To: Delta Council ISB deltacouncilisb@deltacouncil.ca.gov
Sent: Wednesday, May 31, 2023, 3:03 PM
From: Gilbert Cosio gcosio@river-deltaconsulting.com

Subject: Comments re Draft Subsidence Prospectus

Thank you for the opportunity to comment on the draft prospectus, "Managing Subsidence in the Sacramento-San Joaquin Delta". Since my 40 years of experience in the Delta has mainly focused on levee stability and rehabilitation, I am limiting my comments to the impact subsidence halting, or reversal, may have on levee stability.

My comments focus on the effect subsidence management may have on levee stability with my ultimate concern being whether subsidence reversal is a viable alternative for improving levee stability. Improved levee stability is often associated as a benefit of subsidence reversal, but details are lacking in the information I have read. My hope is that your study will develop more specific details on how subsidence, or subsidence reversal, affects levee stability. Also keep in mind that the nonproejct levees in the Delta have not reached the design described in DWR Bulletin 192-82, so time is a factor when considering use of subsidence reversal as a tool to improve levee stability since the time it takes to regenerate enough peat to stabilize a levee may be longer than the estimated life of the levee.

My comments focus on 3 areas:

1. Making sure the latest academic studies capture the current state of the levees, and incorporation of geotechnical analysis and design studies to supplement the academic work,
2. Consider the "Zone of Influence" where subsidence and subsidence reversal may affect levee stability, and
3. Consideration of the depth of subsidence reversal, and time it takes establish this depth.

Here are expanded descriptions for the 3 focus areas:

Update Academic Studies and Incorporate Geotechnical Analysis and Levee Design
The studies cited in the prospectus are all academic in nature so we would ask that you utilize the many geotechnical studies that have been developed in design of levee rehabilitation plans over the past 40, or so, years. In addition, some of the academic studies are outdated due to more recent studies that corrected shortcomings of earlier studies. For instance, any study that used levee geometric data prior to 2017 is most likely outdated. The Delta Levees Program granted many funds for levee rehabilitation between 2012 and 2017. These funds were used to complete rehabilitation to the short-term HMP standard on all nonproject levees; much of this work included stabilization by using flat

slopes or toe berms. Studies that use data, or results from the Delta Risk Management Strategy (DRMS) is not be the best available information at this time since the DRMS used levee data circa 2005 and has been shown to have been overly conservative in its assumptions about levees and their susceptibility to failure.

Zone of Influence

When discussing subsidence halting or subsidence reversal, it appears that recent literature assumes that any subsidence on an island will affect levee stability. Levees and their weak foundations have been studied by DWR for over 70 years. Much of the study on how to stabilize levees was performed during the 1970's by DWR, the Corps of Engineers, academics and local stakeholders. This work led to DWR Bulletin 192-82. During these studies, DWR determined that although peats and other weak marsh deposits extend through the islands, the effect of these weak soils on levee stability only extends into the island about 400-feet landward of the levees. In the CALFED Record of Decision, this 400-foot area is referred to as the "Zone of Influence". To this day, purchase of an easement to limit farming and halt subsidence within this 400-foot zone is an eligible cost associated with levee maintenance under the Delta Levees Subventions Program. In addition, DWR also determined that seepage beyond the Zone of Influence was not a critical element to levee stability and thus the Delta Levees Program allows use of on-island borrow material as long as the excavation area is outside of the 400-foot wide zone. Under current conditions, some of these borrow pits are quite deep, in the neighborhood of 15 to 20-feet below existing ground, so that the bottom of the borrow area could be 30-40 feet below sea level.

Peat is Light

In order for peat to stabilize a levee, it would have to be extremely thick which could take many years to get established. Static levee stabilization involves placing weight on the backslope and landward toe area of a levee to counteract the forces placed on the levee by the force of the water pushing against it. In addition, in studies performed over the past 10 years, the use of toe berms has been shown to mitigate the slumping that may be caused by seismic loading. Recent geotechnical studies have shown that a typical toe berm design to meet the factor of safety described in Bulletin 192-82 requires placement of fill about 5-feet thick at the levee toe. This design requires fill that weighs in the neighborhood of 100-120 pcf. Peat, even when saturated with water, does not come close to this unit weight so in order for peat to provide the same stability, subsidence reversal at the levee toe may have to be as thick as it might have been before reclamation of the islands.

Thank you again for the opportunity to comment on the prospectus. I very much appreciated how the DISB 2016 workshop on earthquakes and high water as levee hazards pulled together the academic research, current scientific knowledge, and actual geotechnical data which lead to a very informative workshop and report, and hope the results of your current endeavor lead to a similarly useful report.

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