Sierra Valley Technical Advisory Committee Meeting Summary: June 21, 2021

Project Website: www.sierravalleygmd.org/sierra-valley-groundwater-sustainability-plan

Data Portal: https://sierra-valley.gladata.com

ACTION ITEMS

ACTION ITEM: Send out new Chapter 2 text and Geologic Model 3D Viewer instructions.

ACTION ITEM: Move July TAC meeting to July 19, 2021 from 2:30 – 5:30 p.m.

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Welcome, Introductions, Agenda Review

The eighth meeting of the Technical Advisory Committee (TAC) for the Sierra Valley (SV) Groundwater Sustainability Plan (GSP) was an in-person meeting, with a zoom webinar option for remote participation. (Note: Go to https://youtu.be/G4SsmTI5WIo for the video recording of the meeting.) The meeting agenda was reviewed, followed by introductions. The topics for this meeting covered:

- Project updates
- Geologic modeling of aquifer conditions
- Continued discussion on Interconnected Surface Water (ISW)
- Updates on Groundwater Dependent Ecosystems (GDEs)

There were 21 participants: 14 TAC members and 7 project team members. Six people joined the meeting via Zoom and fifteen participated in person.

Project Updates

NEW TEXT: CHAPTER 2

Laura Foglia, LWA Project Manager, reported that new text for Chapter would be distributed via email on the following day. There is quite a bit of information. Reviewers are asked to confirm the descriptions and characterizations of the basin and whether any information is missing. An excel spreadsheet is provided to submit comments. Additional text will likely be provided in July. Comments are requested by July 17th. The text review is an iterative process: text was previously provided on groundwater quality and subsidence, the current text addresses the basin settings. Text is developed after, and based on, presentations at TAC meetings – so text should look familiar.

PUBLIC WORKSHOPS

As a reminder, Judie Talbot noted the public workshops presented descriptions of the Sustainability Indicators and local conditions. All materials are now online at the GSP website in the Documents sections. This includes background information and two versions of the survey (online and hard copy). At the May workshops, 15 survey responses were submitted – for a 50% response rate. New survey responses are requested to be submitted by July 1st. An email was sent to everyone on the Interested Parties email, providing access to the workshop handouts and survey.

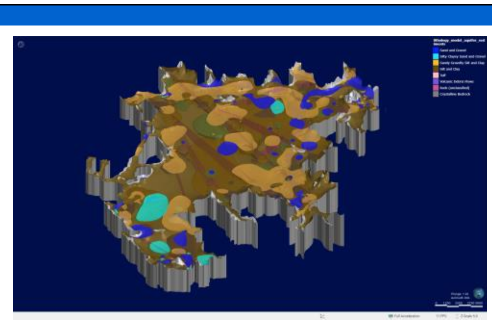
RECAP OF INITIAL DWR ASSESSMENTS FOR GSPs

Laura Foglia and Debbie Spangler, DWR contact for the Sierra Valley basin, reported that DWR has published their first four GSP reviews. Two GSPs were accepted and two had identified deficiencies. Those deficiencies need to be addressed in the next 180 days. Interestingly, one firm produced three of the GSPs – two were accepted, one contained deficiencies.

The DWR assessments were comprehensive, clear and informative. The timing is helpful to inform the GSPs that are currently under development. The reviews emphasized good science and good data, seeking descriptions of why additional data may need to be developed and how it will be used. There were few reviewer comments on management actions, with many of GSPS describing management actions at a conceptual level. DWR reviewers did look for GSA commitments to implementation of the GSPs.

It was noted that management actions fall into two broad categories: supply augmentation and demand reduction. DWR recently hosted a webinar highlighting SGMA-IRWM (Sustainable Groundwater Management Act-Integrated Regional Water Management) approaches to groundwater recharge. The video of the webinar is available online at: https://mavensnotebook.com/2021/06/22/webinar-collaborating-across-irwm-and-sgma-groundwater-recharge/.

Geologic Modeling of Aquifer Conditions



Gus Tolley, hydrogeologist with Daniel B. Stephens and Associates, presented information on the Geologic Model and the 3D results that represent aquifer conditions. Please note that all distances are reported in meters! NOTE: PC users can access the instructions and download for the 3D Viewing software at www.sierravalleygmd.org/files/4d12cb9e0/Geologic-Model-3D-Viewer-Instructions.pdf.

CURRENT STATUS OF MODELING

Gus recapped that the Integrated Hydrologic System Model provide defensible values for the water budget, which is a required component of the GSP. The model produces tables of the water budget components. The accounting of water elements is contained within the model itself, allowing specific queries to be made. Models also helpful in projecting future conditions and looking at "what if" conditions and actions (i.e. seeing the outcomes associated with certain actions or changing conditions). In a previous presentation, three components of the system model include the

- Upper Watershed Model (for streamflow entering the valley)
- Soil-Water Budget Model (looking at recharge and pumping within the valley)
- Groundwater-Surface Water Model (groundwater flow)

Gus compared the modeling elements to layers in a cake. Each layer is a cake that comes together to create a more elaborate cake. Likewise, the models all work together in concert to create the Hydrologic System Model.

The geologic model is a precursor that informs the Groundwater-Surface Water model. The geologic model describes the three-dimensions properties of the aquifer. For example, the model represents the distribution of sediments: where highly conductive sediments occur and where low conductivity sediments are located. This distribution of sediments influences the flow of groundwater through the aquifer system.

3D GEOLOGIC MODEL: AQUIFER SYSTEM CHARACTERIZATION AND VISUALIZATION

A 3D modeling software is being used to represent the current understanding of the aquifer system itself, including sediment distribution and geometry of the bedrock (i.e., what the floor and sides of the aquifer look like; and what the layers of clays, gravels, silts and sands look like). It shows the boundaries of the aquifer, with different colors representing the different sediments that comprise the aquifer. Four general categories of materials are used:

- Very coarse (sands and gravels – dark blue)
- Coarse (silty, clay sands and gravels – light blue)
- Semi-fine (sandy, gravelly silts and clays – light brown)
- Very fine (silts and clays – dark brown)

Where detailed information is not available, silts and clays are assumed to be the background of the basin – given that this is a lake basin. The image represents what is occurring immediately below the topsoil. The image can be manipulated, to look at cross-sections and to pivot the images. Gray areas represent the bedrock that creates the boundaries of aquifer, where no groundwater flow occurs. It was noted that records from well boreholes (from DWR well completion database) informed the development of the geologic model. Some areas of the valley have very few wells.

Values are assigned to the different sediments for:

- Hydraulic conductivity: how easily water can flow through a sediment; higher conductivity correlates to higher flow. There are huge variations (1×10^8) across sediments in terms of hydraulic conductivity. Flows are generally reported in meters/day. Values almost always are different for vertical and horizontal conductivity. Actual groundwater flow is a function of conductivity and gradient.

It was noted that the vertical scale can be increased to better see vertical features. The deeper sections of the aquifer (in the north-east and north-central areas) are about 1,200 feet deep.

Agricultural plots can be imposed over the aquifer, to see the sediment underlaying the acreage.

Different inputs (or parameters) to the model are calibrated to better match modeled outputs with observed conditions. Observed conditions include groundwater elevations, pumping levels and stream flows.

The Geologic Model also shows:

- Faults: there is an array of generally northwest-southeast trending faults. Many are strike-slip that are primarily vertical. The model creates blocks that are sliced by the faults, using data obtained from the US Geologic Survey fault shape-file. A DWR map provides information on relative displacement (i.e., which side of the fault is higher or lower). Gravity maps also inform the location of faults and general bedrock elevation at the bottom of the aquifer. Seismic sections of the USGS survey also help map the faults.

Using the 3D Geologic Model, it is also possible to view cross-sections of the valley. These provides an opportunity to view the offset at fault lines. The USGS shows offsets of 15 meters to 70-80 meters across the fault zone. Over time, older offsets get filled in and covered with sediments. The cross-sections from the model align pretty well with those produced by Ken Schmidt. For next steps, the sequencing of sediments will be entered into ModFlow.

Discussion: Comments, Questions and Answers

Comment: It’s confusing as to whether faults impede or facilitate ground flow. During the 1960s, wells on one side of a fault stopped flowing, others were not affected.
Response: Gus would be glad to take a look at well logs or another other geologic data. It is relatively easy to incorporate new data into the model. While the USGS is currently working in the valley, it’s unlikely that it will be available to include in before the GSP is submitted.

Question: How is offset being represented in the model?
Response: Information across the fault is shared. The different layers have different levels of vertical offset over time, and that can be input into the model. Currently, one value is set for hydraulic connectivity for faults – treating it as a wall, at least initially.

Question: How is lateral displacement represented?
Response: Through the actual well locations.

Comment: This is a great visualization tool to understand the components of the aquifer. This is a significant step forward.

Continued Discussion of Interconnected Surface Water (ISW)

OVERVIEW

Dave Shaw, hydrogeologist and principal at Balance Hydrogeologic, reviewed some of the key points from the May 2021 TAC presentation (primarily on existing available data and field verification) before describing approaches for ISW identification and monitoring. As with the model, Dave noted that identification of ISW is an iterative process: with the model and with information on Groundwater Dependent Ecosystems (GDEs). Better well data will inform better groundwater levels, leading to better insights about where groundwater is shallower or deeper.

Specifically, interconnected surface water is defined as any surface water connected to groundwater through a saturated zone. The direction of flow can be from the surface water feature to the water table (e.g., losing streams), or from water table to the surface water (e.g., gaining streams). An unsaturated zone between the surface water and the water table, then the surface water is disconnected.

Existing Available Data

Existing data comes from a monitoring well network, that provides a depth to groundwater (groundwater levels across the valley. A composite picture emerges from averaging depth to groundwater across several years. Vertical hydraulic gradients can be determined from the seven existing District monitoring wells – where each well is actually a set of three nested wells, at different depths, screened at different levels. Shallower wells may extend down to 100 feet, deeper wells go down to 800 feet. Groundwater pressure at different depths will indicate the direction of the gradient for groundwater flow.

Another source of data provides the starting point for identifying ISWs: the USGS and US Forest Service produce the National Hydrography Dataset (NHD). This stream layer maps all surface waters and is quite detailed, detailing miles of streams (although some streams are actually diversions) along with the number of flowing wells and springs. However, not much field work is done to verify the results.

Field Evaluation and Verification

Members of the technical team are conducting a reconnaissance level of verification in the valley. They are speaking with some of the larger land owners, looking at some of the springs and streams. By identifying diversion ditches, it is possible to eliminate some of the NHD features as not being ISWs. Also, some streams seem to be delivering spring runoff. Most of distribution canals are related to Little Last Chance Creek and the Little Truckee Diversion. The team is also checking some of the flowing wells and springs listed in the NHD. Some of the springs are near faults. The team is looking at the geologic context and flow rates and they are asking land owners about the persistence of springs through droughts.

Measurements are also taken for specific conductance (also referred to as electrical conductivity), to assess how well water conducts electricity. This directly reflects how many electrolytes or salts are in the water. Salts can often reflect how long water has been in the ground. Water properties help determine the similarity or difference between water samples and provides baseline information. For example, the conductance of snowmelt is very close to that of distilled water (with a conductivity of 50-100); values of

200-350 is indicative of groundwater coming to the surface; some hot springs have values of 800 or more.

Overall, the valley has a complex system of channels and ditches. Surface flows and diversions drive a lot of the surface hydrology, with springs and flowing wells also contributing to that. For example, while a stream may be dominated by snowmelt runoff or diversions, spring water is also contributing to the surface flow. The majority of springs and flowing wells are more commonly located near the valley margins, with fewer located in the central portions of the valley.

The refinements result in a map of surface waters.

ISW Identification Approach

This refined system of surface waters is then compared to groundwater elevations. Groundwater levels within 5 feet of the ground surface are assumed to be connecting to surface waters through saturated zones. At this distance, groundwater can contribute to ponding at the surface. The next step is to look at vertical hydraulic gradients. Looking at the potential for upward or downward flow at the District Monitoring Wells (DMW), DWM #1 and #6 can have upward gradients during some parts of the year and downward gradients at other times of the year. Spring-fed wells in the southern part of the valley are almost always upwelling. At other locations, there are losing streams with a downward gradient.

There is a question about the relationship of shallow groundwater and its relationship to deeper groundwater. At DMW #7, there is shallow water about 70 feet above the deeper groundwater. Should ISWs refer to connections to the deeper aquifer (where the surface water would be disconnected) or refer to connectivity with the shallow aquifer? Additional work is needed to determine how far the perched groundwater is from the ground surface. This requires a discussion about which wells to query for depth to groundwater. There is also a question as to the similarities or differences of electrical conductance between surface water and perched groundwater. This might be identified as a data gap, with a clear description of how the data gap will be filled. This could result in a category of “uncertain” or “probable disconnected” as to whether these are ISWs. For now, the aquifer is being defined as a single aquifer with a upper and lower zone.

It was noted that perched groundwater levels rarely change more than 3-4 feet a year. Shallower groundwater down by Marble Hot Springs Road is about 14 feet from ground surface. Most of that shallower groundwater is covered by a layer of clay. The next step would be to determine the depth to the shallow groundwater.

ISW Monitoring Approach

For critical ISW reaches, monitoring would likely entail using existing monitoring wells (wherever possible) to establish horizontal gradients between the surface water body and the water table. Sustainable Management Criteria (SMC) would establish thresholds for changes in gradients. A monitoring well could also be located midway between an ISW feature and a production well.

Alternately, nested DMW would be used to measure vertical hydraulic gradients. Here SMC might define thresholds for when or how long upward gradients need to be supported.

Calculations of ISW depletion would best be done through the model. Currently there is not enough data to determine surface water losses without using the model.

DATA GAPS

The technical team is just beginning to understand the distribution of confining clay beds in the aquifer and possible consequences for connections between the shallower and deep aquifer. Also, monitoring data for basin conditions are still sparse for groundwater levels near valley margins or near surface water features in central portions of the basin. Surface water level data are similar sparse, precluding the opportunity to compare surface water elevation trends with changes in groundwater levels.

Discussion: Comments, Questions and Answers

Question: What is the basis for ISW in areas that is flooded by Little Truckee diversions?
Response: Most of the groundwater data shows upwelling to the surface.

Question: How many years of data is there for the District Monitoring Wells?
Response: Those wells were established starting in 1996. so about 20 years.

Question: What inputs to the model would inform calculations of ISW depletion?
Response: After calibration, observations can be entered into the model. Observed conditions would be compared to historic conditions to determine fluxes to surface water. The model would project surface water flows which could be verified through observations.

Comment: When looking at the plants and animals that might be affected by reductions in surface water, many species are doing just fine as long as surface water is present. We want to keep it that way.
Comment: It can be difficult to tease out whether reductions to ISW are due to reductions in surface water supplies or groundwater supplies.

Updates on Groundwater Dependent Ecosystems (GDEs)

Christian Braudrick, Stillwater Sciences geomorphologist, noted that the GDE map was adapted to incorporate the ISW map. The revised GDE map now shows 17,355 acres of likely GDEs. However, this does not include potential ISWs associated with areas of perched groundwater.

TRACKING GDE HEALTH; SPECIAL STATUS SPECIES

For riparian or wetland GDEs, the Normalized Differential Vegetation Index (NVDI) can be used to track changes in vegetation health (such as plant density and leaf area) through time. This information is obtained from satellite imagery and tracks how green the vegetation is. In tracking NVDI between 2000 and 2020, there is a mix of areas where some GDEs have dried a bit – while others have become greener and many have remained unchanged. When mapping the mean NDVI values, the trend seems to be steady, although it does fluctuate from year to year. Generally, the fluctuation represents wet and dry years. There does not seem to be a large consistent decline in GDE health. The mapped GDEs are doing all right. This is good news, since the GDEs support 25 special-status species. This is a large number of special-status species.

Freshwater emergent wetland is the largest portion of GDE, where less information is know about species and – subsequently – root depths.

Discussion: Comments, Questions and Answers

Question: It is still not clear how special-status species were identified. For example, peregrine falcons are not shown.

Response: There is additional information that is coming in.

Question: How does the number of 25 special-status species compare to other basins?

Response: The Nature Conservancy applies a rating of "high" if a GDE supports even one special-status species. Also, additional species can be added as they are identified.

Comment: It may be less a matter of tracking the species that are added to or fall off the list; it may be more about the types of habitat qualities needed. While a comprehensive list of species is desirable, criteria will also be tied to the habitat properties.

Comment: This may provide enough information to act on, even as more information might be added. Are there data gaps that prevent taking action? Is there a sensitivity analysis that says how important the missing data is?

Response: If we knew that groundwater levels were declining or ISW flows were declining, as a result of pumping, that would be a cause for concern. Interestingly, GDEs are not located in areas where a lot of wells occur. Hopefully the model will provide some initial indications for what is happening with groundwater and ISW flows near GDEs. This is something that would be identified as a data gap and addressed in the monitoring approach – to understand better how the ecosystem is doing.

Question: It's not clear if the spring locations are included in the GDE map, since these are most likely locations for endemic species. Also, it seems that flow would be a good indicator for aquatic species.

Response: A key question is the degree to which ISWs support these large wetlands v. groundwater from below.

Response: The comment about springs is a good one. There is a good body of information that has gotten us pretty far. Another round or two of refinement will take us even further.

Comment: Additional monitoring for plant and animal species should look at surveys that complement the current data available on plant and animal communities. Track overall health to ensure that species don't become listed.

Look Ahead; July and August TAC Meetings

The July TAC meeting will be held on Monday, July 19, 2021 from 2:30 – 5:30 p.m. The session will start with a brief update on development of the water budget. The primary focus of the TAC meeting will be on brainstorming and discussing implementation projects and management actions. After the TAC meeting, working sessions may be convened to expand development of specific approaches.

August will feature a fuller discussion of the water budget and a new topic on financial aspects of GSP monitoring and reporting. A Doodle poll will be sent out to identify the meeting date and time.

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Participants

TAC MEMBERS

X = attendance

	Organization, Name		Organization, Name
X	Agricultural Commissioner, Plumas County Willo Viera		Sierra County Environmental Health Elizabeth Morgan
X	City of Loyalton Joy Markum and Jerry Gerow (alternate)		Sierra Valley Groundwater Mgmt. District Einen Grandi and Dwight Cerasola (alternate)
X	Feather River Land Trust Ken Roby	X	Sierra Valley Resource Conservation District Rick Roberti
	Feather River Trout Unlimited William Copren	X	Sierraville Public Utility District Tom Archer and Paul Rose (alternate)
X	Hinds Engineering Greg Hinds	X	UC Cooperative Extension Tracy Schohr
X	Integrated Environmental Restoration Svcs. Michael Hogan		Upper Feather River IRWM Uma Hinman
X	Plumas Audubon Jill Slocum	X	USFS – Plumas National Forest Joe Hoffman
X	Plumas County Tracey Ferguson		USFS – Tahoe National Forest Rachel Hutchinson
X	Sierra Brooks Water System Tom Rowson		

EX-OFFICIO MEMBERS

X	CA Department of Water Resources Debbie Spangler and Pat Vellines (alt.)		CA Department of Fish and Wildlife Bridgett Gibbons

TECHNICAL TEAM & PLANNING COMMITTEE

X Laura Foglia, LWA Project Manager

X Dave Shaw, Balance Hydrologics

X Christian Braudrick, Stillwater Sciences

X Gus Tolley, DBS&A

X Jack Jacquet, Balance Hydrologics

X Betsy Elzufon, LWA Asst. Project Mgr.

X Dwight Smith, McGinley & Associates

X Kristi Jamason, Planning Committee

X Judie Talbot, Outreach Facilitator