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Addendum to "A Self-Regulating, Inclusive and Sustainable Solution for the Sacramento San Joaquin Delta", December 17, 2012

February 24, 2013, Updated May 8, 2013

The referenced 14-page white paper outlines a comprehensive solution to the current problems of the Sacramento - San Joaquin Delta called the Western Delta Intakes Concept (WDIC). The white paper introduced the concept that in normal to dry years, water would be extracted from the Delta only through a new forebay constructed on the eastern two-thirds of Sherman Island into which water would be drawn during periods of extraction through "permeable embankments that would replace the existing levees along the Sacramento and San Joaquin Rivers; the approach velocities to these permeable embankments would be 100 times slower than the maximum approach velocities used in the current design of fish screens". While the intent to make extraction of water as invisible as possible to migrating fish, including both salmonids and Delta smelt, was clear, this language failed to explain two other important considerations, one involving the fact that the existing levees would be left in place, both to provide added protection to the new embankments and to create new riparian habitat, and the other involving the small proportion of total flow at Sherman Island that would be extracted.

Details of Permeable Embankments

The general layout of the WDIC is shown in Figure 1. More detail of the proposed permeable embankments and levees is shown in this figure than in Figure 3 of the white paper. New permeable embankments would be constructed inside the existing levees along approximately 22,000 feet of the Sacramento River and 31,000 feet of the San Joaquin River and would constitute the world's largest and finest fish screens. The permeable embankment on the Sacramento River side would have a crest width of 100 feet in order to allow the improvement of State Highway 160 to a dual carriageway with 2 lanes in each direction. A new levee with a crest width of 100 feet would connect the western end of this embankment to the Antioch Bridge. The existing levee along 3-Mile Slough at the eastern end of Sherman Island would be improved to the "fat levee" standard with a crest width of 50 feet as suggested in the Delta Protection Commission's Economic Sustainability Plan. The permeable embankment on the San Joaquin River side would have a matching crest width of 50 feet. The existing levees would be intermittently breached to allow flow of water to and through the new permeable embankments.

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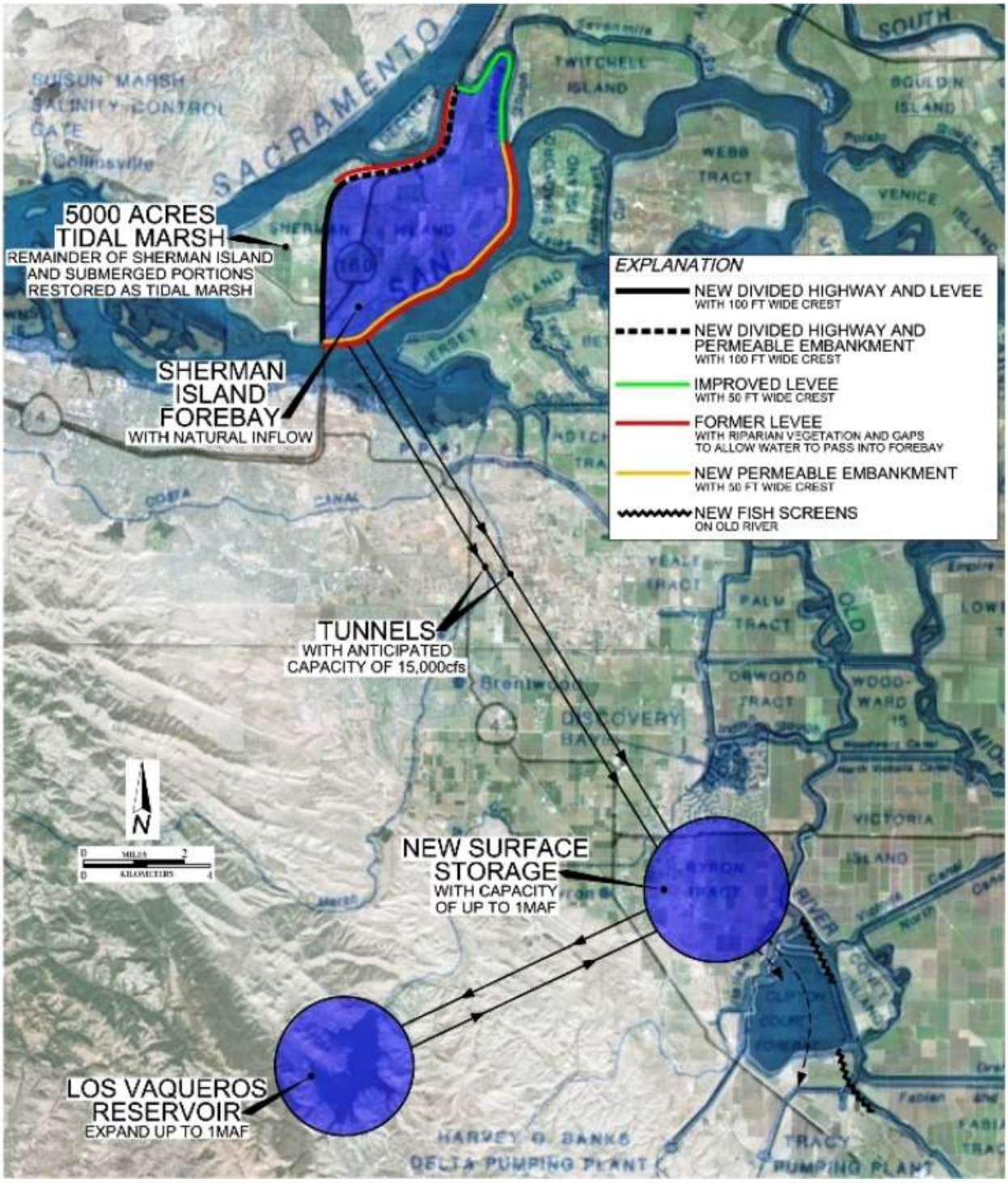

Figure 1 – The Western Delta Intakes Concept

The former levees would then be reconfigured as necessary and planted with appropriate vegetation to provide both erosion protection and riparian habitat. A schematic cross-section through the new permeable embankments and the former levee is shown as Figure 2.

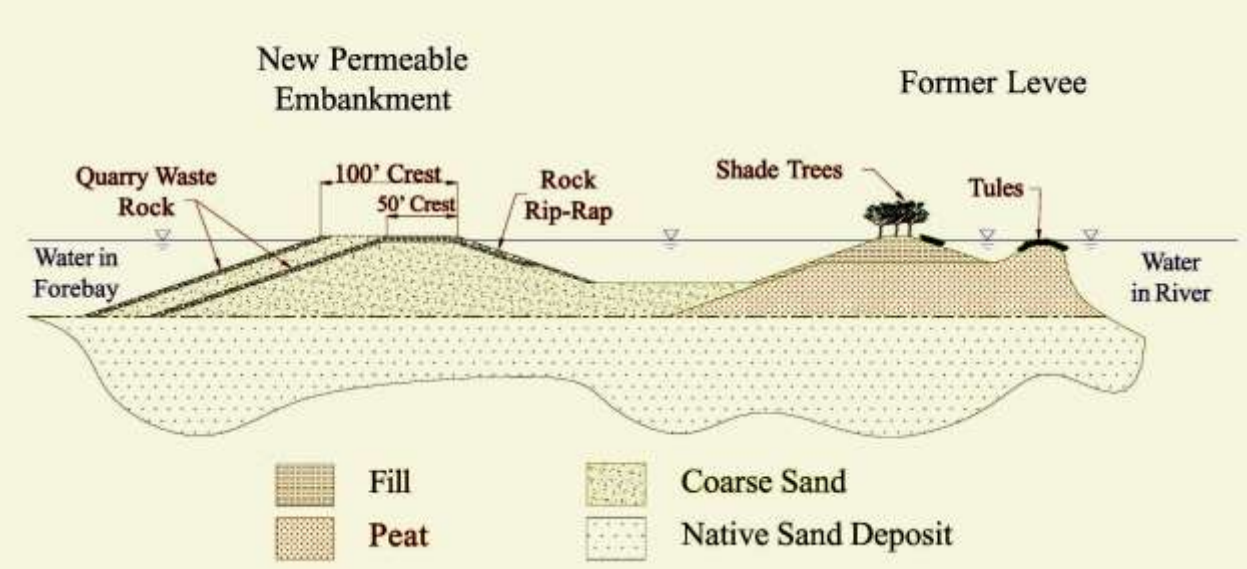

Figure 2 – Cross Section through Permeable Embankment

Of the three materials required for construction of the permeable embankment, only the quarry-waste rockfill needs to be imported. The heavier rock rip-rap would be salvaged from the existing levees and the coarse sand would be obtained from the interior of Sherman Island. The peat inside the forebay would be removed using hydraulic dredging techniques prior to the construction of the new embankments and would be used to create up to 5,000 acres of tidal marsh to the west of the forebay. The coarse sand would also be placed using hydraulic techniques and compacted as necessary in order to make it highly resistant to liquefaction. The maximum pore size in this material would be less than 1 mm, smaller than even Delta smelt eggs and much smaller than the juvenile Delta smelt that was downstream to the mixing zone in Suisun Bay following spawning upstream. Figure 3, from Bennett (2005)[1], shows schematically the size of Delta smelt at various stages during their short life. Thus not even migrating Delta smelt would be at risk of being sucked into these embankments. In fact it can be said zero fish will be taken with this arrangement, as opposed to the up to 15 million fish a year that are sucked into the South Delta salvage facilities.

[1] Bennett, William A., Critical assessment of the delta smelt population in the San Francisco Estuary, California. Journal Issue:San Francisco Estuary and Watershed Science, 3(2) http://escholarship.ucop.edu/uc/item/0725n5vk

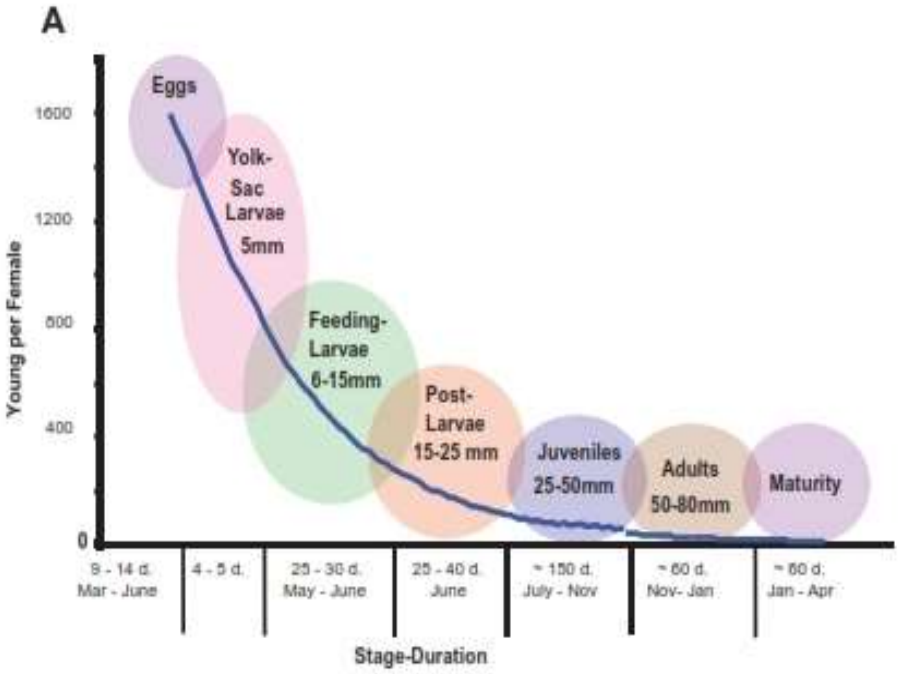

Figure 3 – Sizes of Delta Smelt

Magnitude of Flows at Sherman Island

In order to illustrate the second of the additional considerations noted above, flows measured in March 2011 in the San Joaquin River at Jersey Point, across the river from Sherman Island, are shown in Figure 3. . Even with relatively high flows in the San Joaquin River, the natural flow in the river is dwarfed by the tidal flows. At periods such as this, when under the WDIC 15,000 cfs might be extracted both from the Old River and at Sherman Island, the half of the 15,000 cfs drawn into Sherman Island on the San Joaquin River side would be only a small fraction of the total flow passing Sherman Island.

In addition to the fact that the approach velocities of water drawn through the permeable embankments would be very small, for much of the day there would also be good "sweeping velocities" as a result of the tidal and river flows being parallel to the permeable embankments. Moreover, because of the dominance of the tidal flows, these sweeping velocities are not uni-directional but are reversing.

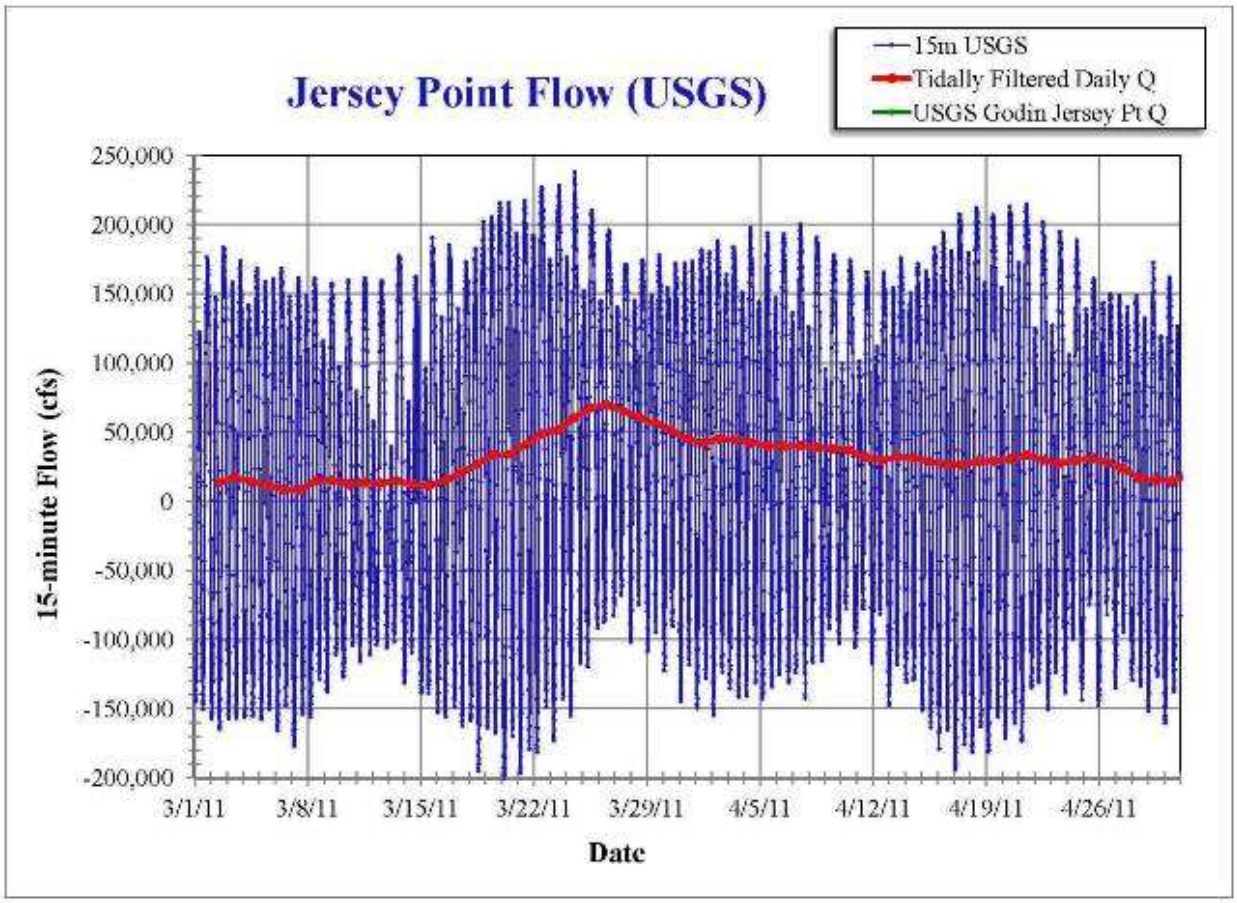

Figure 4 – Flows at Jersey Point

Other Concerns:

Possible clogging of the permeable embankments. It is possible over time that the permeable embankments might clog, reducing the amount of water that can be drawn in through the embankments, but this can be mitigated in three ways: (1) the embankments will be designed to initially have greater flow capacity than required; (2) the outer slopes of the embankments will be maintained and can be replaced as necessary; and (3) the pumps that extract water from Sherman Island could be designed so that the flow can be reversed and water stored in the proposed Brushy Creek reservoir used to raise the water level in Sherman Island so that the embankments are back-flushed. The kind of routine maintenance described under item (2) would typically be instigated after an initial period of, say, five years, and then perhaps a mile or two of the outer surface of the embankment would be replaced each year.

Possible salt water intrusion. While the intent of the WDIC is to maintain X2 well west of Sherman Island, it is possible that in the event of a prolonged drought that, even in the absence of extraction of water from the Delta for export, brackish water might come back as far as Sherman Island and enter the forebay. However, before the resumption of normal operations any brackish water can be pumped out drawing in fresh water to flush out the forebay. The brackish water would either be dumped to the west of the forebay during ebb tides or would be treated in a nearby brackish water desalination plant.

Impact of future sea level rise. The risk that X2 will move significantly inland as a result of sea-level rise can be managed to the point of it being negligible. As sea level rises the current position of X2 can be managed by raising the Delta levee system, restricting the channels of the Sacramento and San Joaquin Rivers, which are broader than they need to be adjacent to Sherman Island, the Sacramento in particular having been dredged out by the California Debris Commission in order to eliminate mining waste, and putting gates on the deepwater ship channels if necessary. If the Delta pool is raised with freshwater to balance the rise in the oceans, the salt water / fresh water transition does not have to move. It would help, and is a good idea otherwise, to have more tidal marshes around San Francisco, San Pablo and Suisun Bays to absorb tidal energy, Sea level rise is a much bigger problem for communities around San Francisco and San Pablo Bays than it is for the Delta.

Summary

The proposed intake forebay is located on Sherman Island in order to fulfill two of the main goals of the WDIC, to help restore natural flows through the Delta and to make the overall scheme self-regulating. That raises other issues including the possible impacts on migrating fish, but these issues can all be managed.

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