Key Uncertainty: Will restoration activities always result in a net decrease in flood hazard?

Increased tidal prism will scour slough channels within a relatively short time frame (months to years) and reduce flood hazard. Changes in tidal elevations and prism in sloughs occurring over months to years may potentially increase flood hazard. To understand this, we must first identify the existing level of flood protection, and then analyze post-restoration conditions to assess the effects of the project. Since the primary metric of flood hazard is elevation of water levels in the vicinity, predictions of future water levels is necessary. Both, short-term as well as long-term, water levels need to be determined to assess flood hazard potential.

Background/Rationale

The restoration project envisions opening up some of the diked salt ponds to tidal action. This implies that the levee along the landward edge of those salt ponds will be improved/rehabilitated to sustain tidal as well as wind-induced wave action, such that flood hazard to local communities will not increase. The subject of this Applied Studies discussion is flood hazard resulting from changes in flow within the sloughs and channels which connect to the Bay through the project area. It is important to quantify the impacts of the restoration project on tidal hydrology and water quality in these lower reaches of the creeks. Both, short- and long-term changes need to be considered because the creeks will most likely have a delayed morphologic response to significant changes in tidal prism such as those expected from the restoration project.

Most of the creeks in the project area offer just enough conveyance capacity to convey the design flood flows (100-year in most cases). This was documented in earlier reports (Moffatt & Nichol 2003a, SCVWD 2002). Some creeks, which do not offer this protection, are being modified to contain the design flood flows and the projects are in various stages of development. Changes in tidal water levels in these creeks, even minor, will change the amount of conveyance and may affect the level of flood protection to adjacent communities. Since water levels in the vicinity are a function of fluvial flows from upstream watersheds, astronomical tides, bathymetry, and bed characteristics, each of these elements need to be known for existing as well as future conditions.

<u>Uncertainties</u>

The Project Key Issues document authored by the Science Team had already recognized that the following questions needed to be answered to assess the hydrological impacts of the restoration project:

- What is the hydrology and current pattern in the South Bay as they exist today, and how have they changed over time?
- How will South Bay hydrology change over 50 years in response to human activities and natural processes?
- How will the hydrology in ponds, sloughs and South Bay react to natural changes, as well as human-induced changes (such as ISP, restoration and other changes), over the next 50 years?

Some of this is already being conducted as part of the environmental review phase. The flood hazard related uncertainties are tied in to hydrological modifications that will occur as a result of the restoration project, primarily due to the combination of fluvial flows and tidal stage. Moving the edge of the Bay farther landward (upstream within the local creeks), as envisioned for the restoration project, may affect the hydrology of the creeks and stability of the levees due to higher currents, scour, and changes in "backwater" elevation. Since the restoration will be phased over several years, assessing the impact of each phase, as well as cumulative impact is necessary.

Applied Study Concepts

Determining the backwater effect within the creeks and potential scour at the base of the flood control levees requires analyzing existing and future hydrological conditions. This is a deterministic effort which can be completed utilizing hydraulic models. Simulations should be conducted for all creeks draining through the project area (Coyote Creek, Guadalupe River, Stevens Creek, Mountain View Slough).

Work should be coordinated with local flood control districts which have conducted Flood Insurance Studies. Output from ongoing SBSP model studies will be needed to model flood stages within the creeks. These parameters include future tidal water levels and allowable future channel dimensions to simulate future conditions. Water levels and velocities should be determined for existing and future conditions, with the emphasis being on storm conditions.

For budgeting purposes, this kind of analysis could be performed using models similar to the existing Flood Insurance Studies models. An allowance of about $200,000 may be sufficient to run the different simulations, assuming that channel surveys and model results from the SBSP restoration project hydrodynamic analysis is available.

Management Options

If it is determined that the backwater elevation increases upstream of the pond levees, due to breaches through slough levees, project design features may have to investigate alternatives for breach locations/dimensions. If it is determined that the base of the flood control levees will scour sufficiently to affect the stability of the levees, mitigation schemes may have to be developed to prevent channel headcutting.