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RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM DRAWDOWN PERIOD MONITORING REPORT #7

JULY 19, 2021

For Compliance with:

Order of Conditions, DEP File No. 294-0607, issued 09/17/2020

Section 401 Water Quality Certification, BRP WW 08, DEP Transmittal No. X286704, issued 07/23/2021

Section 404 Permit, File No. NAE-2020-02301, issued 10/21/2020

Certificate on the SEIR, Secretary of Energy and Environmental Affairs, EOEEA No. 16234, issued 07/31/2020

Prepared by: Adrienne Dunk , Paul G. Davis, PhD

Reviewed by: Tom Jenkins, P.E.

INTRODUCTION AND METHODOLOGY

In compliance with authorized procedures approved under the above-referenced permits and authorizations, GZA is monitoring dissolved oxygen levels, temperature, and transparency during the period of drawdown associated with the Resiliency Improvements at Watershops Pond Dam Project. This report presents the results of the seventh monitoring event conducted during the period of drawdown, which commenced with the opening of the low-level outlets at the dam on October 26, 2020. During the winter drawdown period, dissolved oxygen monitoring will occur at a frequency of once every 2 months. From March through October, during the growing season, monitoring will occur monthly.

Ecological resource monitoring was initially identified as a means to gauge the environmental impacts associated with a partial or full drawdown of Watershops Pond that may occur during the Project. The monitoring was discussed conceptually in the Alternatives Analysis included in the Expanded Environmental Notification Form (EENF) for the Project (EOEEA No. 16234, EENF dated June 15, 2020). On July 31, 2020, the Secretary of Energy and Environmental Affairs issued her Certificate on the EENF requiring the preparation of a Single Environmental Impact Report (SEIR). In response to comments received on the EENF and in response to the Secretary's Certificate on the EENF, a detailed draft "Aquatic and Wetland Resource Monitoring and Mitigation Plan"; the "Plan") was developed in coordination with regulatory agencies and was submitted as an integral mitigation commitment detailed within the SEIR dated August 28, 2020. The Plan was referenced in the Secretary's Certificate on the SEIR (October 16, 2020) and became a mitigation requirement associated with the City of Springfield's Preferred Alternative of full pond drawdown during the Project. The basic elements of the Plan were developed based upon prior studies of the pond and consultations with the Springfield Conservation Commission and State and Federal regulatory officials.



A copy of the Plan was provided in **Appendix 1.** to the “Pre-Drawdown Ecological Monitoring Report,” GZA, September 2020.

During the winter drawdown period, dissolved oxygen monitoring occurred at a frequency of once every 2 months. From March through October, during the growing season, dissolved oxygen and groundwater monitoring occurs monthly. Within the Pond, vertical profiles are being conducted at the three locations and Dissolved Oxygen (DO) and Temperature (°C) were measured at one-foot depth intervals. Secchi disk depth is recorded at each site. Vegetation community monitoring occurs twice per growing season, in late May and between August 15 and September 15. Groundwater and vegetation community monitoring is being conducted at the six stations located at the three BVWs identified during the pre-drawdown report and depicted on **Figures 2 through 4.** This report presents the results of the seventh monitoring event conducted during the period of drawdown, which commenced with the opening of the low-level outlets at the dam on October 26, 2020.

The current monitoring event was conducted on July 19, 2021. Monitoring was repeated at the two locations selected during the first sampling event, conducted December 15, 2020 and a third sampling location near the dam which was added on March 23, 2021, to take advantage of deeper residual pool depth for monitoring (see **Figure 1A** for data collection locations).

RESULTS

The Watershops Pond residual pool encompasses about 125.5 acres upgradient of the dam where the water exits the pond basin through the sluice gates. The maximum pool depth observed was 15 feet deep, with most of the pool area ranging from 12 to 15 feet deep. The height of the pool was determined by measuring the surface water elevation below the deck of the privately-owned steel bridge located approximately 200 feet upstream of the dam. The measured surface water elevation was at Elevation 150.95± which is approximately 10.25± feet higher than the water surface elevation that was measured on May 27, 2021, or as measured in December 2020. Between July 1 and July 19, 2021, approximately 10.2± inches of rain have fallen in the Springfield area.

Based upon the Secchi Disk depth, the water within the pool basin was observed to be more turbid than the April or June sampling events which had Secchi Disk depths recorded at 1.5-3.0 feet and >0.5-2.7 feet respectively.

Watershops Pond had an average temperature of 22.2° C for locations measured. The measured temperatures ranged from 21.3° C to 23.7° C. The maximum DO observed was 5.8 at multiple locations (**Table 1**).



Table 1. Watershops Pond Drawdown Pool Dissolved Oxygen, Temperature, and Secchi Depth Measurements
Date of Data Collection: 07/19/2021 1:30 PM – 2:30 PM

Date: 07/19/2021				Time: 1:20 PM				Surface Water Elevation: 150.95' (note: chisel mark on pond side of pier made at 12.00' below bridge deck)			
Location: Main Body, Near Dam, East of Steel (private) Bridge; 42°05.861 N; 072°33.624 W				Location: Main Body, Central Pond, East of RR Bridge; 42°05.940 N; 072°33.345 W				Location: Main Body, Near Dam, 100'± West of Steel (private) Bridge; 42°05.848 N; 072°33.735 W			
Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C	Secchi Depth (ft)	Depth (ft)	DO (mg/l)	Temp °C
1.75	0	5.7	23.7	2.1	0	5.6	22.7	1.75	0	5.7	22.9
	1	5.8	23.7		1	5.5	22.5		1	5.8	22.7
	2	5.6	23.2		2	5.5	22.4		2	5.8	22.6
	3	5.5	22.5		3	5.5	22.5		3	5.7	22.5
	4	5.5	22.3		4	5.4	22.4		4	5.7	22.5
	5	5.5	22.3		5	5.5	22.4		5	5.7	22.4
	6	5.5	22.3		6	5.4	22.0		6	5.7	22.4
	7	5.5	22.2		7	5.5	21.6		7	5.6	22.4
	8	5.5	22.0		8	5.5	21.5		8	5.6	22.3
	9	5.5	21.9		9	5.5	21.4		9	5.6	22.1
	10	5.4	21.8		10	5.4	21.4		10	5.55	22.0
	11	5.4	21.8		11	5.4	21.4		11	5.6	21.9
	12	5.4	21.8		12	5.4	21.4		12	5.5	21.9
	13.0 bottom	5.4	21.8		12.5 bottom	5.2	21.3		13	5.6	21.8
									14	5.5	21.8
									15.0 bottom	5.3	21.8

*Aerator installed near this location in mid-July 2021; however, it was not operating at time of sampling.

The average DO concentration at each depth range of the water column is shown in **Table 3**. Because the DO concentration changed little over depth, the entire water column is above 5.2 mg/l; above the action level of 5.0 mg/l. The slight elevation of DO near the bottom surface at two locations is suggestive of initial start of growth bottom filamentous green algae.



Table 3. Hypsometric Distribution of Lake Volume and Dissolved Oxygen by Depth

Depth (ft)	Acres Encompassed by Contour Depth	Water column volume by depth interval (CF)	% vol. of water column within depth interval	Cum. % vol. above interval depth	Average DO (mg/l)
0-1	125.5	5,178,393.9	19.6	19.6	5.7
1-2	112.4	4,469,620.2	16.9	36.5	5.7
2-3	93.1	3,593,650.4	13.6	50.1	5.6
3-4	72.3	2,850,450.2	10.8	60.9	5.6
4-5	58.8	2,321,613.8	8.8	69.7	5.5
5-6	48.0	1,930,250.4	7.2	76.9	5.6
6-7	40.7	1,650,247.5	6.2	83.1	5.5
7-8	35.1	1,412,099.0	5.3	88.4	5.5
8-9	29.8	1,135,237.4	4.2	92.6	5.5
9-10	22.5	860,941.9	3.3	95.9	5.5
10-11	17.2	623,461.9	2.4	98.3	5.5
11-12	11.6	335,447.7	1.3	99.6	5.4
12-13	4.3	96,265.6	0.4	100	5.4
13-14	0.63	11,608.4	0.0	100	5.5
14-15	0.03	435.0	0.0	100	5.3
Total		26,469,722.4			

Additional temperature and DO data collection was conducted at the sixth monitoring event up- and downgradient of the Wilbraham Road culvert along the North Branch of the Mill River for comparison to the drawdown pool water measurements in the May 2021 report. These data were not collected in July 2021 as the water level was too high and safety concerns prohibited sampling in these locations.

Groundwater levels were measured at the six stations by auguring a 3-inch diameter hole to a depth of at least 24 inches and allowing time for equilibration. The observed depths to groundwater are shown in **Table 4**.

**Table 4. Watershops Pond Drawdown Groundwater Monitoring Measurements (inches below ground surface)
Date of Data Collection: 7/19/2021 11:00AM – 12:30 PM**

Date	Springfield College	Springfield College East Campus		GYSGT J. Sullivan Park		
	Station 1	Station 1	Station 2	Station 1	Station 2	Station 3
7/19/2021	-24+	-24+	-24+	-12	-5	-1

Note: Depths denoted with a “+” indicate that groundwater was not observed at this depth

DISCUSSION

The Plan suggested the action level for DO should be 5 mg/l for at least 75% of the surface waters in the residual pool. During the July 19, 2021, monitoring event, this standard was met as the average DO concentration exceeded 5.3 mg/l at all contour elevations. This result is in line with expectations and indicates that the water temperature is slowly increasing and DO decreasing with increased air temperatures.






As temperatures continue to increase, it is likely that DO levels will markedly decrease. Based upon the average DO concentration observed at the end of the 2020 growing season in late September, there might be reason to reconsider the “5 mg/l for at least 75% of the surface waters” action level. The average DO concentration observed in late September under normal pond conditions indicated approximately 67% of the pond volume met the suggested minimum DO of 5 mg/l. This indicates that the Watershops Pond biota likely experience lower average DO concentrations across a large percentage of the basin on a normal basis, especially since the September sampling event represented less extreme conditions than those likely to be encountered during peak summer months. While no change of the standard is recommended at this time, the action level to trigger mitigation measures such as aeration may want to be reconsidered as the 2021 growing season progresses. Nevertheless, with about 90% of the residual pool basin less than 2 feet deep, during most 2021 sampling events, shallow adequate DO levels may persist due to wind perturbation of the pool surface. GZA will continue to monitor the pond conditions and initiate discussions should the DO not meet the currently suggested attainment standards.

Though increased water elevation was anticipated due to the significant precipitation in the first half of July, the 10-foot range exceeded expectations. Future sampling events are unlikely to encounter this water elevation again. The sustained rainfall over time did not result in as significant an increase in turbidity and decrease in DO as observed in May. This may be due to the frequency of rain events. In May, the rainfall was preceded by dry weather, where July has had rainfall every or every-other day. This consistent rainfall may not mobilize as much sediment, or it may flush the water through the system more quickly. Additionally, the rain may result in more oxygenated water entering the pond, or the surface perturbation may be sustaining DO levels above the action threshold.

The groundwater levels in the wetlands were expected to drop with the Watershops Pond drawdown. Given the significant rainfall in July, these depths to groundwater decreased at three stations within the sampled depth. Groundwater depths will continue to be monitored throughout the growing season. These data will be discussed and analyzed further in the annual wetland monitoring report. Following the refilling of the pool, wetland impacts, and potential mitigation measures will be discussed.

LEGEND

DISSOLVED OXYGEN PROFILE LOCATIONS

-  ACTUAL POST-DRAWDOWN
-  PROPOSED POST-DRAWDOWN
-  PROPOSED PRE-DRAWDOWN

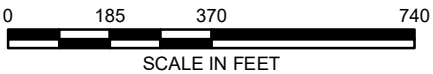


© 2021 - GZA GeoEnvironmental, Inc. J:\0 166600 - 0 166699\15.0166625.20 Watershops Pond Dam\GIS\mxd\DrawdownMonitoringReport\Fig1A_DO_Monitoring_Location.mxd, March 25, 2021 - 2:21:13 PM, Adrienne.dunk



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 1 ALLEN STREET
 SPRINGFIELD, MASSACHUSETTS

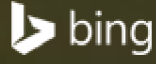
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 CDBG-NDR GRANT#B-13-MS-25-0002

**DISSOLVED OXYGEN PROFILE
 MONITORING LOCATIONS**

PROJ MGR: JRB	REVIEWED BY: TEJ	CHECKED BY: SLL
DESIGNED BY: ARD	DRAWN BY: ARD	SCALE: 1 in = 350 ft
DATE: 03/25/2021	PROJECT NO: 15.0166625.20	REVISION NO:

FIG.
1A

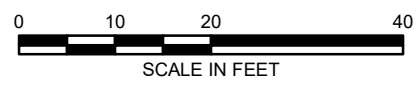


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LEGEND

- + MONITORING STATION
- WETLAND BOUNDARY POINT
- OBSERVED MEAN HIGH WATER
- WETLAND BOUNDARY
- BVW SURVEY AREAS
- PROJECT AREA



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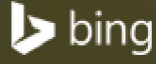
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1 ALLEN STREET
SPRINGFIELD, MASSACHUSETTS

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Engineers and Scientists
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SPRINGFIELD COLLEGE BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 2
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DATE: 11/24/2020	PROJECT NO: 15.0166625.20	REVISION NO:	

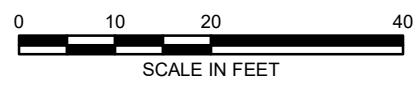


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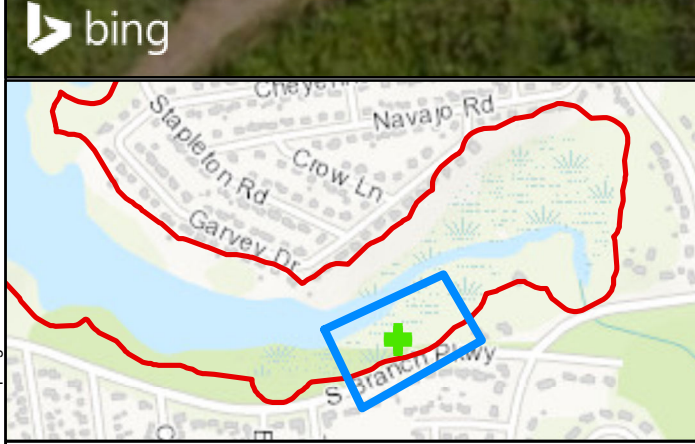
RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM
1 ALLEN STREET
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SPRINGFIELD COLLEGE
EAST CAMPUS BVW

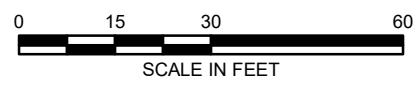
PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 3
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 20 ft	
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GYSGT. J. SULLIVAN PARK BVW

PROJ MGR: TEJ	REVIEWED BY: TEJ	CHECKED BY: SLL	FIG. 4
DESIGNED BY: JRB	DRAWN BY: ARD	SCALE: 1 in = 30 ft	
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