. The layout is also operationally efficient as it allows for an adjacent stacked and secure QTA accessed from a short and secure service route while maintaining a constant flow of traffic, minimizing congestion and interruption to each operator.

The preferred option also provides an efficient and safe circulation pattern within the ready/return garage and QTA, by allowing for free flow of vehicles with few vertical transitions. Additionally, the preferred layout minimizes crossings of vehicles with pedestrians traveling to and from rental cars, thus enhancing customer safety.

3.3.2 Minimal Impact Alternative

In the Minimal Impact Alternative (Exhibit Sheet 3), direct channel and SCPZ impacts have been reduced. Under this alternative, 410 feet of the 574-foot Mason Run stream channel and 0.54 acre of the SCPZ present on site will be impacted. The impacts include re-aligning 255 feet of the stream bed and enclosing 155 feet into a closed storm sewer. The remaining 164 feet of the stream will not be impacted; however, the SCPZ will still be encroached upon. In order to reduce the impacts to Mason Run, modifications were required to the QTA building, ready/return garage and stormwater management facilities, as described below.

QTA Building

In the Minimal Impact Alternative, the QTA building will be shifted further north on the site, resulting in the loss of a floor due to the Part 77 vertical restriction. The square footage of the building is further reduced due to the angling of the west end of the building to minimize impacts to Mason Run. As a result of these modifications to the QTA, the program space requirements will no longer be achieved, resulting in sub-par operational performance for the rental car industry. Additionally, the angled building layout will create operation inefficiencies with the internal partitioning of the building to different rental car companies.

Ready/Return Garage

In the Preferred Alternative, two helix ramps to the ready/return garage will be provided; one for ingress and the other for egress. The benefit of this approach is that inbound and outbound vehicles are separated, which creates a safer, more efficient, and intuitive flow of traffic within the garage. Due to the shifted location of the QTA, there is no longer adequate space on the site to place two sets of helix ramps to the garage. As a result, outbound traffic will be directed to a series of ramps running the length of the garage. These ramps take up significantly more space than the helix, are costlier to construct, and eliminate the ability to expand the garage in the future without significant cost and operational impacts resulting from the removal and reconstruction of the ramps.

Stormwater Management Facilities

In order to minimize impacts to Mason Run, the proposed dry detention basin in the preferred option will be eliminated. In its place, site stormwater management will be provided with underground detention chambers placed beneath the ready/return garage. To allow for adequate space for the detention chambers, the garage column footers will need to be modified. At the outlet of the detention chamber system, a pumping station will be necessary to lift the stormwater to the invert elevation of the Mason Run outlet pipe on the north side of eastbound International Gateway.

The modifications to the QTA, ready/return garage and stormwater management facilities will result in an increase in the estimated construction cost of $2.1 million above the project budget.

Moreover, the preservation of a portion of Mason Run under the Minimal Impact Alternative complicates the wildlife management on the site. Wildlife management, particularly for water fowl, is of critical importance for the safe operation of aircraft, and is mandated by the FAA. In the preferred option, wildlife conflicts are mitigated through the removal and off-site mitigation of the Mason Run stream corridor.

3.3.3 Full Compliance / No-Impact Alternative

If all impacts to Mason Run and its SCPZ are avoided, the site becomes infeasible for development for the ConRAC project. As such, a No Impact Alternative exhibit has not been prepared. The limited area east of Mason Run, coupled with the vertical constraints imposed by the Part 77 surface, result in inadequate space to meet the program needs for the rental car industry. As a result, the ConRAC project would need to be relocated to a different site.

The most likely alternate location for the ConRAC project is a parcel owned by CRAA south of Drake Road and west of Sterling Avenue. This parcel is located northwest of the airport, at a travel distance of nearly three miles from the terminal (refer to Figure 3).

Figure 3: Drake Road Site

The preferred site for the ConRAC development is positioned adjacent to the future new terminal, with a pedestrian sky bridge linking the ConRAC to the terminal. In the near term, busing to and from the existing terminal will occur, but the busing will be eliminated once the new terminal is constructed. As the Drake Road site is located three miles from the terminal, it would require permanent busing for the life of the facility. This would result in significant time impacts on the airport's visitors and the rental car industry's customers. The overall customer experience at CMH and for visitors to the Columbus region would be degraded by relocating ConRAC away from the preferred location adjacent to the new terminal.

Additionally, busing to and from the Drake Road site would add additional traffic onto the City's public roadways. Most noteworthy is the resulting additional northbound left turns at the currently un-signalized intersection of Stelzer Road and Ole County Lane. Turn lane improvements and signalization options are challenging at this intersection due to the close proximity of the I-670 overpass, which is located less than 100 feet from the intersection. This may result in increased congestion on the public roadways and potentially an increased rate of accidents at the intersection.

3.3.4 Comparison of Project Alternatives

As summarized in Table 2, the Preferred Alternative will result in complete impact to the Mason Run channel and 0.85 acre of associated SCPZ. The Minimal Impact Plan will reduce these impacts by approximately one-third.

Table 2: Comparison of Project Alternatives

Alternative	Impacted		Remaining	
	Channel (lf)	SCPZ (ac)	Channel (lf)	SCPZ (ac)
Existing Condition			*574*	*1.16*
Preferred Plan	574	0.85	0	0.31
Minimal Impact Plan	410	0.54	164	0.62
No Impact Plan	0	0	574	1.16

The layout of ConRAC in the Preferred Alternative meets the project's square footage requirements, is operationally efficient and meets the project budget. Modifying the Preferred Alternative plan to reduce the impacts to Mason Run has significant impacts on the operational performance, constructability and cost of the ConRAC facility. Under the Minimal Impact Alternative, the facilities must be reduced and reconfigured to such an extent that the alternative does not meet the space requirements of the facility and significantly increases the project cost. Completely avoiding stream channel and SCPZ impacts under the No Impact Plan would require such significant reductions that the project would be infeasible to construct on the selected project site.

3.4 Impacts to Stormwater Detention and Water Quality

The Preferred Alternative increases impervious area, thereby increasing the volume of stormwater runoff as compared to the Minimal or No Impact Alternatives. However, the stormwater management facilities for both the Preferred Alternative (dry detention basin) and Minimal Impact Alternative (underground detention chambers) would be designed to comply with the stormwater management and water quality requirements of both the City of Columbus and Ohio EPA. Thus, either alternative would have similar impacts on stormwater detention and water quality. The No Impact Alternative would, as a matter of course, have no impact on stormwater detention or water quality on the proposed project site. However, the ConRAC facility would be constructed elsewhere, and would thus have similar attendant impacts elsewhere in the watershed.

3.5 Statement of Hardship

The proposed impact to the Mason Run channel and SCPZ at the proposed ConRAC site under the the Preferred Plan Alternative is driven by the project space requirements and the constraints imposed by the Part 77 surface. As detailed above, implementation of the Minimal Impact Alternative would significantly impact the operational performance of the facility and result in a cost increase of $2.1 million. Avoidance of all stream and SCPZ impacts would render implementation of the ConRAC on the site infeasible, and would require that the project be relocated to a different site. Thus, full compliance with the Manual will result in a substantial hardship to CRAA. Thus, CRAA respectfully requests approval of the variance for the Preferred Plan Alternative.

4.0 MITIGATION

As described in the Manual, adequate mitigation for direct stream impacts must be provided. The proposed impacts under the preferred plan include 574 linear feet of Mason Run and 0.85 acre of associated SCPZ. The Manual states, "If the impact is directly to the stream, the applicant must demonstrate that the predicted post-construction QHEI/HHEI will meet or exceed the existing QHEI/HHEI."

As Mason Run will be impacted in its entirety within the proposed ConRAC site, it was not possible to accomplish onsite mitigation. Therefore, CRAA is proposing to utilize offsite mitigation. The proposed mitigation is located at Walnut Woods Metro Park, 6716 Lithopolis Road, Groveport, Ohio (refer to Figure 4). This site is located approximately 11 miles south of the ConRAC site, within the same 8-digit watershed assessment unit as Mason Run (HUC 05060001 – Upper Scioto).

The former 482-acre Eastside Nursery was purchased by Columbus and Franklin County Metro Parks in 2008 for development of Walnut Woods Metro Park. At that time, Metro Parks and CRAA established a partnership to allow CRAA to use a portion of the site restoration to provide mitigation for contemporaneous and future development projects at CMH and the Rickenbacker International Airport. To that end, CRAA developed a consolidated wetland and stream mitigation project at the site, which was completed in 2011.

The CRAA mitigation site included the restoration of approximately 2,700 linear feet of Big Run, a second order tributary to Walnut Creek. Prior to restoration, Big Run was substantially degraded due to previous channel realignment (straightening) and dredging. A natural channel design approach was utilized to restore the stream, which included lowering streambank heights, realignment of a more nature channel, slope stabilization, and restoration of the riparian vegetation. The pre- and post-restoration conditions of Big Run are further discussed below.

The stream restoration completed at Walnut Woods generated 2,700 linear feet of mitigation credit for use by CRAA (one credit is equal to one foot of restoration). To date, 1,248 linear feet of credit has been utilized by CRAA to mitigate for impacts for two projects. These include the NetJets Corporate Headquarters Project at 4151 Bridgeway Avenue, and the Replacement Runway 10R/28L Project at CMH, as shown in Table 3.

Table 3: Stream Mitigation Credit Balance at Walnut Woods

Project	USACE / OEPA Permit No.	Permit Authorization Date	Stream Impact (lf)	Credits Utilized (lf)	Balance (lf)
				Beginning Balance:	*2,700*
NetJets Corporate Headquarters	USACE File # 2003-270 SCR OEPA ID 083460	USACE: 04/12/11 OEPA: 03/09/11	240	360	2,340
Replacement Runway 10R/28L	USACE File # 2003-270-1 OEPA ID 103655/103683	USACE: 06/23/11 OEPA: 01/19/11	592	888	1,452
				Remaining Balance:	**1,452**

There is more than sufficient mitigation credits remaining at Walnut Woods to mitigate for the proposed impacts to Mason Run. CRAA proposes to utilize 574 linear feet of stream restoration, and 4.13 acres of associated buffer, for the proposed ConRAC project (refer to Exhibit Sheet 4).

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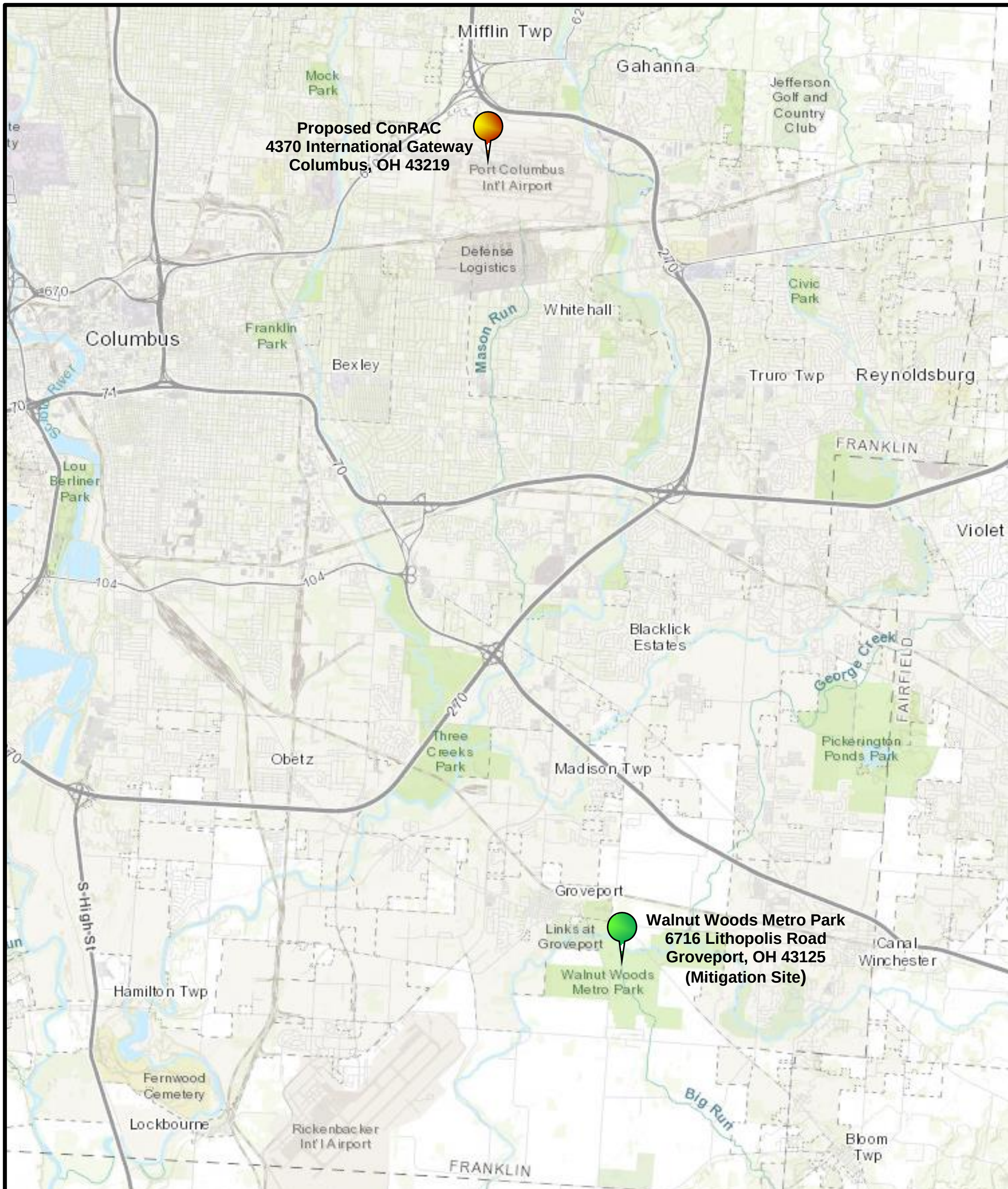

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Mitigation Location Map
Figure 4

4.1 Big Run Pre-Restoration Conditions

The Big Run project reach has an 8.5-square mile watershed, which is primarily agricultural. Sampling conducted by Ohio EPA in 2005 showed the stream to be in non-attainment of its Warmwater Habitat (WWH) aquatic life use designation prior to restoration. The Index of Biotic Integrity (IBI) and Invertebrate Community Index (ICI) scores within the reach indicated that the fish and benthic communities were within the 'fair' narrative range. Past stream channelization activities and impacts to the riparian buffer were contributing to high nutrient levels and significantly degraded habitat conditions.

Big Run received a pre-restoration QHEI score of 28.5, which was in the 'poor' narrative range (Appendix A). This score reflected a lack of sinuosity and instream habitat (riffles and pools), moderate to heavy siltation, fair to poor channel development, lack of fast currents, and a denuded riparian corridor. The stream was notably incised, with bank heights up to seven feet along the channel and Bank Height Ratios (BHR) ranging from 1.14 to 1.52. BHR values exceeding 1.2 generally characterize an unstable, incised channel. The banks were slumping or had failed at several locations due to the high near-bank sheer stress during peak flow events along the denuded, steep to vertical, unstable streambanks.

As a consequence of these impairments, accelerated streambank erosion, channel incision, land loss, aquatic habitat loss, and in-stream and downstream sedimentation was observed throughout the reach. The results of the geomorphic and QHEI assessments indicated that Big Run was a highly degraded stream both physically and from the standpoint of aquatic habitat potential, and the proposed restoration would have a significant beneficial effect on water quality and wildlife habitat in the watershed.

4.2 Big Run Restoration

The restoration of Big Run was completed by CRAA in 2010-2011. The restoration utilized a Priority Level 2 natural channel design approach (stream channel relocation). The existing linear, incised stream channel was restored with appropriate pattern, profile and dimension to convey bankfull flows and the high sediment load from the upstream watershed without aggrading or degrading. Bank heights were lowered and slopes stabilized to reduce streambank erosion potential. The channel was reconnected to a functional floodplain to alleviate channel and near-bank shear stress and shear velocity during flood events. In-stream habitat features were constructed to promote the potential for colonization by aquatic macroinvertebrates and fish. A comprehensive native planting plan was implemented along the channel, including streamside, floodplain and riparian zones. In total, 2,700 linear feet of restored stream channel and 11.56 acres of restored floodplain and riparian corridor was established. The final Wetland and Stream Restoration design plans are included in Appendix B.

4.3 Big Run Post-Restoration Conditions

The USACE and Ohio EPA required that the restored stream be monitored for a total of five years. The fifth and final year of monitoring activities was completed in 2016. The restored stream achieved the WWH aquatic life use designation as documented by the physical habitat and IBI assessments. Additionally, the stream fulfilled the native species performance requirements, which required 80% cover of the riparian zone with native woody and herbaceous species with no more than 5% relative cover of any invasive species.

Big Run received a post-restoration QHEI score of 65 in 2016 (Appendix A), which is in the 'good' narrative range and exceeds the goal score of 60 for WWH designation. As noted in the post-restoration QHEI, the dominant substrate throughout the reach is sand and gravel. Bankfull events have efficiently transported silt and other fine material through the system preventing excessive siltation and embeddedness across stream bed features. Instream cover has increased dramatically since 2011 as streamside trees and shrubs have expanded along the outside meander bends and adjacent riparian areas. This has increased stream bank stability and prevented erosion throughout the length of the restored stream. The increase in woody vegetation has substantially increased overhanging vegetation and rootmats, which in turn have increased microhabitat within the stream channel. Before and after photographs of the restoration are provided in Figure 5.

An IBI assessment was also completed for the restored stream reach in 2016. The IBI score of 41 obtained in 2016 fell within the 'good' narrative range and indicated dramatic improvement over pre-restoration conditions. Fourteen (14) different species of fish were identified during the IBI assessment, which is noteworthy considering the small drainage area of Big Run. The 2016 IBI sampling of the restored section of Big Run met the WWH designation and permit performance requirements. Further details regarding achievement of the post-restoration performance standards for the mitigation stream are provided in the Walnut Woods 2016 Stream and Wetland Monitoring Report (Appendix C).

Figure 5: Big Run Pre- and Post-Restoration Conditions

4.4 Comparison of Proposed Impacts and Mitigation

As detailed in Section 2.2, the segment of Mason Run that will be impacted by the ConRAC project received a HHEI score of 41 and a QHEI score of 23. The HHEI metric is applicable to streams with a watershed area less than one square mile and maximum pool depths less than 40 centimeters, both of which apply to Mason Run within the project site. The HHEI score of 41 indicates that within the project site Mason Run is a Modified Class II Primary Headwater Habitat (PHWH) stream. Modified Class II PHWH streams may support a moderately diverse assemblage of vertebrates and benthic macroinvertebrates adapted to a spectrum of warmwater flow hydrology, but the natural stream channel habitat has been impacted by prior modification.

In order to facilitate comparison of the Mason Run habitat conditions to that of the mitigation site on Big Run, a QHEI assessment of Mason Run was also completed. The QHEI score of 23 obtained for Mason Run falls within the 'very poor' narrative range. The score reflects a lack of coarse substrates, instream cover, sinuosity, and instream habitat (riffles and pools); moderate erosion; poor channel development; and a narrow, denuded riparian corridor.

In contrast, Big Run received a post-restoration QHEI score of 65, indicative of 'good' habitat exceeding WWH standards. This post-restoration QHEI score represents a lift of +36.5 points over the pre-restoration conditions and +42 points over the existing conditions of Mason Run. This represents significant benefits to the water quality and wildlife habitat in the Upper Scioto watershed.

Overall, the proposed mitigation will provide 574 linear feet of high quality, WWH stream (QHEI of 65) and 4.13 acres of associated SCPZ to compensate for impacts to 574 linear feet of low quality, impaired stream (QHEI of 23) and 0.85 acres of SCPZ. The mitigation is located in the same watershed assessment unit (HUC 05060001 – Upper Scioto) as the proposed impacts. The mitigation is more than equivalent as it performs a significantly higher function than the area impacted.

5.0 CONCLUSIONS

CRAA respectfully requests approval of the Type III variance for the Preferred Project Alternative for the proposed ConRAC project. The ConRAC project is an important development to support the expansion of CMH, and the overall growth of the City of Columbus and central Ohio region. The proposed impact to 574 linear feet of Mason Run and 0.85 acre of SCPZ has been carefully considered, and ultimately determined to be necessary to meet the project's space requirements, operational considerations and project budget. Reducing or eliminating these impacts would have significant impacts on the efficiency and operation of the ConRAC facility and, by extension, negative impacts on the airport's visitors to the Columbus region.

The mitigation proposed for the Preferred Alternative includes 574 linear feet of stream restoration and 4.13 acres of associated SCPZ enhancements at CRAA's consolidated wetland and stream mitigation project at Walnut Woods Metro Park. The mitigation of Big Run at Walnut Woods represents a significant ecological lift as compared to the current condition of Mason Run on the proposed ConRAC site. The post-restoration QHEI at Big Run is 65, which is fully compliant with WWH criteria, while the existing QHEI score of Mason Run is 23. The mitigation is more than equivalent as it is performing a significantly higher function than the area impacted.

PHOTOGRAPHS


Photograph 1 – View of Mason Run within narrow riparian corridor, facing upstream


Photograph 2 – View of Mason Run within narrow riparian corridor, facing downstream

Photograph 3 – View of hardpan and leafpack substrates in Mason Run

Photograph 4 – View of Mason Run and culvert under International Gateway, facing northwest

Photograph 5 – View of Mason Run upstream of riparian corridor, facing southeast

EXHIBITS

APPENDIX A
HHEI and QHEI Forms

Ohio EPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3): 41

SITE NAME/LOCATION: Mason Run @ Columbus Airport

SITE NUMBER: ____ RIVER BASIN: Upper Scioto DRAINAGE AREA (mi^2): 0.06

LENGTH OF STREAM REACH (ft): 200 LAT.: 39.99943 LONG.: -82.89919 RIVER CODE: ____ RIVER MILE: ____

DATE: 10/30/17 SCORER: Rahtz COMMENTS: ____

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]	0%	☐☐	SILT [3 pt]	5%
☐☐	BOULDER (>256 mm) [16 pts]	0%	☑☐	LEAF PACK/WOODY DEBRIS [3 pts]	35%
☐☐	BEDROCK [16 pt]	0%	☐☐	FINE DETRITUS [3 pts]	0%
☐☐	COBBLE (65-256 mm) [12 pts]	0%	☐☑	CLAY or HARDPAN [0 pt]	60%
☐☐	GRAVEL (2-64 mm) [9 pts]	0%	☐☐	MUCK [0 pts]	0%
☐☐	SAND (<2 mm) [6 pts]	0%	☐☐	ARTIFICIAL [3 pts]	0%

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock: 0.00%

Substrate Percentage Check: 100%

(A) SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: 3

(B) TOTAL NUMBER OF SUBSTRATE TYPES: 3

HHEI Metric Points — Substrate Max = 40: **6** (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]
- ☐ > 22.5 - 30 cm [30 pts]
- ☐ > 10 - 22.5 cm [25 pts]
- ☑ > 5 cm - 10 cm [15 pts]
- ☐ < 5 cm [5 pts]
- ☐ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS ____ **MAXIMUM POOL DEPTH (centimeters):** 8

Pool Depth Max = 30: **15**

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

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

COMMENTS ____ **AVERAGE BANKFULL WIDTH (meters):** 3.00

Bankfull Width Max=30: **20**

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

COMMENTS ____

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

- ☑ None
- ☐ 0.5
- ☐ 1.0
- ☐ 1.5
- ☐ 2.0
- ☐ 2.5
- ☐ 3.0
- ☐ >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)

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

QHEI PERFORMED? - ☑ Yes ☐ No QHEI Score **23.0** (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☑ WWH Name: **Mason Run** Distance from Evaluated Stream **5.30**
☐ 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: **Southeast Columbus** NRCS Soil Map Page: ____ NRCS Soil Map Stream Order ____

County: **Franklin** Township / City: **City of Columbus**

MISCELLANEOUS

Base Flow Conditions? (Y/N): **Y** Date of last precipitation: **10/28/17** Quantity: **0.19**

Photograph Information: ____

Elevated Turbidity? (Y/N): **N** Canopy (% open): **15%**

Were samples collected for water chemistry? (Y/N): **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) **Y** If not, please explain: ____

Additional comments/description of pollution impacts: ____

BIOTIC EVALUATION

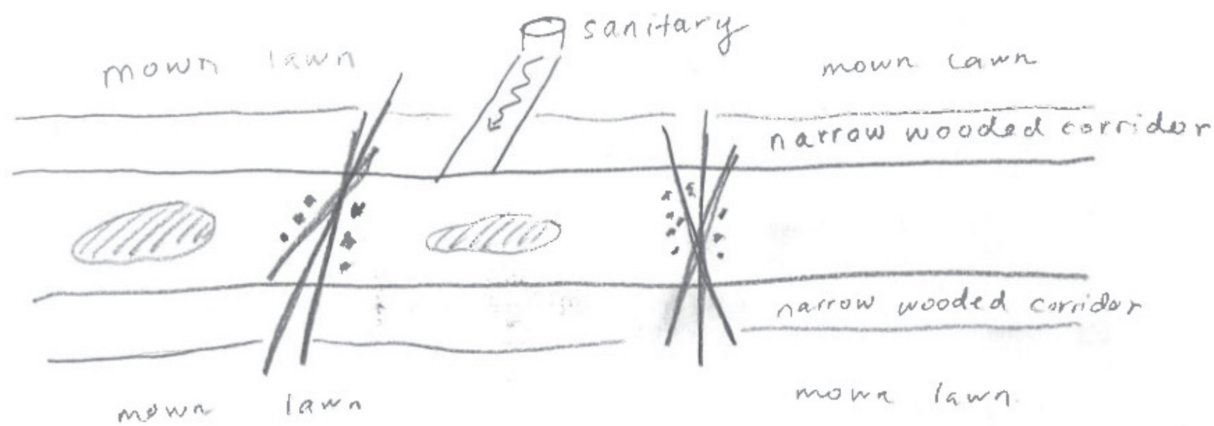
Performed? (Y/N): **N** (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

Fish Observed? (Y/N) **N** Voucher? (Y/N) **N** Salamanders Observed? (Y/N) **N** Voucher? (Y/N) **N**
Frogs or Tadpoles Observed? (Y/N) **N** Voucher? (Y/N) **N** Aquatic Macroinvertebrates Observed? (Y/N) **N** Voucher? (Y/N) **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

FLOW ➔



Save as pdf Reset Form

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 23

Stream & Location: Mason Run Headwaters @ Columbus Airport **RM:** _ _ _._ **Date:** 10/30/17

Scorers Full Name & Affiliation: C. Rahtz, EHM&T

River Code: _ _ _-_ _ _-_ _ _ **STORET #:** _ _ _ _ _ _ **Lat./ Long.:** (NAD 83 - decimal °) 39.9994 /82.8992 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]	60	
☐ ☐ BOULDER [9]			☐ ■ DETRITUS [3]	35	
☐ ☐ COBBLE [8]			☐ ☐ MUCK [2]		
☐ ☐ GRAVEL [7]			☐ ☐ SILT [2]	5	
☐ ☐ SAND [6]			☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

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

Comments

Check ONE (*Or 2 & average*)

ORIGIN	QUALITY	
☐ LIMESTONE [1]	☐ HEAVY [-2]	SILT
☑ TILLS [1]	☐ MODERATE [-1]	SILT
☐ WETLANDS [0]	☑ NORMAL [0]	SILT
☐ HARDPAN [0]	☐ FREE [1]	SILT
☐ SANDSTONE [0]	☐ EXTENSIVE [-2]	EMBEDDEDNESS
☐ RIP/RAP [0]	☐ MODERATE [-1]	EMBEDDEDNESS
☐ LACUSTRINE [0]	☑ NORMAL [0]	EMBEDDEDNESS
☐ SHALE [-1]	☐ NONE [1]	EMBEDDEDNESS
☐ COAL FINES [-2]		

Substrate 8 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]
- ___ OVERHANGING VEGETATION [1]
- ___ SHALLOWS (IN SLOW WATER) [1]
- ___ ROOTMATS [1]
- ___ POOLS > 70cm [2]
- ___ ROOTWADS [1]
- ___ BOULDERS [1]
- ___ OXBOWS, BACKWATERS [1]
- ___ AQUATIC MACROPHYTES [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 1 Maximum 20

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☑ LOW [1]
☑ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments

Channel 4 Maximum 20

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

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

Comments

Riparian 5 Maximum 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (*ONLY!*)	CHANNEL WIDTH Check ONE (*Or 2 & average*)	CURRENT VELOCITY Check ALL that apply	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☐ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☑ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☑ < 0.2m [0]			

Indicate for reach - pools and riffles.

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

Comments

Pool / Current -1 Maximum 12

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	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run 0 Maximum 8

6] GRADIENT (8 ft/mi)
DRAINAGE AREA (0.06 mi²)

- ☑ VERY LOW - LOW [2-4]
- ☑ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: 5 %GLIDE: 95
%RUN: 0 %RIFFLE: 0

Gradient 6 Maximum 10

A] SAMPLED REACH
Check ALL that apply

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

Drainage area less than 1 square mile, QHEI completed for comparative purposes

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

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

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

61 meters

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

1st pass ________ cm
2nd pass ________ cm

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

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

C] RECREATION
POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE
Circle some & *COMMENT*

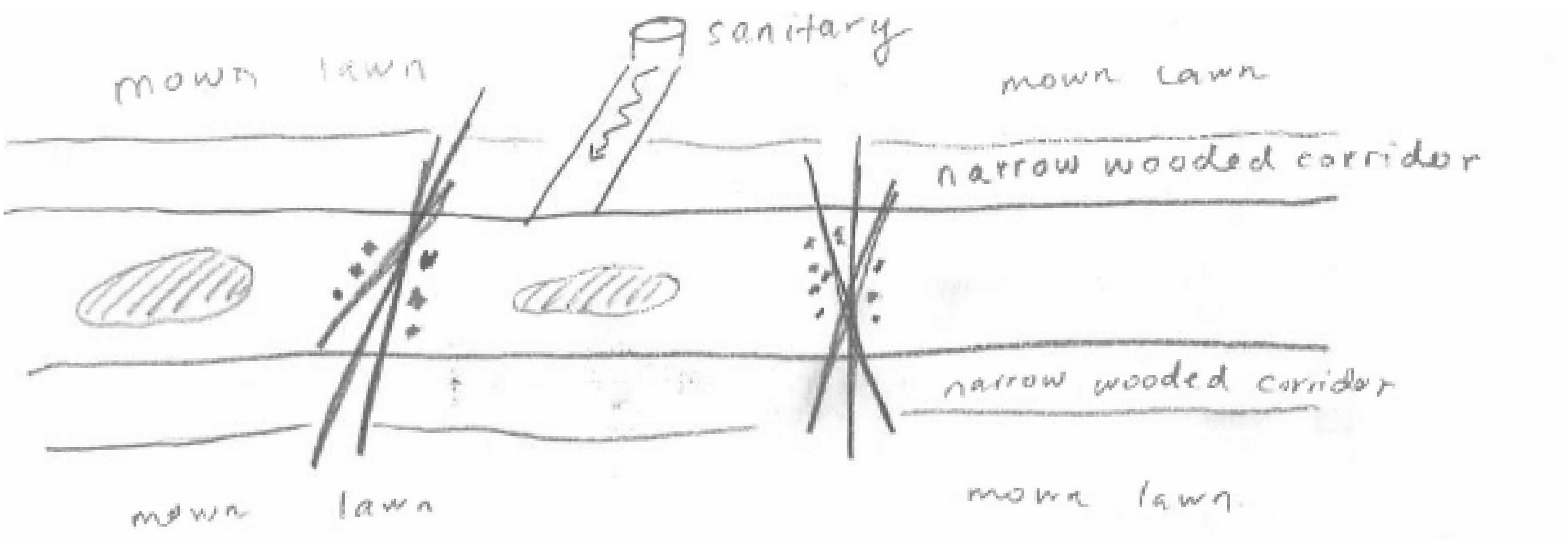
PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

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:



OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 28.5

Stream & Location: Big Run, Sample 2 Eastside Nursery **RM:** _ _ _ . _ **Date:** 08 / 11 / 06

Scorers Full Name & Affiliation: M. Queen Darby

River Code: _ _ _ - _ _ _ - _ _ _ **STORET #:** _ _ _ _ _ _ **Lat./ Long.:** (NAD 83 - decimal °) _ _ . _ _ _ _ /8 _ . _ _ _ _ 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]			☐☐ DETRITUS [3]		
☐☐ COBBLE [8]			☐☐ MUCK [2]		
☐☐ GRAVEL [7]			☐☑ SILT [2]		20
☑☐ SAND [6]	80		☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]					

(Score natural substrates; ignore sludge from point-sources)

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

Comments

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]

Substrate: 6.5 (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]
- 1 OVERHANGING VEGETATION [1]
- ___ SHALLOWS (IN SLOW WATER) [1]
- 1 ROOTMATS [1]
- ___ POOLS > 70cm [2]
- ___ ROOTWADS [1]
- ___ BOULDERS [1]
- ___ OXBOWS, BACKWATERS [1]
- 1 AQUATIC MACROPHYTES [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: 4 (Maximum 20)

3] CHANNEL MORPHOLOGY

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☑ RECOVERING [3]	☑ LOW [1]
☐ NONE [1]	☑ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments Relocation of channel; canopy removal; dredging

Channel: 7 (Maximum 20)

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 R)
- ☐☐ NONE / LITTLE [3]
- ☑☑ MODERATE [2]
- ☑☑ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L R)
- ☐☐ WIDE > 50m [4]
- ☐☐ MODERATE 10-50m [3]
- ☐☐ NARROW 5-10m [2]
- ☐☐ VERY NARROW < 5m [1]
- ☑☑ NONE [0]

FLOOD PLAIN QUALITY (L R)
- ☐☐ FOREST, SWAMP [3]
- ☐☐ SHRUB OR OLD FIELD [2]
- ☐☑ RESIDENTIAL, PARK, NEW FIELD [1]
- ☑☐ FENCED PASTURE [1]
- ☑☐ OPEN PASTURE, ROWCROP [0]
- ☐☐ CONSERVATION TILLAGE [1]
- ☐☐ URBAN OR INDUSTRIAL [0]
- ☐☐ MINING / CONSTRUCTION [0]

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

Comments

Riparian: 2 (Maximum 10)

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: 3 (Maximum 12)

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 Instream features not present

Riffle / Run: 0 (Maximum 8)

6] GRADIENT (8.27 ft/mi)

DRAINAGE AREA (8.5 mi²)

- ☐ VERY LOW - LOW [2-4]
- ☑ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ___ %GLIDE: 100 %RUN: ___ %RIFFLE: ___

Gradient: 6 (Maximum 10)

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

QHEI Score: 65

Stream & Location: Big Run Section 2 Walnut Woods Stream Relocation **RM:** _ _ _._ **Date:** 10 / 11 / 16

Scorers Full Name & Affiliation: Stephen Bailey/ EMH&T

River Code: _ _ _-_ _ _-_ _ _ **STORET #:** _ _ _ _ _ _ **Lat./ Long.:** (NAD 83 - decimal °) _ _ . _ _ _ _ /8_ . _ _ _ _ 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]		15
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]	10	
☐ ☐ COBBLE [8]		10	☐ ☐ MUCK [2]		
☐ ▣ GRAVEL [7]	10	50	☐ ☐ SILT [2]	20	15
▣ ☐ SAND [6]	60	10	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]					

(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	QUALITY
☐ LIMESTONE [1]	SILT: ☐ HEAVY [-2]
☐ TILLS [1]	☑ MODERATE [-1]
☐ WETLANDS [0]	☐ NORMAL [0]
☐ HARDPAN [0]	☐ FREE [1]
☑ SANDSTONE [0]	EMBEDDEDNESS: ☐ EXTENSIVE [-2]
☐ RIP/RAP [0]	☑ MODERATE [-1]
☐ LACUSTURINE [0]	☐ NORMAL [0]
☐ SHALE [-1]	☐ NONE [1]
☐ COAL FINES [-2]	

Comments

Excellent natural substrate. Some concrete and brick

Substrate: 11 (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]	1	POOLS > 70cm [2]	___	OXBOWS, BACKWATERS [1]
1	OVERHANGING VEGETATION [1]	1	ROOTWADS [1]	1	AQUATIC MACROPHYTES [1]
___	SHALLOWS (IN SLOW WATER) [1]	___	BOULDERS [1]	___	LOGS OR WOODY DEBRIS [1]
___	ROOTMATS [1]				

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

Comments

Cover: 12 (Maximum 20)

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

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☑ NONE [6]	☑ HIGH [3]
☑ MODERATE [3]	☑ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel: 17 (Maximum 20)

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

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

Comments

Riparian: 9 (Maximum 10)

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH — Check ONE (ONLY!)	CHANNEL WIDTH — Check ONE (Or 2 & average)	CURRENT VELOCITY — Check ALL that apply	
☐ > 1m [6]	☑ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☑ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]			

Indicate for reach - pools and riffles.

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

Comments

Pool / Current: 7 (Maximum 12)

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	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run: 3 (Maximum 8)

6] GRADIENT (9.74 ft/mi)
DRAINAGE AREA (8.5 mi²)

- ☐ VERY LOW - LOW [2-4]
- ☑ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

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

Gradient: 6 (Maximum 10)

A] SAMPLED REACH
Check ALL that apply

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

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

STAGE

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

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

200 meters

CLARITY

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

pass 1st ________ cm
2nd ________ cm

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

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

C] RECREATION
AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

D] MAINTENANCE
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

Circle some & *COMMENT*

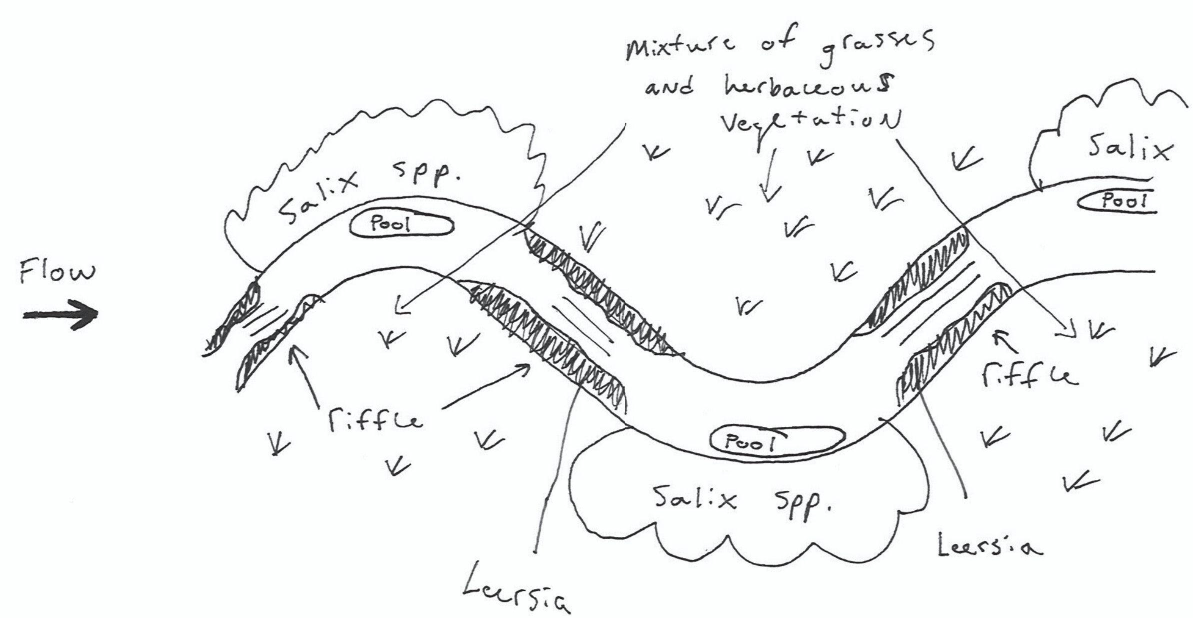
D) Private, Relocated

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:



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APPENDIX B

Wetland and Stream Restoration Plan at the Former Eastside Nursery Site (As-Built Plan)

(Provided on enclosed CD)

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APPENDIX C
Walnut Woods Stream and Wetland Monitoring Report – 2016

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(Provided on enclosed CD)