

17 October 2024

TECHNICAL MEMORANDUM

TO: Delia Kaye, Natural Resources Director

FROM: Amy Hunt, PE, Senior Engineer
Erika Towne, PE, Project Engineer

SUBJECT: Warner's Pond Dam Removal Preliminary Design
North Field Capacity
EA Project No. 64040-01-00-LS

EA Engineering, Science, and Technology, Inc., PBC (EA) was contracted by the Town of Concord (the Town) in September 2023 to prepare preliminary engineering designs for the removal of the Warner's Pond dam. EA's scope of services under this contract also includes a general evaluation of up to five alternative/supplemental projects related to the management and/or restoration of Warner's Pond. Based on our discussions with the Town, one such project is the dredging of Warner's Pond. As part of the evaluation of this project idea, the Town requested that EA calculate the potential storage capacity of the field north of Warner's Pond and immediately south of Route 2 (see Figure 1) in the context of a potential dredged material disposal location. The Town has suggested that a certain depth of material could be excavated from this field to provide additional storage capacity for dredged material; this assumption was included in the analysis. This technical memorandum summarizes the methodology and results of this volumetric analysis.

DATA SOURCES

The data required for this analysis consists of (1) the horizontal limits of the proposed dredged material disposal location, (2) a topographic surface of the proposed dredged material disposal location, and (3) the depth of existing soil to be excavated prior to placing dredged material at this location. The following sections describe the data sources.

Horizontal Limits

The Town identified the parcel to be used for the analysis (AP 8D, Map 2014). The owner of record of the subject parcel is the Commonwealth of Massachusetts and the total lot size is approximately 18.1 acres. The Town indicated that the limit of proposed dredged material disposal should include the open field portion of this parcel (approximately 10.7 acres) while excluding areas of trees and the access road located at the western end of the parcel. Figure 2 shows the horizontal limits of the proposed dredged material disposal location.

Topographic Data

EA used the 2021 US Geological Survey (USGS) LiDAR of Central/Eastern Massachusetts for the topographic surface. A digital elevation model (DEM) of the LiDAR was downloaded from

the National Oceanic and Atmospheric Administration (NOAA) Data Access Viewer on February 21, 2024. Figure 2 shows the existing topography of the site.

Existing Soil Excavation Depth

The Town and the property owner visited the proposed dredged material disposal location on 11 September 2024 to determine the approximate depth of topsoil throughout the proposed dredged material disposal location (see Figure 3 for locations of test pits). The results of the field visit are presented in Table 1.

Table 1. Approximate Topsoil Depths

Test Pit Number	Depth of Topsoil (feet)
1	0.8
2	1.0
3	2.0
4	1.8
5	1.3
6	1.0
7	1.3
8	1.0
9	1.5
10	2.0

These results indicate that the median depth of topsoil across the 10 test pits was 1.3 feet.

VOLUMETRIC ANALYSIS

The volumetric analysis was performed in Autodesk Civil 3D using a volume surface. The inputs required for a volume surface are two triangulated irregular network (TIN) surfaces; one surface representing the existing ground surface elevations and one surface representing the proposed (e.g., following the placement of dredged material) ground surface elevations. The volume surface consists of multiple polyhedrons that are created between the TIN surfaces, and Civil 3D adds the volume of the polyhedrons together to calculate the total volume between surfaces. The following sections describe the methodology and assumptions for creating the two TIN surfaces.

Methodology

The existing conditions TIN surface was created by lowering the LiDAR surface to represent the excavation of topsoil material that could occur prior to placing dredged material. The surface was lowered by 1.3 feet, which is the median depth of all topsoil measurements as discussed previously.

The proposed conditions TIN surface was created under the following assumptions. EA was instructed by the Town to assume that the dredged material stockpile would be contained within the horizontal limits of the area as discussed previously, and that the elevation of the dredged material stockpile would not exceed the elevation of Route 2 to the north, of the BFRT to the south, of the dirt road to the west, or encroach upon the existing areas of trees around portions of

the field. The height and extent of fill near the established vegetation was more conservative (i.e. the boundary line was offset from the vegetation based on aerial imagery and the proposed conditions elevation was not as high as near the adjacent roads). This was due to the higher uncertainty of the accuracy of LiDAR ground elevations that occurs when there is dense vegetation that can cause interference with the LiDAR data collection. The proposed elevations and extent of the proposed surface was generated from a 3D line drawn around the perimeter of the proposed dredged sediment disposal location that has elevations corresponding to the unmodified existing conditions LiDAR surface. This 3D line was then used to create the proposed conditions TIN surface.

Results

The volumetric capacity of the proposed dredged material disposal location based on the parameters discussed previously was calculated to be approximately 49,500 cubic yards (cy) (Figure 4). Figure 5 displays two small areas where the lowered ground surface is still above the elevation of Route 2 and the BFRT. These areas are also represented by gaps in the volume surface in Figure 4. Since these areas are above the elevation of Route 2 and the BFRT, no fill would be placed in these locations.

Assumptions and Limitations

The following assumptions were made in the volumetric capacity analysis of the north field:

- 1.3 feet of topsoil will be excavated prior to placement of dredged material;
- the dredged material stockpile will be contained within the horizontal limits of the area; and
- the elevation of the dredged material stockpile will not exceed the elevation of Route 2 to the north, of the BFRT to the south, of the dirt road to the west, or encroach upon the existing areas of trees around portions of the field.

The approximate volumetric capacity of the subject site as calculated through this analysis is not necessarily equal to the final volume of dewatered sediment that could realistically be accommodated in this area as part of a hydraulic dredging project. The volume of material removed in a hydraulic dredging project is between 80-90% water, and an evaluation of dewatering and water management methods for this area would be necessary to better determine the practical capacity of this site as part of such a project. Additional construction-related considerations such as access, staging, erosion and sedimentation controls, and other factors would also be needed to further refine the capacity of this site.

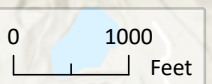
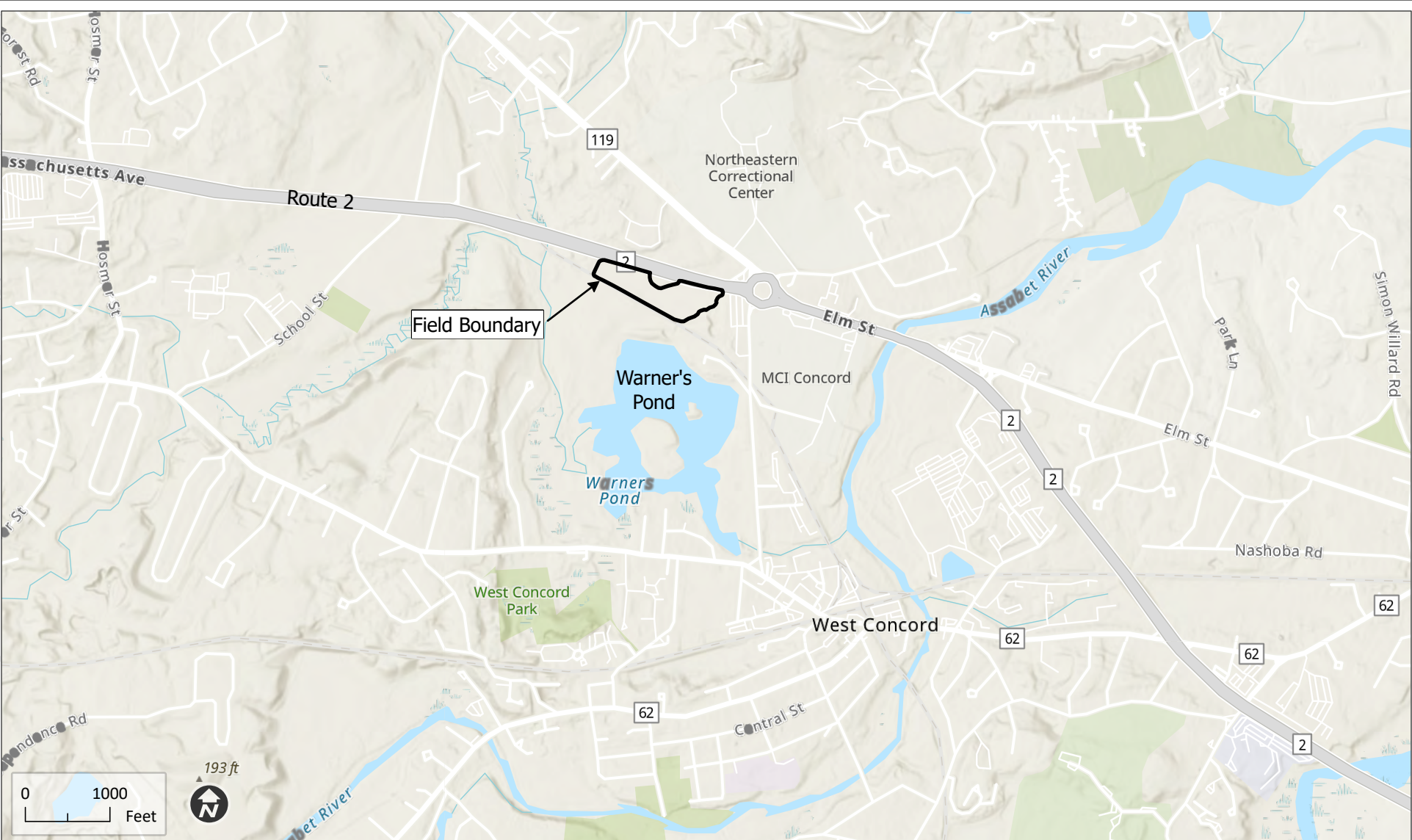
Figures

- 1 Site Location
- 2 Existing Conditions
- 3 Test Pit Locations
- 4 Storage Capacity of Field
- 5 No Fill Areas

Figures

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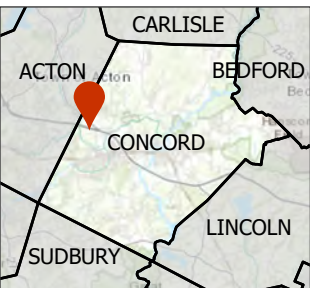
 Field Boundary

Figure 1 Site Location

Warner's Pond
North Field Capacity
Concord, Massachusetts



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- 1-Foot Contour
- Field Boundary

Figure 2
Existing Conditions

Warner's Pond
North Field Capacity
Concord, Massachusetts

Data Source: MassGIS 2023 Contours from USGS 2021 Lidar



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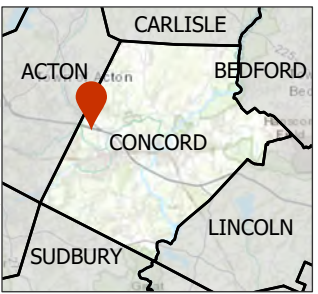


Figure 3
Test Pit Locations

Warner's Pond
North Field Capacity
Concord, Massachusetts

Image provided by Natural Resources Division



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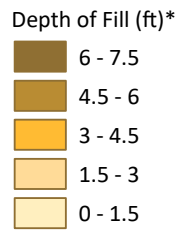
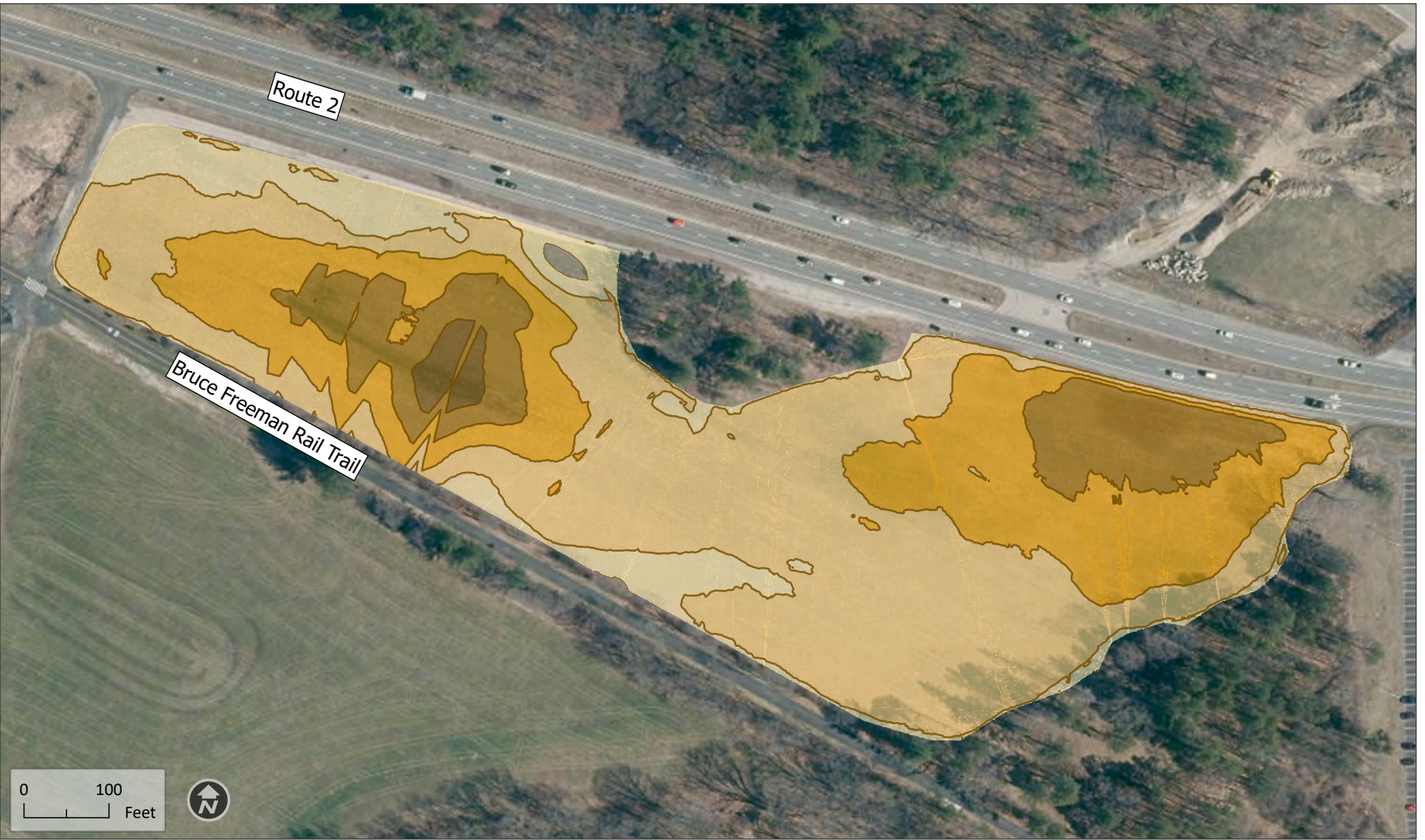


Figure 4 Storage Capacity of Field

Warner's Pond
North Field Capacity
Concord, Massachusetts

*Depth assumes 16 inches of soil removed prior to placement.
Total volumetric capacity is approximately 49,500 CY.



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- Fill
- No Fill

Figure 5
No Fill Areas

Warner's Pond
North Field Capacity
Concord, Massachusetts

