Agenda Item 13
SMMC
12/12/16

Stillwater Sciences

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TECHNICAL MEMORANDUM

DATE: 16 August 2011

TO: Eric Raffini
Environmental Scientist
Environmental Protection Agency
Region IX
Wetlands Regulatory Office
75 Hawthorne St.
Mail Code: WTR-8
San Francisco, CA 94105

FROM: Glen Leverich
Senior Geomorphologist/Geologist
Stillwater Sciences

SUBJECT: Comments on the Surface Water Hydrology and Flood Control, and Geomorphology and Riparian Resources Sections of the Newhall Ranch RMDP-SCP Final EIS/EIR, June 2010

Dear Mr. Raffini,

This technical memorandum presents a brief summary of our limited review of the hydrology and geomorphology sections of the final draft of the Newhall Ranch Resource Management and Development Plan (RMDP) and Spineflower Conservation Plan (SCP) environmental impacts statement/report (FEIS/R) (USACE and CDFG 2010). These sections, which were prepared by PACE Engineers, Inc., are referred presented in the FEIS/R as sections 4.1: Surface Water Hydrology and Flood Control, and 4.2: Geomorphology and Riparian Resources. Based on our geomorphology, hydrology, and ecology expertise in the Santa Clara River (SCR) watershed, within which the proposed development would be located, we performed this review at your request on 3 August 2011. The purpose of this review is to identify notable deficiencies and/or discrepancies in the assumptions, methods, and findings presented in these two sections of the FEIS/R document, and to further address several specific questions/comments you had raised, namely:

1. <u>Was the use of the 1994 hydrology data rather than the more current 2006 data appropriate in the analysis of project effects on local hydrology?</u> Specifically, the 1994 data has the 100-year recurrence interval event at 60,000 cfs, while the 2006 data puts the 100-year event higher at 66,000 cfs (an 11% increase). How would using the newer recurrence interval value change the results and conclusions of the analysis? Is there an updated hydrology dataset available for the remainder of the SCR in LA County? And, finally, why does the 2011(a) SCR watershed geomorphology assessment document prepared by Stillwater show the 1969 flood event to have a 58-year recurrence interval

with flows of 68,000 cfs (i.e., 2,000 to 8,000 cfs greater than the county-published 100-year event recurrence interval discharge)?

2. Was it appropriate that the hydrology analysis assumed that the post-project surface water runoff would not impact the hydraulic models? This question stems from the statement in the FEIS/R on page 6.0-52:

   "Development of the Specific Plan, along with development facilitated on the VCC and Entrada planning areas, would increase runoff into the Santa Clara River from upland areas due to increased impervious surface areas (*e.g.*, pavement, roads, and buildings). The increase in discharges for different return events (two-year, five-year, 10-year, 20-year, 50-year, and 100-year) would be measurable to a point about four miles downstream of Newhall Ranch in Ventura County. Beyond this point, development of the Project would have no impact to flows."

   Table 4.4-15 shows that the average annual stormwater runoff volume released from the project site will increase 257% from existing (pre-project) condition (1,302 acre-feet to 3,356 acre-feet). Despite these findings, the HEC-RAS analysis assumed that the pre- and post-project flow rates were unchanged because:

   a. The size of the project watershed with development impacts is only 1% of the total SCR watershed size; therefore, the peak flow impact in the river would be negligible; and

   b. The project watershed would be located immediately to the river and, accordingly, runoff of concentration is very short as compared to the overall river time of concentration; thus, there would be no impact to the change in peak flow rate.

3. Based on the hydrology studies performed by Sikand in 2000 and PACE in 2008, does Stillwater concur with the chief conclusion that the project would not result in any off-site increases in water surface elevation (and flow velocities) downstream of the project boundary in Ventura County?

<u>Summary of Review</u>

Based on our limited review of the hydrology and geomorphology sections of the FEIS/R, we note the following:

- It appears that the intent of the project is to "freeze" the zone of active channel activity in its present location, as is described in the text and indicated by the bank stabilization features shown on the project map in Figure 4.1-5 ("Alternative 2 Proposed RMDP Santa Clara River Features"). Significant encroachments on the river will occur at three new bridges: Commerce Center Drive, Long Canyon, and Pico Canyon.

- The sediment delivery analysis contains errors and is often misleading (e.g., Table 4.2-5). Rates cited from Stillwater Sciences (2005) are misquoted (and underestimated by more than a factor of 2), and they are applied to tributary channels, mainstem channel bed, and upland watershed areas as though these three areas are equivalent in their contribution to downstream sediment, when in fact they are morphologically and hydrologically distinct (see p. 4.2-23 to 24).

- The analysis also fails to recognize that the bedrock materials underlying the project watershed are the most erosive of the region. That is, the Pico Formation siltstones (and some sandstones) have erosion rates up to an order of magnitude greater than any other lithology in the entire watershed (see USCR geomorphology report, Stillwater Sciences 2011b). Therefore, even an area-averaged amount (if correctly transcribed) would potentially be incorrect many-fold and, accordingly, the final estimates of impact to sediment delivery into the lower SCR and the coastline are likely about an order of magnitude too low.

The study does acknowledge earlier on p. 4.2-18 that the project area is situated within a portion of the watershed having a "seemingly large volume of sediment" in storage. This statement indicates that the study authors are indirectly aware of the high sediment production and delivery rates occurring in the project area that contribute to that large volume of stored sediment, but they do not integrate this finding into associated analyses on project effects to erosion and sedimentation.

- Figure 4.2-1 ("Riparian Resources") grossly underestimates the planform extent of the "active channel" path. It is unclear what methodology was employed to define this extent. We and others define the active channel area, or width, as part of the mainstem channel bed that has carried a significant part of the flood and sediment discharge during the recent flood events (see Simons, Li & Associates 1983, 1987, and Stillwater Sciences 2005, 2007, 2011a, b). We previously mapped active channel areas following the river's largest floods in Ventura County, which could have been used as reference in this analysis (see Stillwater Sciences 2005 and 2007). We recently mapped active channel areas in the project area as part of the upper SCR study (see Stillwater Sciences 2011a, b). It can be clearly seen in our maps that the geomorphically active channel areas are considerably broader than those shown in Figure 4.2-1 of the FEIS/R (see also the comparison on the last page of this memo). Specifically within the project area boundaries, the floodplain area where the proposed "Landmark Village" development will be constructed (between the river's right bank and Highway 126) was most recently flooded and scoured during the 1983 flood event, for which we determined the peak instantaneous flow to have a recurrence interval of 15 years (based on 57-year gauge record at the County line and new SCR NR Piru station: WY 1953–2009). This demonstrates just how active the entire channel width and floodplain can be during these episodic events.
- It is not clear how the data representing "upstream" flows in Table 4.2-2 were determined considering that there is only one gauge in this reach located downstream of the project area in Ventura County (i.e., County line and now the new SCR Nr Piru gauges). The assertion of flow changes through the project area is not based on actual data.
- The assertion on page 4.2-18 that the river channel in the project reach has exhibited "fluctuating stability" over time is directly contradicted by our findings (Stillwater Sciences 2007 [see Figure 5-19], 2011a [see Figure 4-19]) and those of Simons, Li & Associates (1987) that show long-term aggradation, with some localized incision.
- (Same page) The assertion that there has been a stable channel width pre- and post-1974 with the closure of Castaic Dam is also directly contradicted by our findings (Stillwater Sciences 2007 [see Figure 5-17], 2011a [see Figure 4-17g, 4-18a]) where significant changes to the active channel width have occurred over the past century in response to the largest flood events. Another more probable explanation why the river has not adjusted morphologically to the closure of Castaic Dam is because the dam not only intercepted sediment, it also changed the hydrological conditions (i.e., reduced peak flows); a condition that will not be present in the project area.

- (Same page) Assuming that the statement that the closure of Castaic Dam has not had an effect on the river's morphology is true, the dam closure has been found by Simons, Li & Associates (1987) and Stillwater Sciences (2011b) to have caused substantial incision within lower Castaic Creek. This trend has the potential to be continued and possibly worsened following project construction due to further sediment reductions in the creek's major tributary, Hasley Canyon, where the VCC development will be built.
- (Same page) The assertion that "reset events" are important ignores the historic evidence that bank armoring strongly influences the area and extent of the river following such events, particularly in the upstream half of the project area. They "reset" the channel only within boundaries defined by human infrastructure.
- On page 4.2-44, the statement that the "Project involves limited physical modification to the (river) channel and floodplain" is inconsistent with the project description that states that about 29,000 linear feet of bank armoring, in addition to floodplain elevation increases, will be implemented. Also on this page, it is stated that "the Project will involve significant physical modification to all or portions of the drainage channels and floodplain areas for the major tributaries"; however, it is later stated in this document that no significant impacts resulting from the project will occur. Both of these aspects of the project indicate inconsistencies with the significance determination presented here.

To address your specific questions outline above, we have attempted to provide you with some brief answers:

1. It does not appear that using the 1994 hydrology data rather than the 2006 data was appropriate; however, these data were not available during the initial analysis performed by Sikand in 2000. Our analysis of the County line stream gauge data found the largest flood on record (Jan 25, 1969) to have a recurrence interval of 58 years (Stillwater Sciences 2011a, b). We also compute that the 100-year recurrence interval discharge at this gauge would be about 73,000 cfs [1]. Our analysis utilized both gauges located near the County line (USGS 11108500 [WY 1953–1996], USGS 11109000 (WY 1997–2009). It appears that the FEIS/R analysis either did not consider the 2006 county dataset, the new county line stream gauge data (USGS 11109000), or both.

   For reference, we computed the 1983 flood event that inundated and scoured the "Landmark Village" floodplain area to have a recurrence interval of 15 years. Therefore, it seems probable that this size of flood could occur again in the coming decades; forecasted impacts to the modified project reach are not sufficiently explored and critically evaluated in the FEIS/R.

   The project design elements appear to depend greatly on the accuracy of their 50-year prediction. On page 4.1-4 of the FEIS/R, it is stated that the project preparation would include "the placement of sufficient fill material across the site (floodplain), so as to provide a minimum of one foot of freeboard above the 50-year level." Given that there is some question as to the accuracy of the 50-year recurrence interval discharge (and the

[1] Analysis employed the flow frequency approach of Water Resources Council Bulletin 17B (USGS 1982), which Ventura County Watershed Protection District also applied in their analysis (VCWPD 2006). Their 2006 re-evaluation of flood frequency at the County line gauge estimated the 100-year event to be about 66,000 cfs, which is slightly lower than our estimate because they considered a slightly shorter duration (WY 1953–2005).

corresponding flow depth), this represents a significant shortcoming in the FEIS/R analysis on flooding hazards.

2. We were not able to thoroughly review the supporting hydraulic studies; however, the large increase in average annual stormwater runoff volume released from the project site likely represents a significant impact to the local river reach and farther downstream into Ventura County.
3. Similar to our response to Question #2, the FEIS/R does acknowledge that localized increases in flow hydraulics (i.e., shear stresses) will potentially occur. Although we do not agree with their conclusion that these increases do not pose a significant impact to the stability of the Santa Clara River and its tributaries.

In summary, the project area is situated within one of the most highly productive parts of the SCR watershed for sediment loading to the river and the downstream beaches of the Santa Barbara Channel. From the perspective of human development, the stabilization of the rapidly eroding uplands could represent a positive outcome of the project; however, the associated impacts on the downstream system are not at all quantified and the values presented in the FEIS/R are grossly understated. When considering that the project will increase stormwater runoff volume, but reduce sediment supply to a historically dynamic river reach that will be constrained by significant bank armoring, it is highly probable that resulting channel instabilities not yet considered in the FEIS/R study will occur. For example, channel incision appears to be a likely result, along with associated bank erosion along those segments not receiving armoring treatment at the onset of project. Continued channel maintenance would therefore be expected in the long-term as the remaining active river and tributary channels respond to this and other developments in the upper watershed. Some years or decades post-construction, full armoring of one of the last unconstrained reaches of the upper SCR seems likely.

Encroachment into and armoring of the active channel boundaries of the mainstem river will undoubtedly reduce ecological function in the river and riparian zone; this reach is presently the least constrained of the upper SCR and a significant fraction of the unconstrained river throughout the entire watershed. Therefore, we presume that its current ecological value is substantially greater than its fraction of the total river length.

Background of Reviewers

For your reference, my position is Senior Geomorphologist/Geologist at Stillwater Sciences where I specialize in studying and interpreting the dynamics of watershed geomorphology. I have been involved with studying the geomorphology, hydrology, and geology of the entire Santa Clara River watershed for the past 4 years. My most recent effort was the completion of a detailed upper SCR watershed geomorphology assessment (Stillwater Sciences 2011), which included synthesizing the document with our 2007 lower SCR assessment document to produce a comprehensive account of the hydrogeomorphic processes in the entire watershed, from a historic, contemporary, and future perspective. This work was conducted for the Santa Clara River Watershed Feasibility Study agencies, which includes the L.A. Department of Public Works, Ventura County Watershed Protection District, and the U.S. Army Corps of Engineers–L.A. District.

This review was also conducted by Drs. Derek Booth and Yantao Cui who serve as our senior Geologist and Hydraulic Engineer, respectively. Dr. Booth has 32 years' experience in the fields of river dynamics and deposits, urban watershed management and stormwater, landscape processes, and geologic hazards. Dr. Cui's expertise is in hydraulic, hydrologic, sediment transport, and fluvial geomorphologic analyses. Both have extensive experience working in coastal California watersheds, including the SCR basin; Dr. Booth is also an Adjunct Professor in the Bren School of Environmental Science and Management at the University of California Santa Barbara.

Literature Cited:

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Stillwater Sciences. 2011a. Geomorphic assessment of the Santa Clara River watershed: synthesis of the lower and upper watershed studies, Ventura and Los Angeles counties, California. Prepared by Stillwater Sciences, Berkeley, California for Ventura County Watershed Protection District, Los Angeles County Department of Public Works, and the U.S. Army Corps of Engineers–L.A. District.

Stillwater Sciences. 2011b. Assessment of geomorphic processes for the upper Santa Clara River watershed, Los Angeles County, California. Final report. Prepared by Stillwater Sciences, Berkeley, California for Ventura County Watershed Protection District, Los Angeles County Department of Public Works, and the U.S. Army Corps of Engineers-L.A. District.

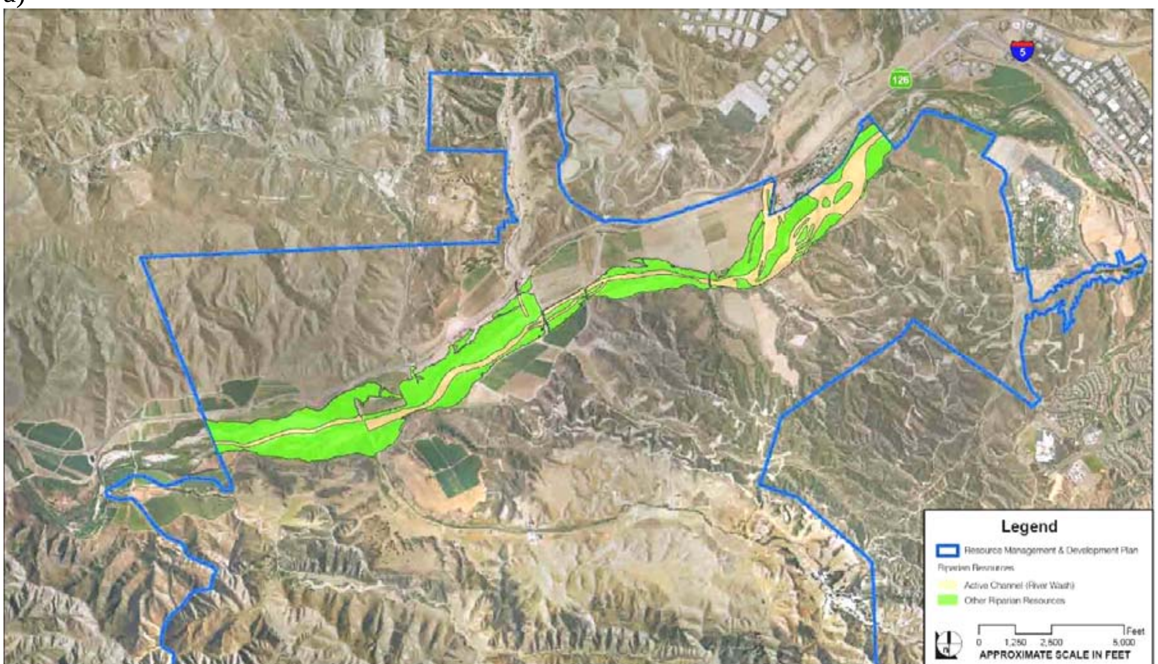
USACE and CDFG (U.S. Army Corps of Engineers and California Department of Fish and Game). 2010. Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan. Final Joint Environmental Impact Statement and Environmental Impact Report. SCH No. 2000011025. June.

USGS (U.S. Geological Survey). 1982. Guidelines for Determining Flood Flow Frequency. Bulletin #17B of the Hydrology Subcommittee,

VCWPD (Ventura County Watershed Protection District). 2006. Santa Clara River 2006 Hydrology Update. Phase I: from ocean to County line. December.

Comparison of designated "active channel" zone from Section 4.2 of the FEIR/S (a) with scaled views of the river before in 2006 (b) and after in 2009 (2009; c), showing significantly greater areas of fresh sediment-transport activity and flow than shown in the mapped "active channel" zone in the FEIR/S figure (a). Also shown is our "active channel" mapping (d) showing the geomorphically active channel areas following a series of historical flood events.

a)



SOURCE: DUDEK, PACE 2008

FIGURE 4.2-1

b)

c)

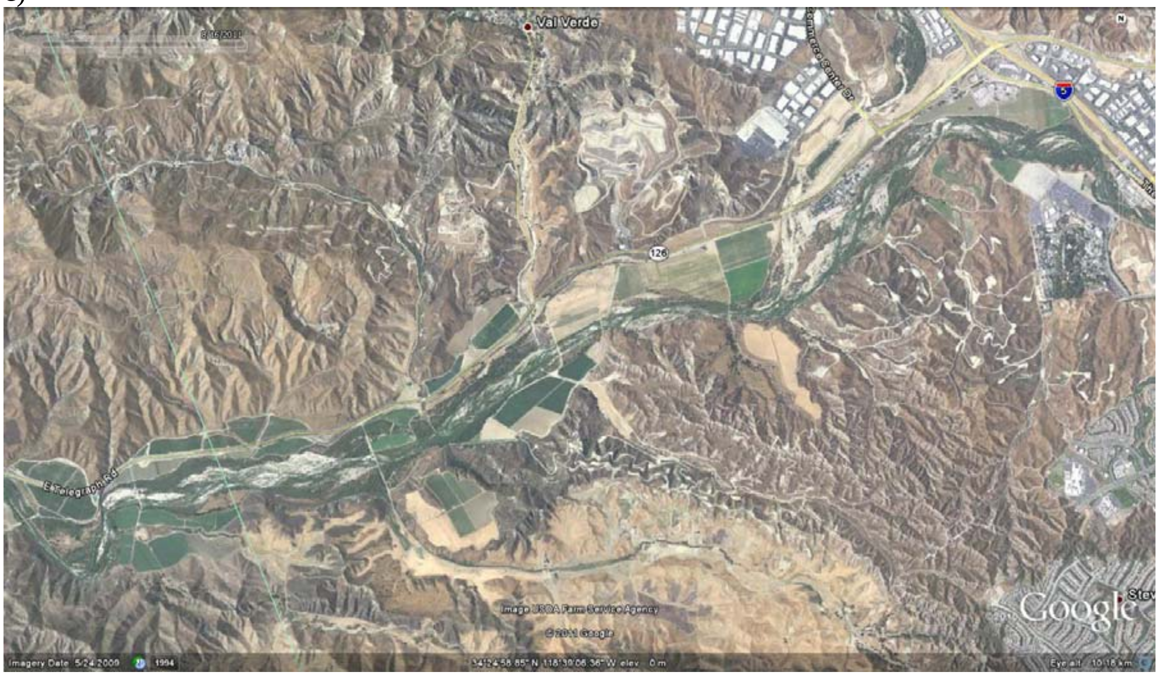

Val Verde
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Image USDA Farm Service Agency
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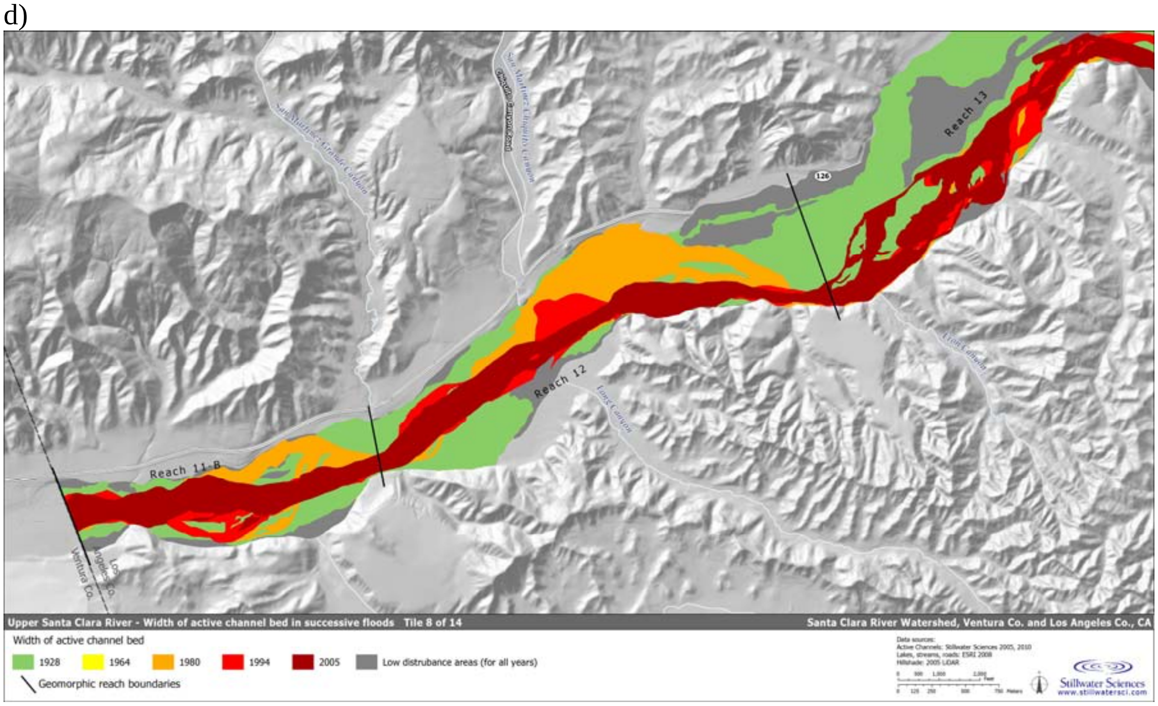
Google
Imagery Date: 5/24/2009
1994

d)


Reach 11-B
Reach 12
Reach 13
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Ventura Co.
Los Angeles Co.
Upper Santa Clara River - Width of active channel bed in successive floods Tile 8 of 14
Santa Clara River Watershed, Ventura Co. and Los Angeles Co., CA
Width of active channel bed
1928
1964
1980
1994
2005
Low distrubance areas (for all years)
Geomorphic reach boundaries
Data sources:
Active Channels: Stillwater Sciences 2005, 2010
Lakes, streams, roads: ESRI 2008
Hillshade: 2005 LiDAR
Stillwater Sciences
www.stillwatersci.com