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February 21, 2011

City of Ventura
Attn: Karen Waln
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VIA EMAIL

Re: Ventura Coastkeeper's Comments on the City of Ventura's Estuary Subwatershed Study - Draft Synthesis Report based on the work of the third party objective experts Dr. Richard Ambrose and Dr. Sean Anderson

Wishtoyo Foundation's Ventura Coastkeeper Program ("VCK") retained independent objective experts Dr. Richard Ambrose[1] and Dr. Sean Anderson[2] to conduct an independent expert review of the City of Ventura's Estuary Special Studies and the environmental effects of the City's Tertiary Treated Flow discharge to the Estuary to provide stakeholders with an independent expert evaluation of the affect of the City's water treatment operation on the Santa Clara River Estuary's water quality and aquatic life. Dr. Ambrose's and Dr. Anderson's first task was to submit comments to VCK on Ventura's Estuary Special Studies that were publically available for their review and analysis as of January 20, 2011.

Dr. Richard Ambrose's and Dr. Sean Anderson's comments below consist of their objective scientific analysis and review of the findings, methodology, analysis, and management recommendations in the "City of Ventura Special Studies: Estuary Subwatershed Study Year One Data Summary and Assessment" ("Year 1 Report") and all of the City's publically available Estuary Special Study reports available as of January

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[2] DR. SEAN ANDERSON, Ph.D.; Assistant Professor of Environmental Science and Resource Management California State University Channel Islands; Postdoctoral Fellow, Center for Conservation Biology, Stanford University; Ph.D. in Population Biology, UC Los Angeles; B.S. in Ecology and Evolution & in Environmental Studies, UC Santa Barbara.

20, 2011.

While these comments have evaluated and analyzed the findings, analysis, and study design of Ventura's Estuary Special Studies released by January 20, 2011, Dr. Ambrose and Dr. Anderson needed the complete Estuary Special Studies Draft Synthesis Report to fully evaluate the analysis, findings, and methodology in the City's Estuary Special Studies, and for instance, to assess the adequacy of the study on evaluating the impacts of the VWRF discharge on Southern California Steelhead ("steelhead") and tidewater goby, and their habitat. Because Dr. Ambrose and Dr. Anderson received the Draft Synthesis Report almost twelve days later than expected, and only had seven business days to analyze the Draft Report, which was incomplete because it did not include Appendix's with Draft Report's underlying data, Dr. Ambrose and Dr. Anderson were not able to provide any additional comments on the Draft Synthesis Report at this time.

Dr. Anderson and Dr. Ambrose expect to complete the Independent Expert Review of not only the City's Estuary Special Studies, but also of the environmental effects of the City's Tertiary Treated Flow ("TTF","VWRF", or "VWRF Discharge") by May 31, 2011.

Please address and incorporate Dr. Anderson's and Dr. Ambrose's comments contained in this letter into Ventura's Final Estuary Special Studies / Synthesis Report that will be submitted to the Regional Water Quality Control Board on March 6, 2011. While these comments were previously received by the City on January 31, 2011, many of Dr. Ambrose's and Dr. Anderson's comments below can be applied to the Draft Synthesis Report.

Dr. Ambrose's and Dr. Anderson's Independent Expert Comments on the City's Estuary Special Studies - Year 1 Report

1.1. Estuary Hydrology and Morphology Survey

Comments

A.) Estuary Morphology

i. The assumption that the post-2005 flood morphology will persist is concerning to us. While we of course understand using the available bathymetric data until one can obtain more recent data, asserting the persistence of the bathymetry following the large flood event in 2005 is not justified. As pointed out at several points in this document and related supporting documents, the very dynamic nature of the estuary has been used

to explain variances in infaunal organism abundance in 2009 vs. previous years, etc. The 2005 event was indeed quite large and did alter sediment deposition across the Santa Clara River Watershed, but the bathymetry has changed, perhaps substantially, since that 2005 event. The easiest way to see evidence of post-2005 continued alteration of the Santa Clara River Estuary is to simply examine Google Earth's historic imagery function. Here, one can see multiple changes to the estuary since 2005. Another key reason to doubt a relatively static long-term morphology of the estuary is the interest in shifting around parking lots/picnic areas at the McGrath Day Use/Overnight areas (southern edge of the estuary). While this is something beyond the charge of the investigators and not under the city's control (it is State Park Land), we suggest it prudent to at a minimum model the effect of such altered hydrology. Such a simplistic assumption/"what if" scenario is at least as simplistic as saying the morphology from 5 years ago will persist in perpetuity.

Apparent changes to the estuary since 2005 include:

1) Ocean-ward beach edge has moved approximately 100-150 m relative to the morphology reported in Fig 2-4.

2) Apparently different central channel benthic topography/morphology. Walking the estuary in January 2011 and over the previous two years seems to imply a somewhat different central channel morphology than suggested in Fig. 2-4. This seems supported by Google Earth imagery from July 8 2006:

3) continued dynamic filling/emptying of sand in the central channel (creating/altering braiding)

4) dynamic presence/elimination of the "beach finger"channel extending northward along beach. In other southern California estuaries such ephemeral water bodies up against the beach can have major impact on the ecology of the system. For example this is the region where we see abundant *Ulva*/*Enteromorpha* build-up in the Zuma system and is important foraging area for beach birds. This channel's location suggests that it *could* be impacted differentially by the discharge waters.

5) On page 44, the report notes that there were large expanses of sand and silt substrates caused by the "large amount of fine sediment entering the Estuary." This implies that the bathymetry used overestimates the volume/capacity of the estuary.

These post-2005 changes to the estuary may not be particularly significant in a large system. However, the small size of this estuary and the great importance the authors place on a static or essentially static morphology of this system for their water budgets, etc. means one must take such variations in depth, channel braiding, etc. into account. Small changes in morphology can lead to relatively large proportional changes in water retention, resident times, etc.

B.) Water Budget

i. The water budget seems a good first pass, but we fear it is not robust enough to quantify the true benefits or impacts of VWRF. There are a host of minor issues as well that seem perplexing: Why is VWRF reporting "average daily discharge"? Why not simply report the total discharge per day? Surely this is being logged. If (as is discussed later) we are taking river stage readings every 30 minutes, why is the discharge not similarly reported with the same temporal resolution?

iii. Although it is essential to understand the present water balance, it would seem that a critical aspect of assessing whether the discharge enhances the estuary would be to understand the historic water balance. More information about this would be useful. The breaching history would also be useful. Artificial breaching is noted on page 14 of the Year 1 Report but not before; it would be useful to know when the estuary breached naturally and when it was artificially breached.

iv. The methods for measuring hydrology (estuary stage and groundwater elevation) seem appropriate. However, the stage sensors obviously cannot record water level when the estuary is breached; it is not noted how long the SCCWRP sensor will be available, but it is supplying critical data on stage. The data show GW-1 above the estuary stage at the end of the data period; why? It looks like these are going to be useful data, though they need to be extended to include different mouth conditions, flooding, etc.

v. We are interested in hearing the explanation for the location of the groundwater monitoring wells; why are GW-2 and GW-3 so far away from the estuary, but so close to the ocean? Also, and more importantly, this is just one portion of the area surrounding the estuary. The hydrology of the northern and eastern areas are likely to look very different. We are not sure how an accurate water balance can be derived without information from these northern and eastern areas. It appears that this uncertainty is being dealt with by assuming that the groundwater flow is the difference between the direct measurements and the calculations of the residual volume. There will be a good deal of uncertainty in this estimate. The "direct measurements" are not all direct measurements (see comment below about ocean exchange values, for example). On the other hand, there is mention of other groundwater wells, which should be helpful for values for the southern floodplain but not the northern areas. The report judges this to be appropriate because "all other water balance components are well constrained (i.e., values come from direct measurements in or near the Estuary." But all the other values are *not* direct

measurements, which begs the question of how well constrained this estimate actually is. The estimate of groundwater influence would clearly be much improved with groundwater wells in the northern floodplain.

vi. We are confused as to why a single ground water well transect was used. At a minimum there should have been another transect to the north, (and ideally one near the golf course). While we clearly expect subsurface water movement to be heavily dictated by the beach/ocean, we wonder if a grid of four or two rows of three wells each would help better understand the flow field of this and resolve the issue of a perched or semi-perched piece of land. Such a 2-dimensional array of monitoring locations would also help detangle the long-shore vs. inland flowfield vectors of subsurface migration. The investigators may be correct that we have a perched or semi-perched system to the south of the central lagoon but we need slightly more info to understand water movements over time.

vii. Once we have looked at the technical memo on the water balance, we may have different questions, but even the information in this draft report raises some questions. For example, the evaporation estimate are likely to be biased high since the station is 6 miles east of the estuary, which will have quite a different climate (especially amount of fog). Also, the ocean exchange is going to be quite important, both when the mouth is open and when it is closed. It is not clear exactly how the open-mouth exchange is being calculated – the report says the estimates of flow across the mouth are being made by the City, but there are no details about how frequently these estimates are made, by whom, and so forth. Similarly, there is an explanation about how the subsurface exchange in open-mouth and closed mouth (lagoon) conditions will be estimated, but we don't see a procedure for validating these theoretical calculations. The report states that hydraulic conductivity and porosity are being estimated from literature values for beach sand, which seems pretty indirect. It would be useful to look at published exchange values for sand berms associated with coastal lagoons.

viii. As noted above, the assumption that the 2005 LiDAR data represent current bathymetry may not be true, especially since the intervening years were relatively dry and so the estuary apparently experienced some sediment in-filling. It would be useful to have bracketing conditions – the 2005 LiDAR data would be one extreme of maximal capacity, but we should also have data for the estuary when is has minimal capacity.

1.2. Estuary Water Quality and Nutrient Survey

Comments

A. Monitoring

i. The water quality monitoring sites seem well located, distributed across the estuary. However, we wonder if R-1 really does characterize the inflow from the river; how far up river does tidal influence reach? We would think it would reach much farther than R1; if so, this site is not going to reflect on river water quality. (Moreover, as noted in the Results section, the original location of R-1 was inundated when the estuary was full, further suggesting it is not at an appropriate location.) In addition, the stations near the discharge channel are much more heavily vegetated, and it would be useful to have more information about this to provide context for the water quality data; some of the difference seen could be due to vegetation.

ii. One potentially useful measurement would be irradiance at each sample location, especially if taken when the trees have leaves (but ideally taken at every sampling time); as an alternative, tree canopy cover could be recorded. Information like this could help us interpret differences among locations that could be due to differences in vegetation rather than something to do with the water itself. For example, E-U3 and E-M2 stand out from many other stations in not having greatly elevated DO values during summer 2009 – despite having remarkably high nitrate and phosphate values; this could be because those sites are heavily shaded, reducing photosynthesis until the nutrient-laden water reaches areas with more sunlight.

iii. For sample timing, the Year 1 Report states that the mouth was closed, but it does not state what the water level was (although this information can be gleaned from Table 3-5), which is important. The Year 1 Report and final report should note how much rain, if any, occurred before the November sampling. It would also be useful to know the river inflow rates during the sampling periods.

iv. The Year 1 Report asserts that the closed condition represents the condition when VWRF discharges are most likely to have an effect of Estuary water quality, but this is not entirely correct. If there is a relatively large influx of water from the river, then the proportional contribution of the VWRF discharge will be relatively small even if the mouth is closed. On the other hand, if the mouth closes and there is relatively little inflow from the river, then the VWRF discharge will be proportionately large. This is why the water quality data need to be interpreted in the context of the hydrodynamic history

of the estuary around the time of sample collection. The necessary context information is missing from this report.

v. Water quality data from the VWRF discharge itself should be included in the Year 1 and Final Synthesis report. If the point is to evaluate whether water quality of the estuary might be influenced by the discharge, then it is essential to have the water quality data for the discharge for comparison. For example, if we want to know if the discharge is changing the nitrate concentration in the estuary, nitrate values for the estuary itself cannot address this question. As it is, none of the preliminary results can really be evaluated for the goals of the study since that essential information is missing.

vi. We think information on the water quality parameters in the ocean would be useful in the context of this study.

vii. For density stratification, the text of the Year 1 report states simply "There was no detectable density stratification in the outfall channel." Yet the figure shows clearly that some stations were highly stratified, and this should be noted. Tables 3-5 and 3-6 of the Final Synthesis Report should be amended to show that samples were taken at multiple depths at some times.

viii. The text of the Year 1 Report implies that differences between summer and fall sampling was due to "two estuary breaching events," but no such conclusion about the cause of the differences can be drawn from the available data.

B. Nutrient Sampling and Analysis

i. Nutrient sampling is too infrequent in year 1 to tell us much of anything. One date in September and one date in November is not enough information to characterize the nutrient status of the Estuary. It seems that at a minimum we would need monthly nutrient, etc. data. This when paired with mouth breaching events would allow us to see if the extended periods of mouth closures are really dictating water quality issues as implied often here. Also we would like to see the monitoring done at any one period be something more of a transect away from the VWRF point source. Such a transect would better help us evaluate the spatial extent/dilution of nutrient species from the treatment facility.

ii. Nutrients are a difficult substance to monitor and assess impact from (hence the delay in rolling out nutrient TMDL in our dynamic coastal waterways in California). Unlike metals or organic contaminants, nutrient presences can be quite ephemeral and are often dictated by the flushing rate of the system. For

this reason a better long-term assessment of the nutrient dynamics (nutrient stress/eutrophication) may be via Chl-a or ephemeral algae such as *Ulva*/*Enteromorpha* bloom monitoring.

iii. We like the idea of a nutrient mass balance model, but no details are given in the report. This is not simple, so the details are essential for evaluating the results of such an exercise.

C. Dissolved Oxygen ("DO")

i. The authors do a good job in targeting their attention to the late summer/fall for water quality assessment. This time of year is likely to yield the most problematic conditions. But particularly for DO, we would like to see a 24-hour time series to pick-up any low DO conditions pre-dawn when we have algal bloom or potential algal bloom conditions. This low oxygen stressful situation may be a key stressor for larval fish and invertebrates. These data exist within the Bight '08 data set. The data that were collected at various times near mid-day cannot give a clear indication of the lowest low oxygen conditions.

ii. Bight '08 sondes resolve the problem of non-continuous DO readings, but these sondes are not mentioned in the Methods section and apparently had limited spatial coverage. No information is given about where the sondes were located, and especially their depth. Please describe where the sondes were located and especially their depth.

D. General Comments / Data Assessment Section

i. The Data Assessment section is very brief and understated and does not capture much of the information that could be gleaned from even this limited data set, but we presume the final report will be more thorough. The reference to Bricker et al. is good but so generic it doesn't really give much information about the trophic status of the Estuary.

ii. The general lack of details here with regards to discharge water quality, etc. makes interpretation difficult. We hope the Final Synthesis report that is set to expand some of this data collection effort will answer some of these gaps.

1.3 Upland and Tidal Vegetation and Habitat Mapping & Organisms

Comments

A. Metrics for Water Quality Parameters

i. While fish selection seems good and we know why the T&E birds (snowy plover & least tern) were chosen, we nevertheless find the beach-nesting plovers and tern to be not particularly useful. These birds' distributions are so dictated/controlled by human and anthropogenic animal disturbance that we wonder about their utility to be used as a useful/fair metric for water quality parameters here. Their absence from the system does not necessarily indicate poor water quality/habitat degradation via VWRF.

B. Aquatic Focal Species and Aquatic Mapping

ii. Utilizing all available data, analysis on the health of the benthic macroinvertebrate community in the estuary and analysis on the impact of the VWRF's TTF discharge on the estuary's benthic macroinvertebrate community should be incorporated into the Final Synthesis Report. Benthic macroinvertebrates are important food sources for steelhead smolt, tidewater goby, and other estuarine species.

iii. In discussing threats to steelhead smolts in the Estuary, Kelley (2008) is referenced, but certainly the threats listed are not complete for either adult or smolt steelhead; for example, they do not include poor water quality, changes to the breaching schedule, or effects on estuary water chemistry or salinity from the VWRF TTF discharge.

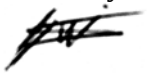
iv. In general, the discussion of steelhead habitat needs within the Santa Clara River Estuary seems adequate, except for the lack of discussion of over summering / rearing estuary lagoon habitat needed by steelhead smolt, of sufficient water quality needed for steelhead smolt and adults, and of healthy macroinvertebrate populations needed for steelhead smolt rearing. It would, however, be useful if the literature summary would make explicit reference to conditions in the estuary. For example, we are told the temperature range for optimal steelhead growth, but how does that temperature compare to the temperatures in the estuary when the juveniles would be present? It would be useful to have more explicit information about the influence of water quantity (e.g., depth in the estuary, amount of wetted area, etc.) and the importance of habitat heterogeneity. The effect of artificial breaching – and the underlying cause for this breaching – should also be discussed. The recent Entrix fish survey report provides some relevant observations. And some comments about the availability of prey based on the fish surveys would also be useful. In other words, this section could benefit from (1) more explicit reference to the conditions in the Santa Clara River Estuary, and (2) better integration with the other information we know about the Estuary.

v. As with the steelhead, the list of threats to the tidewater goby omits some important threats. In particular, changes in hydrology (including berm breaching) could be a threat, and perhaps habitat loss.

vi. For tidewater gobies, the summary of habitat needs is generally adequate. There are a few statements that are at odds with scientific literature and our own studies of the tidewater gobies. Tidewater gobies can tolerate full seawater salinity, not just 28 ppt. And we haven't found them necessarily associated with submerged vegetation. Also as with the steelhead section, it would be useful to link the general statements about conditions to the specific conditions in the Santa Clara River Estuary. And even more than with steelhead, there is a lot of information about the gobies in the estuary that isn't really incorporated into this section, but which would strengthen it.

Thank you for considering Dr. Ambrose's and Dr. Anderson's comments. Please feel free to contact us with any questions.

Sincerely,



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