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RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM DRAWDOWN PERIOD MONITORING REPORT #4

APRIL 14, 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: Paul G. Davis, PhD, Adrienne Dunk

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 fourth 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 has 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. Groundwater 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 fourth 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 April 14, 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 17 acres upgradient of the dam where the water exits the pond basin through the sluice gates. The maximum pool depth is slightly over 4 feet, with most of the pool area less than 2 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 140.80± which is approximately 0.5± feet lower than the water surface elevation that was measured in March 2021 and approximately 0.1± feet higher than measured in December 2020.

Based upon the Secchi Disk depth, the water within the pool basin was observed to be more turbid than the March sampling event; Secchi Disk depths recorded at 3.3 feet deep. Watershops Pond had an average temperature of 12.6° C for locations measured. The measured temperatures ranged from 12.0° C to 14.0° C. The DO exceeded 9 mg/l for all samples (**Table 1**) except at the bottom sediment surface at one location.

Table 1. Watershops Pond Drawdown Pool Dissolved Oxygen, Temperature, and Secchi Depth Measurements
Date of Data Collection: 04/14/2021 10:00AM – 12:00 PM

| Wednesday 04-14-2021; 10:30 AM | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------|--------------|-----------|---------|---------------------------------------------------------------------------------|------------|-----------|---------|------------------------------------------------------------------------------------------------|------------|-----------|---------|
| Surface Water Elevation: 140.80' 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 |
| 3.0 | 0 | 9.0 | 12.4 | >1.5 | 0 | 9.7 | 14.0 | 3.3 ft | 0 | 9.5 | 12.8 |
| | 1 | 9.0 | 12.3 | | 1 | 9.9 | 13.9 | | 1 | 9.5 | 12.4 |
| | 2 | 9.1 | 12.2 | | 1.5-bottom | 10.0 | 13.9 | | 2 | 9.3 | 12.2 |
| | 3 | 9.1 | 12.1 | | | | | | 3 | 9.2 | 12.1 |
| | 3.3 - bottom | 8.7 | 12 | | | | | | 4 | 9.2 | 12.1 |
| | | | | | | | | | 4.3-bottom | 9.8 | 12.1 |



The average DO concentration at each depth range of the water column is shown in **Table 2**. Because the DO concentration changed very little over depth, the entire water column was above 9 mg/l. The slight elevation of DO at the bottom surface at two locations is suggestive of initial start of growth of bottom filamentous green algae.

Table 2. 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) (from Table 1) |
|------------|------------------------------------|--------------------------------------------|----------------------------------------------|----------------------------------|----------------------------------|
| 0-1 | 17.2 | 623,461.0 | 58.4 | 58.4 | 9.4 |
| 1-2 | 11.6 | 335,447.7 | 31.3 | 89.8 | 9.5 |
| 2-3 | 4.3 | 96,265.6 | 9.0 | 98.8 | 9.5 |
| 3-4 | 0.63 | 11,608.4 | 1.1 | 99.9 | 9.2 |
| 4-5 | 0.03 | 435.0 | 0 | 99.9 | 9.0 |
| 5-6 | 0 | 0 | 0 | 99.9 | 9.8 |
| Total | | 1067217.7 | | | |

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 3**.

Table 3. Watershops Pond Drawdown Groundwater Monitoring Measurements (inches below ground surface)
Date of Data Collection: 04/14/2021 11:00AM – 1:00 PM

| Date | Springfield College | Springfield College East Campus | | GYSGT J. Sullivan Park | | |
|-----------|---------------------|---------------------------------|-----------|------------------------|-----------|-----------|
| | Station 1 | Station 1 | Station 2 | Station 1 | Station 2 | Station 3 |
| 4/14/2021 | -27+ | -27+ | -27+ | -6 | -6 | -27+ |

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 April 2021 monitoring event, this standard was met as the average DO concentration exceeded 9.0 mg/l at all contour elevations. This is an unsurprising result during the early-growing season with low water column temperatures.

The groundwater levels in the wetlands were expected to drop with the Watershops Pond drawdown. 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

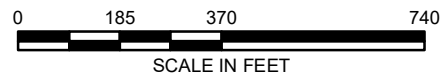


© 2021 - GZA GeoEnvironmental, Inc. J:\0 166600 - 0 166699\15.0166625.20 Watersheds Pond Dam\GIS\mxd\DrawdownMonitoringReport\Fig1A_DO_Monitoring_Location.mxd, March 25, 2021 - 2:21:13 PM, Adrienne.dunk



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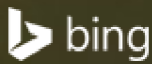
RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM
1 ALLEN STREET
SPRINGFIELD, MASSACHUSETTS

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 **GZA GeoEnvironmental, Inc.**
Engineers and Scientists
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PREPARED FOR:
CITY OF SPRINGFIELD
NATIONAL DISASTER RESILIENCY PROGRAM
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**DISSOLVED OXYGEN PROFILE
MONITORING LOCATIONS**

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

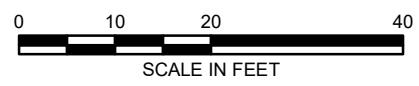


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LEGEND

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



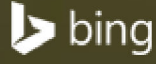
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RESILIENCY IMPROVEMENTS AT WATERSHOPS POND DAM
1 ALLEN STREET
SPRINGFIELD, MASSACHUSETTS

| | |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
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|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|

SPRINGFIELD COLLEGE BVW

| | | | |
|------------------|---------------------------|---------------------|---------------|
| PROJ MGR: TEJ | REVIEWED BY: TEJ | CHECKED BY: SLL | FIG. 2 |
| DESIGNED BY: JRB | DRAWN BY: ARD | SCALE: 1 in = 20 ft | |
| DATE: 11/24/2020 | PROJECT NO: 15.0166625.20 | REVISION NO: | |

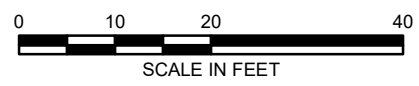


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LEGEND

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



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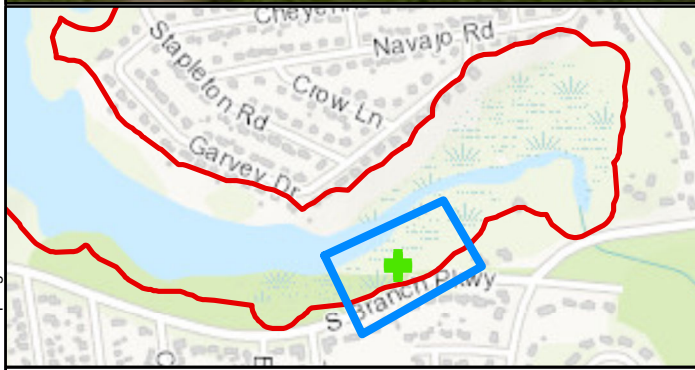
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SPRINGFIELD COLLEGE
EAST CAMPUS BVW

| | | | |
|------------------|---------------------------|---------------------|-------------------------|
| PROJ MGR: TEJ | REVIEWED BY: TEJ | CHECKED BY: SLL | FIG. 3 |
| DESIGNED BY: JRB | DRAWN BY: ARD | SCALE: 1 in = 20 ft | |
| DATE: 11/25/2020 | PROJECT NO: 15.0166625.20 | REVISION NO: | |



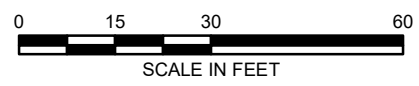
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LEGEND

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

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| | | | |
|------------------|---------------------------|---------------------|---------------|
| PROJ MGR: TEJ | REVIEWED BY: TEJ | CHECKED BY: SLL | FIG. 4 |
| DESIGNED BY: JRB | DRAWN BY: ARD | SCALE: 1 in = 30 ft | |
| DATE: 11/24/2020 | PROJECT NO: 15.0166625.20 | REVISION NO: | |