APPENDIX C

Yolo Bypass Wildlife Area–Hydraulic Modeling Workplan

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For any proposed restoration project within the Yolo Bypass, hydraulic modeling is an essential element to guide the design of the project and to confirm that performance criteria are being achieved (i.e., adverse affects to flow conveyance are being avoided). This hydraulic modeling is an essential element in permit application submitted to the State Reclamation Board for approval. To improve the probability of permit approval, the hydraulic modeling needs to demonstrate neutral or beneficial hydraulic effects to the 100-year design water surface profile. To facilitate this, the U.S. Army Corps of Engineers (USACE), using CALFED Bay-Delta Program 2002 Ecosystem Restoration Program (ERP) grant funding, has developed a baseline two-dimensional hydraulic model of the Bypass using RMA2 (USACE 2006). Exhibit C-1 (see below), in conjunction with text below, is intended to provide the end-user of the RMA2 model a work plan for guiding design and confirming that performance criteria are being achieved for any proposed restoration project or "encroachment" within the Bypass.

1. PROJECT INITIATION (PHASE I) - IDENTIFY AND CONFIRM THE BASELINE RMA2 MODEL.

a. The baseline RMA2 model originally developed by the USACE (2006) uses the Sacramento/San Joaquin Rivers Comprehensive Study topography and roughness coefficients calibrated to the 1997 flood event.

b. The Comprehensive Study topography is of 1-foot accuracy and lacks detail below the water line (e.g. the Toe Drain) due to the method (LiDAR) used to obtain the topographic surface. Additional topographic and bathymetric data in the Toe Drain and in Liberty Island (areas currently under water) were collected in 2005 to augment the existing data as part of the modeling effort.

c. The calibrated roughness coefficients (see Table 3.4-1) were updated per the land use distribution observed in 2002 aerial photographs.

d. The baseline model should be continually updated to reflect the cumulative effects of permitted encroachments and land use changes. As such, it is imperative to obtain the current baseline model and model history from the "model gatekeeper". The Reclamation Board should also approve the baseline model before moving to Phase II.

   Note: at the time of writing this Land Management Plan (LMP), the "model gatekeeper" has not been identified; as an important step in any future management actions, a "model gatekeeper" should be identified.

2. PROJECT DESIGN / ASSESSMENT (PHASE II) – GUIDE DESIGN AND CONFIRM ACHIEVEMENT OF PERFORMANCE CRITERIA OF THE PROPOSED PROJECT.

a. Install the current baseline RMA2 model.

b. Create a baseline sub-model to encompass the proposed encroachment per USACE recommendations (see User Manual for details).

c. Run the baseline sub-model and verify that sub-model outputs (i.e. depth and velocity) match the model outputs from the larger model. Furthermore, verify that the current baseline water surface profile is less than or equal to the design water surface profile or notify the Reclamation Board if it is not.

d. Create proposed restoration project sub-model(s) by updating the baseline sub-model with proposed topographic and land use conditions. If topographic updates include localized mesh refinements, then grid sensitivity/grid dependency analyses need to be conducted. If proposed land uses differ from those provided in Table 3.4-1 (Chapter 4 of the LMP), formulate proposed roughness coefficients based on engineering judgment (see, e.g., Chow [1959] and Arcement & Schneider [1989]) and composite roughness estimation techniques (e.g. Freeman et al. [2000]) for the mid-to-late winter flood season.

e. Run proposed restoration project sub-model(s) and compare model outputs with baseline sub-model output. To make permit approval more likely, the goal for project design should be that there are neutral or beneficial hydraulic effects to the 100-year design stage and that velocities are not erosive. Furthermore, there should be no hydraulic effects (i.e., beneficial or detrimental) at the sub-model boundaries; if there are adverse hydraulic effects, sub-model boundaries need to be adjusted (i.e., moved sufficiently distant from the area of interest such that boundary forcing effects are not observed).

f. Submit permit application to the State Reclamation Board for review. The permit application should include the hydraulic modeling results for the recommended project. The State Reclamation Board will forward the permit application to the USACE for comment.

g. Address State Reclamation Board and USACE comments and/or refine recommended project by returning to Item 2.d.

h. Following permit application approval by the Board, forward recommended and as-built project sub-models to the model gatekeeper.

3. MODEL UPDATE (PHASE III) – UPDATE MODEL FOR CUMULATIVE EFFECTS.

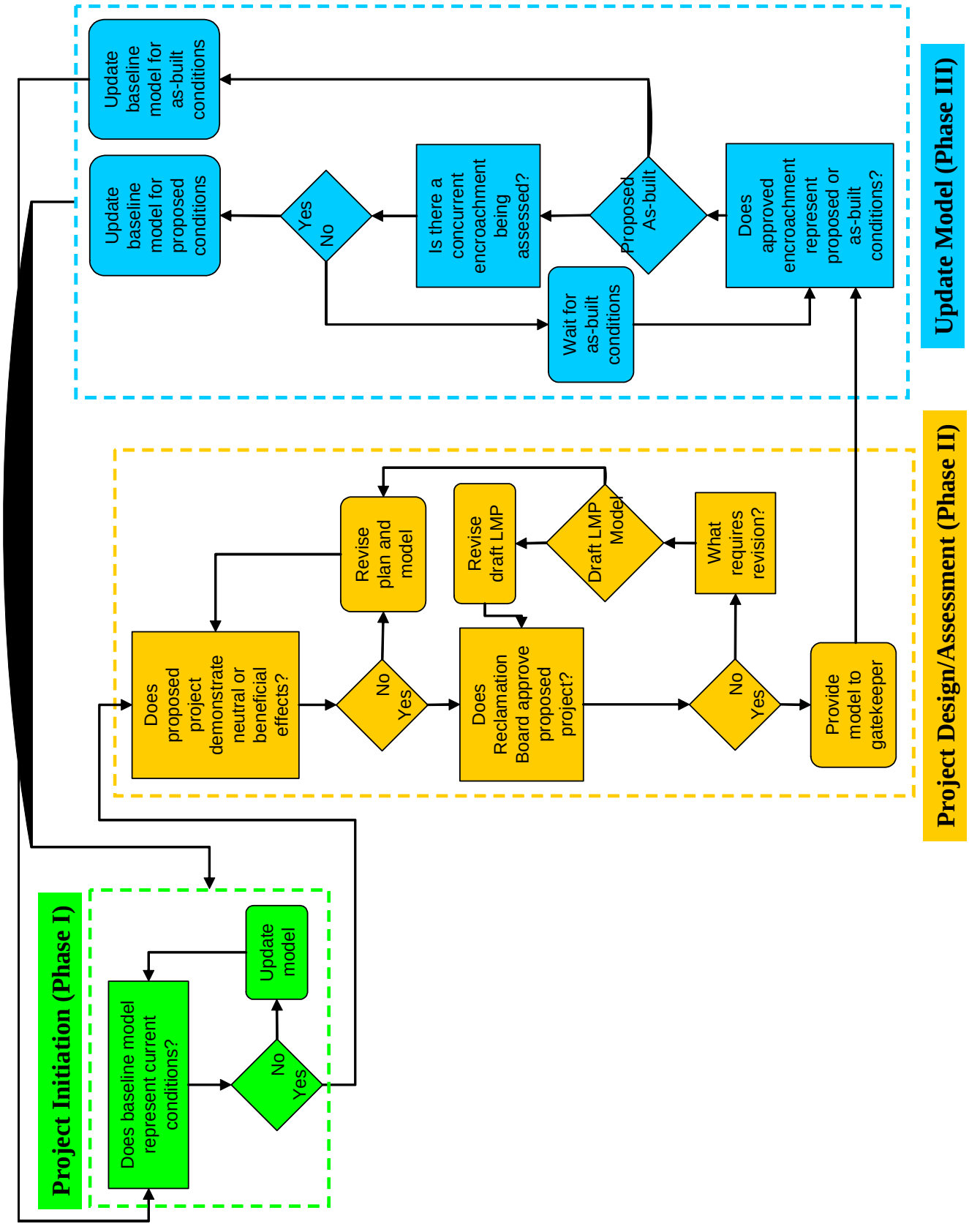
a. To ensure that the baseline RMA2 model is maintained to address the cumulative hydraulic effects of permitted encroachments, a designated model gatekeeper is responsible for updating the model.

b. The model gatekeeper has the sole responsibility of updating the baseline model for permitted encroachments, documenting the evolution of the baseline model, and distributing the updated baseline model and documentation to the end-user.

c. The end-user has the responsibility of furnishing to the model gatekeeper the proposed encroachment sub-model and the as-built encroachment sub-model. The proposed encroachment sub-model is necessary to define the expected condition of the baseline model in the event that there are concurrent permit applications seeking approval.

d. The end-user also has the responsibility of providing a monetary means for the model gatekeeper to update the model.

Note: regarding non-permitted changes, natural or otherwise, we suggest the model gatekeeper be responsible for updating the model.



Yolo Wildlife Area – Hydraulic Modeling Work Plan Flow Chart **Exhibit C-1**

REFERENCES

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