CDM Smith

Memorandum

To: *Paul Holzen, PE*

From: *Dave Mason, PE*
Zack Daniel, PE

Date: *August 15, 2017*

Subject: *Scope of Work for Robinson Lake Dam – Conceptual Engineering Report (CER)*
Franklin, Tennessee

The purpose of this memorandum is to provide a scope of work and cost proposal for performing investigations and analyses and preparing a Conceptual Engineering Report (CER) for rehabilitation measures for Robinson Lake Dam in Franklin, Tennessee.

Background

The existing dam for Robinson Lake is an earth embankment dam with a concrete spillway in the right abutment area discharging to the Harpeth River. The dam has a structural height of 22.5 feet and hydraulic height of 19 feet, with a storage capacity of 91 acre-feet at normal pool and 136 acre-feet at maximum pool.

CDM Smith was recently engaged by the City of Franklin to perform a preliminary assessment of Robinson Lake Dam prior to the City's acquiring the property on which the dam and lake are located. The purpose of the assessment was to identify potential dam safety deficiencies and provide recommendations for future actions. As a follow-up to that initial assessment, the City has requested that CDM Smith perform a conceptual design evaluation to identify potential deficiencies, provide a proposed alternative for rehabilitation (as needed), and provide an refined opinion of probable construction cost (OPCC).

Scope of Services

Task 1.0 Project Kickoff Meeting

CDM Smith will conduct a project kickoff meeting within one week from receipt of a written authorization from the City. This meeting will ensure that all parties understand the scope, schedule, budget, and individual responsibilities for project completion. City staff and key CDM Smith team members will attend this project meeting at the City's office. Other appropriate CDM Smith team members will attend via conference call.

CDM Smith will prepare and distribute a summary of meeting minutes to document items discussed with the parties in attendance.

Task 2.0 Data Collection

CDM Smith will review existing information that may include:

- Recent and historical aerial photography of the study area.
- Topographic/survey information provided by others, include field survey and bathymetric survey
- GIS data of the Robinson drainage basin and surrounding area.

This scope of work assumes that Barge Waggoner Sumner and Cannon (BWSC) have completed a field survey sufficient to support this project. CDM Smith will review and incorporate this survey into the work products and deliverables. If the survey provided by BWSC is not sufficient to support the evaluation and conceptual design, CDM Smith will use the City's LiDAR data to generate 1-foot contours for use during the conceptual design. Additional field survey may be required for future phases of the work to refine the design.

CDM Smith will also engage a local geotechnical drilling and geophysical firm to perform field explorations in the dam and downstream areas to investigate subsurface conditions and identify potential karst features. The geotechnical exploration will consist of up to four standard penetration test (SPT) borings: two through the crest of the dam and into the foundation soils and two at the toe of the dam section. Up to two of the borings will be completed as piezometers to monitor water levels through the existing dam. Geophysical studies will be performed along the dam and downstream area. Up to four transect locations are anticipated, one along the dam crest, two perpendicular to the dam crest extending into the downstream areas, and one parallel to the spillway channel. CDM Smith's level of effort for this task includes field oversight by a qualified geotechnical engineer to direct the work and verify that appropriate methods are used. This oversight is typical for CDM Smith projects where dam safety investigations are performed.

Geotechnical laboratory tests will be performed on selected samples from the borings. The tests will include grain size tests, moisture content, Atterberg limits, and triaxial tests.

Task 3.0 TDEC Dam Safety Coordination

CDM Smith will coordinate with TDEC Dam Safety staff to review the project and confirm regulatory requirements. We will also confirm dam break study requirements for determination of dam hazard classification. CDM Smith will prepare a summary of conversations with TDEC Dam Safety to document their direction on this project.

Task 4.0 Studies & Analyses

Task 4.1 Dam Break Study

CDM Smith will perform an analysis to develop a Simplified Inundation Map (SIM) for the identification of potential downstream impacts. The inundation maps will be utilized to confirm/recommend dam hazard classification, which will determine the required spillway design flood. Hazard classification will be confirmed with Dam Safety prior to proceeding with design alternatives for additional spillway capacity (if required). SIMS are developed for guidance only

and are not meant to displace any state or federal regulatory requirement or the need for detailed inundation mapping for assessment of downstream hazard potential. Additional analysis may be required for future phases of this project.

Task 4.2 Hydrologic and Hydraulic Model Development & Analysis

CDM Smith will develop hydrologic and hydraulic (H/H) models for the Robinson Lake drainage area, dam, spillway, and downstream areas.

CDM Smith will delineate the approximate drainage basin boundary by using available data collected as part of Task 2.0 (topographic data and prior survey information). The hydrologic model will consist of basin-specific data including soils and overland flow path characteristics.

CDM Smith will develop a hydraulic model of the Robinson Lake Dam, including the dam, spillways, and downstream areas. CDM Smith will utilize the model to confirm the existing spillway capacity and to develop one proposed spillway configuration to meet the relevant dam safety spillway requirement.

Task 4.3 Geotechnical Analyses

CDM Smith will perform preliminary geotechnical design analyses for the current dam structure and the proposed rehabilitation design. The analyses will include slope stability, seepage, and karst potential.

Task 4.4 Progress Meeting No. 1

A progress meeting will be conducted near the end of Task 4.2 to present the findings for Tasks 2.0 and 3.0 and to discuss the plan for conceptual design in Task 5.0. Based on the discussions during this meeting, CDM Smith will develop one proposed conceptual design to address identified dam safety deficiencies. This proposed design will serve as the basis for the cost evaluation performed. City staff and the CDM Smith project manager will attend this progress meeting which will be held at the City's office. A CDM Smith geotechnical representative will attend via conference call.

CDM Smith will prepare and distribute a summary of meeting minutes to document items discussed with all parties in attendance.

Task 5.0 Conceptual Design

Task 5.1 Conceptual Design Development and Evaluation

CDM Smith will develop one conceptual design and will provide a plan view, cross-section view, and one detail sheet for this concept.

Task 5.2 Conceptual Design Deliverable

CDM Smith will prepare a Conceptual Engineering Report (CER) as a 10-percent design package summarizing the rehabilitation measures. The report will summarize the data collection completed, provide the updated modeling and analyses completed under Task 2.0, and will include 11x17" conceptual design figures.

The report will generally be presented as follows:

- Summary of data collection
- Hydrologic/hydraulic and geotechnical analyses.
- Summary of Conceptual Design.
- Summary of Permitting Requirements.
- Opinion of probable construction cost (OPCC).
- Conceptual Design Figures.

Three hard copies and one digital copy of the CER will be provided to the City for review. Comments will be incorporated and three hard copies and one digital copy of the final CER will be provided to the City.

Task 5.3 Progress Meeting No. 2

Progress Meeting No. 2 will be held after the City has reviewed the conceptual design and provided written comments to CDM Smith. Based on the discussions during this meeting, CDM Smith will provide written responses to the City's comments and provide a final CER.

CDM Smith will prepare and distribute a summary of meeting minutes to document items discussed with all parties in attendance.

Final design, permitting, bidding, or construction services are not included in this scope of work.

Schedule

CDM Smith will begin work on this project within one week from receipt of a written authorization from the City. Due to the time-sensitive nature of this work, this authorization may simply be an email from staff asking us to proceed. It is anticipated that the hydrologic/hydraulic modeling and geotechnical studies will be completed within 45 calendar days of receipt of topographic and land survey information. The conceptual design deliverables will be completed within 45 days of the first progress meeting with the City.

Compensation

CDM Smith will perform Tasks 1.0 through 5.0, billed hourly, for a not-to-exceed upper limit of $97,100, which includes CDM Smith labor, outside professionals (including 5% markup for administration), and other direct costs (see attached budget sheet). Invoices will be submitted to the City monthly based on hours completed and charges incurred within the billing period. A project status report will accompany each invoice.

City of Franklin, Tennessee
Lake Robinson Dam Conceptual Design Study
August 2017

Task	Description	Task Hours	Labor Cost	Other Direct Costs	Total Cost
1	**Project Kick-off Meeting**	**16**	**$ 2,900**	**$ 1,000**	**$ 3,900**
2	**Data Collection**	**71**	**$ 9,100**	**$ 23,300**	**$ 32,400**
	Review of Available Information	15	$ 2,400.00	$ -	$ 2,400
	Geotechnical Investigations	56	$ 6,700.00	$ 23,300	$ 30,000
3	**TDEC Dam Safety Coordination**	**18**	**$ 3,100**	**$ -**	**$ 3,100**
4	**Studies & Analyses**	**138**	**$ 19,100**	**$ -**	**$ 19,100**
	Dam Break Study	**17**	$ 2,400.00	$ -	$ 2,400
	Hydrologic and Hydraulic Modeling & Analyses	**46**	$ 5,700.00	$ -	$ 5,700
	Geotechnical Analyses	**64**	$ 8,800.00	$ -	$ 8,800
	Progress Meeting No. 1	**11**	$ 2,200.00	$ -	$ 2,200
5	**Conceptual Design**	**254**	**$ 37,600**	**$ 1,000**	**$ 38,600**
	Conceptual Design Development and Evaluation	**84**	$ 12,700.00	$ -	$ 12,700
	Conceptual Design Deliverable	**110**	$ 15,100.00	$ -	$ 15,100
	Opinion of Probable Construction Cost	**46**	$ 6,900.00	$ -	$ 6,900
	Progress Meeting No. 2	**14**	$ 2,900.00	$ 1,000	$ 3,900
	TOTAL CONTRACT SERVICES =	**497**	**$ 71,800**	**$ 25,300**	**$ 97,100**