County of Lassen
Department of Planning and Building Services
• Planning • Building Permits • Code Enforcement • Surveyor • Surface Mining

August 1, 2018

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TO: Board of Supervisors
Agenda Date: August 14, 2018

FROM: Maurice L. Anderson, Director

SUBJECT: Consider submittal of a letter to the Department of Water Resources (DWR) commenting on the designation of the Big Valley Groundwater Basin as a medium priority basin pursuant to the Sustainable Groundwater Management Act for the 2018 basin prioritization process.

ACTION REQUESTED:

1. Receive report; and
2. Consider approval of a comment letter to the DWR

SUMMARY

The intent of this Board letter is to provide an update to the Board of Supervisors regarding actions the Department of Water Resources (DWR) has recently taken pursuant to the Sustainable Groundwater Management Act (SGMA) so that the Board can determine if a comment letter will be submitted to the DWR. Specifically, the SGMA requires that the DWR rank all groundwater basins in the state as very low, low, medium or high priority. The Big Valley Groundwater Basin was again (as it was in 2014) designated a medium priority groundwater basin. As a result, the SGMA requires preparation of a Groundwater Sustainability Plan (GSP) by January 31, 2022. All other groundwater basins in Lassen County continue to be designated as "low" or "very low", meaning that a GSP is not required for any basin other than Big Valley.

The attached draft comment letter to the DWR is in regard to the designation of the Big Valley Groundwater Basin as a medium priority basin and is recommended to be from both GSAs. Comments submitted to the DWR in regard to the 2018 prioritization are due by August 20, 2018.

Abbreviated Chronology:

- On March 14, 2017, the Board of Supervisors adopted Resolution Number 17-013, agreeing to be the Groundwater Sustainability Agency (GSA) for the Lassen County portion of the Big Valley Groundwater Basin (the Modoc County Board of Supervisors elected to be the GSA for the Modoc County portion of the Basin).
- On October 10, 2017, the Board adopted Resolution Number 17-062, authorizing submittal of a grant application to the DWR to provide funding for preparation of the required GSP. Said Resolution also authorized the County Administrative Officer to execute a Grant Agreement with the DWR.
- On May 8, 2018, the DWR notified Lassen County that the grant had been funded in the amount of $999,185.00. Currently, the DWR is preparing a grant agreement, and anticipates its release to Lassen County in the next month or so.

- On May 18, 2018, the DWR released the draft 2018 Basin Prioritization results, with a deadline of August 20, 2018, to comment.

Basin Information:
Big Valley is located in the Northwest corner of Lassen County and extends into Modoc County. The basin is 92,050 acres (143.8 sq. mi) and on average 40-60% of water used within the valley is from groundwater. More detailed information about Big Valley Basin is available in California's Groundwater Bulletin 118 and the portion of the Lassen County Groundwater Management Plan pertaining to Big Valley. Attached is a "Hydrogeologic Data Assessment" prepared by GEI, under contract with Lassen County, summarizing available data for the basin. The 2018 SGMA Basin Prioritization "Dashboard" provided by the DWR is located at the following URL: https://gis.water.ca.gov/app/bp2018-dashboard/.

Sustainable Groundwater Management Act:
The Sustainable Groundwater Management Act (SGMA), adopted in September 2014, was created to ensure groundwater basins throughout the state are managed to reliably meet the needs of all users, while mitigating changes in the quality and quantity of groundwater. The intent of the Act as described in section 10720.1 is to:

- Provide for the sustainable management of groundwater basins.
- Enhance local management of groundwater consistent with rights to use or store groundwater.
- Establish minimum standards for sustainable groundwater management.
- Provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater.
- To avoid or minimize subsidence.
- To improve data collection and understanding about groundwater.
- To increase groundwater storage and remove impediments to recharge.
- To manage groundwater basins through the action of local governmental agencies to the greatest extent feasible, while minimizing state intervention to only when necessary to ensure that local agencies manage groundwater in a sustainable manner.

To meet the goals of sustainably managed basins, all basins within the state were assessed and prioritized based on their importance in meeting urban and agricultural needs. The basins were first prioritized in 2014 (during the CASGEM process, prior to SGMA) then again in 2018. Prioritization was determined through eight data components including the current population, projected population, number of public supply wells, total number of wells, irrigated acreage, degree to which the population relies on groundwater as their primary water source, any documented impacts on the groundwater (overdraft, subsidence, saline intrusion, and quality degradation) and other information determined by the DWR to be relevant.

The 2018 prioritization considered the following additional criteria that were not considered for the 2014 prioritization (2018 SGMA Basin Prioritization Process and Results):

- The updated SGMA provision in component 8 that requires consideration of *"... adverse impacts on local habitat and local stream flows";*
- Other information from a sustainable groundwater management perspective in accordance with the provision *"Any other information determined to be relevant by the Department...";*

- Use of updated datasets and information in accordance with the provision *"...to the extent data are available"*.

Based on the SGMA updates to component 8, the 2018 SGMA Basin Prioritization considered the following four new sub-components:

- Adverse impacts on local habitat and local streamflow's
- Adjudicated areas
- Critically overdrafted basins
- Groundwater related transfers

By tabulating the score of the above attributes, basins were placed into one of four priority categories: very low, low, medium and high.

For those basins ranked as medium or high priority, SGMA requires the basins be managed by a Groundwater Sustainability Agency (GSA) and that a Groundwater Sustainability Plan (GSP) be created and approved by the Department of Water Resources. The Act defines a "Groundwater Sustainability Agency" as one or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, GSA also means each local agency comprising the GSA if the plan authorizes separate agency action. It further defines a "local agency" as a local public agency that has water supply, water management, or land use responsibilities within the groundwater basin.

The role of the GSA is to create a GSP and then to implement and enforce that plan. The plan must include measurable objectives that can be used to demonstrate the basin is sustainably managed within 20 years of implementation. The Act gives the GSA many authorities including the ability to adopt rules, regulations, ordinances and resolutions, conduct investigations, impose fees, and control groundwater extraction by regulating, limiting or suspending extractions from wells.

Big valley Groundwater Basin Prioritization:
The Big Valley Groundwater Basin was first designated a medium priority basin in 2014 (prior to adoption of SGMA). The Board will recall that in 2016 Lassen County identified errors in the scoring applied to the Big Valley Basin ranking. Specifically, an additional 8,585 acres of irrigated acreage was used in the calculation. In summary, the Big Valley Prioritization data set indicated 34,129 acres while the record indicated that there were 25,544 acres of irrigated land in the Basin. The DWR ultimately declined to make any change in the ranking. This discrepancy in the irrigated acreage has been corrected for the 2018 prioritization. The results of the May 2018 prioritization, provided by the DWR, are attached.

Below is a table summarizing the differences between the 2014 prioritization results and the 2018 results. The ranges are slightly different between the two years. For example, the medium range changed from between 13.43 and 21.08 in 2014 to between 15 and 21 in 2018:

	2014 score	2018 score
1. Population	1	1
2. Population Growth	0	0
3. Public Supply Wells	1	1
4. Total Wells	1.5	2
5. Irrigated Acreage	4	3
6. Groundwater Reliance	3	3.5
7. Impacts	3	3
8. Other Information (expanded in 2018	0	7
TOTALS:	**13.5**	**20.5**

In 2014, the Basin was 0.08 from being classified as a low priority; whereas, in 2018, the Basin is now 6.5 points from classification as a low priority basin. As discussed in the attached draft comment letter to the DWR, these additional points come primarily from component 8, "Any other information determined to be relevant by the department, including adverse impacts on local habitat and local streamflows". The attached draft letter from the Board to the DWR discusses the reasons the score should be reduced. The pertinent portion of said letter is repeated below for convenience:

Component 7 Impacts: Declining Groundwater Levels

Groundwater levels in Big Valley have remained stable in some areas and declined in others over the last 10 years. Declines have been as much as 30 feet, but have been rising since 2016. Prioritization points for declining groundwater level are appropriate in this basin, however the identical score was given to all basins in the state with documented water level declines. This includes critically overdrafted basins where water levels have declined hundreds of feet, chronically over the course of many decades. Evaluating Big Valley's water level declines on par with these basins does not adequately represent Big Valley's priority in the state and therefore we would like to request DWR reconsider the points associated with this portion of the scoring criteria.

Component 7 Impacts: Water Quality

This scoring appears to be based on 14 measurements that exceeded the Secondary MCL (maximum contaminant level) for iron and manganese at the two wells used to supply water to the town of Bieber. Although secondary MCLs are enforceable standards in California, they are *not* due to public health concerns but, due to nuisance and aesthetics such as taste, color, and odor. Iron and manganese are not typically concerns for agricultural use, which is the primary beneficial use in Big Valley. Iron and manganese are naturally occurring minerals that are prevalent in volcanic areas such as Big Valley. These water quality issues are therefore not due to mismanagement of the resource and conversely cannot be substantially addressed through better management. Again, DWR did not make adequate consideration of the severity of this issue, with Big Valley receiving the same number of points as areas of the state that have significant issues with salinity, nitrate, and toxic metals that have a much greater impact on beneficial uses and human health and have the potential to be better managed under SGMA.

Further we ask that DWR consider methodologies for Component 7 to account for the severity of each impact. If those methodologies cannot be developed, we ask that DWR use their discretion to adjust points in consideration of the low level of severity of these impacts for Big Valley.

Component 8b: Other Information Deemed Relevant by the Department

While DWR did apply their methodologies consistently for Components 1 through 7, they were not consistent with Component 8 and provided little justification in applying five (5) points to Big Valley Basin for:

1. "Headwaters for Pit River/Central Valley Project - Lake Shasta"
2. "Extensive restoration project at Ash Creek State Wildlife Area has improved groundwater levels in immediate vicinity of project but declining groundwater levels over past 10 years persist outside of project area which includes numerous wetlands and tributaries to the Pit River."

This limited information about the application of DWR's discretion on these points begs numerous questions such as:

1. What headwaters does this refer to? Headwaters of the Pit River? Headwaters of the CVP? Headwaters of Lake Shasta?
2. What are DWR's concerns relative to Big Valley's position within the watershed?
3. What concerns does DWR have specific to Big Valley, given that there are numerous other groundwater basins within the Pit River, Lake Shasta, CVP and State Water Project watersheds that were not awarded these points?
4. Why are water levels in the vicinity of Ash Creek and other wetlands considered "other information deemed relevant"? Wasn't this information already considered in Component 7: Declining Groundwater Levels and Component 8a: Streamflow and Habitat?

Comments on this prioritization must be submitted to the DWR by August 20, 2018. The attached draft letter is joint letter with Modoc County, who is the GSA for the Modoc County portion of the Big Valley Groundwater Basin.

MLA:gfn

Enclosures:
1. Draft letter to the DWR, commenting on the Prioritization
2. December 2017 Hydrogeologic Data Assessment (portion), by GEI
3. 2018 Sustainable Groundwater Management Act (SGMA) Basin Prioritization Results for the Big Valley Groundwater Basin by the DWR

Pla/admin/files/1252/Board Letter for 7-14-15 Agenda

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August 14, 2018

Trevor Joseph
Department of Water Resources
Sustainable Groundwater Management Office
P.O. Box 942836
Sacramento CA 94236-0001

Dear Mr. Joseph:

This letter is in regard to the proposed ranking of the Big Valley Groundwater Basin as a medium priority basin pursuant to the Sustainable Groundwater Management Act (Part 2.74 of the California Water Code). The Lassen County Board of Supervisors has elected to be the Groundwater Sustainability Agency for the Lassen County portion of the basin and the Modoc County Board of Supervisors has elected to be the Groundwater Sustainability Agency for the Modoc County portion of the basin pursuant to said Act and has been designated as such. Lassen and Modoc County are working in a coordinated effort to comply with the Sustainable Groundwater Management Act by retaining local control for the benefit of our constituents.

This letter is to provide comments regarding the above ranking and present justification for consideration to reduce the 2018 Big Valley Groundwater Basin prioritization score.

The 2018 ranking considered the following additional criteria that were not previously considered for the 2014 prioritization (2018 SGMA Basin Prioritization Process and Results):

- The updated SGMA provision in component 8 that requires consideration of *"...adverse impacts on local habitat and local stream flows"*;
- Other information from a sustainable groundwater management perspective in accordance with the provision *"Any other information determined to be relevant by the Department..."*;
- Use of updated datasets and information in accordance with the provision *"...to the extent data are available"*.

Based on the SGMA updates to component 8, the 2018 SGMA Basin Prioritization considered the following four new sub-components:

- Adverse impacts on local habitat and local streamflows

- Adjudicated areas
- Critically overdrafted basins
- Groundwater related transfers

Lassen and Modoc County have carefully evaluated the information and data provided to establish the 2018 SGMA Basin Prioritization results. The datasets, methodologies, and documentation provided for this process are an improvement over the previous prioritization, and DWR made efforts to standardize the datasets and criteria used for nearly all the components including Component 7: Impacts. However, DWR did not make adequate consideration of the severity of the impacts for Component 7 and did not apply consistent methodologies and justification for Component 8. Particular inadequacies related to Big Valley's prioritization include:

Component 7 Impacts: Declining Groundwater Levels

Groundwater levels in Big Valley have remained stable in some areas and declined in others over the last 10 years. Declines have been as much as 30 feet, but have been rising since 2016. Prioritization points for declining groundwater level are appropriate in this basin, however the identical score was given to all basins in the state with documented water level declines. This includes critically overdrafted basins where water levels have declined hundreds of feet, chronically over the course of many decades. Evaluating Big Valley's water level declines on par with these basins does not adequately represent Big Valley's priority in the state and therefore we would like to request DWR reconsider the points associated with this portion of the scoring criteria.

Component 7 Impacts: Water Quality

This scoring appears to be based on 14 measurements that exceeded the Secondary MCL (maximum contaminant level) for iron and manganese at the two wells used to supply water to the town of Bieber. Although secondary MCLs are enforceable standards in California, they are *not* due to public health concerns but, due to nuisance and aesthetics such as taste, color, and odor. Iron and manganese are not typically concerns for agricultural use, which is the primary beneficial use in Big Valley. Iron and manganese are naturally occurring minerals that are prevalent in volcanic areas such as Big Valley. These water quality issues are therefore not due to mismanagement of the resource and conversely cannot be substantially addressed through better management. Again, DWR did not make adequate consideration of the severity of this issue, with Big Valley receiving the same number of points as areas of the state that have significant issues with salinity, nitrate, and toxic metals that have a much greater impact on beneficial uses and human health and have the potential to be better managed under SGMA.

Further we ask that DWR consider methodologies for Component 7 to account for the severity of each impact. If those methodologies cannot be developed, we ask that DWR use their discretion to adjust points in consideration of the low level of severity of these impacts for Big Valley.

Component 8b: Other Information Deemed Relevant by the Department

While DWR did apply their methodologies consistently for Components 1 through 7, they were not consistent with Component 8 and provided little justification in applying five (5) points to Big Valley Basin for:

1. "Headwaters for Pit River/Central Valley Project - Lake Shasta"
2. "Extensive restoration project at Ash Creek State Wildlife Area has improved groundwater levels in immediate vicinity of project but declining groundwater levels over past 10 years persist outside of project area which includes numerous wetlands and tributaries to the Pit River."

This limited information about the application of DWR's discretion on these points begs numerous questions such as:

1. What headwaters does this refer to? Headwaters of the Pit River? Headwaters of the CVP? Headwaters of Lake Shasta?
2. What are DWR's concerns relative to Big Valley's position within the watershed?
3. What concerns does DWR have specific to Big Valley, given that there are numerous other groundwater basins within the Pit River, Lake Shasta, CVP and State Water Project watersheds that were not awarded these points?
4. Why are water levels in the vicinity of Ash Creek and other wetlands considered "other information deemed relevant"? Wasn't this information already considered in Component 7: Declining Groundwater Levels and Component 8a: Streamflow and Habitat?

Due to the need for further clarification on the preceeding questions regarding component 8b, both Lassen and Modoc GSAs would like to request the points associated with this portion of the scoring criteria be reconsidered.

Lassen and Modoc County understand the vast complexity of evaluating each basins data and information, however, we feel a further assessment of the 2018 SGMA Basin Prioritization score is desired by both GSAs. For the above reasons, Lassen and Modoc County GSAs would like to request an assessment of the questions regarding the basins data, detailed in this letter, to be reviewed for a potential lowering of the overall basin score. We appreciate the consideration of our comments and look forward to hearing from you.

Sincerely,

Chris Gallagher, Chairman
Lassen County Board of Supervisors

Patricia Cullins, Chair
Modoc County Board of Supervisors

Memo

GEI Consultants

RECEIVED

DEC 2 8 2017

Lassen County Department of Planning and Building Services
Received by email

To: Mr. Gaylon Norwood

From: David Fairman and Rodney Fricke

Date: December 28, 2017

Re: Hydrogeologic Data Assessment
SGMA Support Services – Big Valley Groundwater Basin
Lassen County, California
GEI Project 1611089 Task 4

Dear Mr. Norwood:

GEI Consultants, Inc. (GEI) prepared this technical memorandum to describe the results of the Hydrogeologic Data Assessment (Data Assessment) for the Big Valley Groundwater Basin (BVGB, 5-004), located in northwestern Lassen County and southwestern Modoc County. The purpose of the Data Assessment is to compile existing readily-available hydrogeologic information, identify critical data gaps, and prepare this memorandum to document the findings. This document will support the development of a more detailed Data Gaps Assessment for the BVGB along with a Critical Gap Workplan and Monitoring Plan.

Background

The Sustainable Groundwater Management Act (SGMA) of 2014 requires the preparation of a Groundwater Sustainability Plan (GSP) for all medium- and high-priority basins by January 31, 2022. The Big Valley Groundwater Basin (BVGB) was classified as a medium-priority basin by the California Department of Water Resources (DWR) because of the relatively large area of irrigated land, the reliance on groundwater as a source of supply, and declining groundwater levels.

Lassen County has elected to be the groundwater sustainability agency (GSA) for its portion of the basin, effective on July 18, 2017; and Modoc County has elected to be the GSA for its portion, effective on June 28, 2017. These GSAs have agreed to coordinate on the preparation of a basin-wide GSP for the Big Valley Groundwater Basin.

Development of a GSP requires a quantitative understanding of specific conditions within a basin and the assimilation of a considerable amount of information. Many local, regional, and state programs have information and studies that will be useful in the GSP development. This Data Assessment begins to identify existing and readily-available information; which will serve as a basis for future development of a more detailed Data Gaps Assessment, Critical Gap Workplan, Hydrogeologic Conceptual Model, and the GSP Monitoring Plan for the BVGB.

Groundwater Sustainability Plan

A GSP is a comprehensive document that presents the GSAs' detailed understanding of the hydrology and hydrogeology of the groundwater basin and establishes a long-term plan for the sustainable utilization of groundwater resources. The content of a GSP is defined in the 2016 Final GSP Regulations (Title 23, Division 2, Chapter 1.5, Subchapter 2. Article 5). DWR has also published several guidance documents for SGMA implementation, including a Preparation Checklist for GSP Submittal and a GSP Annotated Outline Guidance Document. These documents were consulted along with a review of the GSP regulations to identify the necessary data to prepare an adequate GSP. **Attachment 1** provides a list of hyperlinks to key SGMA documents, including the regulations and DWR's Guidance Documents.

A generalized GSP outline adapted from DWR's GSP Annotated Outline Guidance Document is shown below.

Generalized GSP Outline

1. Introduction
    1.1. Purpose of GSP
    1.2. Sustainability Goal
    1.3. Agency Information
    1.4. GSP Organization
2. Plan Area and Basin Setting
    2.1. Description of Plan Area
        2.1.1. Jurisdictional Areas and Other Features
        2.1.2. Monitoring and Management Programs
        2.1.3. Land Use Elements and General Plans
        2.1.4. Additional GSP Elements
        2.1.5. Notice and Communication
    2.2. Basin Setting
        2.2.1. Hydrogeologic Conceptual Model
        2.2.2. Current and Historical Groundwater Conditions
        2.2.3. Water Budget Information
        2.2.4. Management Areas
3. Sustainable Management Criteria
    3.1. Sustainability Goal
    3.2. Measurable Objectives
    3.3. Minimum Thresholds
    3.4. Undesirable Results
    3.5. Monitoring Network
4. Projects and Management Actions to Achieve Sustainability Goal
    4.1. Project/Action #1
    4.2. Project/Action #2
    4.3. Etc...
5. Plan Implementation
    5.1. Estimate of GSP Implementation Costs
    5.2. Schedule for Implementation
    5.3. Annual Reporting
    5.4. Periodic Evaluations
6. References and Technical Studies

Each of the above sections will need support by existing information: studies, maps, and tabulations of historic, current, and estimated future conditions. Some of the sections require existing information that is not hydrogeologic while information will be created during GSP development for other sections. The sections of the GSP which require existing hydrogeologic information are shown in **bold** characters, and are the sections of the GSP that were assessed for this document.

SGMA defines six sustainability indicators: 1) Chronic lowering of groundwater levels, 2) Reduction of groundwater storage, 3) Seawater intrusion [Not applicable to BVGB], 4) Degraded water quality, 5) Land subsidence, and 6) Depletion of interconnected surface water. The GSP must establish and describe the monitoring networks (Section 3.5) for the five applicable sustainability indicators and establish quantitative minimum thresholds for each.

The five sustainability indicators can be monitored with four networks in the BVGB. **Table 1** lists the monitoring networks and the sustainability indicator(s) monitored by each network. Maps of available data under existing programs were developed for the four networks and included in **Attachment 5.** These maps are useful for determining the adequacy of the existing information and monitoring programs for GSP compliance.

Table 1: Monitoring Networks and Sustainability Indicators

Monitoring Network	Sustainability Indicator(s)
Groundwater Level Measurements	Chronic Lowering of Groundwater Levels Reduction of Storage
Groundwater Quality Sampling	Degraded Water Quality
Land Surface Elevation Survey, Water Level Measurements	Land Subsidence
Surface Water Flow Measurements, Groundwater Level Measurements	Depletion of Interconnected Surface Water

Data Assessment

Attachment 2 presents a listing of the sources consulted in the data review. **Attachment 3** contains a bibliography of the findings. The findings were then correlated with the GSP checklist in **Attachment 4.** Provided below is a general discussion of information available for the development of the hydrogeologic conceptual model (HCM) and the water budget (WB), and then a description and assessment of the adequacy of each of the four monitoring networks (**Table 1**).

Basin Setting

The key information that needs to be contained in the HCM is a description of the physical characteristics of the basin that control flow, including the lateral basin boundaries, bottom of basin, principal aquifers and aquitards, and recharge and discharge areas. The bibliography in **Attachment 3** identifies numerous regional studies, maps, and data related to the geology and hydrogeology of the region, but only two studies contain basin-specific information and analyses: Northeastern Counties Ground Water Investigation, Bulletin 98 (DWR 1963) and Geology of the Big Valley Geothermal Prospect, Lassen, Modoc, Shasta, and Siskiyou Counties, California (GeothermEx 1975). These studies will provide much of the information to describe the physical characteristics listed above. However, DWR (1963) describes two components that will require further study for the purposes of developing Basin Setting portion of the GSP.

First, DWR (1963) describes an area of confining conditions in the southwestern portion of the basin as shown in **Figure 1.** This area may need to be divided into two principal aquifers: a shallow, unconfined aquifer and a deeper, confined aquifer. More detailed information about the nature of the confining layer, and the extent of the confining conditions is needed.

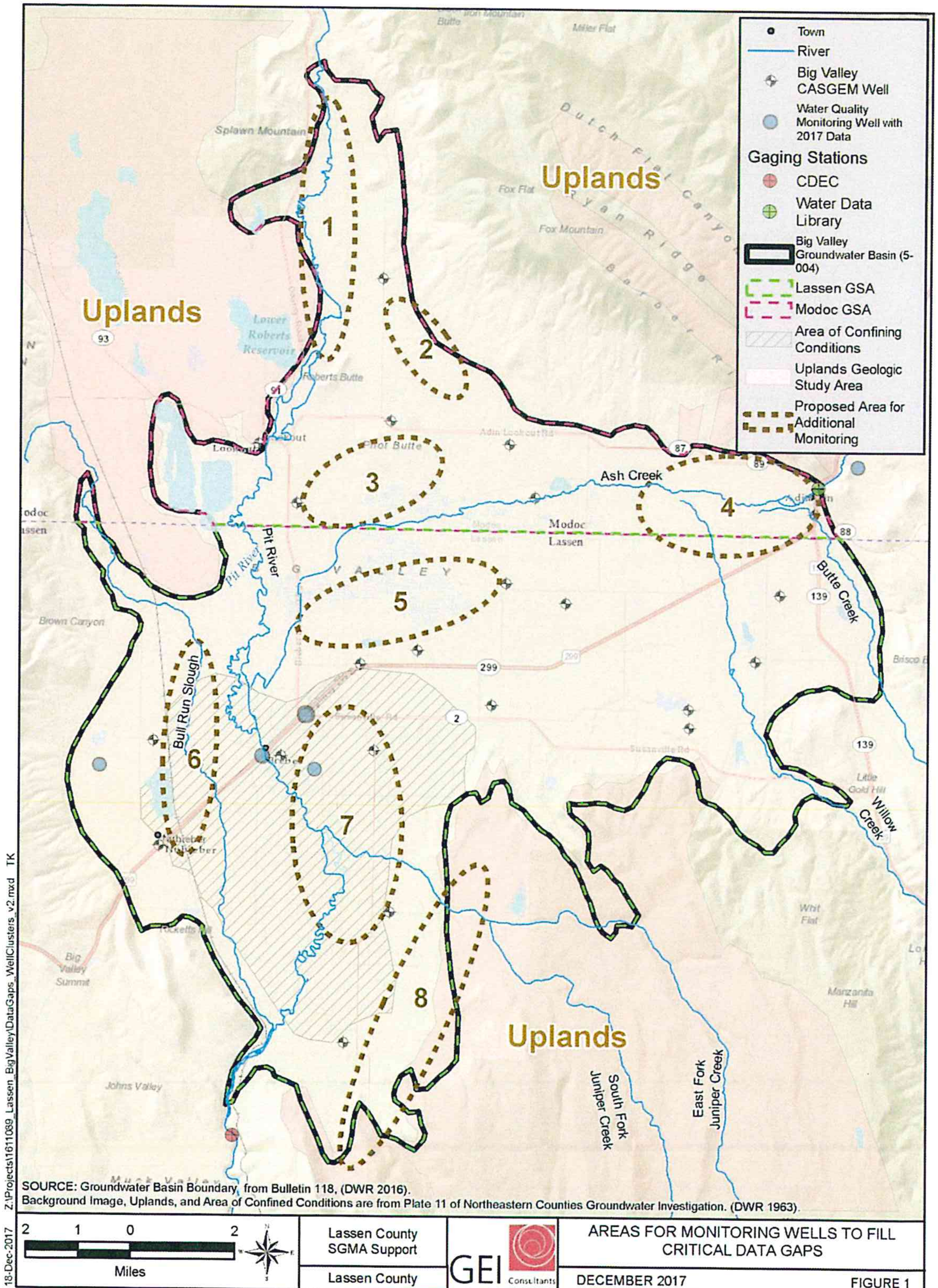

Figure 1: Areas for Monitoring Wells to Fill Critical Data Gaps

Second, DWR (1963) identifies recharge areas that are outside of the groundwater basin in "upland" areas. The Bulletin describes volcanic beds of the Turner Creek Formation that outcrop in the upland areas and dip beneath the BVGB, providing recharge to the groundwater basin. This condition will require further information to determine how and where recharge occurs, particularly in relation to the water budget which will need to quantify subsurface inflows and outflows from the basin. **Figure 2** shows a schematic of the required components of a water budget. The required components are color-coded by the adequacy of information to quantify each. Green have adequate information, orange have some information, but may need to be enhanced with additional information, and red have inadequate information (critical data gap). Each orange and red component is discussed below.

Water budget components with some information, but may need enhancement

Water budget components that may need enhancement are shown in orange and include surface water measurements, precipitation, infiltration of precipitation and agricultural water, and groundwater extractions.

Surface water flows are measured by streamflow gages and the nearest flow gage (PCN) on the Pit River is located in Canby, 25 river miles upstream of the BVGB. The PCN gage is not located close enough to BVGB to adequately define the surface water flow into BVGB. Conversely, the MVD gage is located at the downstream side of BVGB but only measures the river height (stage) so stream velocity measurements are required at this location. Flow measurements will likely be needed at confluence locations of the Pit River and other tributaries within BVGB to understand the total quantity of surface water flows into and out of the basin. **Figure A4-3** shows the location of the various gages near BVGB.

Precipitation is measured throughout California at stations managed under the California Irrigation Management Information System (CIMIS). The nearest CIMIS stations are located in McArthur and Alturas, about 15 to 30 miles from Big Valley, respectively. Interpretation of the data from these stations can be performed to estimate precipitation in Big Valley, but a temporary or permanent station in the BVGB may be needed for a higher level of precision.

Estimates of infiltration of precipitation and applied water can be made using information about crop demand, soils properties, and subsurface geology. Some information is available from existing reports on geologic and soils mapping, but these estimates can be greatly enhanced by field confirmation of soils through additional soils mapping and by logging of subsurface sediments during well drilling.

An approach for quantifying groundwater extractions can be identified during the development of the GSP and may include the use of flow meters and the use of remote sensing to tally the acreage of irrigated land and crop type. Stakeholder input will assist in developing the approach.

Water budget components with inadequate information (critical data gaps)

These critical data gaps are shown in red below and include surface water/groundwater interactions and sub-surface groundwater inflows.

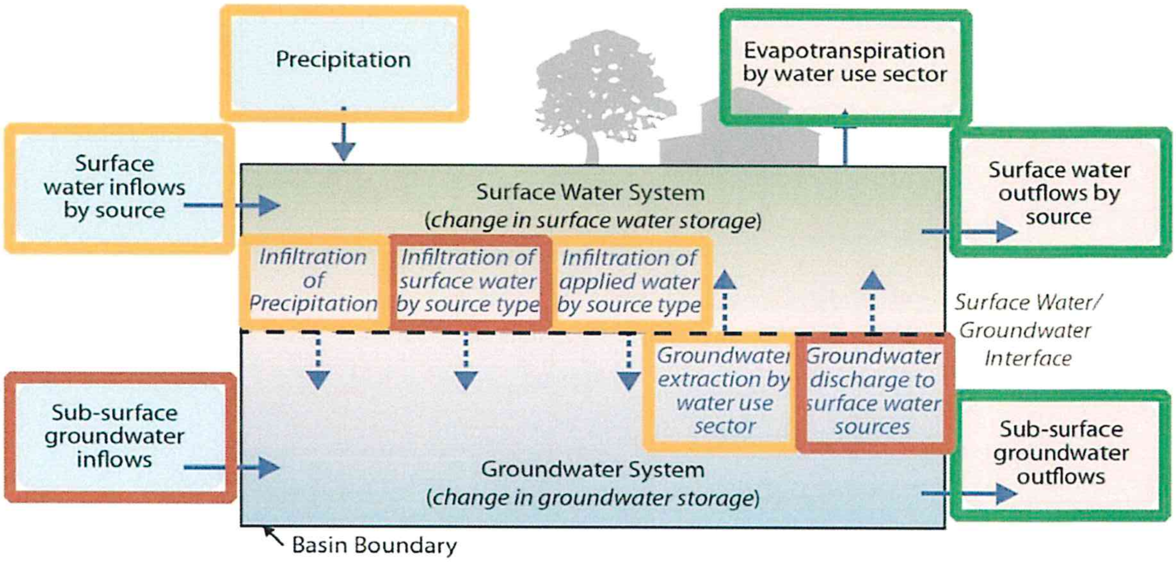

Figure 2: *Schematic of Required Water Budget Components*

Infiltration of surface water and groundwater discharge to surface water (i.e. surface water/groundwater interactions) will need physical monitoring data to quantify the amount of interactions, to assess the potential for the "depletion of interconnected surface water" as required by SGMA. The most informative and defensible approach to this indicator is to monitor shallow water levels adjacent to streams. The current CASGEM monitoring network contains very few shallow wells adjacent to streams. The only potential candidates for this type of monitoring are wells 23E1 and 28F1 shown in **Figure A5-1**. The volume of flow to or from the stream cannot be determined with confidence using only one well, because the direction of flow can't be determined. At least three wells in the same vicinity are needed to determine the direction and magnitude of flow. Additional shallow monitoring in clusters of three wells adjacent to streams would provide the needed information. **Figure 1** shows circled areas where additional monitoring would provide that information. Shallow monitoring clusters in areas 1 and 4 would monitor the surface water/groundwater interaction where the two major streams (Pit River and Ash Creek) enter the basin, areas 3 and 5 would provide information at the confluence of the rivers, and areas 6 and 7 would provide information where the Pit River leaves the basin.

Sub-surface groundwater inflow is the other water budget component that needs further investigation because previous investigation identified recharge areas outside of the basin (DWR 1963). To confirm the interaction between the Turner Creek Formation in the upland areas, additional monitoring in areas 1, 2, and 4 on **Figure 1** would provide information about inflow to the basin on the Modoc County side, and area 8 would provide the information on the Lassen County side. Monitoring wells in these areas would need to be drilled through the Turner Creek Formation (if encountered) to determine the thickness of the unit and ensure that the monitoring is interconnected to the upland recharge areas. Water quality data from these wells could provide information to confirm the interconnection.

Monitoring Networks

Groundwater Level Monitoring

Table A5-1 lists the 23 wells currently in the California Statewide Groundwater Elevation Monitoring (CASGEM) program. Two of the wells have historic data going back to the late 1950s and 18 wells have data since the late 1970s or early 1980s while monitoring at three wells started in 2016. During 2017, groundwater levels were measured at 20 wells during March and at 18 wells during October. Well 12G1 (411467N1211110W001 or 38N07E12G001M) has not been measured since 1992 and should be delisted if the owner does not want to reactivate the well.

Figure A5-1 shows the location of these wells. The depths for these wells ranges from 49 to 800 feet and likely provide data from different aquifers. According to DWR (1963), several types of groundwater are present in BVGB, including near-surface groundwater, several bodies of deeper confined groundwater, and relatively small quantities of mineralized (geothermal) groundwater. Additional wells will likely be necessary to address depth-specific groundwater conditions (shallow and/or deep) along with monitoring of the principal aquifers in the southwest of the BVGB, spatial data gaps (GEI, 2015), or other conditions that may be identified later on. According to two DWR inventories (2015, 2017), a total of 630 wells are located in BVGB, mostly (70%) in Lassen County, which occupies a similar portion (72%) of BVGB. Areas 1 through 8, shown on **Figure 1,** are proposed for monitoring wells to increase the density of monitoring throughout the basin.

Water Quality Monitoring

The GeoTracker GAMA website provides groundwater quality data from various programs shown in **Table A5-2. Figure A5-2** shows the approximate sampling locations and highlights the 2017 sampling that most likely will be ongoing. The two programs with ongoing monitoring are from the Division of Drinking Water (DDW) and Environmental Monitoring Sites (EDF). The DDW sites will likely provide useful data for the GSP, while the EDF monitoring may be limited going forward, depending on the status of the site remediation and the evolution of the monitoring requirements. With the Bieber area as the only location with DDW wells, water quality monitoring will need to be performed in other areas of the basin. Water quality sampling of wells constructed in the areas identified in **Figure 1** could provide this information, particularly in the Modoc County side and in the eastern portion of the basin.

Surface Water and Surface Water/Groundwater Monitoring

Measurement of surface water flow is necessary under SGMA for water budget calculations, for quantifying surface water deliveries, and for quantifying the interconnections of surface water and groundwater. Shallow monitoring wells are needed for groundwater conditions near surface water as described above. **Figure A5-3** shows surface water flow stations available from the California Data Exchange Center (CDEC) and the water data library. Current monitoring exists on the Pit River with a gage located 25 miles upstream of Big Valley at Canby (PCN), including flow and stage, and at the outflow from the BVGB (MVD) as stage data only. Historic records are available for a gage in Adin (Ash Cr @ Adin) between 1975 and 1997. Estimates of surface water flow into and out of the basin for the major streams will utilize the existing data to the extent possible, but these data will need to be enhanced with surface water flow measurements at the north end of the basin (Pit River) and where smaller streams enter the basin. The groundwater monitoring would need to be enhanced as well to include additional shallow monitoring in areas 1, 3, 4, 5, 6, and 7 shown in **Figure 1.**

Land Subsidence Monitoring

Evidence of subsidence was not found in the review of existing data for the BVGB. However, the BVGB was designated to have a medium to high potential (MHP) for land subsidence (DWR, 2014) as a result of declining water levels. Therefore, the water level monitoring network described above will be used as a part of subsidence monitoring. Land elevation data are also needed to directly measure subsidence. **Figure A5-4** shows that a continuous global positioning system (CGPS) station is located near the town of Adin as part of the National Oceanic and Atmospheric Administration's (NOAA's) Continuously Operating Reference Station (CORS). This station provides good reference data, as this location is unlikely to undergo subsidence being located at the fringe of the basin where the aquifer is thinner. The most likely area for subsidence would be in the area of confining conditions shown on **Figure 1** where aquifer thickness is large and clay content (confining material) may be high. Clays are typically responsible for much of the inelastic subsidence experienced by aquifers. **Figure A5-4** shows numerous National Geodetic Survey (NGS) survey monuments are located in this area. One of these monuments may be re-surveyed and used if appropriate, or a new monument could be established at one of the new monitoring well sites in area 7. The monument would need to be surveyed using high-precision techniques and calibrated to the CORS station in Adin.

Summary of Critical Data Gaps and Future Work

The critical data gaps identified in this report are listed below.

- Two principal aquifers in the southwest portion of the basin.
  - Detailed information about the nature of the confining layer(s), and the extent of the confining conditions
  - Wells that can adequately monitor the two principal aquifers
- Recharge Areas
  - Detailed descriptions of the Turner Creek Formation in the upland areas, outside of the BVGB
  - Detailed descriptions of subsurface sediments and water quality information within the BVGB for correlation to the potential upland recharge areas
  - Monitoring wells near the fringes of the basin to monitor groundwater recharge (direct infiltration) and potential inflow from the upland areas outside the basin
- Groundwater levels
  - Additional groundwater level monitoring throughout the basin to increase the density of monitoring
- Water quality
  - Analyses from wells throughout the basin, particularly in Modoc County portion and at the eastern end of the basin
- Surface water/groundwater interactions
  - Shallow monitoring wells (clusters of three) adjacent to major streams
- Land subsidence
  - Surveyed monument(s) in the area of confined conditions

Further recommendations may arise as a more detailed assessment of available data is conducted during GSP development.

If you have any questions pertaining to this technical memorandum, please contact David Fairman at (916) 631-4528 or Rodney Fricke at (916) 341-9138.

Regards,

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Enclosures:

Attachment 1: Hyperlinks to SGMA Legislation, Regulations, Guidance Documents, and Best Management Practices (BMPs)

Attachment 2: Data Sources

Attachment 3: Bibliography

Attachment 4: Data Assessment

Attachment 5: Monitoring Networks

2018 Sustainable Groundwater Management Act (SGMA) Basin Prioritization Results

RECEIVED
JUL 24 2018
Lassen County Department of Planning and Building Services
Submitted by email
[illegible]

Basin Name: Big Valley	County: Lassen and Modoc
Basin ID#: 5-004	Hydrologic Region: Sacramento River

Basin Prioritization Scores

Component	Priority Points
1	1
2	0
3	1
4	2
5	3
6	3.5
7	3
8	7

Total Priority Points = 20.5

Basin Priority = Medium

Component 1 - Population Overlying the Basin = 1 Priority Points

The basin's total population was calculated by summing all the included 2010 population blocks and portions of population blocks per 2018 SGMA Basin Prioritization Process and Results document. The basin's total population was normalized for basin comparison by dividing the total population by the area of the basin, producing a value that represents people per square mile or population density value.

Priority Point Process:

The population density value was used for numerical comparison of the population across all 517 groundwater basins statewide. Priority points were applied to each basin based on the value of population density. The information and table (Table 1) below lists and highlights the priority point current draft values for the Smith River Plain Groundwater Basin and associated ranges of population density.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/a7ab61e7-bd1b-4740-bd1b-e0bbc39044d7
Population (2010): 1,046
Square Miles of Basin: 143.85 mi²

$$\frac{1{,}046\ Population}{143.85\ Square\ Miles} = 7.27\frac{Persons}{sq\ mile}$$

Priority Points	2010 Population Density (persons/square mile) (x = population density)
0	x < 7
1	7 ≤ **7.27** < 250
2	250 ≤ x < 1,000
3	1,000 ≤ x < 2,500
4	2,500 ≤ x < 4,000
5	x ≥ 4,000

Table 1 Big Valley – Component 1 = 1 Priority Points

Component 2 – Population Growth = 0 Priority Points

Part A: Estimating Basin and Non-Basin Population within each Hydrologic Region-County
The 2000 and 2010 population were estimated for all basins, portions of basins, and non-basin area using the methods described for component 1. The county 2000 and 2010 population estimates from United States Census Bureau and the CA Department of Finance's current trend for 2030 county total projections were used to project 2030 Basin population.

Percent Growth = (2030 Basin Population – 2010 Basin Population) / 2010 Basin Population * 100

For basins located in more than one county, the 2030 Basin projections for each portion of a basin that crossed a county boundary were summed to produce a 2030 population projection for the entire Basin.

The methods described above and in the 2018 SGMA Basin Prioritization Process and Results document characterize the general process for projecting 2030 basin and non-basin population within each county; however, throughout the process, intermediate results were evaluated, and adjusted as necessary to conform with DOF current trend 2030 county projections per California Government Code Section 13073(c).

Part B: Determining the Priority Points for Population Growth
Using the percent growth calculated above, the basin was assigned the preliminary priority points identified in Table 2. Before determining the final priority points for population growth, additional analysis was completed to determine if the basin met the minimum requirements for population growth as defined in the 2014 CASGEM Basin Prioritization process (California Department of Water Resources 2014b):

- Does the basin have zero 2010 Population?
- Does the basin have less than or equal to zero percent growth?
- Is the basin's 2010 population (component 1) less than 1,000 people and does the basin have growth greater than zero?
- Is the basin's 2010 basin population less than or equal to 25,000 and is the basin's 2010 population density less than 50 people per square mile?

If the answer was 'yes' to any of the four questions above, the priority points for component 2 were recorded as zero. If the answer was 'no' to all four questions above, the priority points were applied to each basin based on the percentage of population growth. Table 2 lists the priority point values and associated ranges of population growth percentage.

For Big Valley Basin, the answer to the last question was yes, therefore growth percent priority points was determined to be zero.
Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/a7ab61e7-bd1b-4740-bd1b-e0bbc39044d7?inner_span=True Census 2000: 991; Census 2010: 1,046
Projected 2030 Population: 1,086
Population Growth: 3.82%

Table 2 Big Valley Basin – Component 2 = 0 Priority Points

Component 3 - Public Supply Wells = 1 Priority Points

The consideration of public supply wells as a component of the 2108 SGMA Basin Prioritization used the same methods and database as the 2014 CASGEM Basin Prioritization. Data for public supply wells was obtained from the SWRCB-Division of Drinking Water's statewide public supply well database. The database is dynamic listing wells as "active" or "inactive" based on information received from water suppliers. Due to this fact, the database was queried once in March 2016 for all public supply wells listed as "active" and the results of this query were included in the 2018 SGMA Basin Prioritization evaluation.

Priority Point Process:

The process for assigning priority points for public supply wells is based on density of public supply wells per square mile. The total number of public supply wells is divided by the total basin area resulting in a ratio of PSW/sq. mile. Table 3 lists the priority point values and associated ranges of public supply wells.

Big Valley Basin (5-004)

Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/6eec22a1-baf2-4171-907d-f604277cf27e

Number of Public Supply Wells: 4

Square Miles of Basin: 143.85 mi^2

$$\frac{4\ Public\ Supply\ Wells}{143.85\ Square\ Miles} = 0.02\frac{PSW}{sq\ mile}$$

Priority Points	Public Supply Well Density (PSW/Sq. Mile)
0	x = 0
1	0 < **0.02** < 0.1
2	0.1 ≤ x < 0.25
3	0.25 ≤ x <0.50
4	0.50 ≤ x < 1.0
5	x > 1.0

Table 3 Big Valley Basin – Component 3 = 1 Priority Point

Component 4 - Total Number of Production Wells = 2 Priority Points

The density of production wells in the basin was analyzed for Component 4. The analysis was done by querying the Online System for Well Completion Reports (OSWCR) to identify wells drilled in the basin. The total number of production well logs identified by OSWCR was refined to include logs previously flagged as unknown use as potential production wells by only including wells with a casing size of 4" or greater and a depth of 22 feet below ground surface or greater.

Well locations in OSWCR without a georeferenced location were assigned a location using the centroid of the section they were in using the Public Land Survey System (PLSS) information on the WCR. Wells assigned a centroid location were proportionally added to the total wells in the basin based on the proportion of the basin located in the spatial reference area. For example, if 60% of the centroid spatial reference area was within a basin boundary then 60% of the reporting wells with that centroid were included in the production well total for the basin.

Priority Point Process:

Production well density was calculated for each basin by dividing the total number of production wells by the area of the basin to produce a value that represents production wells per square mile. Table 4 lists the priority point values and associated ranges of production wells.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/7cafd279-d50f-43cc-8e76-c7d484ae0af7
Total Wells: 419
Square Miles of Basin: 143.85 mi^2

$$\frac{419\ Wells}{143.85\ Square\ Miles} = 2.91 \frac{Wells}{sq\ mile}$$

Priority Points	Production Well Density (x = wells per square mile)
0	x = 0
1	0 < x < 2
2	2 ≤ 2.91 < 5
3	5 ≤ x < 10
4	10 ≤ x < 20
5	20 ≤ x ≥ 20

Table 4 Big Valley Basin – Component 4 = 2 Priority Points

Component 5 - Irrigated Acres = 3 Priority Points

For the purposes of basin prioritization, all agriculture identified in the Statewide Crop Mapping 2014 dataset (California Department of Water Resources 2014c) was identified as irrigated unless an agricultural field had been previously identified by DWR as dry-farmed. Only irrigated acreage inside the basin boundaries was included in the calculation and analysis. This was accomplished by overlying the spatial crop mapping data on groundwater basin boundaries to determine total agricultural field acreage overlying the basin. DWR staff consulted with the Del Norte Resource Conservation District in Del Norte County to update land use data for the Smith River Plain Basin.

Priority Point Process:

Irrigated acreage data were normalized by dividing the total irrigated acres by the area of the groundwater basin (in square miles) to determine the basin's irrigation density. Table 5 lists the priority point values and associated ranges of density of irrigated acres.

Big Valley Basin (5-004)
Data: 1 - https://data.cnra.ca.gov/dataset/crop-mapping-2014
Irrigated Acres: 19,403 Acres
Square Miles of Basin: 143.85 mi^2

$$\frac{19{,}403\ Irrigated\ Acres}{143.85\ Square\ Miles} = 134.87\frac{Irr.Acre}{sq\ mile}$$

Priority Points	Density of Irrigated Acres (x = acres per square mile)
0	x < 1
1	1 ≤ x < 25
2	25 ≤ x < 100
3	100 ≤ **134.87** < 200
4	200 ≤ x < 350
5	x ≥ 350

Table 5 Big Valley Basin – Component 5 = 3 Priority Points

Component 6 – Groundwater Reliance = 3.5 Priority Points

The Groundwater Reliance component of Basin Prioritization is based on two factors: **Total Estimated Groundwater Use** (Component 6a) in the basin and the **Percentage Groundwater** contributes to the total water supply in the basin (Component 6b). These two factors are assigned separate scores between 0-5 and then averaged which is the final Priority Point Score for Component 6.

Component 6a – Groundwater Use

The calculation for total groundwater use was done by separately calculating total agricultural applied water and total urban water use in the basin. The total water use calculations are below:

Agricultural Groundwater Use
Agricultural groundwater use was estimated using a remote sensing dataset from July 2014 which identified total irrigated acres and crop type in the basin. This data was then updated for Smith River Plain by DWR staff with the assistance of the Del Norte RCD. Land Use Cropping Information (LUCI) files containing localized crop information that includes crop, planting and irrigation dates, irrigation efficiency, crop coefficients, and other factors needed to characterize the crops in the basin were input into a model (Cal-SIMETAW) to estimate unit applied water for a single acre for each DWR crop category in the basin. Each crop's unit applied water was multiplied with the land use crop acreage data to estimate total agricultural applied water demand. The groundwater component of total agricultural applied water demand was calculated using localized Water Balance or Water Source data which estimates water source percentages.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/ac7f1950-b2b3-435b-9c3c-92550434f41a
Irrigated Acres: 19,403 Acres
Agricultural Applied Water: 58,050 Acre Feet
Agricultural GW-SW Ratio: 65% GW, 35% SW

$$58{,}050\ Acre\ Ft\ Agricultural\ Applied\ Water * 0.65\ GW\ Source = 37{,}732\ AcreFt\ Agricultural\ Groundwater$$

Urban Groundwater Use
For the areas of the basin that are served by a water purveyor for 2014 the calculation for supplied urban groundwater and surface water use was based on data reported by water purveyors via their 2014 annual report to the Waterboards. The total groundwater used/supplied by the purveyor is divided by the population serviced in the basin to report a groundwater community per-capita. If there is population remaining in the basin not serviced by a water purveyor the are assumed to use the same community per-capita.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/ac7f1950-b2b3-435b-9c3c-92550434f41a
Reported Urban Water Use: 260 Acre Feet
Urban GW-SW/Purchased Water Ratio: 100% GW, 0% Other

$$260\ Acre\ FT * 1.00\ GW\ Source\ =\ 260\ AcreFt\ Urban\ Groundwater$$

Total Groundwater Reliance (Component 6a):
The total groundwater used was calculated by adding the Agricultural groundwater use and urban groundwater use values.

$$37{,}732\ Acre\ Ft\ Agricultural\ GW + 260\ Acre\ Ft\ Urban\ GW$$
$$= 37{,}992\ Acre\ Ft\ \ Total\ Groundwater$$

Points were assigned to component 6a by taking the total groundwater usage in the basin and dividing that number by the total area of the basin in acres.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/ac7f1950-b2b3-435b-9c3c-92550434f41a
Total Groundwater Use: 37,992 Acre Feet
Basin Area: 92,067 Acres

$$\frac{37{,}992\ Acre\ Ft\ GW}{92{,}067\ Acres} = \frac{0.41\ Acre\ Ft\ GW}{Acre}$$

Points	Groundwater Volume Density (Acre FT/Acre)
0	x < 0.03
1	0.03 ≤ x < 0.1
2	0.1 ≤ x < 0.25
3	0.25 ≤ **0.41** <0.50
4	0.50 ≤ x < 0.75
5	X ≥ 0.75

Table 6 Big Valley Basin – Component 6a = 3 Points

Component 6b – Groundwater Supply

Groundwater supply was calculated by evaluating the overall water supply in the basin met by groundwater. The total agricultural and urban water use values were combined and then the total groundwater volume calculated in Component 6a was divide by the total water use to calculate the overall percentage of the water supply in the basin reliant on groundwater.

Big Valley Basin (5-004)
Data: https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/ac7f1950-b2b3-435b-9c3c-92550434f41a
Total Groundwater Use: 37,992 Acre Feet
Total Water Use: 58,310 Acre Feet

$$\frac{37{,}992\ Acre\ Ft}{58{,}310\ Acre\ Ft} = \frac{65\%\ GW\ Supply}{Total\ Supply}$$

Points	Groundwater Supply Percent
0	x = 0
1	0 < x < 20
2	20 ≤ x < 40
3	40 ≤ x < 60
4	60 ≤ **65** < 80
5	X ≥ 80

Table 7 Big Valley Basin – Component 6b = 4 Points

Priority Point Process:

Priority Points were assigned to Component 6 by taking the average scores of Components 6a and 6b.

Component 6a Points	3
Component 6b Points	4
Average =	**3.5**

Table 8 Big Valley Basin – Component 6 Total = 3.5 Priority Points

Component 7 – Documented Impacts = 3 Priority Points

The Documented Impacts component of Basin Prioritization evaluates four different impacts - Overdraft, Subsidence, Saline Intrusion, and Water Quality Degradation. Each of the four impacts are assigned **Impact Points** using different criteria and then Priority Points are assigned based on the total amount of **Impact Points**.

- Component 7a – Overdraft = 7.5 Impact Points
- Component 7b – Subsidence = 0 Impact Points
- Component 7c – Saline Intrusion = 0 Impact Points
- Component 7d – Water Quality Degradation = 4 Impact Points

Component 7a – Overdraft = 7.5 Impact Points

The assessment of overdraft was done by evaluating groundwater elevation level trends in the basin. The evaluation was done by reviewing published groundwater level data for each basin and identifying the overall trend in the basin over the last 20 years. The results of the evaluation were assigned a status of stable, rising or declining.

Big Valley Basin (5-004)
Data: 1) https://data.cnra.ca.gov/dataset/sgma-basin-prioritization-2018/resource/9467ebe3-62fe-465e-a802-f05fea1e9e0b
2) Attachment Overdraft Assessment Hydrographs – Big Valley Basin
Total Hydrographs: 23
Evaluation Result: Declining Groundwater Levels

Assigning Overdraft Documented Impact Points

The evaluation of groundwater levels in Big Valley resulted in an assessment of **declining groundwater levels**. During the 2018 SGMA Basin Prioritization, 7.5 Documented Impact Points were assigned basins with declining groundwater levels.

Documented Impacts Points	Groundwater Level Status
0	Rising
0	Stable
7.5	**Declining**

Table 9 Big Valley Basin – Component 7a Impacts Total = 7.5 Documented Impact Points

Component 7d – Documented Water Quality Degradation = 4 Impact Points

Documented water quality degradation was evaluated by querying the State Water Resources Control Board's Groundwater Ambient Monitoring and Assessment (GAMA) database. The GAMA database includes the results of local, state, and federally mandated water quality testing of public supply wells. To evaluate water quality degradation two factors were considered: **average exceedance of water**

quality objectives (Component 7d1) and **percentage of impacted supply wells** in basin with water quality sample exceedances (component 7d2).

Note: Only samples of raw, untreated groundwater were used for the water quality degradation evaluation. These samples represent baseline groundwater quality conditions in the basin including any naturally occurring constituents.

Component 7d1 – Average Water Quality Sample Exceedances

Within each basin, GAMA results were evaluated for total number of Maximum Contaminant Level (MCL) exceedances and magnitude of MCL exceedances. Each MCL exceedance was given a relative value based on the magnitude of the exceedance.

Example: (West Park Properties, 06/27/14, Nitrate Value = 29.367mg/L, MCL = 10mg/L)

$$\frac{Sample\ (29.367\frac{mg}{L})}{MCL\ (10\frac{mg}{L})} = 2.9367\ MCL\ Exceedance$$

For 2018 SGMA Basin Prioritization, all MCL exceedances within a basin were given relative scores using this method. After each water quality sample was assigned a relative exceedance score, the results were averaged to assign the entire basin an average MCL exceedance score per Table 10.

Big Valley Basin (5-004)
Data: 1) https://data.cnra.ca.gov/dataset/13ebd2d3-4e62-4fee-9342-d7c3ef3e0079/resource/267e2f02-d7c8-4d7b-a4d1-a8c1e60ec861/download/full7dwq20180530.zip
2) Attached Water Quality MCL Exceedances – Big Valley Basin
Total MCL Exceedances: 14
Average MCL Exceedance: 5.73

Water Quality Points	Average MCL Exceedance
0	x ≤ 1
1	1 < x < 2
2	2 ≤ x < 3
3	3 ≤ x < 4
4	4 ≤ **5.73** < 6
5	x ≥ 6

Table 10 Big Valley Basin – Component 7d1 = 4 Water Quality Points

Component 7d2 – Extent of Groundwater Contamination

To evaluate the overall distribution of water quality degradation within a basin, the total number of supply wells with MCL exceedances was divided by the total number of supply wells (Component 3). Individual Supply wells identified in the GAMA database with MCL Exceedances were used for this calculation.

Big Valley Basin (5-004)

Data: 1) https://data.cnra.ca.gov/dataset/13ebd2d3-4e62-4fee-9342-d7c3ef3e0079/resource/267e2f02-d7c8-4d7b-a4d1-a8c1e60ec861/download/full7dwq20180530.zip

2) Attached Water Quality MCL Exceedances – Big River Valley

Public Supply Wells with MCL Exceedances: 3

Total Public Supply Wells: 4

$$\frac{3\ PSW\ wit\text{?}\ MCL\ Exceedances}{4\ Total\ PSW} = \frac{0.75\ WQ\ PSW}{Total\ PSW}$$

Water Quality Points	Proportion of PSW w/ MCL Exceedances
0	x = 0
1	0 < x < 0.5
2	0.5 ≤ x < 0.75
3	0.75 ≤ **0.75** < 1
4	X = 1
5	X > 1

Table 11 Big Valley Basin – Component 7d2 = 3 Water Quality Points

Component 7d1	4 Water Quality Points
Component 7d2	3 Water Quality Point
Component 7d Total	**7 Water Quality Points**

Table 12 Big Valley Basin – Component 7d Total = 4 Water Quality Points

Converting Water Quality Points into Documented Impact Points

After the total number of Water Quality Points are calculated, this number is converted into Documented Impact Points. The ratio of Water Quality Points to Documented Impact Points is shown in the table below.

(Component 7 – Documented Impacts continued)

Documented Impacts Points	Water Quality Points (7d1 + 7d2)
0	x = 0
1	0 < 4 < 5
2	5 ≤ x < 6
3	6 ≤ x < 7
4	7 ≤ **7** < 8
5	X ≥ 8

Table 13 Big Valley Basin – Component 7d Impacts Total = 4 Documented Impact Points

Priority Point Process:

All Documented Impacts Points were combined and used to calculate Priority Points as shown in the table below.

- Component 7a – Overdraft = **7.5 Impact Points**
- Component 7b – Subsidence = 0 Impact Points
- Component 7c – Saline Intrusion = 0 Impact Points
- Component 7d – Documented Water Quality Degradation = **4 Impact Points**

Priority Points	Documented Impacts Points
0	x < 3
1	3 ≤ x < 7
2	7 ≤ x < 11
3	11 ≤ **11.5** < 15
4	15 ≤ x < 19
5	X ≥ 19

Table 14 Big Valley Basin – Component 7 = 3 Priority Points

Component 8 – Habitat and Other Information = 7 Priority Points

Component 8a: Habitat and Streamflow

Data Source
- Natural Communities Commonly Associated with Groundwater Dataset (Natural Communities)
- USGS National Hydrography Dataset (NHD)

The following process was used to determine if there is a possibility of adverse impacts occurring within the basin.

Part A: Identifying habitat and streamflow in the basin

DWR evaluated if habitat or streamflow exists in the basin using the Natural Communities and NHD datasets to determine if one or more habitats commonly associated with groundwater or streamflow exist within a groundwater basin. DWR determined that there are one or more Natural Communities' polygons representing vegetation, wetland, seep, or spring habitat in the Big Valley basin. DWR also determined with NHD that one or more perennial or permanent streams were located within or adjacent to the basin. Thus, the Big Valley basin was assigned one streamflow point and one habitat point.

Part B: Determining if potential adverse impacts on habitat and streamflow are occurring in the basin

Potential adverse impacts to habitat and streamflow resulting from groundwater pumping were determined by evaluating the amount of groundwater pumped and if 7.a (declining groundwater levels) is determined that the basin is experiencing declining groundwater levels. It was determined that groundwater pumping exceeded 0.16 acre-feet per basin acre in the Big Valley basin (see component 6.a). It was also determined that groundwater level monitoring indicates declining groundwater levels in the Big Valley basin (see component 7.a). Thus, the habitat and streamflow points assigned in Part A were applied to the basin's priority points for basin prioritization.

Big Valley Basin (5-004)
Data: https://gis.water.ca.gov/app/bp2018-dashboard/sitedocs/habitatOtherInfo/# and ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution
Streamflow Points: 1
Habitat Points: 1

Part C: Documented adverse habitat and streamflow impacts

If the results from Part B indicated that there were no potential adverse impacts to habitat or streamflow in the basin, but there was documentation to support that habitat and/or streamflow were being adversely impacted by groundwater activities in the basin, the habitat and/or streamflow priority point(s) assigned in Part A were applied to basin prioritization. Other documentation reviewed included, but was not limited to, groundwater levels, hydrologic models, hydrologic studies, and court judgements to determine if the habitat or streamflow are being adversely impacted.

Component 8b: Other Information

Each basin was reviewed based on the individual basin's hydrology, geology, land use, and challenges to determine if there are groundwater-related actual or potential impacts to unique features (such as surface water, wetlands, and headwaters) or actual or potential challenges for groundwater management within the basin. Basins with actual or potential impacts to unique features that could result in an unrecoverable loss and basins facing groundwater management challenges that could be serious enough to impact the sustainability of the basin if the necessary groundwater management is not applied to the basin were assigned 5 points.

Using the above criteria, it was determined that unique features, such as wetlands and the headwaters for the Pit River exist within the Big Valley basin. Furthermore, although an extensive restoration project at Ash Creek State Wildlife Area has improved groundwater levels in the project's immediate vicinity, persistent declining groundwater levels over the past 10 plus years may potentially impact future project management and success.

It was determined that potential impacts exist in the Big Valley basin: declining groundwater levels may potentially impact wetlands and Pit River tributaries, and could result in unrecoverable losses to these unique features; thus, the basin was assigned five priority points.

Big Valley Basin (5-004)

Data: https://gis.water.ca.gov/app/bp2018-dashboard/sitedocs/habitatOtherInfo/#

Component 8b Priority Points: 5

Habitat and Other Information	Priority Points
8a: Habitat and Streamflow	2
8b: Other Information	5
Component 8 Total	**7**

Table 15 Big Valley Basin (5-004) – Component 8 = 7 Priority Points