San Pasqual Valley (SPV) Groundwater Sustainability Plan (GSP)
Technical Peer Review (TPR) Meeting
Meeting Summary

The following is a summary of the TPR discussion, comments, and questions. This summary reflects the general content and spirit of each discussion point, but is not a verbatim recording.

Date: Thursday December 17, 2020 from 9:00 to 11:30 pm

Location: GoToMeeting

Purpose: Technical Peer Review Meeting

Attendees:	Technical Peer Review (TPR) • Will Halligan (WH), Luhdorff & Scalmanini • Peter Quinlan (PQ), Dudek	City of San Diego (City) • Sandra Carlson (SC) • Karina Danek (KD) • Niki McGinnis • Mike Bolouri
	Advisory Committee (AC) • Frank Konyn (FK) • Matt Witman (MWit) • Rikki Schroeder (RS) • Eric Larson (EL)	County of San Diego (County) • Jim Bennett (JB) • Leanne Crow
	Public • Anita Regmi, Dept of Water Resources • Lani Lutar, Responsible Solutions, on behalf of Ranch Guejito • Hank Rupp, Rancho Guejito (RG) • Andre Monette, Best Best & Krieger, on behalf of Ranch Guejito • Mark Stadler, San Diego County Water Authority • Brad Blaes, The Pinery	Consultant Team • John Ayres (JA), Woodard & Curran • Rosalyn Prickett, Woodard & Curran • Nicole Poletto, Woodard & Curran • Heidi Gantwerk, HG Consulting • Nate Brown (NB), Jacobs • Craig Cooledge, Jacobs • Armin Munevar, Jacobs • Jason Smesrud, Jacobs • Paula Silva, Jacobs

Roll Call and Introductions

Rosalyn Prickett, Consultant Team, greeted participants as they signed onto GoToMeeting and reviewed basic instructions for GoToMeeting user tools. Rosalyn reviewed when and how members of the public can provide input.

Review

Heidi Gantwerk, Consultant Team, reviewed the meeting agenda and meeting objectives. She directed participants to Handout 1 with the last meeting summary. There were no TPR comments on Handout 1.

Nate Brown, Consultant Team, reviewed how the Consultant Team has addressed the modeling comments submitted by TPR members. Those responses were sent out, then additional responses were circulated on Monday December 14, 2020.

Groundwater Model Update - Historical

Nate provided an overview of the areal characteristics of the San Pasqual Valley (SPV) GSP Model domain, which is the same as that used for the SPV Salt and Nutrient Management Plan (SNMP). He then described the vertical characteristics of the model domain and how they were updated from the SNMP based on geologic cross sections developed by Snyder Geologic.

- WH: Underlying the alluvium, there is bedrock (shown as lavender on the cross section). How was the dashed line that separates the residuum and bedrock developed? Seems like there isn't as much control from the well logs for development of that dashed line.
    - NB: In the well logs, there appeared to be fractures above the more competent zone. This was based on the lithologic descriptions.
    - PQ: People don't tend to go very far into the weathered bedrock. Weathering isn't uniform at all, so it's tough to know where that is. Sometimes we drill below the weathered bedrock to get to the granite to set the steel.
    - WH: Drilling through materials such as that (like large boulders) can get expensive and if there isn't much return, then you don't want to go deeper than you need to.

Nate explained the thickness of the 4 layers as established in the model. He then reviewed the selected model codes – One-Water Hydrologic Flow Model (One-Water) within the model domain and Basin Characterization Model (BCM) for watershed inputs. Boundary conditions for the historical simulations (WY2005 through WY2019) were described in detail.

- PQ: No flow boundaries – in the bottom 2 layers of granite. Where we have gages, the model doesn't extend into the watershed; whereas, there is recharge from rainfall in the northern portion of the watershed. We have surface water inflows from the stream gages, but no groundwater. So when modeled in this manner, it shows bedrock wells getting water from Layers 1 and 2. We know we have water coming into the basin from the catchment above in the granite. By having no flows, the model is missing recharge in the lower layers. There isn't good, measured data, but this will cause the results to be that pumping in Layers 3 and 4 have to get water from Layers 1 and 2.
- WH: In prior slides, when you described thicknesses of Layers 3 and 4, seemed like Layer 3 was relatively thin and Layer 4 was over 1,000 ft thick. Are there wells that are actually penetrating Layer 4 or do the granite wells predominantly stop in the Layer 3 interval? Maybe the focus of recharge question should be focused on Layer 3.
    - PQ: We have drilled a number of wells that are over 1,000 ft deep. Not necessarily in Rockwood Canyon, but up on the ranch itself.
- WH: Are they sealed through the residuum and alluvium?
    - PQ: Yes. Its good practice, and the driller was worried about caving. Set steel caging all the way through alluvium and residuum.
    - WH: One of the key pieces of information is the annular seal, when we discuss these really deep wells in the granite rock. If they're sealed through the alluvium and residuum, that helps a lot to not having contributing water percolating to the underlying zones.
- NB: These are complicated questions. We're making good use of stream gage data where and when it's available. We do not have good data on the importance of subsurface inflow from the contributing catchments.
- PQ: Agree. Issue is that when we incorporate into the model domain the pumping from Layers 3 and 4, that pumping can't be served by the missing recharge in the granite, so it takes from

the water available in Layers 1 and 2. It's the incorporation of that pumping in Layers 3 and 4 that is the issue – that's tilting the table. Hard to put a general head boundary, I know.

  - NB: How would you handle this issue if this were your tool? What kind of boundary condition would you use?
  - PQ: Have already commented on the BCM recharge values. Suggest adding in the BCM recharge into Layers 3 and 4.
  - WH: Other regions in California have encountered similar issues with mountain-front recharge. In Antelope Valley adjudication, there was a phase of the trial that tried to estimate mountain-front recharge from hard rock. Look at other basins with similar issues?

- NB: What complicates things is the degree, nature, and interconnectedness of fracturing, which is unknowable. We don't know with certainty how pumping in each layer affects the others. It is possible that the bedrock wells do induce some vertical groundwater flow from the SPV Basin.
  - PQ: You're making a decision that its only coming from the alluvium. Including a specific flux, guided by the BCM, along the boundaries with the larger upper watershed would be reasonable. Maybe you do 2 model runs – one with and one without. You're not deciding what the answer is. It's possible that there may be one suggestion.
  - WH: Is this the sensitivity analysis that Nate was planning on doing?
  - NB: Yes. It's all about the water budgets here -that's why we built this tool. The rock is tight except for the fracture zones and we don't know the regional patterns of fracturing. We will look at the effect of mountain-front recharge on ag pumping in the alluvium and residuum.

Nate explained that at downgradient end of basin (at Hodges Reservoir), there is an outflow boundary assigned to the Hodges Reservoir stages.

- PQ: Agree this is reasonable approach.

Nate explained the basins of parameter assumptions for the historical simulations, broken out into surface and subsurface.

- WH: On soils, where did you get information on capillary fringe?
- NB: We used One Water manual assumptions.

Nate reviewed the calibration period selected for the model. The calibration targets are quantitative (measured head) and qualitative (vertical head difference targets, general flow patterns).

- PQ: What wells is calibration being done on?
- NB: Calibration is being done on 15 single wells and 3 multi-completion wells.

Nate shows some example head hydrographs and vertical head difference (VHD) for East SPV.

- PQ: Middle hydrograph on bottom – seems to be more fluctuation in simulated heads than in the observed data. Why is that happening?
- NB: I would have to look at the model in that specific area to answer that.
- WH: Nice to look at those periods of time when you don't have as much measured data, but you have a sense of climatic variations, to assess if you think the model is capturing those climatic trends.
- NB: I focused more on capturing the general trends for the purposes of the GSP.

Moving down the basin, Nate presented example head hydrographs and VHDs for Rockwood Canyon and SDSY (USGS multi-well completion near Santa Ysabel). Model tends to overestimate the SDSY levels in later years.

- WH: On these, I'm wondering if we better understood water demand and pumping in those later years, we'd have a better outcome.
- NB: We have the same thoughts. There appears to be more pumping in late 2016 and after that is missing.
- PQ: In the calibration, are you adjusting hydraulic conductivity and storage?
- NB: Bedrock hydraulic connectivity around the basin has a substantial impact on the modeled hydrographs.
- PQ: That is probably the bedrock recharge, rather than no flow boundary.
- NB: Normally, we'd see upward gradients in portions of valleys. But at the USGS multi-completion sites, we typically see downward hydraulics gradients. That is more likely than not from bedrock pumping.

  PQ: That is also discharge to Hodges Reservoir.

Model has pretty good fits in the West SPV and Cloverdale Canyon. They both have small residuals. In the SDCD (USGS multi-completion well in Cloverdale area) area, the model does not fit downward hydraulic gradients as well as the other locations. If we had a better understanding of the well construction in some of the bedrock wells, that would create the opportunity to improve the calibration in the Cloverdale area from a VHD perspective.

The final USGS location at SDLH (near Lake Hodges), we're not well aligned in the deeper layers. In the VHD plots at SDLH, there are huge downward gradients (up to 14 ft).

- PQ: Blue line here is the simulated head vs observed?
- NB: Yes, in the model, the difference between the alluvium and residuum is small, but the observed data shows large variability. You would think it should look more similar to alluvium, but it doesn't. Model jives with lithologic log. If that log did not exist, I would tend to tighten up the residuum to look more like the bedrock.

Nate provided a scatterplot showing all results for head target locations and times. A majority of points fall within one standard deviation. Model trends match the observed data, but appear to project low in the eastern end of the Basin.

- WH: There is special indication of low on one end and high on the other end.
- NB: Once we let more water into the front end of the Basin, we then push the points up in the middle portion of the Basin as well, which increases residuals at those locations.
- WH: Appears that the hydraulic gradient is flatter than observed. Usually when you have lower-permeability materials, that results in steeper gradient as compared to higher-permeability materials.
- WH: On this scatterplot, this is grouping all layer and aquifer zone information onto one graph. Are you separating the data and looking at it by layer?
    - NB: Good idea, can symbolize by color for different layers. Good comment.

Nate described the groundwater level contour map for May 2016. Curious what you think of this depiction of a water table?

- PQ: These are layer 1 heads? Appears to be 395 ft in upper Rockwood, but that is higher than what we observed in the Rockwood observation wells.

- NB: We will check that out, Slide 35.

Nate showed example streamflow plots for three different water year types. This is a flashy, dynamic basin; dry much of the time with flashy events.

Nate reviewed the consumptive use approach for the historical simulations, then provided example plots of agricultural supply and demand calibration.

- WH: On the first source of water, that's where the capillary fringe comes into play?
    - NB: Yes.
- WH: Earlier, you mentioned how your adjusting hydraulic connectivity for calibration. Are you tweaking rooting depth and capillary fringe too?
    - NB: Yes, working with internal soils expert to adjust these. But appears the model is more sensitive to bedrock K.

Nate provided status of streamflow routing package calibration parameters.

- WH: Vegetation in stream channel – are there any locations in basin that there is periodic channel maintenance that would clear out vegetation?
    - NB: Not that I am aware of. We have not made transient roughness coefficients. They're left static.
- PQ: Were streambed hydraulic connectivity's adjusted in calibration?
    - NB: Yes, we did make some adjustment to better match where streamflow was available.
    - PQ: What did you start with? 1 ft/day?
    - NB: started with 10 ft/day and adjusted from there.
    - PQ: Some of these numbers seem off – Santa Ysabel Creek is steep and silty, which would indicate lower hydraulic conductivity.
    - NB: Tried to address losing and gaining stream flows. The distribution of hydraulic conductivity of streambed material is complicated by several factors in reality. It's just a lumped parameter in the model.

Nate described status of crop calibration parameters and ranges of hydraulic conductivity. Layers 3 and 4 are modeled as confined.

AC Comments on the Historical Model

Heidi invited comments from AC members on the historical model calibration.

- FK: Nate was asking for feedback on Slide 36 – the Santa Maria Creek for August (critically dry) image appears correct. Santa Maria Creek is usually the last creek to dry up.
- FK: Around 9:27/9:28am – Peter reiterated twice that pumping in Layers 3 and 4 need to get their water from Layers 1 and 2. <<*Clarification – This comment was attributed to PQ when he had stepped away from the meeting.*>>
- MW: On hydrographs targets (Slide 24), you're using Well SP072 and SP086 – the City has gotten bad readings on those wells for years.
- MW: Agree with Frank's comments on the streamflow slides (Slide 36)
- MW: There has been zero channel maintenance over the last 15 years.

John explained how the numerical modeling fits into the GSP. We will not manage to the water budget; the water budget information acts as a guide. The GSAs will manage to the observed/monitoring data for levels and quality. The SMCs will set thresholds for those monitoring wells. The groundwater model

will help us assess if we'll need management, but the decision to initiate projects or management actions will be made based on monitoring data.

Nate added that SPV GSP Model and models like it are central to the GSP process; but these are not modeling projects. The models only need to be good enough to serve as a guide to alert the GSA to future conditions that might require adaptive management. There are always improvements that could be made to these tools – some could be done now, and some could be done later. This is the first GSP for this Basin. Additional data collection will occur during GSP implementation. Ultimately, it's the monitoring data compared with SMCs along with adaptive management actions that will demonstrate to DWR whether the Basin is being managed sustainably.

Groundwater Model Update - Projection

Nate explained that DWR requires that the groundwater modeling include a projection period of at least 50 years from 2022 through 2071. Historical calibration is based on last 15-years (2005-2019). We'll use monthly stress periods throughout. The parameter assumptions for projection simulations include input from the TPR members. He used projections of reference ET based on global climate model via BCM, along with HadGEM2-ES RCP 8.5 precipitation projections. Boundary conditions will be largely left unchanged, with the exception of some pumping wells that will no longer be used, according to stakeholder feedback.

Hodges Reservoir stage projections for 2020-2071 are based on averages by water year type. Division of Safety of Dams has set a maximum pool elevation of just under 300 ft, which means there will be increased releases until the dam is improved. General head boundary will be capped at that level. There is no known schedule, so left this assumption through projection period.

Nate then explained the approach to water budgets. He reminded TPR members of the model domain and explained that we're using stream gage data at the SPV basin boundary. Laterally, ag pumping will only be reported for Layers 1 and 2 in the basin. Any pumping from Layers 3 and 4 do not get reported in the water balance, but the modeled influence of that pumping on the Basin water budget will be reported.

Run times are really long, so we don't have water budget projections for this call. Results will be presented at the January TPR meeting.

- WH: On groundwater pumping, are you going to report the groundwater budget for Layers 1 and 2 combined or separated? Reason I'm asking is that when you get into groundwater pumping, you have influence of inter-borehole flow, and with downward gradients, you may show initially a lot for groundwater pumping in model layers that have pull from other layers.
    - NB: Yes, with the One water code, we can slice and dice the outputs. If there is a multi-layer wells (from Layers 1 and 2 and 3, the only pumping that will be reported is for the top 2 layers. We're not going to show separate water budgets for Layers 1 and 2. Nate showed image from model of spatial model domain.
    - WH: Pumping from layers 1 and 2, plus subsurface outflow from those 2 layers into Layer 3 and 4 that reflect influence of pumping. Wondering if there is a way to differentiate what portion of subsurface flow is from inter-borehole flow and compared to other subsurface flow components.
    - NB: GSP regulations don't require that much granularity.
    - WH: Want to make sure there isn't double counting. If you have outflow from Layers 1 and 2 from pumping, initial budget term includes water leaving those 2 layers whether it leaves from surface discharge vs inter-borehole flow.

    - NB: With deep wells, there will be some flows that come out of legal basin and down into the lower levels, that is captured. The well itself will be a conduit for downward flow – that occurs even when wells aren't pumping.
    - WH: This is complicated, and we've had to develop our own python scripts. You might get a sense that Layer 1 and 2 pumping is much greater than what it actually is. If you want a sense of what is being pumped from Layers 3 and 4, may be undercounting.
- PQ: For that to happen, don't you need to show that well has perforations in each of those layers?
    - WH: No, if you have a well that penetrates, you can still get the model to simulate borehole flow from non-perforated layers.
    - PQ: In 100 square foot grid, talking about less than 1 square foot. Would have to assign hydraulic connectivity to that annulus.

AC Comments on the Projection Model

Heidi invited AC members to comment on the projection model. No comments were offered.

Final Thoughts from TPR

Heidi invited TPR members to provide any final thoughts. No comments were offered.

Public Comments

Public comments provided in the "Chat" during the meeting are listed below. Public comments provided verbally by meeting participants follow:

- Andre Monette, BBK, Counsel for RG – Thanks to the team for this presentation. On the model construction and no flow boundaries, want to reiterate that model has bias that only shows recharge from coming from Layers 1 and 2. This is a flaw in the model. Need to acknowledge that this model can't be used to demonstrate outflow to Layers 3 and 4, because it's constructed in a way that will always show outflow from Layers 1 and 2.
- Andre Monette, BBK, Counsel for RG – Looks like there is data in head levels that show outflow. But conclusions are being made that aren't supported by the evidence (e.g., caused by pumping). Could be other regional issues at play here – work done by USGS looking at regional flow from fractured bedrock from mountains to ocean. Need to evaluate this to find out causes before jumping to conclusions.
- Andre Monette, BBK, Counsel for RG – Model is about groundwater flow and water budgets. But no discussion about trying to model water quality. Need to make sure that we're keeping an eye on that -nitrate and salinity. This is something that the GSP should be looking at.

Next Steps

The next TPR Group meeting is scheduled for Thursday, January 14, 2021 from 9 to 11:30 am.

Comments should be sent directly to Sandra Carlson at carlson@sandiego.gov.

The TPR meeting ended at 11:28am.

GoToMeeting Chat Log from TPR Meeting

Rosalyn Prickett, Woodard & Curran (to Everyone): 8:40 AM: Good morning!

W&C-Heidi Gantwerk (to Everyone): 10:40 AM: AC members-if you have comments on what has been presented so far, we can take a few minutes when we get back before going into projections.

W&C-Heidi Gantwerk (to Everyone): 11:06 AM: A reminder for those watching who wish to comment at the end of the TPR and AC discussion; please put your name and organization into the chat

Andre - Best Best & Kreiger LLP (for Rancho Guejito) (to Everyone): 11:07 AM: Hi, I would like to make a comment during the public comment period. Thanks!

W&C-Heidi Gantwerk (to Everyone): 11:08 AM: Thanks Andre.

Cooledge, Craig (to Everyone): 11:26 AM: Thank you!

Images from TPR Meeting