

City of Greensboro Air Harbor Reservoir Evaluation Engineering Scope of Services September 27, 2016

Project Overview

The City of Greensboro (City) has requested a scope and fee from HDR Engineering Inc. of the Carolinas (HDR) to conduct a study to assess the current condition of the City's Air Harbor Raw Water Reservoir. The existing reservoir currently has showed some signs of distress including bowed walls and possible leakage to adjacent areas. HDR will evaluate structural options for rehabilitating the reservoir, and will also determine from a process and water quality standpoint if the current reservoir should be modified and/or replaced to optimize water quality to the existing N.L. Mitchell Water Treatment Plant (WTP).

Background

Raw water for the Mitchell WTP is provided by the Lake Brandt Pump Station which pulls water from Lake Brandt. The Pump station conveys water to the Air Harbor Raw Water Reservoir where it flows by gravity to the Mitchell WTP. The Air Harbor Raw Water Reservoir was constructed in mid 1920's and is an open top square with concrete walls. The approximate plan dimensions are 440 square feet, and it is situated mostly below grade. Besides providing storage, the reservoir also provides performance function as a pre-sedimentation basin. Previously taking the reservoir out of service for cleaning was problematic, however, some recent piping modifications have allowed for taking the reservoir out of service, draining and cleaning of the reservoir to allow a structural condition assessment. Due to its age and critical role in conveyance of raw water to the Mitchell WTP, it is necessary to inspect the tank to determine its condition, potential required repair work, and overall useful life.

Additionally, the City would like for HDR to evaluate the reservoir's role in water treatment performance in terms of turbidity, TOC, and dissolved metals reduction to determine its true benefit to treatment performance.

Scope of Services

This scope of services is subdivided into the following tasks:

- Task 1.0: Project Management
- Task 2.0: Review Background Information
- Task 3.0: Evaluate Water Treatment Performance of Reservoir
- Task 4.0: Develop and Implement an Assessment Plan
- Task 5.0: Develop Reservoir Alternatives
- Task 6.0: Operational Solids Removal Options
- Task 7.0: Contingency
- Task 8.0: Opinions of Probable Construction Cost

- Task 9.0: Phasing and Continuity of Operations
- Task 10.0: Develop Report to Document Evaluation

Task 1.0: Project Management and Meetings

HDR will perform project administration activities throughout the duration of the Project, including maintaining a Project filing system for storage and retrieval of documents, managing subcontractors, preparing monthly invoices for services, and maintaining a Project Cost Accounting system. The Engineer will apply on-going quality assurance and quality control (QA/QC) procedures throughout the duration of the Project.

HDR will host a kick-off meeting, as well as four (4) project meetings are anticipated during the project. Meeting notes will be provided to document the meetings.

Task 2.0: Review Background Information

Existing record drawings, past reports, Lake Brant Pump Station capacity information, transmission main modifications, relevant water quality data, and hydraulic grade line information will be reviewed and staff will be interviewed to gain historical knowledge regarding the reservoir.

Task 3.0: Evaluate Water Treatment Function and Performance

The impact that the reservoir has on water quality and treatability will be assessed. This will be accomplished using historical water quality data from Lake Brandt, Air Harbor Reservoir and the Mitchell WTP. If necessary, HDR will identify any additional short-term water quality testing to be completed by the City to better understand the impact of the reservoir on water quality. Key parameters to be assessed include TOC, iron and manganese, pH, alkalinity, and turbidity.

Task 4.0: Develop and Implement an Assessment Plan

This task will include developing and implementing a plan to evaluate the reservoir from a structural standpoint.

HDR will utilize a subconsultant (S&ME, Inc.) to obtain wall and floor core samples to establish construction and gage condition. S&ME will also perform hand augured geotechnical borings to establish condition of subgrades under the bottom slab of the reservoir. Petrographic analysis of up to 5 of the cores will be performed to determine the makeup of the concrete.

HDR will utilize an M/WBE subconsultant (JC Waller & Associates, PC) to survey the reservoir to determine physical attributes, and determine wall displacements since original construction.

HDR will utilize an M/WBE subconsultant (Kennerly Engineering and Design, Inc.) will be utilized to perform catalog all structural deficiencies at the reservoir including spalled concrete, exposed rebar and cracks. A report will be provided that maps the location of each item, size, length and photographs included of each item.

HDR will provide a site visit by structural engineer to assess the condition of the reservoir after the subconsultants have prepared their evaluations and reports. It is noted that this work shall be done after the reservoir has been emptied and cleaned (by the City) in order to obtain the best value and most appropriate recommendations. HDR will use the results of this

investigation to evaluate to identify the need and type of rehabilitation options to address any identified structural deficiencies.

Task 5.0: Develop Reservoir Alternatives

HDR will identify and evaluate alternatives for the long-term disposition of the reservoir including: eliminating and decommissioning the reservoir, constructing new reservoir on same site, constructing new reservoir on alternate site, and repairing and/or lining existing reservoir reducing the size of the reservoir and providing the identified improvements.

Compartmentalizing will also be considered to allow for isolating sections of the reservoir for future maintenance and repair. The alternatives analysis will include an identification of the advantages and disadvantages associated with each option.

Task 6.0: Operational Solids Removal Options

HDR will evaluate options for future solids removal from the reservoir. This task will focus on options for sediment removal in conjunction with any alternatives developed in Task 5.0.

Removal options to be considered include routine manual cleaning by taking the reservoir out of service, fixed mechanical removal devices and a mobile dredge. The evaluation will consider options for disposing of the solids and a cleaning frequency.

Task 7.0: Contingency

Contingency to be used for additional unforeseen tasks. Contingency will only be used with prior authorization from City.

Task 8.0: Opinions of Probable Construction Cost

Preliminary Opinions of Probable Construction Cost will be developed for each alternative developed in Tasks 4.0, 5.0, and 6.0.

Task 9.0: Phasing and Continuity of Operations

Phasing and continuity of operations will be considered for each alternative in Tasks 5.0 and 6.0.

Task 10.0: Develop Report to Document Evaluation

A draft and final report will be developed to document the findings and present a recommended alternative for Air Harbor Reservoir. Five (5) hard copies will be provided for draft and final reports, as well as a PDF version. HDR will update the draft report to reflect comments received from the City.

Schedule

See Attachment A.

Payments to Engineer

Compensation for the services outlined in Tasks 1.0 to 10.0 above shall be on a Lump Sum basis. Monthly invoices will be based on actual work completed. The Lump Sum amount shall be \$199,500 based upon the following breakdown:

Task 1.0: Project Management	\$30,000
Task 2.0: Review Background Information	\$6,500
Task 3.0: Evaluate Water Treatment Function and Performance	\$20,000
Task 4.0: Develop and Implement an Assessment Plan	\$62,000
<i>S&ME (\$15,000 = 7.5%)</i>	
<i>Kennerly Engineering (\$12,000 = 6.0%)</i>	
<i>JC Waller (\$11,000 = 5.5%)</i>	
Task 5.0: Develop Reservoir Alternatives	\$28,000
Task 6.0: Operational Solids Removal Options	\$4,500
Task 7.0: Contingency	\$8,000
Task 8.0: Opinions of Probable Construction Cost	\$8,500
Task 9.0: Phasing and Continuity of Operations	\$7,000
Task 10.0: Develop Report to Document Evaluation	<u>\$25,000</u>
Total Fee:	\$199,500