SCOPE OF WORK

Date:	May 26, 2020
To:	Tim Washburn (SAFCA) and Melinda Frost-Hurzel (Cosumnes Coalition)
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Project:	20-39: Cosumnes-Blodgett Multi-Objective Project
Subject:	Scope of Work and Budget Estimate

INTRODUCTION

At the request of Tim Washburn (SAFCA) and Melinda Frost-Hurzel (Cosumnes Coalition), cbec eco engineering (cbec) has developed a scope of work and an estimate probable costs of the Cosumnes-Blodgett Multi-Objective Project. The objectives of this project are broadly:

1. To develop a conceptual multi-objective restoration project, through removal of the existing Blodgett Dam and recontouring of floodplains or realignment of the Cosumnes River, in order to restore fish passage, increase ecological performance, and enhance floodplain infiltration.
2. To analyze the concept to determine the increased floodplain infiltration potential of the proposed conceptual project compared to baseline (existing) conditions.

The following sections provide additional details of the tasks included in this scope of work. Unless otherwise stated, all deliverables will be shared digitally with project collaborators.

TASK 1 – Topographic surveys and existing data processing:

Existing Topographic Data

Existing topographic data for the project reach will be acquired and QAQC'd to validate accuracy. A Lidar dataset collected between 2004 and 2007 has been identified for the project area but may require post-processing of the point cloud to before use. All existing topographic data will be reviewed, and the most recent high-quality dataset will be extracted for the project reach.

Groundwater and Infiltration Data

The groundwater recharge and infiltration datasets described in the "Groundwater Recharge Project Monitoring Network" by Brad T Gooch and Laura Foglia will be reviewed for use in this effort.

Field Reconnaissance and Survey

A field survey will be carried out to validate existing topographic data, survey key areas within the project reach, and develop conceptual project designs. The topographic survey will focus efforts nearby in the area directly adjacent Blodgett Dam. Data collection may include use of drones or boat surveys of river bathymetry. Survey extents will be approximately 1,000 feet upstream of the dam and 1,000 feet downstream of the dam. There is significant uncertainty in the quality of the existing topographic and bathymetric data available. Therefore, up to six, 10-hour field days for a two person field crew has been allocated to this effort, with associated data analysis. This amount of survey data collection may not be required, dependent on the quality of existing LiDAR, and we will invoice on a time and materials basis.

Assumptions:

1. The county will be able to confirm the post-processing steps carried out on existing LIDAR

Deliverables:

1. A digital terrain surface representing existing conditions
2. Methodology described in final reporting (Task 5)

Task 2 - Develop existing conditions 1D/2D model:

A 2D hydraulic model of existing conditions will be developed for an area approximately one mile upstream and downstream of Blodgett Dam. The 2D model will be integrated into readily available existing 1D flow models and take advantage of already developed boundary condition. The 2D model will be simulated for a range of flows to evaluate the extent of wetted area across any given year.

1. Simulate a range of flows (up to 10 steady flows from low flow to event that inundates entire floodplain)
2. Develop a rating curve between flow and wetted area
3. Run historic hydrology through rating curve to calculate wetted acre-days across a range of water year types.

Assumptions:

1. Limited calibration and validation of the model will be undertaken to compare the nested 2D model developed for this project with the existing 1D model. Due to the paucity of measured data, detailed calibration and validation will not be possible.

Deliverables:

2. Methodology and results described in final reporting (Task 5)

Task 3 - Develop conceptual plan:

A restoration concept will be developed to maximize ecological enhancement and floodplain infiltration. This will be developed through collaboration with SAFCA, the Cosumnes Coalition and the local water

agency. A Concept Design Meeting will be scheduled at which time elements of the concept will be discussed and finalized. A digital terrain surface will be developed to represent a multi-benefit floodplain restoration concept for further analysis in Task 4.

Assumptions:

Deliverables:

1. Draft concept sketches will be produced in 11x17 format and circulated to the stakeholder group for comment. Further description will be provided in final reporting (Task 5)

Task 4 - Analyze conceptual plan:

A baseline (existing conditions) and Concept (restored) scenario will be evaluated in the 1D/2D Hydraulic model to yield spatial extent of wetted area under both scenarios. The spatial distribution recharge rates across the project area will be delineated into zones. The wetted acre-days under each recharge zone can be evaluated to approximate annual recharge under baseline and Concept (restored) conditions for a range of water year types. Results will be compared between the relative performance for Existing and Concept conditions.

Assumptions:

1. Surface water-groundwater modeling will not be undertaken.
2. Analysis of wetted acre-days will be considered as a surrogate for groundwater recharge.

Deliverables:

1. Methodology and results described in final reporting (Task 5)

Task 5 – Reporting

In this task all prior deliverables will be collated together in one report package. Draft and final deliverables will be produced.

Assumptions:

1. One set of collated comments provided by SAFCA

Deliverables:

1. Draft and final Feasibility Report (PDF)

Task 6 – Project Management

This task will include scheduling, project budget tracking/invoicing, day-to-day coordination, biweekly check-in meetings with SAFCA, Cosumnes Coalition and Water Agency.

Assumptions:

1.

Deliverables:

2. Monthly invoices

BUDGET

The level of effort per task is commensurate with the staff hours defined in the attached budget. Additional effort or study requests will be considered out of scope and may incur extra costs. The estimated cost to perform the full proposed scope of work is **$81,000.**

SCHEDULE

cbec proposes to perform these services in approximately three months from notice to proceed.

CBEC COST MATCH

As an additional research initiative, cbec is willing to put forth extra effort to quantify floodplain recharge free of charge. We will consider this as a Research and Development initiative and we are prepared to contribute an additional **$20,000** match to the project to complete this additional work, over and above the proposal outlined previously. Broadly, cbec will utilize the surface water modeling data/results developed as described through the prior tasks and develop them further as follows.

Due to paucity of available data and complexity of infiltration processes, many surface and groundwater models do not accurately quantify recharge potential. Instead, the recharge suitability or the saturated conductivity of the top layers of soil are often considered. This can misrepresent many of the complex physical processes involved in recharging water beyond the root zone and lead to inaccurate estimates to total recharge. This can be problematic when attempting to compare quantitative estimates of recharge across projects.

cbec is interested in applying robust tools to better quantify floodplain recharge. One way this could be done is by running a vadose zone model to estimate floodplain recharge in distinct hydrogeologic zones within the floodplain. A vadose zone model such as Hydrus 1D can model the physics of variably saturated flow and can represent multiple simultaneous processes such as evapotranspiration from the root zone during infiltration. Running a vadose zone model can more accurately quantify the volume of water recharged through many distinct soil profiles and beyond the root zone. cbec would use the data collected in the nearby “Groundwater Recharge Project”, if provided, to run a vadose model of the 30 feet below the project area. This could provide a more realistic representation of steady recharge rates for distinct areas within the floodplain and river channel. Additional exploration could help understand complex questions regarding quantities and duration of water on the floodplain needed to recharge water past the capillary zone, where water may primarily contribute to evapotranspiration.