

September 2018 Buffalo Motor Generator Corporation and Blue Tower Turning Basin Habitat Restoration



## Habitat Restoration Monitoring Report

Prepared for Buffalo Niagara Waterkeeper



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**Prepared for** Buffalo Niagara Waterkeeper 721 Main Street Buffalo, New York 14203

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## **ABBREVIATIONS**

Anchor QEA	Anchor QEA Engineering, PLLC
AOC	Area of Concern
BMGC	Buffalo Motor & Generator Corporation
BNW	Buffalo Niagara Waterkeeper
BTTB	Blue Tower Turning Basin
EV	emergent vegetation
GLLA	Great Lakes Legacy Act
NOAA	National Oceanic and Atmospheric Administration
SAV	submerged aquatic vegetation
SLY	Scott Lawn Yard, Inc.

## **1** Introduction

This report documents the habitat restoration monitoring activities conducted by Anchor QEA Engineering, PLLC (Anchor QEA), on behalf of Buffalo Niagara Waterkeeper (BNW) at the Buffalo Motor & Generator Corporation (BMGC) and Blue Tower Turning Basin (BTTB) habitat restoration sites located in the Buffalo River, Buffalo, New York. This report documents site conditions observed during the July 2018 inspection, including the presence and condition of emergent vegetation (EV), submerged aquatic vegetation (SAV), and riparian planting. Visual inspections of structural habitat restoration elements such as anchored rootwad logs, log boom chain, and the crib structure were also conducted. The construction and monitoring work associated with the BMGC and BTTB sites has been conducted to fulfill the partnership agreement with the Great Lakes Commission, with Great Lakes Restoration Initiative funding provided by the National Oceanic and Atmospheric Administration (NOAA).

### 1.1 Project Area Overview

The BMGC site is located along the right descending bank of the Buffalo River, immediately south of the Michigan Avenue lift-bridge, and immediately west of River Fest Park. It is approximately 1 mile upstream of the mouth of the Buffalo River (Figure 1-1 in Attachment 1). The site includes riparian sections of bank and adjacent in-water areas outside the navigation channel.

The BTTB site is located along the left descending bank of the Buffalo River, east of Katherine Street Peninsula, and due west of an active CSX rail line. It is approximately 3.1 miles upstream of the mouth of the river. Adjacent land uses include the active railroad and abandoned industrial land (Figure 1-1 in Attachment 1). The site includes in-water and shoreline areas surrounding the former turning basin extending from the former Concrete Central buildings (north-northwest) to the Cargill grain elevator (south-southwest).

#### 1.2 Habitat Restoration Summary

The BMGC and BTTB habitat restoration projects were constructed from July to November 2017 by Scott Lawn Yard, Inc. (SLY) in accordance with the final design bid documents developed by Anchor QEA (Anchor QEA 2017). Both project areas involved the installation of structural habitat elements and placement of bank run substrate materials to enhance river bottom conditions for planting EV and SAV the following season (2018). Project as-built drawings documenting project area conditions following the 2017 construction are provided in Appendix A.

#### 1.2.1 EV Planting

EV and SAV species were initially installed by SLY's subcontractor, Cardno, in July 2018. EV plantings were performed via the installation of pre-fabricated "rock socks" in the BMGC and BTTB project

areas. The rock socks were generally comprised of a bank run planting substrate with fertilizer amendment contained within a burlap sack and outer coir jute fabric. EV species were planted within the rock sock units early in the spring of 2018 and allowed to mature at Cardno's off-site nursery prior to delivery to Buffalo. Each rock sock contained approximately 4 to 6 mature plants. Figure 1 shows the rock socks being staged prior to installation.

#### Figure 1 EV Rock Socks Staged Prior to Installation



Similar rock socks were installed by Cardno in other areas of the Buffalo River as part of the Buffalo River Area of Concern (AOC) Great Lakes Legacy Area project and performed well relative to other EV planting techniques. Mixed groupings of EV species were planted in polygons within the two project areas, with each polygon containing approximately 4 to 6 rock socks (for a total of 19 to 26 plants per polygon). EV species planted in 2018 included the following:

- Acorus calamus (Sweet Flag)
- Justicia americana (American Water-Willow)
- *Peltandra virginica* (Green Arrow Arum)
- Pontederia cordata (Pickerelweed)
- Scirpus acutus (Hard Stem Bulrush)

As-built figures of the EV planting polygons, including breakdowns of EV plants contained within each, are provided in Appendix B.

A protective coir fence was constructed around the perimeter of each polygon to deflect debris and provide herbivory protection. Figure 2 shows an example of the rock sock groupings contained within the coir fabric enclosure.



## Figure 2

#### 1.2.2 SAV Planting

SAV planting was performed via the installation of small, pre-fabricated SAV "plug pods." The plug pods were comprised of bank run planting substrate and fertilizer contained within a small coir fabric pouch. SAV species were contained within each pouch. The plug pods were installed in high-density groupings within polygon areas in both restoration areas. The weighted plug pods were installed via release at the surface of the water. Approximately 35 to 54 plug pods were installed within each polygon. SAV species planting in 2018 included the following:

- Elodea canadensis (Canadian Waterweed)
- *Nymphaea odorata* (Fragrant Water-Lily)

As-built figures of the SAV planting polygons, including breakdowns of SAV plants contained within each, are provided in Appendix B. Figure 3 shows the plug pods prior to installation.



### 1.2.3 Riparian Planting

Riparian planting was performed along the shoreline of the BMGC site in November 2017. The planting followed removal of invasive plant species, including mechanical removal of Japanese Knotweed, Tree of Heaven, and Buckthorn in July 2017. A variety of riparian tree and shrub species were planted along the shoreline, as well as within the nearshore footprint of the existing shoreline crib structure, which was a component of the structural habitat enhancements. A list of planted tree species and a figure indicating the locations of riparian plantings submitted by SLY is provided in Appendix C. The riparian planting area also included hydroseeding of open areas with a Terra-Mulch Terra-Blend meadow mix for surface cover.

In June 2018, chemical herbicide treatments that primarily address the presence of Japanese Knotweed in the BMGC riparian area began on a monthly schedule and will continue through September 2018.

## 2 Habitat Restoration Monitoring

Habitat restoration area monitoring was conducted to evaluate the success of recent plantings, estimate coverage in planting areas, and provide information for comparison against future monitoring events.

### 2.1 EV Monitoring Method and Locations

EV plant monitoring was performed to assess the performance of the recently planted rock socks, as well as to evaluate the presence of other volunteer plant species in the project areas. The monitoring entailed the use of random plot sampling within the polygon planting areas using a 1-meter-square quadrat, similar to ongoing investigations and monitoring occurring at other restoration sites as part of the overall AOC program. Data was gathered within each planted polygon (18 total at BTTB and 3 total at BMGC).

### 2.1.1 Data Collected

The condition of the protective fencing around each EV planting polygon was recorded. Within each quadrat, the following pieces of information were recorded:

- Plot coordinates
- Overall plant density
- Species type and coverage
- General health and condition of plants
- Presence of debris or other potential impacts to growth or establishment
- Other observable changes (e.g., observable deposition, erosion, damage)
- Presence of invasive species
- Photographs of the plot and individual species

### 2.2 SAV Monitoring Method and Locations

SAV plant monitoring was also performed to assess the performance of the recently planted plug pods and to evaluate the presence of other volunteer plant species in the project areas. Anchor QEA assessed the condition of SAV in the project area by running transects through each of these areas, conducting float-over visual inspections, and collecting underwater video recordings along each transect. The recordings were performed using a Diamond VC500 video capture device/software and a Delta Vision high-definition industrial video camera. Transects at the BMGC site were run parallel to the shoreline. Transects at BTTB were run parallel to the shoreline and adjacent to the log boom chain and anchored rootwad log structures.

### 2.2.1 Data Collected

The visual observations and video recordings were intended to provide a qualitative evaluation of SAV vegetation condition and coverage. Along each transect, the following pieces of information were recorded:

- Transect path
- Species type and coverage
- General health and condition of plants
- Presence of debris or other potential impacts to growth or establishment
- Other observable changes (e.g., observable deposition, erosion, and damage)
- Presence of invasive species

#### 2.3 Riparian Planting Monitoring

Visual inspection of the riparian planting areas was performed during the July field monitoring event. The areas were inspected for general plant health, presence of invasive species, and signs of herbivory. Photographs of the planting areas were also taken.

In addition to the July monitoring event, BNW has performed weekly inspections of the riparian planting area through the 2018 growing season which will conclude in September.

#### 2.4 Habitat Structure As-Built Monitoring

Visual inspection of the Habitat Structures during the EV and SAV plant monitoring was compared to as-built documentation of installed habitat features. The inspections were intended to document structure conditions and look for evidence of wear or damage. Observable usage of features, such as fish schooling or turtle basking, was also documented at the time of inspection. Photographs of the features were also taken.

## 3 Results

Anchor QEA performed an EV and SAV plant monitoring and habitat structure as-built monitoring event at the BMGC and BTTB sites on July 27, 2018. The monitoring was conducted by Anchor QEA scientists operating both on foot and from a vessel for deeper water areas.

### 3.1 Emergent Vegetation

EV quadrat monitoring results are summarized in Table 1. Corresponding quadrat locations are shown on Figures 1-2 through 1-4 in Attachment 1. The recently installed rock sock plantings were generally in good condition in BTTB and fair condition in BMGC. Coverage within the planted polygons were generally consistent with conditions following initial planting, and plant stock was in visually good health with few apparent signs of stressors (e.g., disease, herbivory, algal growth). An example quadrat plot from the BTTB site is shown on Figure 4.



The following are pertinent observations from the EV monitoring effort:

- All planted polygon areas were present and populated at the time of inspection. All planted species exhibited similar health and in some instances were expanding in coverage within the polygons. Estimated plant density varied from 20% to 60%, as expected from the point planting basis of the rock sock installations.
- Volunteer species outside of the polygons planted in 2018 were not observed in either project area.

- No invasive species were observed in the EV planting areas during the course of the monitoring event. Algal growth was observed on EV species in one quadrat of the BMGC site.
- There were no obvious signs of herbivory in the planted polygons. The perimeter controls and herbivory deterrent flagging will be left in place to continue to provide protection of the polygon areas until mid-October 2018.
- SAV species were observed in some of the EV quadrats.

### 3.2 Submerged Aquatic Vegetation

SAV transect monitoring results are summarized in Table 2. Corresponding transect lines are shown on Figures 1-2 through 1-4 in Attachment 1. Observations of the SAV planting areas were made through a variety of techniques, including observations from the surface of the water, using the underwater video camera recording, and sampling of plant material for species identification. The underwater video recording was hampered by low visibility due to somewhat turbid conditions, particularly at the BMGC site, as well as coverage of the camera lens by accumulated SAV materials. In general, SAV conditions were good at the BTTB restoration site and fair at the BMGC site. Due to the prevalence of SAV at the BTTB, it was difficult to discern the recently planted stock from the abundant volunteer plants.

The following are pertinent observations from the SAV monitoring work:

- The SAV transect performed along the log boom chain in BTTB included the observation of *Najas sp.* and *Vallisneria americana* (Wild Celery) in large beds with bare spots in between. Both species are volunteer species.
- The SAV transect performed along the anchored rootwad logs in BTTB included the observation of *Najas sp., Potamogeton nodosus* (Long-Leaf Pondweed), and trace *Vallisneria americana*.
- The SAV transects performed at BMGC included the observation of *Potamogeton nodosus* and *Najas sp.* Three separate transects were performed, with one transect showing no SAV, another showing trace, and the third showing SAV species along the entire transect.
- Recently planted SAV species were not observed during the monitoring effort.
- Some woody debris were observed at the surface of the water and along the river bottom at the BTTB and BMGC sites.
- No invasive species were observed in the SAV planting areas during the course of the monitoring event. Algal growth was observed on SAV species in two of the BMGC transects.

#### 3.3 Riparian Vegetation

Anchor QEA visually inspected the riparian planting areas of the BMGC site during the July monitoring event. Riparian vegetation species that were present were in generally good health,

although some losses from the 2017 planting were observed. A photograph of the planting area is provided on Figure 5. The following are pertinent observations of this project area:

- Riparian vegetation species present were in good health, with tree species performing particularly well. Approximately 50% of shrub species survived. Shrub species were observed in the third of the planted crib structure closest to the shoreline.
- There were no visible signs of herbivory, and herbivory protection fencing around trees remained in place.
- At the time of the inspection, two monthly rounds of chemical herbicide treatment had taken place. Only trace Japanese Knotweed was observed and appeared to be emanating from the adjacent city-owned property downstream. Trace Tree of Heaven was also observed. Due to the proximity of some shrub species to the Japanese Knotweed populations, there appeared to be limited non-target species loss as a result of the herbicide treatment.
- The seeded meadow area continues to establish itself, and coverage at the time of the inspection was fair.
- Woody debris were observed along the shoreline of BMGC but did not appear to impact vegetation at higher elevations.

#### Figure 5 Riparian Planting Area



#### 3.4 Habitat Structures

During the planting monitoring event, Anchor QEA visually inspected the conditions of structural habitat elements, including anchored rootwad logs and crib structure at BMGC and anchored rootwad logs and the log boom chain at BTTB. Surficial conditions of the structures (where visible),

including mechanical connections, were inspected. The structures were in sound condition, reflective of original as-built conditions except for the following observations:

- Two anchored rootwad logs in BTTB were observed to have a damaged connection at one of the anchoring stones. In one of the cases this has caused the log to deflect approximately 45 degrees. For both damaged units, the remaining anchoring stone connection continues to hold the log in place. The location of the damaged units is indicated in the as-built drawings provided in Appendix A. SLY will repair the steel cable-based connections in early September 2018.
- Two horizontal log booms were observed to be submerged at the connection point at the same timber pile. The booms could be observed at the surface and the up- and downstream timber piles. It is presumed that the connection between these adjacent log booms has been caught at a lower elevation of the timber pile due to either debris or friction (Figure 6). The connection will be inspected during lower water conditions in the river to further assess the issue.

#### Figure 6 Submerged Boom Logs

![](_page_14_Picture_4.jpeg)

Wildlife observations during the inspection included the observation of spiny soft-shelled turtle and blue heron in the debris field of BTTB. Mallard ducks were observed using the log boom chain. Freshwater bryozoans were observed within the EV monitoring areas of BTTB.

## 4 References

Anchor QEA, 2017. *Blue Tower Turning Basin and Buffalo Motor Generator Corporation Restoration Final Design*. Prepared for Buffalo Niagara Waterkeeper. June 2017.

## Tables

# Table 1Emergent Vegetation Monitoring Results

				Corresponding				Debris	Invasive Species	
Project Area	Sampling Plot Number	Coordinates (X)	Coordinates (Y)	Cardno As-Built Plot Number	Estimated Plant Density	Species Type	General Health/ Condition	Presence (Y/N)	Presence (Y/N)	Other Observations
	BTTB-1a	1075817.33	1041694.99	1	60%	A. calamus; P. cordata	Good	N	N	SAV present; <i>Najas sp.</i>
	BTTB-1b	1075817.33	1041694.99	I	60%	A. calamus; P. cordata	Good	N	N	SAV present; <i>Najas sp</i> .
	BTTB-2a	1075888.76	1041674.34	2	50%	J. americana; P. cordata	Good	Y	N	Log debris drifted into netting; SAV present; <i>Najas sp</i> .
	BTTB-2b	1075888.76	1041674.34	L	30%	A. calamus; P. cordata	Good	Y	N	Log debris drifted into netting; SAV present; <i>Najas sp</i> .
	BTTB-3a	1075926.54	1041647.00		60%	A. calamus; P. cordata	Good	N	Ν	SAV present; <i>Najas sp</i> .
	BTTB-3b	1075926.54	1041647.00	3	40%	A. calamus; J. americana; P. cordata	Good	N	N	SAV present; <i>Najas sp</i> .
	BTTB-4	1075926.54	1041647.00	4	60%	A. calamus; P. cordata	Good	N	N	-
	BTTB-5	1076090.29	1041554.09	5	50%	A. calamus; J. americana; P. cordata	Good	N	Ν	SAV present; <i>Najas sp</i> .
	BTTB-6	1076127.70	1041537.16	6	50%	J. americana; P. cordata; S. acutus	Good	N	N	-
	BTTB-7	1076192.38	1041504.44	7	30%	A. calamus; P. cordata; S. acutus	Good	N	N	SAV present; <i>Najas sp.</i>
Blue Tower Turning Basin (BTTB)	BTTB-8	1076303.98	1041432.69	8	20%	A. calamus; J. americana; P. cordata	Good	N	Ν	-
	BTTB-9	1076368.09	1041100.37	9	40%	A. calamus; P. cordata	Good	N	N	-
	BTTB-10	1076343.50	1041067.53	10	50%	A. calamus; P. cordata; S. acutus	Good	N	N	-
	BTTB-11	1076284.55	1041040.59	11	30%	A. calamus; P. cordata; S. acutus	Good	N	N	SAV present; <i>Najas sp .;</i> Large <i>A. calamus</i> bed outside planting polygon

# Table 1Emergent Vegetation Monitoring Results

				Corresponding				Debris	Invasive Species	
	Sampling Plot	Coordinates		Cardno As-Built Plot	Estimated Plant		General Health/	Presence	Presence	
Project Area	Number	(X)	Coordinates (Y)	Number	Density	Species Type	Condition	(Y/N)	(Y/N)	Other Observations
						A. calamus;				
	BTTB-12	1076265.84	1041022.58	12	40%	P. cordata;	Good	N	N	-
						S. acutus				
	BITE 12	1076209.28	1040982.05	12	20%	P. cordata;	Good	N	N	
	0110-15	1070209.20	1040902.05	15	3078	S. acutus	9000	IN	IN	-
						A. calamus;				
	BTTB-14	1076138.74	1040945.70	14	25%	P. cordata;	Good	N	N	-
						S. acutus				
	BTTB-15	1076094 99	10/0916 39	15	20%	A. calamus;	Good	Ν	N	_
	0110-15	1070054.55	1040510.55	15	2078	P. cordata	0000			_
						J. americana;				
	BTTB-16	1076036.97	1040872.79	16	30%	P. cordata;	Good	N	N	-
						S. acutus				
	BTTB-17	1076000 37	10/08/8/8	17	25%	A. calamus;	Good	Ν	N	_
		107 0000.57	1040040.40	17	2370	P. cordata	0000	N.		_
						A. calamus;				
	BTTB-18	1075927.80	1040814.77	18	50%	P. cordata;	Good	N	N	-
						S. acutus				
	BMGC-1	1071014.56	1046297.19	19	25%	P. cordata	Fair	Ν	N	2 unrooted plugs
						A. calamus;				
Buffalo Motor &	BMGC-2	1071009.15	1046298.29	20	40%	J. americana;	Good	N	N	-
Generator Corporation						P. cordata				
										Algae growth on plants;
(BMGC)	BMGC-3	1070968 64	1046335.88	21	30%	A. calamus;	Fair	N	N	SAV present;
	Divide 5	1010500.04	1010000	- '	5570	P. cordata				E. canadensis ,
										P. nodosus

Note:

SAV: submerged aquatic vegetation

#### Table 2

#### Submerged Aquatic Vegetation Monitoring Results

Project Area	Transect Number	Plant Density	Species Type	General Health/ Condition	Debris Presence (Y/N)	Invasive Species Presence (Y/N)	Other Observations
Blue Tower Turning	BTTB-SAV-1	High	Najas sp.; V. americana; P. nodosus	Good	Y	Ν	Performed along timber boom chain; moderate debris
(BTTB)	BTTB-SAV-2	Moderate	Najas sp.; V. americana	Good	Y	Ν	Performed along anchored rootwad logs; moderate debris
	BMGC-SAV-1	Trace	Utricularia Sp.	Fair	Y	Ν	Algae growth on plants; Heavy debris in area; Water highly turbid
Buffalo Motor & Generator Corporation (BMGC)	BMGC-SAV-2	None	N/A	N/A	Y	Ν	Algae growth on plants; Heavy debris in area; Water highly turbid
	BMGC-SAV-3	Moderate	P. nodosus; Najas sp.	Good	Y	Ν	Algae growth on plants; Heavy debris in area; Water highly turbid

Note:

SAV: submerged aquatic vegetation

Attachment 1 Additional Figures

![](_page_21_Picture_0.jpeg)

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![](_page_21_Picture_2.jpeg)

Figure 1-1 Site Overview 4

		<figure></figure>	
SOURCE: Aerial Photography from Bing Maps HORIZONTAL DATUM: New York State Plane West, North American Datum (NAD83), U.S. Feet. NOTES:	LEGEND: EV Original Design Limits	SAV Transect Line	
1. As-built EV and SAV polygon locations provided by Cardno.         BTTB: Blue Tower Turning Basin         EV: Emergent Vegetation         SAV: Submerged Aquatic Vegetation	<ul> <li>EV Quadrat Monitoring Locations</li> <li>As-Built EV and SAV Polygon Locations</li> </ul>	ns	
Filepath: K:\Projects\1235-Buffalo Waterkeeper\Buffalo River\1235 RP-00120180813 FIELD	DATA.dwg Figure 5		

ANCHOR QEA

![](_page_22_Picture_2.jpeg)

#### Figure 1-2 BTTB EV and SAV Monitoring Locations

![](_page_23_Picture_0.jpeg)

And		recourse of the SAV 1	5 SAV 16
	EFALO RIVER	EV 8- EV 7- SAV 18- SAV 19-	BWTB-11
EV QUADRAT MONITORING LOCATIONS Easting Northing Point Description	BUR, SAV 22	EV 5 SAV 20 AV 21	EV 9
1076367.96'       1041100.40'       BWTB-9         1076343.48'       1041067.50'       BWTB-10         1076284.56'       1041040.60'       BWTB-11         1076265.90'       1041022.63'       BWTB-12         1076209.26'       1040982.06'       BWTB-13         1076138.72'       1040945.74'       BWTB-14         1076094.93'       1040916.43'       BWTB-15	SAV 23 SAV 24 SAV 25	BWTB-14 BWTB-15 BWTB-16	3TTB-SAV-2
1076036.82' 1040872.76' BWTB-16 1076000.38' 1040848.50' BWTB-17 1075927.73' 1040814.82' BWTB-18	EV 1 BWTB-18	WTB-17	
			S designed
	C Stelle		Jall Com

sol	JRCE: Aerial Photography from Bing Maps		LEGEND:		
Nor Nor	th American Datum (NAD83), U.S. Feet. TFS:		EV Original Design Limits	•	As-Built EV and SAV Polygon Locations
1.	As-built EV and SAV polygon locations provided by Cardno. BTTB: Blue Tower Turning Basin	$\boxtimes$	SAV Original Design Limits		SAV Transect Line
	EV: Emergent Vegetation SAV: Submerged Aquatic Vegetation	•	EV Quadrat Monitoring Locations		

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![](_page_23_Picture_5.jpeg)

![](_page_23_Picture_6.jpeg)

![](_page_23_Picture_7.jpeg)

![](_page_23_Picture_8.jpeg)

#### Figure 1-3 BTTB EV and SAV Monitoring Locations

![](_page_24_Picture_0.jpeg)

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![](_page_24_Picture_3.jpeg)

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NITORING LOCATIONS							
hing	<b>Point Descriptior</b>						
03.28'	BMG-SAV-1						
28.26'	BMG-SAV-2						
32.23'	BMG-SAV-3						
97.07'	BMG-1						
98.31'	BMG-2						
35.68'	BMG-3						

![](_page_24_Picture_6.jpeg)

#### Figure 1-4 **BMGC EV and SAV Monitoring Locations**

Appendix A Project As-Built Drawings

![](_page_26_Picture_0.jpeg)

Unauthorized alteration or addition to a survey map bearing a licensed land surveyors seal is a violation of Section 7209, Subdivision 2 of the New York State Education Law.

Only copies from the original of this survey marked with an original of the surveyor's inked seal or his embossed seal shall be considered to be valid and true copies.

![](_page_26_Picture_4.jpeg)

![](_page_26_Picture_5.jpeg)

- This survey is referenced horizontally to the North American Datum of 1983, 2011 adjustment (NAD83/2011) and projected on the New York State Plane Coordinate System (West Zone), and vertically to the International Great Lakes Datum of 1985 (IGLD85).
- 2. North arrow as shown indicates Grid North referenced to NAD83/2011 projected on the New York State Plane Coordinate System (West Zone).
- Contours shown hereon were generated from a Digital Terrain Model utilizing Autodesk Civil 3D Surveying and Engineering software.
- The bathymetric and planimetric information shown hereon was compiled from data collected utilizing multi-beam acoustic surveying techniques and an instrument survey on May 9, 2018.
- 6. The shoreline and upland are to be located and provided by Terratek GPS Modeling.

## Legend:

Minor Contour Proposed Submerged Aquatic Vegetation (566' to 570' elevation) Proposed Emergent Aquatic Vegetation (570' to 572' elevation) Log Boom/Rootwad Chain Log Rootwad Chain Log Pile Spot Elevation and Location

GRAPHIC SCALE

-	£.,			1 inch = 20 ft.			
				drawn: <b>MRW</b>	Existi	Map Showing ing Bathymetric Condit	ions
				checked: JST	Buffalo M	otor and Generator Cor Buffalo River	poration
				scale: 1" = 20'		City of Buffalo County of Erie State of New York	
		PROJECT NUMBER: CK3872-04-18		date: 07-17-2018	P.O. Box 463 6431 US Highway 11		9478 River Road Marcy, New York 13403
					T: 315/386-2776 F: 315/386-1012	www.ThewAssociates.com	T: 315/733-7278 F: 315/797-1957

![](_page_27_Picture_0.jpeg)

Only copies from the original of this survey marked with an original of the surveyor's inked seal or his embossed seal shall be considered to be valid and true copies.

DESCRIPTION

CK3872-04-18

Appendix B EV and SAV Planting As-Built Figures

![](_page_29_Picture_0.jpeg)

![](_page_29_Figure_1.jpeg)

![](_page_30_Picture_0.jpeg)

#### 1 inch = 200 feet **EV Planting Location** ۲ 0 100 200 400 Feet SAV Planting Location This map and all data contained within are **Buffalo Generator and** supplied as is with no warranty. Cardno, Inc. expressly disclaims responsibility for damages or Motor Corporation Cardno liability from any claims that may arise out of the **Buffalo River** use or misuse of this map. It is the sole responsibility of the user to determine if the data Scott Lawn Yard, Inc. 708 Roosevelt Road, Walkerton, IN 46574 USA on this map meets the user's needs. This map was not created as survey data, nor should it be used Niagra Falls, New York Phone (+1) 574-586-3400 Fax (+1) 574-586-3446 as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed www.cardno.com Project No. J182038900 surveyor, where required by law. Date: 7/31/2018 File Path: R:\Projects:118/182/182038900\_ScottLawnYard\_BuffaloRiverBlueTowerBasinSAV/GIS\MXD/AsBuilts/20180731\_Motor Corporation.mxd Basemap: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp., Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community GIS Analyst: christine.dittmar

		EV Rock Sock Quantity Installed					
Location	EV Polygon	Pon Cor	Aco ame	Jus ame	Sch acu	Pel vir	Poly Total
	1	4	4	3	10	3	24
	2	3	4	3	5	5	20
	3	4	4	2	10	4	24
	4	4	4	8	2	3	21
	5	4	6	4	9		23
	6	4	4	4	2	7	21
in	7	6	2	2	12	1	23
3as	8	7	1	5	7	4	24
а	9	3	6	4	6	7	26
nic	10	4	4	3	11	2	24
In	11	3	3	6	4	3	19
F	12	3	3	3	3	5	17
	13	7	3	5	4		19
	14	6	3	6	4		19
	15	3	9	2		5	19
	16	3	8	2		6	19
	17	9	6	4			19
	18	8	11				19
or p.	19	2	2	0			4
	20	2	3	1			6
≥ 0	21	7	10	3			20
Project	t Total	96	100	70	89	55	410

	SAV	Qu	antity Insta	led
Location	Polygon	Nym odo	Elo can	Poly Total
	1	28	26	54
	2	28	26	54
	3	28	26	54
	4	28	26	54
	5	28	26	54
	6	28	26	54
	7	28	11	39
	8	28	11	39
	9	28	11	39
	10	28	10	38
sin	11	25	10	35
Ba	12	25	10	35
b	13	25	11	36
nir	14	29	11	40
Lur	15	29	11	40
	16	29	11	40
	17	29	11	40
	18	29	11	40
	19	29	11	40
	20	29	11	40
	21	29	11	40
	22	29	11	40
	23	29	11	40
	24	29	11	40
	25	29	11	40
p.	26	25	15	40
orl	27	25	15	40
ΣU	28	25	15	40
Projec	t Total	778	407	1185

		Supplemental Plug Quantity Installed					
Location	EV Polygon	Pon Cor	Aco ame	Bol flu	Sch pun	Pel vir	Poly Total
	1		8	15	2		25
	2		8	15	2		25
	3		8	15	2		25
	4		8	15	2		25
	5		8	15	2		25
	6		8	15	2		25
in	7		8	15	2		25
3as	8		8	15	2		25
в	9		8	15	2		25
ic	10		8	15	2		25
un .	11	8			9	8	25
	12	8			9	8	25
	13	8			8	9	25
	14	9			8	8	25
	15	8			9	8	25
	16	8			8	9	25
	17	8			8	9	25
	18	9			8	8	25
p.	19	8			9	8	25
	20	9			8	8	25
≥0	21	8			8	9	25
Project Total		91	80	150	112	92	525

Label	Species			
Aco ame	Acorus americanus			
Bul flu	Bulboschoenus fluviatilis			
Elo can	Elodea canadensis			
Jus ame	Justicia americana			
Nym odo	Nymphaea odorata			
Pel vir	Peltandra virginica			
Pon Cor	Pontdaria cordata			
Sch acu	Schoenoplectus acutus			
Sch pun	Schoenoplectus pungens			

Appendix C Riparian Area Planting Plan

BMGC											
	PLANT SCHEDULE										
	RIPARIAN VEGETATION - PROJECT TOTAL: 0.25 ACRES										
Quantity	ABV	Common Name	Species Name	PLANTING ZONES	SPACING	NOTES					
	Top of Slope (~6000 SF)										
		TREES	TREES								
4	PO	AMERICAN SYCAMORE	Platanus occidentalis								
8	TA	AMERICAN BASSWOOD	Tilja americana	1							
6	JN	BLACK WALNUT	Juglans nigra	+ 580' ELEVATION	AS SHOWN	5 GAL. CONTAINERS					
5	LT	TULIP POPLAR	Linodendron tulipifera								
3	QA	WHIT EOAK	Quercus alba	1							
		SHRUBS									
16	ca	ALTERNATE LEAF DOGWOOD	Comus alternifolia								
16	vf	AMERICAN CRANBERRYBUSH	Viburnum trilobum		AS SHOWN						
18	ро	COMMON NINEBARK	Physocarpus opulifolius								
10	SC	ELDER	Sambucus canadensis	+ 560 ELEVATION		1-2 GAL. CONTAINERS					
225	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus								
22	lb	SPICEBUSH	Lindera benzoin								
		Slope (~3500 SF)			-						
		SHRUBS									
12	ca	ALTERNATE LEAF DOGWOOD	Cornus alternifolia								
10	vt	AMERICAN CRANBERRYBUSH	Viburnum trilobum	7							
10	ро	COMMON NINEBARK	Physocarpus opulifolius	7							
15	SC	ELDER	Sambucus canadensis	+ 573' EL EVATION	THROUGHOUT VOIDS IN ROCK ON SLOPE	12 CAL CONTAINERS					
25	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus	+ 5/3 LLLVATION		1-2 GAL. CONTAINERS					
35	rs	RED RASPBERRY	Rubus strigosus								
15	lb	SPICEBUSH	Lindera benzoin								
15	rt	STAGHORN SUMAC	Rhus thyphina								
		Bottom of Slope (~1000 SF)									
		SHRUBS									
9	со	COMMON BUTTONBUSH	Cephalanthus occidentalis								
10	SC	ELDER	Sambucus canadensis	+ 570' ELEVATION	5' O.C.	1-2 GAL. CONTAINERS					
35	CS	RED OSIER DOGWOOD	Cornus sericea								
		Crib Structure (~1800 SF)		-	•						
	SHRUBS										
5	ро	COMMON NINEBARK	Physocarpus opulifolius								
10	CS	RED OSIER DOGWOOD	Cornus sericea	1	SPACING TO BE						
10	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus	1	DETERMINED IN THE	1-2 GAL. CONTAINERS					
10	rs	RED RASPBERRY	Rubus strigosus	1	FIELD						
5	rt	STAGHORN SUMAC	Rhus thyphina								

![](_page_35_Picture_0.jpeg)

	BMGC						
			PLANT SC	HEDULE			
			RIPARIAN VEGETATION - PR	OJECT TOTAL: 0.25 ACRES			
Quantity	ABV	Common Name	Species Name	PLANTING ZONES	SPACING	NOTES	
		Top of Slope (~6000 SF)					
		TREES					
4	PO	AMERICAN SYCAMORE	Platanus occidentalis				
8	TA	AMERICAN BASSWOOD	Tilia americana	-			
6	JN	BLACK WALNUT	Juglans nigra	+ 580' ELEVATION	AS SHOWN	5 GAL. CONTAINERS	
5	LT	TULIP POPLAR	Liriodendron tulipifera				
3	QA	WHITE OAK	Quercus alba				
		SHRUBS					
4	са	ALTERNATE LEAF DOGWOOD	Cornus alternifolia				
6	vt	AMERICAN CRANBERRYBUSH	Viburnum trilobum				
3	ро	COMMON NINEBARK	Physocarpus opulifolius	+ 580' ELEVATION AS SHOWN		1-2 GAL CONTAINERS	
10	SC	ELDER	Sambucus canadensis		AS SHOWN	1-2 GAL CONTAINERG	
40	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus				
7	lb	SPICEBUSH	Lindera benzoin				
		Slope (~3500 SF)					
		SHRUBS					
12	са	ALTERNATE LEAF DOGWOOD	Cornus alternifolia				
10	vt	AMERICAN CRANBERRYBUSH	Viburnum trilobum				
10	ро	COMMON NINEBARK	Physocarpus opulifolius				
15	SC	ELDER	Sambucus canadensis	+ 573' EL EVATION		1-2 GAL CONTAINERS	
25	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus	+ 3/3 ELEVATION	ON SLOPE		
25	rs	RED RASPBERRY	Rubus strigosus				
15	lb	SPICEBUSH	Lindera benzoin				
15	rt	STAGHORN SUMAC	Rhus thyphina				
		Bottom of Slope (~1000 SF)					
		SHRUBS					
10	CO	COMMON BUTTONBUSH	Cephalanthus occidentalis				
10	SC	ELDER	Sambucus canadensis	+ 570' ELEVATION	5' O.C.	1-2 GAL. CONTAINERS	
25	CS	RED OSIER DOGWOOD	Cornus sericea				
		Crib Structure (~1800 SF)					
		SHRUBS					
5	ро	COMMON NINEBARK	Physocarpus opulifolius				
10	CS	RED OSIER DOGWOOD	Cornus sericea				
10	ro	PURPLE FLOWERING RASPBERRY	Rubus odoratus			1-2 GAL. CONTAINERS	
10	rs	RED RASPBERRY	Rubus strigosus				
5	rt	STAGHORN SUMAC	Rhus thyphina				

SLOPE		
%	SEED MIX - ERNMX-140 Partially Shaded Area Roadside Mix (or equivalent)	
32	Little Bluestem, Fort Indiantown Gap-PA Ecotype (Schizachyrium scoparium, Fort Indiantown Gap-PA Ecotype)	
20	Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)	
20	Autumn Bentgrass, PA Ecotype (Agrostis perennans, PA Ecotype)	
5	Purple Coneflower (Echinacea purpurea)	
4	Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)	
3	Tall White Beardtongue, PA Ecotype (Penstemon digitalis, PA Ecotype)	
3	Marsh (Dense) Blazing Star (Spiked Gayfeather), PA Ecotype (Liatris spicata, PA Ecotype)	
2	Blackeyed Susan, Coastal Plain NC Ecotype (Rudbeckia hirta, Coastal Plain NC Ecotype)	
2	Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)	
1.5	Slender Bushclover, VA Ecotype (Lespedeza virginica, VA Ecotype)	
1	Ohio Spiderwort, PA Ecotype (Tradescantia ohiensis, PA Ecotype)	
1	White Wood Aster, PA Ecotype (Aster divaricatus (Eurybia divaricata), PA Ecotype)	
1	Eastern Columbine (Aquilegia canadensis)	
1	Thimbleweed, PA Ecotype (Anemone virginiana, PA Ecotype)	
1	Browneyed Susan, WV Ecotype (Rudbeckia triloba, WV Ecotype)	
0.8	Blue False Indigo, Southern WV Ecotype (Baptisia australis, Southern WV Ecotype)	
0.5	White (Silver Rod) Goldenrod, PA Ecotype (Solidago bicolor, PA Ecotype)	
0.5	Wild Bergamot, Fort Indiantown Gap-PA Ecotype (Monarda fistulosa, Fort Indiantown Gap-PA Ecotype)	
0.5	Zigzag Goldenrod (Solidago flexicaulis)	
0.2	Hoary Mountainmint, MD Ecotype (Pycnanthemum incanum, MD Ecotype)	
100	2.1 lbs.	
BOTTO	OM OF SLOPE	
%	SEED MIX - ERNMX-122: FACW MEADOW MIX (or equivalent)	
31	Fox Sedge, PA Ecotype (Carex vulpinoidea, PA Ecotype)	
20	Virginia Wildrye, PA Ecotype (Elymus virginicus, PA Ecotype)	
14	Lurid (Shallow) Sedge, PA Ecotype (Carex lurida, PA Ecotype)	
5	Green Bulrush, PA Ecotype (Scirpus atrovirens, PA Ecotype)	
4	Blue Vervain, PA Ecotype (Verbena hastata, PA Ecotype)	
3.5	Wood Reedgrass, PA Ecotype (Cinna arundinacea, PA Ecotype)	
3	Soft Rush (Juncus effusus)	
3	Blunt Broom Sedge, PA Ecotype (Carex scoparia, PA Ecotype)	
3	Hop Sedge, PA Ecotype (Carex lupulina, PA Ecotype)	
2	Sensitive Fern (Onoclea sensibilis)	
2	Oxeye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)	
1	Rattlesnake Grass, PA Ecotype (Glyceria canadensis, PA Ecotype)	
1	Woolgrass, PA Ecotype (Scirpus cyperinus, PA Ecotype)	
1	Swamp Milkweed, PA Ecotype (Asclepias incarnata, PA Ecotype)	
1	New England Aster, PA Ecotype (Aster novae-angliae (Symphyotrichum n.), PA Ecotype)	
1	Flat Topped White Aster, PA Ecotype (Aster umbellatus (Doellingeria umbellata), PA Ecotype)	
0.5	Joe Pye Weed, PA Ecotype (Eupatorium fistulosum, PA Ecotype)	
0.5	Boneset, PA Ecotype (Eupatorium perfoliatum, PA Ecotype)	
0.5	Ditch Stonecrop, PA Ecotype (Penthorum sedolades, PA Ecotype)	
0.5	Narroweat Blue Eyed Grass (Sisyfrinchium angustirolium)	
0.5	Seedoox, YA Ecotype (Ludwigia alternitolia, YA Ecotype)	
0.5	Great Blue Lobella, PA Ecotype (Lobella siphilitica, PA Ecotype)	
0.5	I mud Plantain (water Plantain), PA Ecotype (Alisma subcordatum (A. plantago-aquatica), PA Ecotype)	
0.5	Square Steiningu wunikeynowel, PA Ecotype (Minifulus Inigens, PA Ecotype)	
0.4	Bladder (Stal) Sedge, FA ECOUPPE (Carex InitialitiesCens, FA ECOUPPE)	
100		