TECHNICAL MEMORANDUM

DATE January 24, 2022 **Project No.** 21457143

TO Shawn Tylee
Port Colborne Quarries Inc.

CC David Sisco

FROM Luke Owens **EMAIL Luke_Owens@golder.com**

SUPPLEMENTARY BAT SURVEY IN SUPPORT OF THE NATURAL ENVIRONMENT REPORT LEVEL1/2 FOR THE PORT COLBORNE QUARRY EXTENSION

1.0 INTRODUCTION AND BACKGROUND

Golder Associates Ltd. (Golder) was retained by Port Colborne Quarries Inc. (PCQ) to complete a Natural Environment Report Level 1 & 2 (NEL1/2) for the Aggregate Resources Act (ARA) licence application for the Port Colborne Quarry Extension (the project). Stationary bat acoustic surveys were completed in potentially suitable natural and anthropogenic bat roosting habitat within the study area (the site and an area of 120 m surrounding the site), where access was available. In addition to passive acoustic monitoring, active monitoring exit surveys were also completed in the deciduous swamp at the north end of the study area. The Joint Agency Review Team (JART) conducted a review of the NEL1/2 and provided preliminary comments in an email to PCQ on June 7, 2021. The preliminary comments included a request for additional bat maternity roost stationary acoustic surveys to be completed in the deciduous swamp (SWD3-2), and in the ash-lowland deciduous forest (FOD7-2) and lowland deciduous forest (FOD7) communities in the northeast corner of the site.

This technical memorandum provides a description of the methods and the results of the supplemental 2021 bat surveys and is to be considered an addendum to the NEL1/2.

2.0 METHODS

The locations of the survey stations provide additional spatial coverage to supplement the bat surveys completed in 2017 and 2019.

Wildlife Acoustics Song Meter SM3BAT FS acoustic monitors were deployed at three stations on June 11, 2021. The acoustic detectors were set to record from 30 minutes before sunset to 30 minutes after sunrise for 14 nights in June. The detectors were retrieved on June 25, 2021. Details of the bat detector locations are provided in Table 1.

Table 1: Description of Passive Acoustic Bat Detector Locations and Habitat

Station	Location (NAD83) Zone 17T		Feature Targeted	Description
	Easting	Northing		
PCBAT21A	646600	4752328	Deciduous Swamp (SWD3-2)	Mature silver maple (*Acer saccharinum*) deciduous swamp. Several large diameter cavity trees were present in this swamp. The microphone was located 2.25 m above the ground with a 65° orientation, along the linear feature of Carl Road which bisects the deciduous swamp and provides a suitable travel corridor for bats that may emerge from roosts in the deciduous swamp.
PCBAT21B	646860	4751996	Ash Lowland Deciduous Forest (FOD7-2)	This feature consisted of a small deciduous forest community containing ash (*Fraxinus* sp.), easter cottonwood (*Populus deltoides*) and Manitoba maple (*Acer negundo*). No cavity trees, bark trees, or other potentially suitable bat roost trees were observed in this feature. The microphone was located 3 m above the ground with a 45° orientation.
PCBAT21C	646926	4752140	Lowland Deciduous Forest (FOD7)	Immature deciduous forest dominated by trembling aspen (*Populus tremuloides*) and green ash (*Fraxinus pensylvanica*). No cavity trees, bark trees, or other potentially suitable bat roost trees were observed in this feature. The microphone was located 2 m above the ground with a 294° orientation.

2.1   Data Analysis and Assessment

Acoustic data was filtered in Sonobat Data Wizard to remove noise files, and the high-grade noise scrubber setting was used. The data was analyzed and auto-classified using SonoBat 4.4.5 call analysis software (Sonobat, Arcata, CA, USA) with the north-northeast classifier for automated classification (Sonobat 2017). To identify calls to the species level, SonoBat measures numerous variables of call sequences (e.g., maximum frequency, minimum frequency, duration, and call slope; see Table 2). SonoBat regional classifiers are based on the most robust, species-confirmed full-spectrum reference library available, and also integrate quantitative machine learning with algorithms that incorporate more than two decades of expert acoustic classification (SonoBat 2018). Manual call analysis of a portion of the calls was performed to determine at what threshold the software's species attributions become unreliable. Manual call analysis was also performed to test attribution of call sequences to the non-bat category (i.e., birds, rodents, or static discharge). The same call analysis criteria used by SonoBat 4.4.5 was applied during manual analysis in addition to visual comparison to reference files. Call analysis software may give false positive identifications or false negative non-identifications and the likelihood of these erroneous identifications is related to the presence of various factors, including echoes, multiple bats,

naturally overlapping call characteristics and poor recording quality. In some instances, all files within a species category were manually analysed to confirm identifications (i.e., for unlikely species and high frequency files). Calls were grouped as undetermined high- or low- frequency species (i.e., characteristic frequency above or below 35 kHz), or undetermined bats when species or group determinations could not be made. A Myotis category was also created that included calls identified as Myotis species since the listed species identified during this survey are also from the Myotis genus, as well as high-frequency calls not identified to the species level. For calls that were auto-classified to species by SonoBat but not reviewed, the SonoBat classification was accepted.

Bat passes cannot always be identified to species level. This can be due to either poor quality of the recording (i.e., high signal to noise ratio), or ambiguity of the call type. Some bat species have very similar calls and all bats have variability in their call repertoires. Some bat calls are quite diagnostic and can be confidently identified to species while other bat passes can only be identified to a Genus or to a group of species.

Table 2: Bat call analysis criteria used to inform Sonobat 4.4.5 Auto-classification and Manual Call Analysis

Bat Species or Group	Criteria* (values indicated are one standard deviation below and above each respective mean)
Bat	Calls with poor recording quality that hinders discrimination of other call characteristics
High-frequency bat	Broad band FM calls with a Lo f >35Khz but where poor recording quality hinders discrimination of other call characteristics
Little brown myotis	Lo f 35-38 kHz, f_c 38-41 kHz, Hi f 61-78 kHz, upper 6.7-14, lower 2.3-4.6, dur 4.9-6.7 Longer duration calls (duration >7 and lower slope <3) are distinctive
Northern myotis	Lo f 32-42 kHz, f_c 40-47 kHz, Hi f 95-114 kHz, upper 18-30, lower 7.4-16, dur 3.1-4.6
Eastern small-footed myotis	Lo f 42-39 kHz, f_c 42-46 kHz, Hi f 86-104 kHz, upper 27-40, lower 7-12, dur 2.5-3.9 Frequency modulation sweep a smooth curve (i.e., no inflection), beginning steeply and then increasing in curvature. May have a well-defined downward tail. Some calls may have an inflection, but the smoothly curved variant is diagnostic.
Tri-colored bat	Lo f 40-43 kHz, f_c 37-44 kHz, Hi f 54-81 kHz, upper 1.7-14, lower 0.4-1.7, dur 5.8-8.4 Strongly inflected, almost vertical frequency modulation changing to low slope below 47 kHz for the majority of the call
Eastern red bat	Lo f 37-43 kHz, f_c 37-44 kHz, Hi f 54-81 kHz, upper 4.4-16, lower 0.7-3.2, dur 4.6-9.1 U-shaped calls (up–turn at end of call); may exhibit variable f_c across sequence
Low-frequency bat**	Short band FM calls with a Lo f <35Khz but where poor recording quality hinders discrimination of other call characteristics
Big brown bat	Lo f 25-28 kHz, f_c 26-30 kHz, Hi f 42-56 kHz, upper 3.3-8.3, lower 0.7-2.9, dur 5.3-11. Calls with Hi f above 65kHz are diagnostic (distinguished from silver-haired bat)
Silver-haired/big brown bat	Lo f 25-27 kHz, f_c 26-28 kHz, Hi f 42-51 kHz, upper 3.3-8.3, lower 0.7-2.7, dur 5.3-11

Bat Species or Group	Criteria* (values indicated are one standard deviation below and above each respective mean)
Silver-haired bat	Lo f 24-27 kHz, f_c 25-28 kHz, Hi f 33-51 kHz, upper 1.7-9.3, lower 0-2.7, dur 4.8-13, calls with flat slope ≥26 kHz is diagnostic (distinguished from big brown bat)
Hoary bat	Lo f 18-22 kHz, f_c 18-22 kHz, Hi f 21-31 kHz, upper 0.3-4.1, lower -0.1-0.2, dur 7-15, call may have pronounced or subtle U-shape

* **Lo f**: lowest apparent frequency, **f_c**: frequency of the call at its lowest slope or the lowest frequency for consistent FM sweeps, **Hi f**: highest apparent frequency, **upper**: the slope of the upper portion or onset of the call (kHz/ms), **lower**: the slope of the lower portion or body of the call (kHz/ms), **dur**: call duration (ms).
** Used for manual call identification. SonoBat attributes high- or low-frequency species groupings based on individual calls identified to the species level (SonoBat 2017).

Manual call analysis effort is presented in Table 3.

Table 3: Percentage of Files Manually Reviewed

Station	All Files	High Frequency Files	Low Frequency Files
PCBAT21A	674/2359 (28.57%)	368/368 (100%)	306/1991 (15.37%)
PCBAT21B	300/596 (50.34%)	44/44 (100%)	256/552 (43.38%)
PCBAT21C	176/438 (40.18%)	26/26 (100%)	150/412 (36.41%)
All Stations Combined	**1150/3393 (33.89%)**	**438/438 (100%)**	**712/2955 (24.09%)**

3.0   RESULTS

Five bat species were identified during the acoustic surveys: big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and tri-colored bat (*Perimyotis subflavus*). Additional bat passes were identified as high frequency unknown species and low frequency unknown species.

Table 4 provides the total number of passes recorded for the entire maternity roost monitoring period for each species and species group at each acoustic survey station. Table 5 provides mean passes per night with standard deviation for each species at each station.

The number of bat passes recorded by a detector may include multiple passes by the same bat individual and therefore are only indicative of presence/absence, rather than the number of bats that are potentially using the study area and adjacent areas. However, the number of bat passes is used as an indication of the level of bat activity at each station.

Bat Activity by Station

The highest overall bat activity was recorded at the station located within the deciduous swamp (PCBAT21A) with 2359 total passes and 168.5 mean passes per night. The most commonly recorded species at PCBAT21A and PCBAT21B was big brown bat. The most commonly recorded species at PCBAT21C was silver-haired bat.

Table 4: Total bat passes

Station	Number of Nights	High Frequency Unknown Species	Low Frequency Unknown Species	Big Brown Bat	Eastern Red Bat	Hoary Bat	Silver-haired Bat	Tri-colored Bat	Total
PCBAT21A	14	1	411	1507	366	54	19	1	2359
PCBAT21B	15	3	176	289	41	74	13	0	596
PCBAT21C	12	1	162	105	25	132	13	0	438
Total		5	749	1901	432	260	45	1	3393

Table 5: Mean (StDev) Bat Passes / Night

Station	Number of Nights Surveyed	High Frequency Unknown Species	Low Frequency Unknown Species	Big Brown Bat	Eastern Red Bat	Hoary Bat	Silver-haired Bat	Tri-colored Bat	Total Bat Passes
PCBAT21A	14	0.07(0.27)	29.36(22.57)	107.64(105.37)	26.14(14.6)	3.86(3.25)	1.36(1.82)	0.07(0.27)	168.5(125.03)
PCBAT21B	14	0.2(0.41)	11.73(9.01)	19.27(14.18)	2.73(2.6)	4.93(3.06)	0.87(1.41)	0(0)	39.73(23.85)
PCBAT21C	14	0.08(0.29)	13.5(7.66)	8.75(7.88)	2.08(1.51)	11(6.47)	1.08(2.02)	0(0)	36.5(20.69)

SAR Bats

A single SAR bat pass was recorded at the acoustic station within the deciduous swamp (PCBAT21A). A tri-colored bat pass was recorded on June 18. There were also five bat passes classified as high-frequency unknown species as follows: one at PCBAT21A, three at PCBAT21B, and one at PCBAT21C. High frequency unknown species can be indicative of potential SAR bat species. High frequency calls may include tri-colored bat, little brown myotis (*Myotis lucifugus*), eastern small-footed myotis (*Myotis leibii*), northern myotis (*Myotis septentrionalis*), or eastern red bat. However, of all the high frequency bat passes classified to species in the 432 were classified as eastern red bat and one was classified as tri-colored bat. Based on this data set it can be inferred that the high frequency unknown species bat passes are most likely eastern red bat passes. Eastern red bat is not a SAR.

4.0   CONCLUSIONS

Based on the low number of SAR and potential SAR bat passes during the 2021 maternity roost survey, it was determined that there is a low potential for SAR bat maternity roosting habitat to be present in the areas surveyed.

The deciduous swamp (SWD3-2) and the lowland deciduous swamp (FOD7) will not be removed as part of the quarry extension. Although, the ash-lowland deciduous forest community (FOD7-2) will be removed as part of the quarry extension, there were no potential SAR bat roost trees identified in this community and no confirmed SAR bat passes recorded at this station.

Because no maternity roost habitat for SAR bats was identified on the site during the 2021 surveys or during prior surveys conducted for the NEL1/2, these species are not expected to be affected by the project. This assessment confirms the conclusions of the NEL1/2 (Golder 2020).

Golder Associates Ltd.

DRAFT

Luke Owens
Terrestrial Ecologist

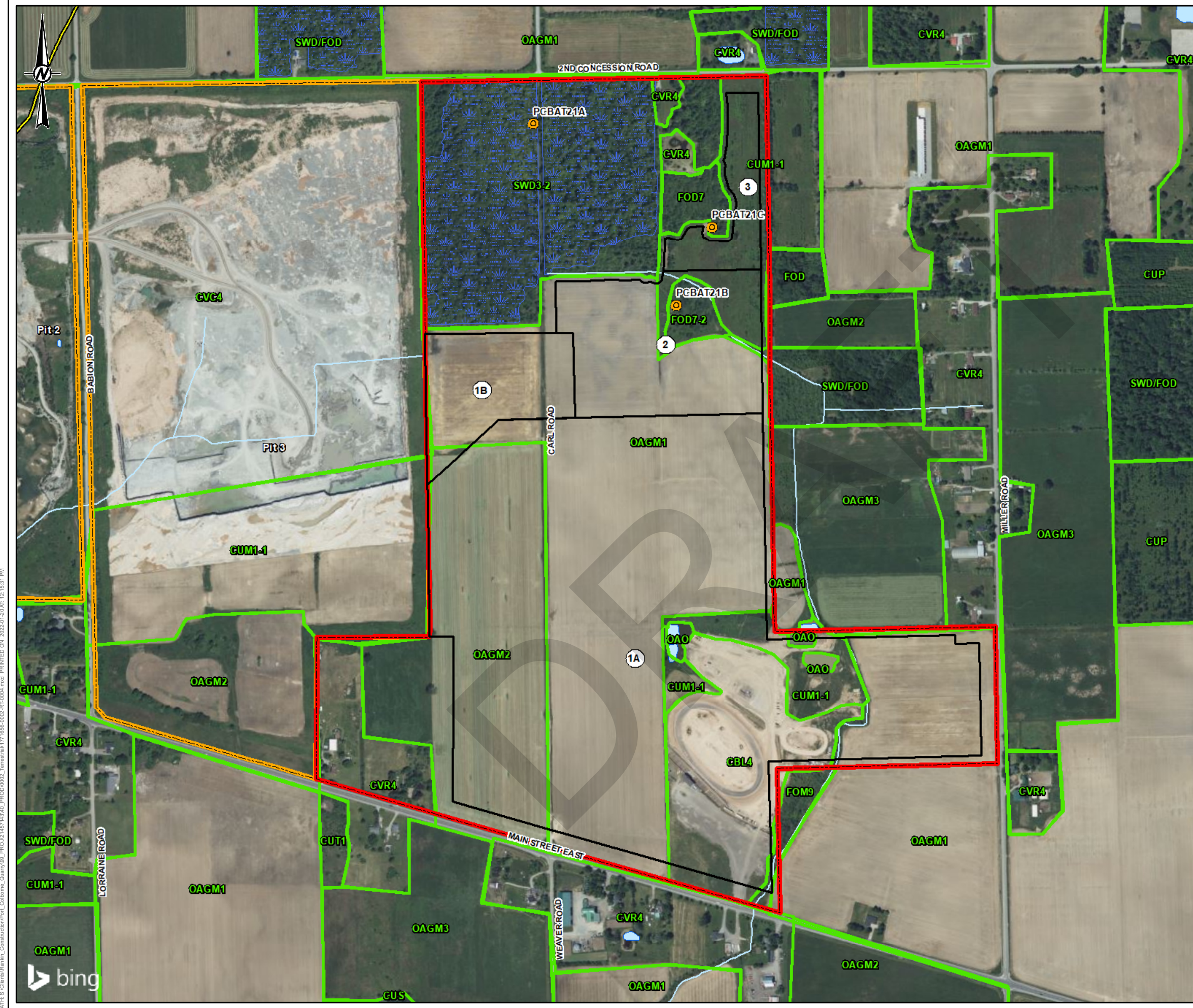*DRAFT*

Heather Melcher, MSc
Principal, Senior Ecologist

LO/HM/ff

Attachments: Figure: 2021 Supplemental Bat Acoustic Survey Station Locations

https://golderassociates.sharepoint.com/sites/32998g/deliverables/phase 3000 natural environment/2021 bat survey tech memo/21457143-tm-reva-2021 bat memo-24jan2022.docx

FIGURE

GOLDER
MEMBER OF WSP

LEGEND

- — Roads
- — Watercourse
- Wetland
- Waterbody
- ⊙ Bat Acoustic Station, 2021
- ▢ Approximate Excavation Phasing Boundary
- ▢ Proposed Quarry Extension
- ▢ Property Boundary
- ▢ ELC Area
- ▢ Study Area (1000 m from Extraction Area Boundary)

ELC Code	Plant Community Name
CBL4	Recreational (Speedway)
CUM1-1	Old Field Cultural Meadow
CUP	Cultural Plantation
CUS	Cultural Savannah
CUT1	Cultural Thicket
CVC2	Light Industry
CVC4	Extraction
CVI3	Water and Sewage Treatment
CVR4	Rural Residential
FOD	Deciduous Forest
FOD2	Dry - Fresh Oak - Maple - Hickory Deciduous Forest
FOD7	Fresh - Moist Lowland Deciduous Forest
FOD7-2	Fresh-Moist Ash Lowland Deciduous Forest
FOM9	Scot's Pine - Conifer - Green Ash Forest
OAGM1	Open Agriculture -annual row crop.
OAGM1	Annual Row Crop Ariculture
OAGM1	Annual Row Crop Agriculture
OAGM2	Open Agricultural -perennial cover crop (hay)
OAGM2	Perennial Cover Crop (Hay)
OAGM3	Pasture
OAO	Open Water Aquatic
SWD/FOD	Deciduous Swamp / Deciduous Forest
SWD3	Maple Mineral Deciduous Swamp
SWD3-2	Silver Maple Mineral Deciduous Swamp

DRAFT
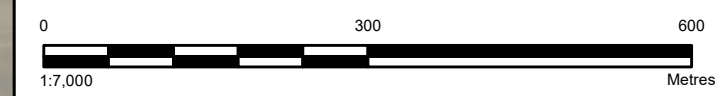
0 — 300 — 600
1:7,000 Metres

CLIENT
RANKIN CONSTRUCTION

PROJECT
PROPOSED PORT COLBORNE QUARRY EXTENSION

TITLE
2021 SUPPLEMENTAL BAT ACOUSTIC SURVEY STATION LOCATIONS

CONSULTANT

GOLDER
MEMBER OF WSP

	YYYY-MM-DD	2022-01-20
	DESIGNED	PR
	PREPARED	PR
	REVIEWED	LO
	APPROVED	-

PROJECT NO.	CONTROL	REV.	FIGURE
21457143	0002	4	4