Draft Atascadero Groundwater Sustainability Plan

Atascadero Groundwater Subbasin Section 5

DRAFT

October 2019

Prepared for: Atascadero Subbasin Groundwater Sustainability Agency

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Appendices

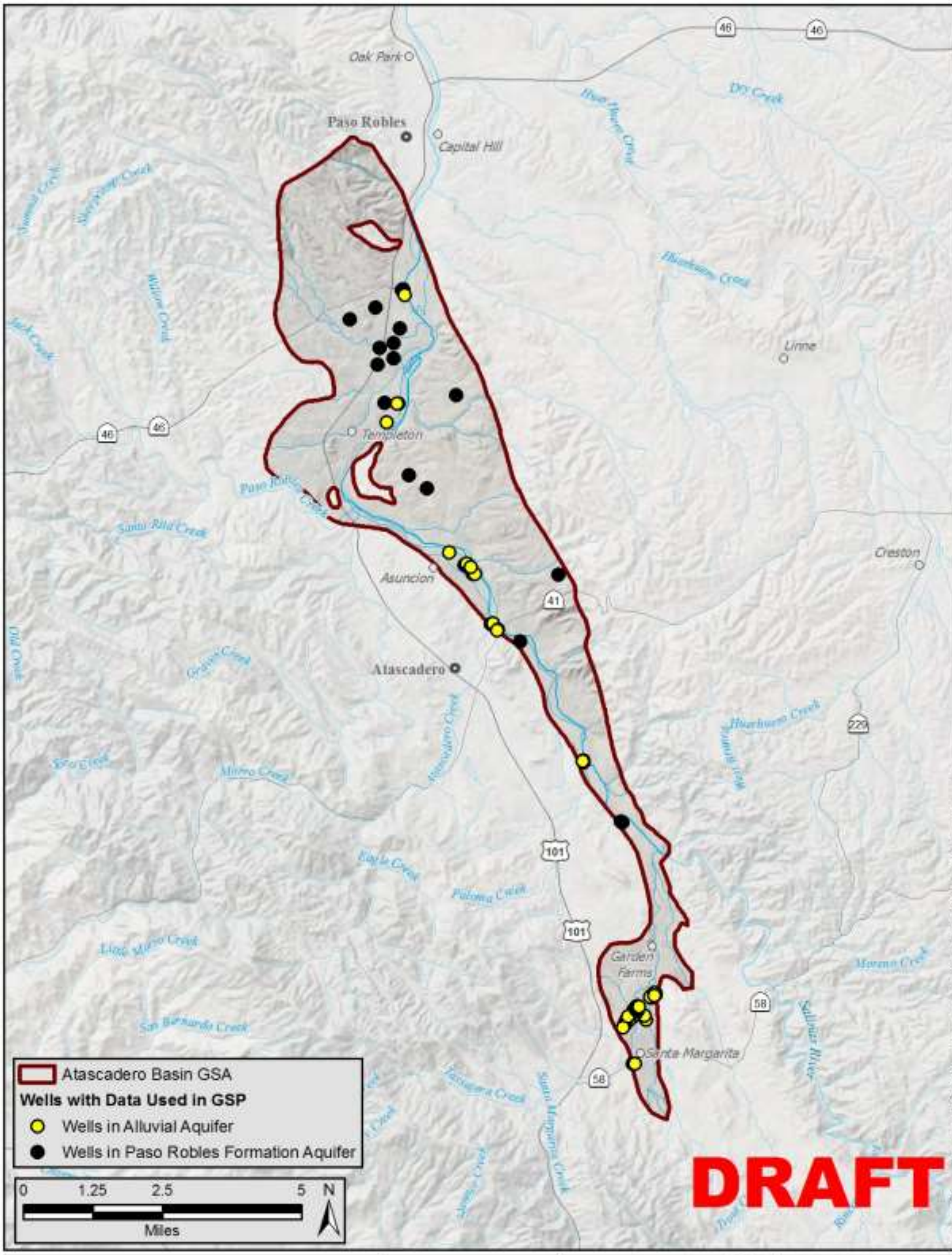
5. Groundwater Conditions

This section describes the current and historical groundwater conditions in the Alluvial Aquifer and the Paso Robles Formation Aquifer in the Atascadero Area Groundwater Sub-basin of the Salinas Valley Basin (Basin). In accordance with the SGMA emergency regulations §354.16, current conditions are any conditions occurring after January 1, 2015. By implication, historical conditions are any conditions occurring prior to January 1, 2015. This section focuses on information required by the GSP regulations and information that is important for developing an effective plan to achieve sustainability. The organization of Section 5 aligns with the six sustainability indicators specified in the GSP regulations, including:

1. Chronic lowering of groundwater elevations
2. Changes in groundwater storage
3. Seawater intrusion
4. Subsidence
5. Depletion of interconnected surface waters
6. Groundwater quality

5.1 Groundwater Elevations

The following assessment of groundwater elevation conditions is based largely on data from the San Luis Obispo County Flood Control and Water Conservation District's (SLOFCWCD) groundwater monitoring program. Groundwater levels are measured by the SLOFCWCD through a network of public and private wells in the Basin. Additional groundwater elevation data for wells were obtained from environmental investigations pertaining to the crude oil pipeline spill in the Santa Margarita area (see Section 5.6.3, below). Approximately 150 wells (depending on year) were used for the groundwater elevation assessment. Of these wells, about 100 are not subject to confidentiality agreements. The locations of these non-confidential wells used for the groundwater elevation assessment are shown on Figure 5-1. Although the groundwater elevation data from the 50 confidential wells were included in the groundwater assessment, their locations are not provided in this GSP, as consistent with their confidentiality agreements. In no cases are the well owner information provided in this GSP.



Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California
Atascadero Basin GSA
Location of Wells Used for Goundwater Elevation Assessments
OCTOBER 2019
FIGURE 5-1

The set of wells used in the groundwater elevation assessment were selected based on the following criteria:

- The wells have groundwater elevation data for 1997, and/or 2011, and/or 2015, and/or 2017
- Sufficient information exists to assign the well to either the Alluvial Aquifer or Paso Robles Formation Aquifer
- Groundwater elevation data were deemed representative of static conditions

Additional information on the monitoring network is provided in Section 8 – Monitoring Networks.

Based on available data, the following information is presented in subsequent subsections.

- Groundwater elevation contour maps for spring 1997, 2011, 2015, and 2017
- Groundwater elevation contour maps for fall 2017
- A map depicting the change in groundwater elevation between 1997 and 2011 (Paso Robles Formation Aquifer only)
- A map depicting the change in groundwater elevation between 2011 and 2015 (Paso Robles Formation Aquifer only)
- A map depicting the change in groundwater elevation between 2015 and 2017 (Paso Robles Formation Aquifer only)
- Hydrographs for select wells with publicly available data
- Assessments of horizontal and vertical groundwater gradients

5.1.1 *Alluvial Aquifer*

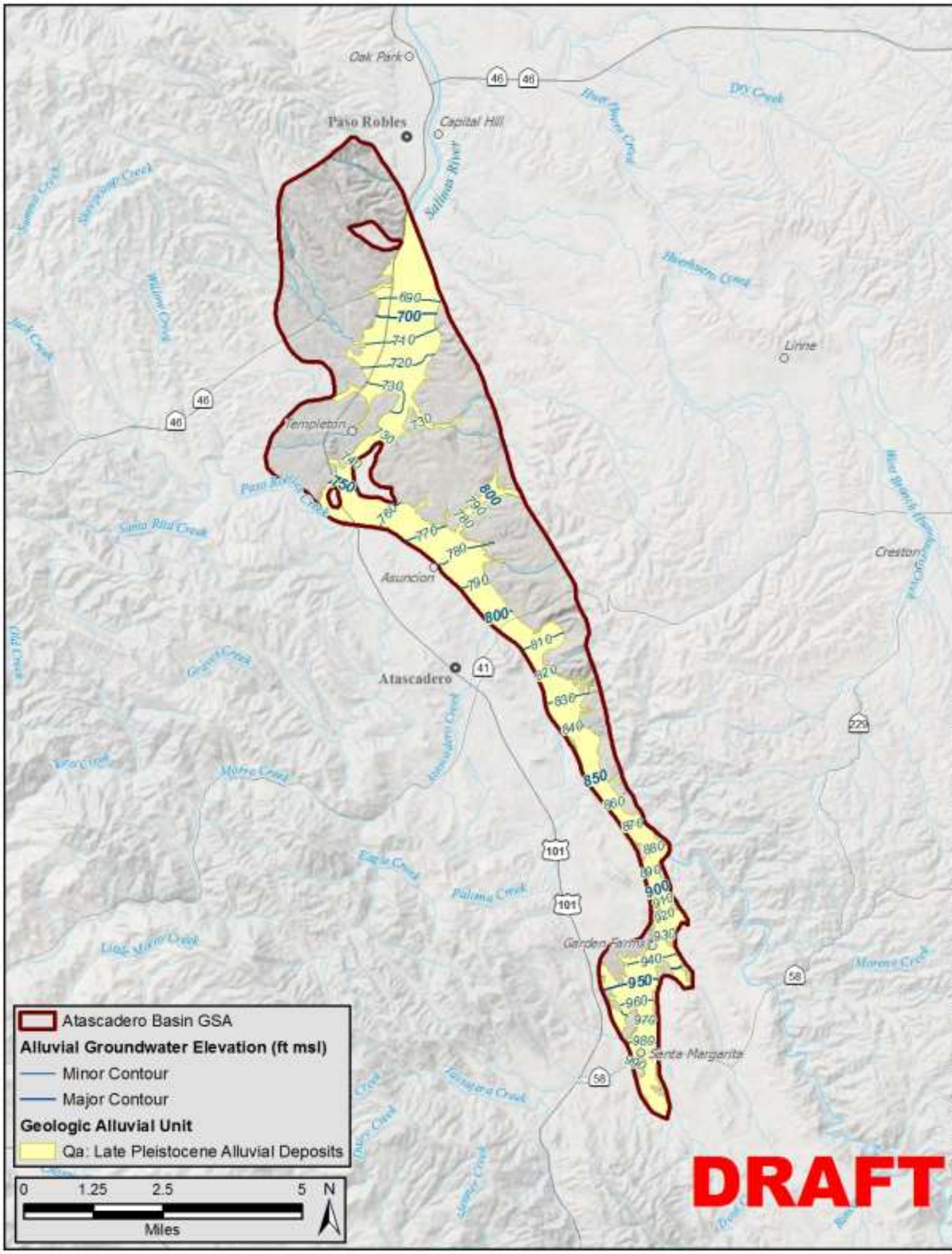
Water levels in wells in the Alluvial Aquifer are relatively stable, exhibiting little seasonal fluctuation and rapid recovery with any substantial rainfall. Because the water table is recharged rapidly immediately following any substantial stream runoff, alluvial water levels show no long-term decline. The locations of the non-confidential alluvial wells used in the groundwater elevation assessment are shown in Figure 5-1.

5.1.1.1 Alluvial Aquifer Groundwater Elevation Contours and Horizontal Groundwater Gradients

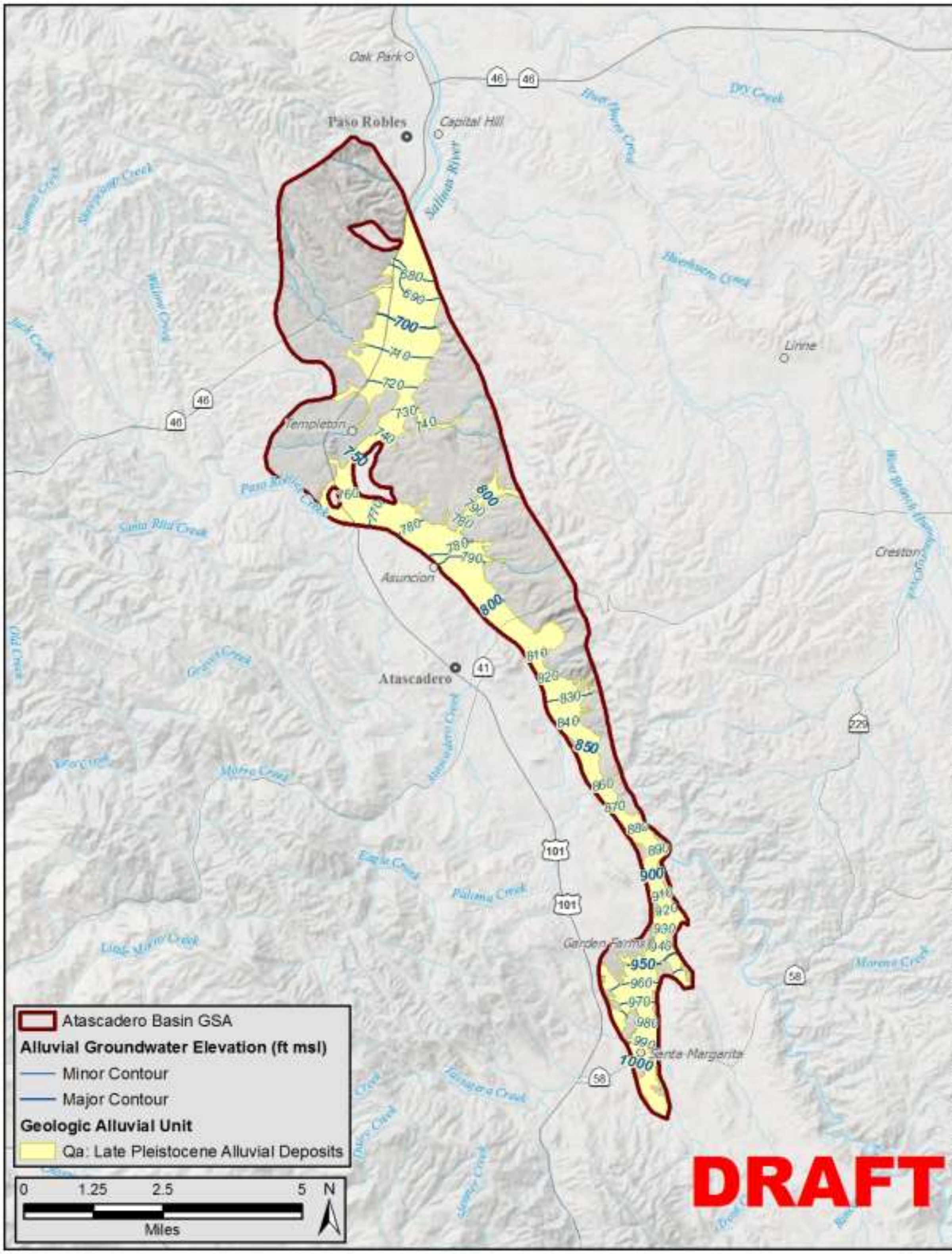
Groundwater elevation data for spring 1997, spring 2011, spring 2015, spring 2017, and fall 2017 for the Alluvial Aquifer were contoured to assess historical and current spatial variations, groundwater flow directions, and horizontal groundwater gradients. Data from public and private wells were used for contouring. The contours are based on groundwater elevation measurements from the non-confidential wells shown on Figure 5-1 and additional wells subject to confidentiality agreements not shown on the figure. Contour maps were generated using a computer-based contouring program and checked/modified by a qualified hydrogeologist. Groundwater elevation data deemed unrepresentative of static conditions or obviously erroneous were not used for contouring.

Historical groundwater elevation contours for the Alluvial Aquifer are shown on Figure 5-2 (spring 1997) and Figure 5-3 (spring 2011). Current groundwater elevation contours for the Alluvial Aquifer are shown on Figure 5-4 (spring 2015), Figure 5-5 (spring 2017), and Figure 5-6 (fall 2017). For each of the time periods depicted, alluvial groundwater elevations range from approximately 1,000 feet above mean sea level (ft msl) in the Santa Margarita area to approximately 660 ft msl in the north where the Salinas River exits the Basin. A comparison of alluvial groundwater elevations between the five time periods depicted shows that alluvial groundwater elevations were generally higher in spring 2011 than in spring 1997, were generally the lowest in spring 2015, and were approximately equal between spring 2011 and spring 2017. These observations align with the historical precipitation record (discussed further below) and demonstrate the ability of the alluvial aquifer to recharge rapidly following any substantial rainfall. Unsurprisingly, alluvial groundwater elevations were generally slightly higher in spring 2017 than in fall 2017.

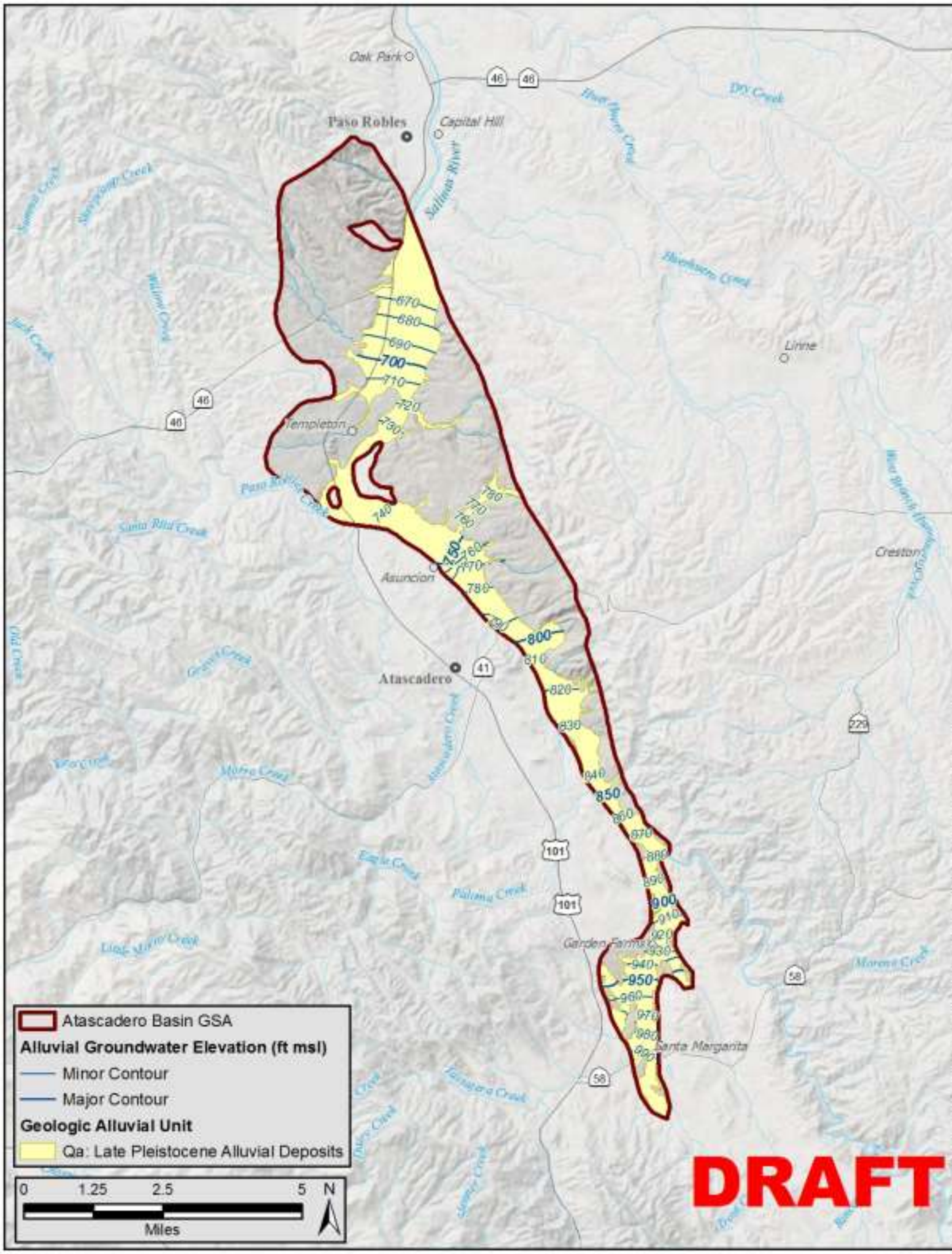
Groundwater flow in the Alluvial Aquifer generally follows the alignment of the creeks and the Salinas River. Overall, groundwater in the Alluvial Aquifer flows generally to the north and northwest, parallel to flow in the Salinas River. Throughout the historical and current periods, the overall alluvial hydraulic gradient generally approximates the topographic profile of the Salinas River or its tributaries (generally between 0.002 and 0.007 ft/ft). Areas of steepened hydraulic gradient and areas of flattened hydraulic gradient are apparent due to localized pumping depressions and infiltration basin operations. These are most notable in the Atascadero and Templeton areas.



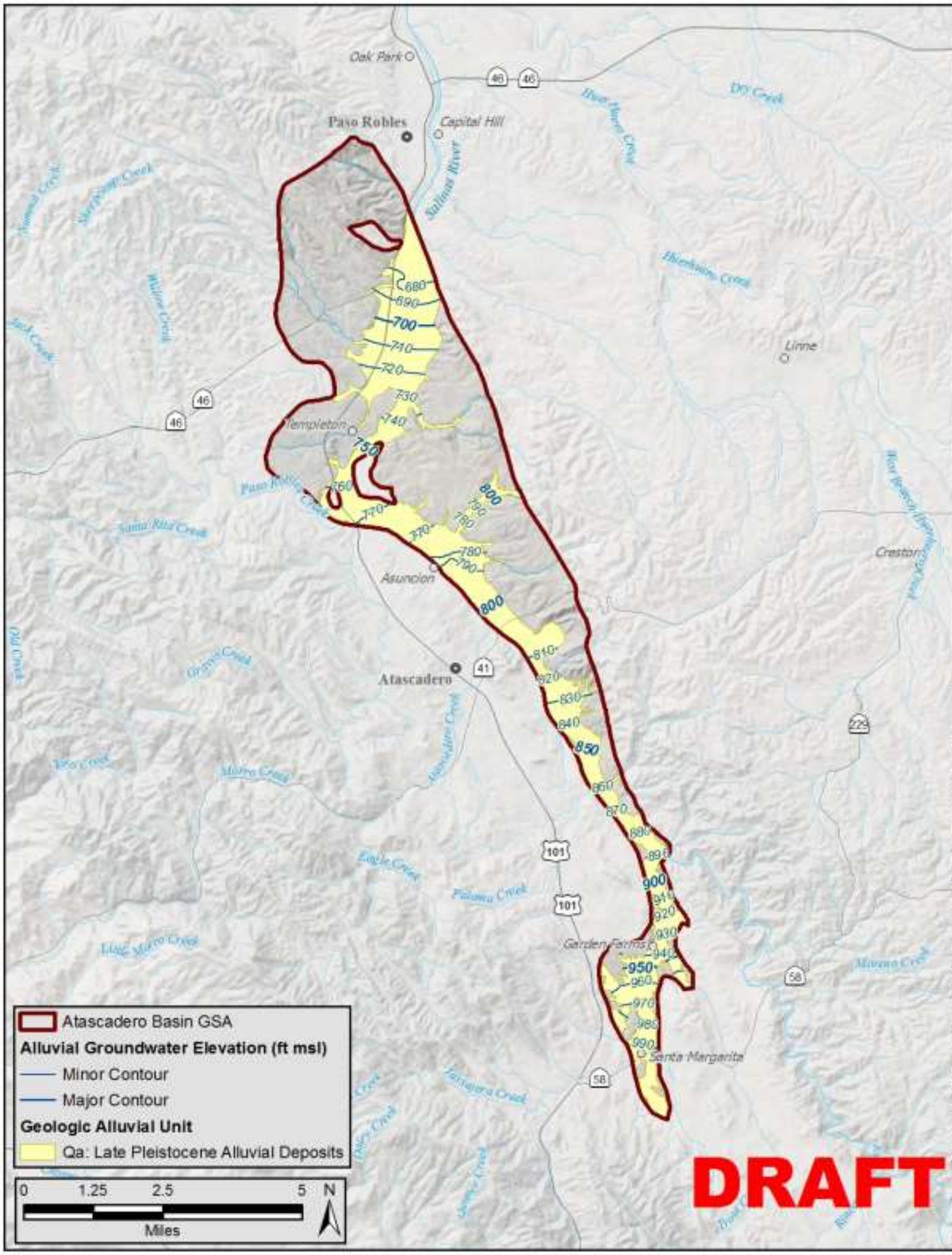
Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 1997 Alluvial Aquifer Groundwater Elevation Contours	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-2



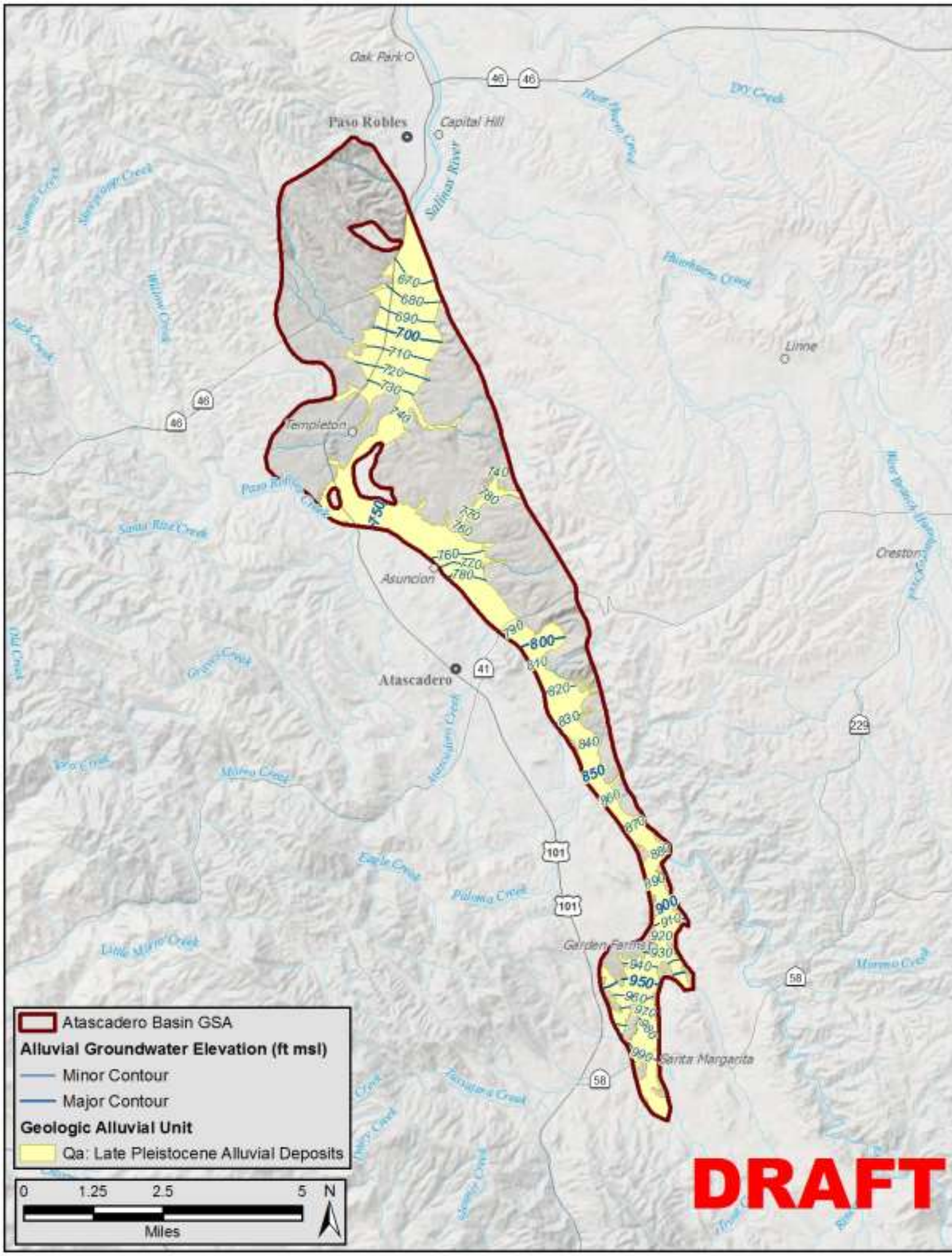
Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2011 Alluvial Aquifer Groundwater Elevation Contours	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-3



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2015 Alluvial Aquifer Groundwater Elevation Contours	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-4



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2017 Alluvial Aquifer Groundwater Elevation Contours
Atascadero Basin GSA		OCTOBER 2019 — FIGURE 5-5



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San Luis Obispo County, California

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Fall 2017 Alluvial Aquifer Groundwater Elevation Contours

OCTOBER 2019

FIGURE 5-6

5.1.1.2 Alluvial Aquifer Hydrographs

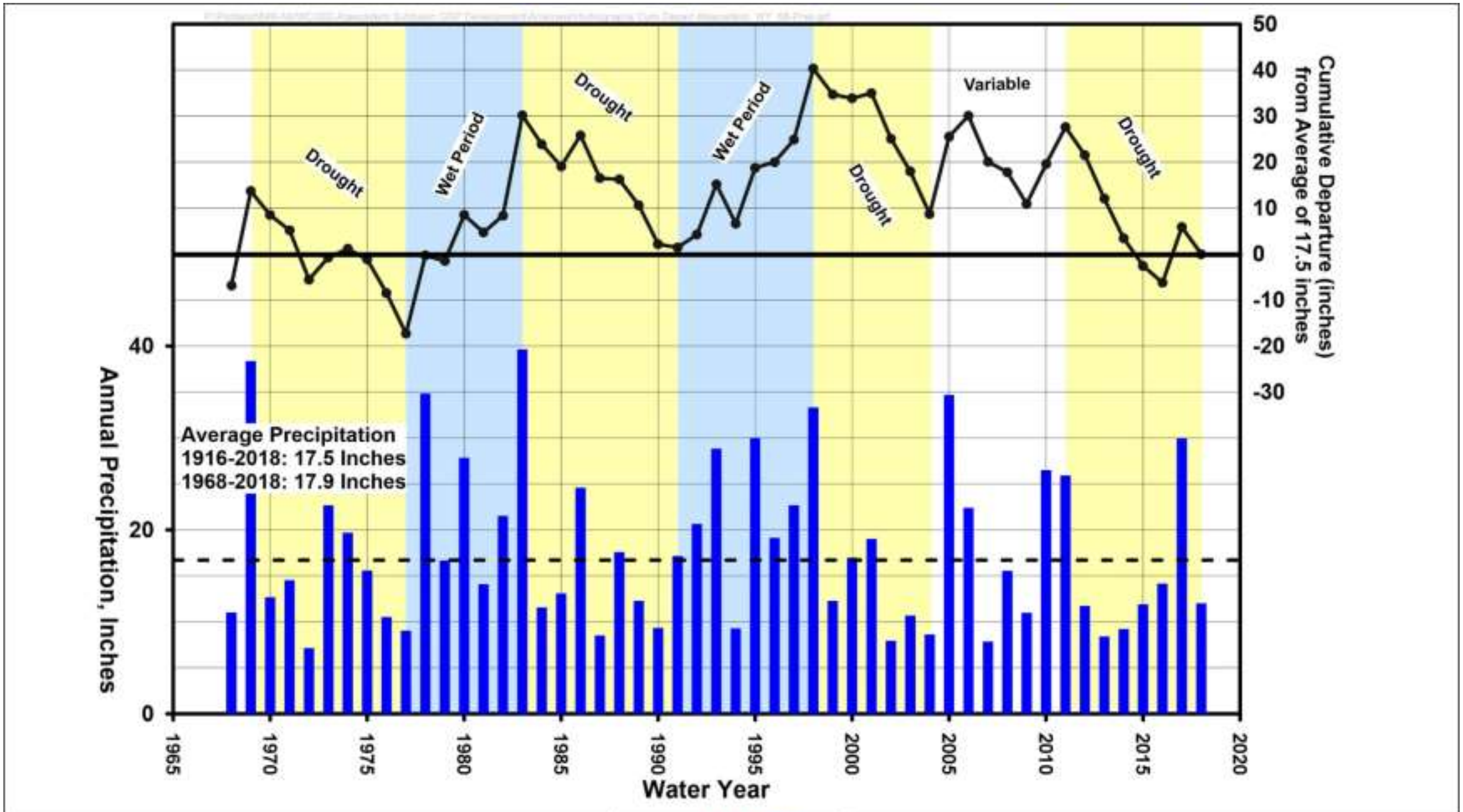
Appendix 5A includes seven hydrographs for wells in the Alluvial Aquifer. These wells were chosen because they have sufficient periods of record to identify trends and/or responses to climatic conditions, they are distributed throughout the Basin, and they have publicly available, non-confidential data.

The hydrographs show periods of climatic variations grouped by the following designations: drought, wet period, or variable. Precipitation data were reviewed and analyzed to determine the occurrence and duration of wet and dry periods for the Basin. Precipitation data from the Atascadero Mutual Water Company (AMWC) Station #34 was used for this analysis because it is representative of conditions in the Basin and has the longest period of record of any station in the Basin (1916 to present). Figure 5-7 shows total annual precipitation by water year and cumulative departure from average as recorded at AMWC Station #34 for 1968 through 2018. Mean annual precipitation is 17.5 inches for the period of record 1916 to present.

For wells that are located in close proximity to the Salinas River the hydrographs also show the elevation of the adjacent Salinas River thalweg (deepest part of the river channel, in cross section) and periods when water was present in the Salinas River (called "Live Stream" periods[1]).

The alluvial hydrographs show no discernable long-term trends. Although the hydrographs typically show declining water levels in response to drought periods, they also demonstrate the ability of the alluvial aquifer to fully recharge during wet periods. Alluvial groundwater elevations are typically higher in spring than in the fall and generally fluctuate by 30 feet or less annually.

[1] San Luis Obispo County monitors the Salinas River at seven locations to determine "Live Stream" status. The seven monitoring locations are: Highway 58 Bridge, Highway 41 Bridge, Immediately upstream of Graves Creek, Templeton Bridge, Paso Robles 13th St. Bridge, Wellsona Crossing, and the San Miguel Bridge.



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	CLIMATIC PERIODS IN THE ATASCADERO SUBBASIN
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-7

5.1.2 *Paso Robles Formation Aquifer*

Locations of the non-confidential Paso Robles Formation Aquifer wells used to assess the hydrogeologic conditions of the Paso Robles Formation Aquifer are shown on Figure 5-1. Groundwater occurs in the Paso Robles Formation Aquifer under unconfined, semi-confined, and confined conditions in the Basin.

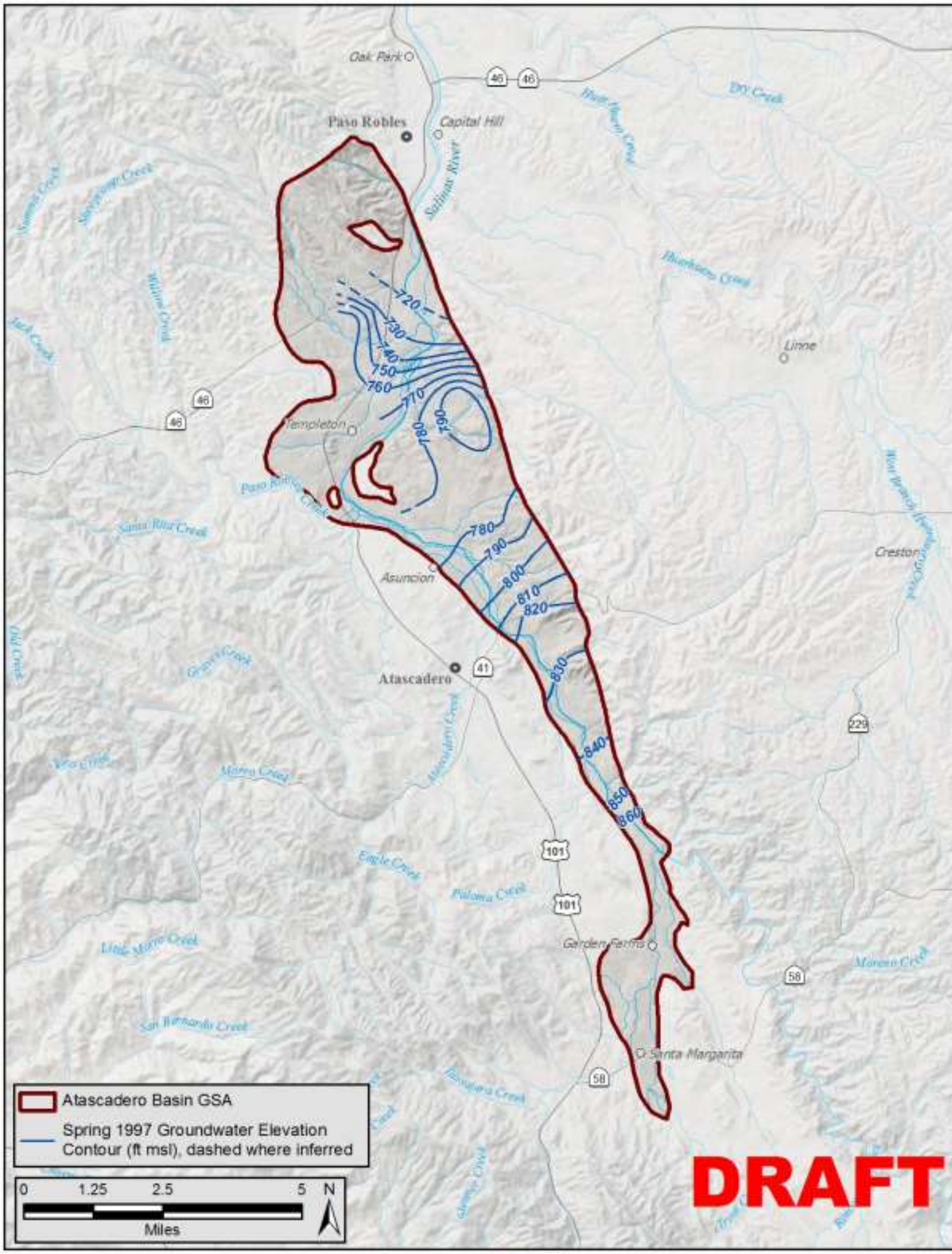
5.1.2.1 Paso Robles Formation Aquifer Groundwater Elevation Contours and Horizontal Groundwater Gradients

Groundwater elevation data for spring 1997, spring 2011, spring 2015, spring 2017, and fall 2017 for the Paso Robles Formation Aquifer were contoured to assess historical and current spatial variations, groundwater flow directions, and horizontal groundwater gradients. Data from public and private wells were used for contouring. The contours are based on groundwater elevation measurements from the non-confidential wells shown on Figure 5-1 and additional wells subject to confidentiality agreements not shown on the figure. Contour maps were generated using a computer-based contouring program and checked/modified by a qualified hydrogeologist. Groundwater elevation data deemed unrepresentative of static conditions or obviously erroneous were not used for contouring.

Figure 5-8 and Figure 5-9 show contours of historical groundwater elevations in the Paso Robles Formation Aquifer for spring 1997 and spring 2011, respectively. Spring 1997 groundwater elevations in the Paso Robles Formation Aquifer ranged from approximately 870 ft msl in the south to approximately 730 ft msl in the northern part of the Basin. Spring 1997 groundwater flow direction in the Paso Robles Formation Aquifer is generally to the north-northwest with hydraulic gradients ranging from approximately 0.02 to 0.001 ft/ft. A pumping trough is evident in the area northeast of Templeton as well as an area of elevated water levels in the northeastern part of the Basin.

Spring 2011 groundwater elevations in the Paso Robles Formation Aquifer ranged from approximately 870 ft msl in the south to approximately 685 ft msl in the northern part of the Basin. Spring 2011 groundwater flow direction in the Paso Robles Formation Aquifer is generally to the north-northwest with hydraulic gradients ranging from approximately 0.01 to 0.002 ft/ft. A slight pumping trough is evident in the northern part of Templeton near the junction of US HWY-101 and HWY-46 West.

Figure 5-10, Figure 5-11, and Figure 5-12 show contours of current groundwater elevations in the Paso Robles Formation Aquifer for spring 2015, spring 2017, and fall 2017, respectively. The spring 2015 groundwater elevations in the Paso Robles Formation Aquifer ranged from approximately 821 ft msl in the south to approximately 689 ft msl in the middle of a significant pumping depression in the Atascadero area (Figure 5-10). Groundwater flow directions in the Paso Robles Formation Aquifer were generally radially inward towards the Atascadero area



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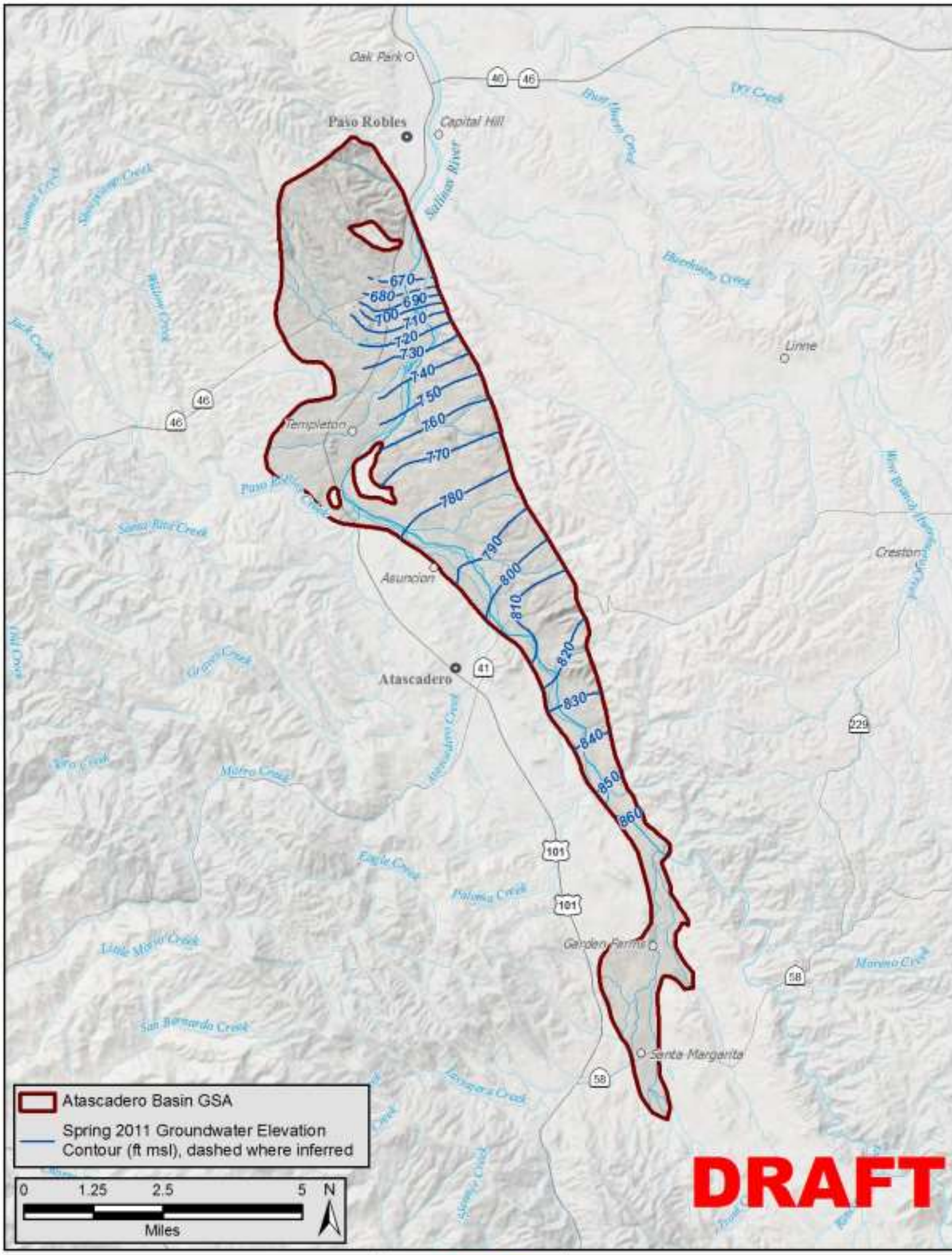
San Luis Obispo County, California

Atascadero Basin GSA

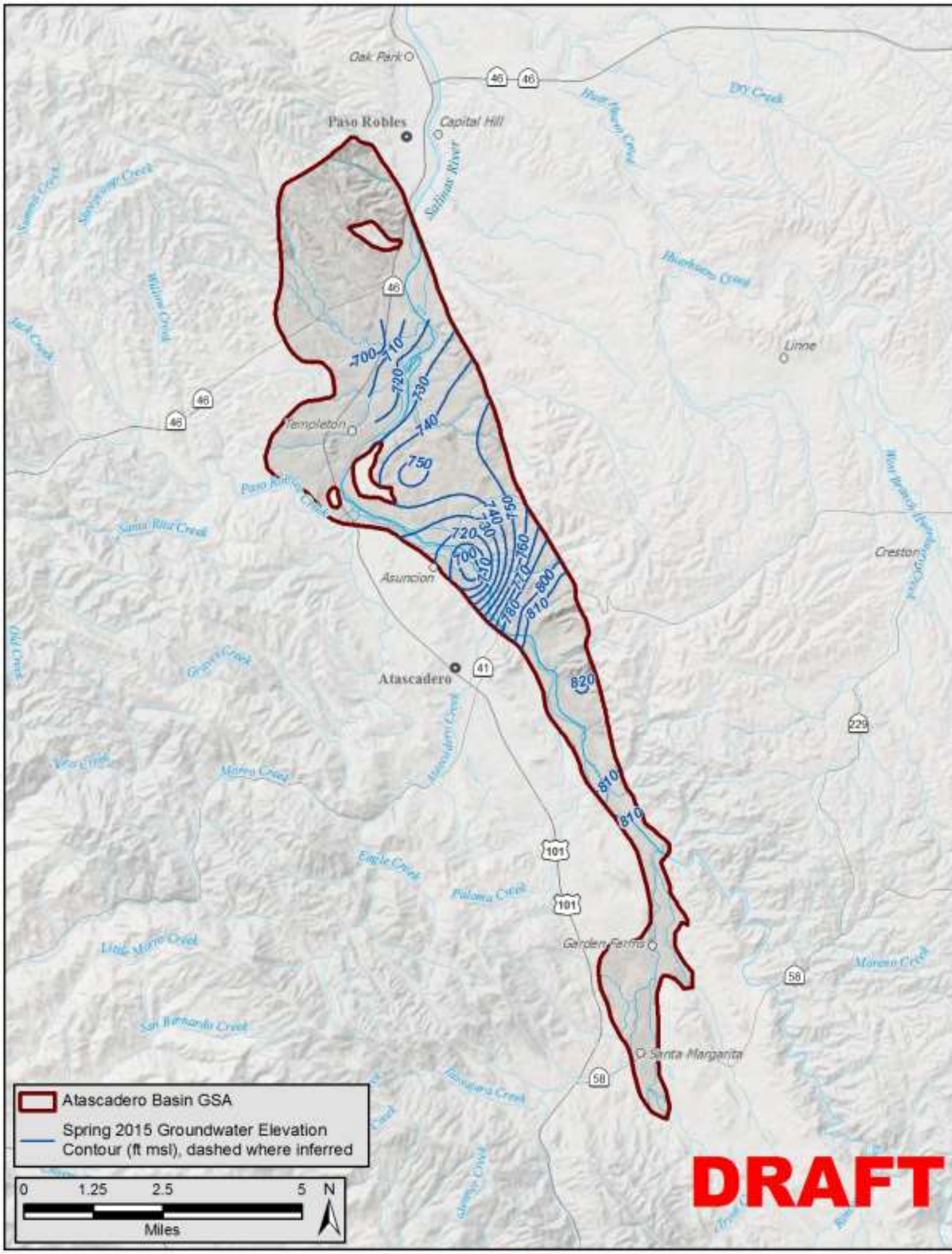
Spring 1997 Paso Robles Formation Aquifer Groundwater Elevation Contours

OCTOBER 2019

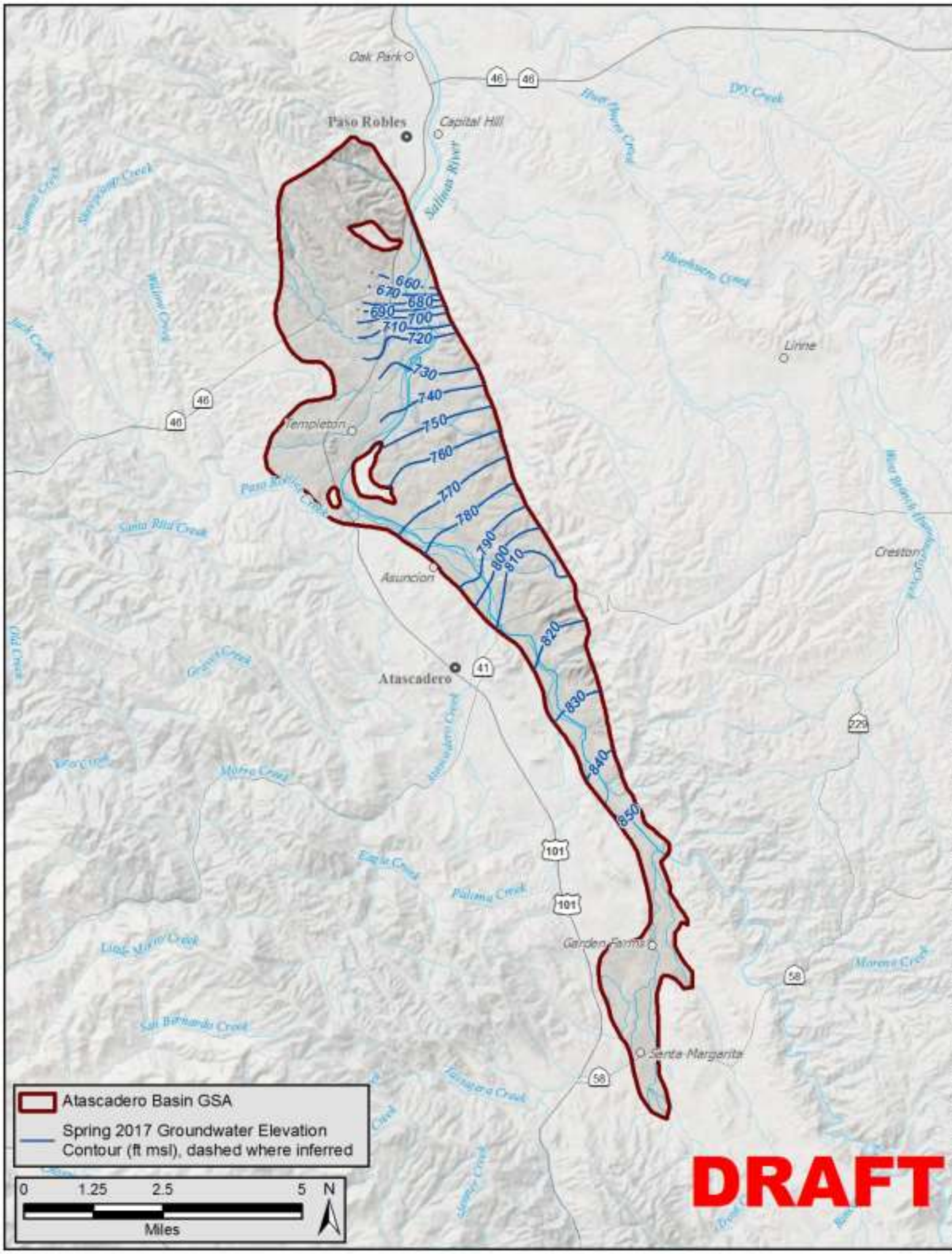
FIGURE 5-8



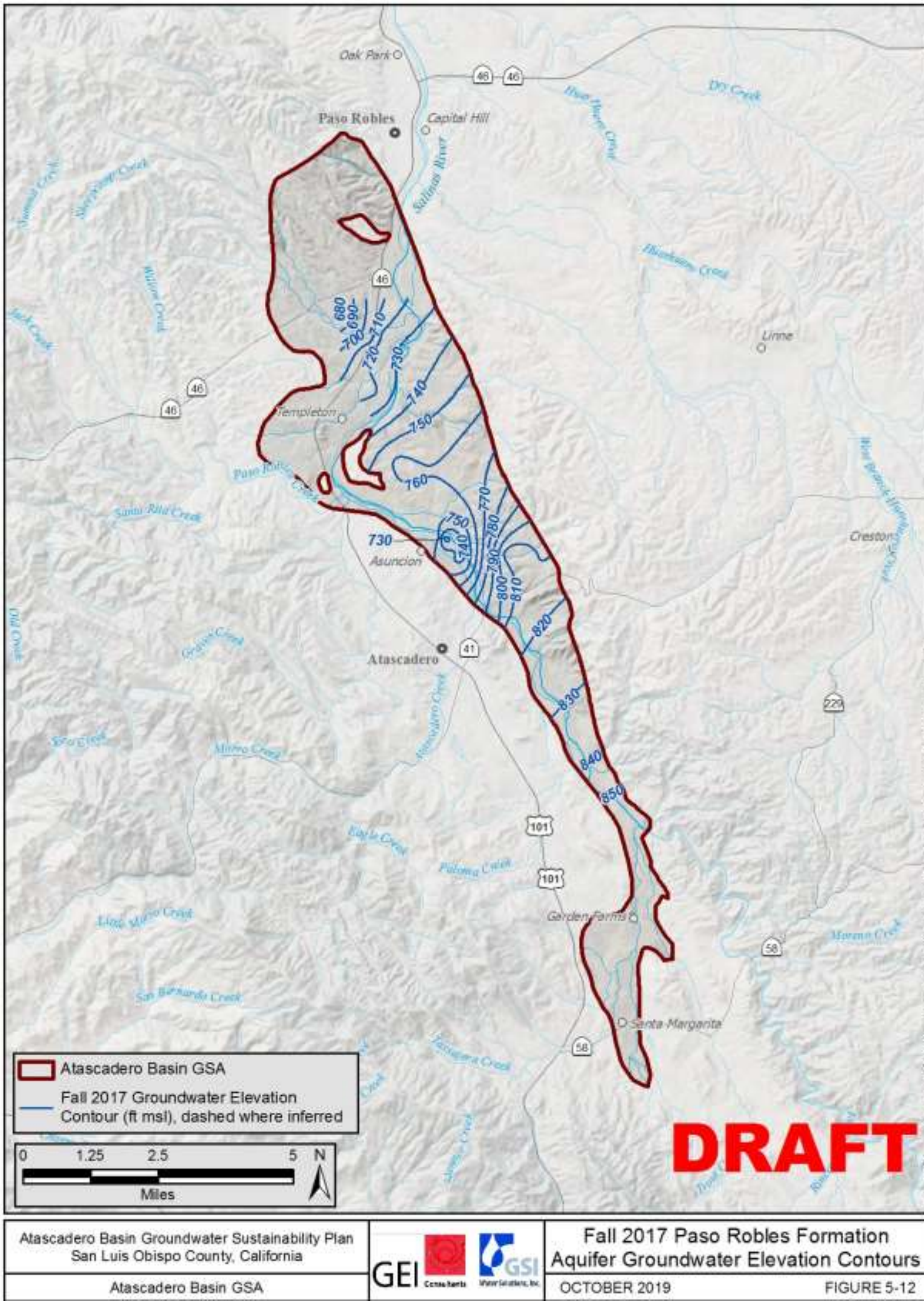
Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2011 Paso Robles Formation Aquifer Groundwater Elevation Contours
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-9



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2015 Paso Robles Formation Aquifer Groundwater Elevation Contours	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-10



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Spring 2017 Paso Robles Formation Aquifer Groundwater Elevation Contours	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-11


Oak Park
Paso Robles
Capitol Hill
Salinas River
Dry Creek
Templeton
Asuncion
Atascadero
Creston
Linne
Garden Farms
Santa Margarita
680
690
700
710
720
730
740
750
760
770
780
790
800
810
820
830
840
850
Atascadero Basin GSA
Fall 2017 Groundwater Elevation Contour (ft msl), dashed where inferred
0 1.25 2.5 5
Miles
N
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Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California
Atascadero Basin GSA
Fall 2017 Paso Robles Formation Aquifer Groundwater Elevation Contours
OCTOBER 2019
FIGURE 5-12

pumping depression in spring 2015 except for in the north part of the Basin where flow direction was generally toward the northwest. Hydraulic gradients ranged from approximately 0.01, in close proximity to the pumping depression, to 0.0006 ft/ft elsewhere in the Basin. The spring 2015 contours indicate pumping influences in the Templeton area as well, although not as significant as those in the Atascadero area.

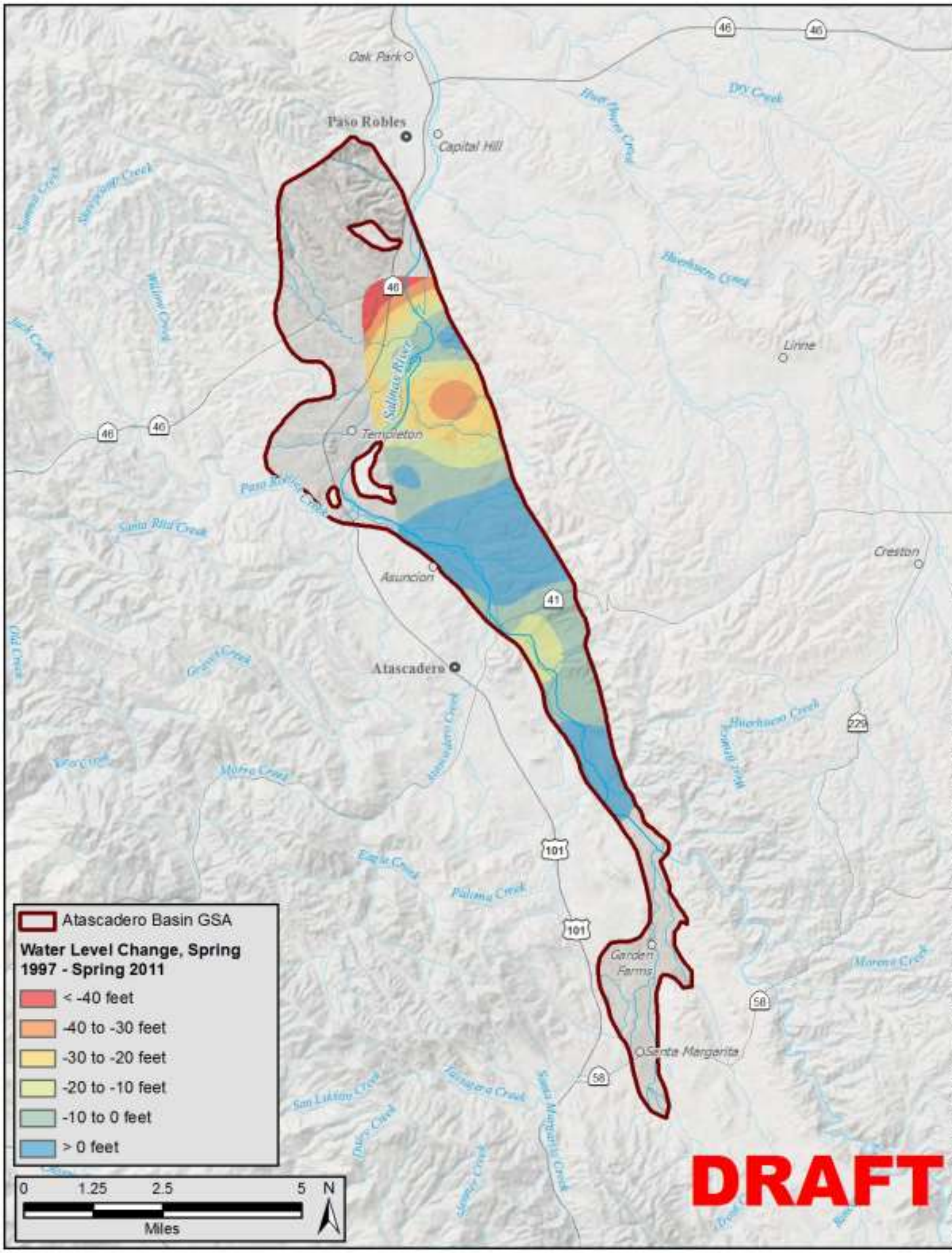
The spring 2017 groundwater elevations in the Paso Robles Formation Aquifer ranged from approximately 860 ft msl in the south to approximately 660 ft msl in the northern part of the Basin. Similar to spring 2011, the spring 2017 groundwater flow direction in the Paso Robles Formation Aquifer is generally to the north-northwest with hydraulic gradients ranging from approximately 0.02 to 0.001 ft/ft. The spring 2017 contours appear to show slight pumping influences in the Atascadero and Templeton areas.

Fall 2017 groundwater elevations in the Paso Robles Formation Aquifer ranged from approximately 860 ft msl in the south to approximately 680 ft msl in the northern part of the Basin. Fall 2017 groundwater flow direction in the Paso Robles Formation Aquifer is generally to the north-northwest with hydraulic gradients ranging from approximately 0.01 to 0.002 ft/ft. Pumping troughs are evident in the Templeton and Atascadero areas.

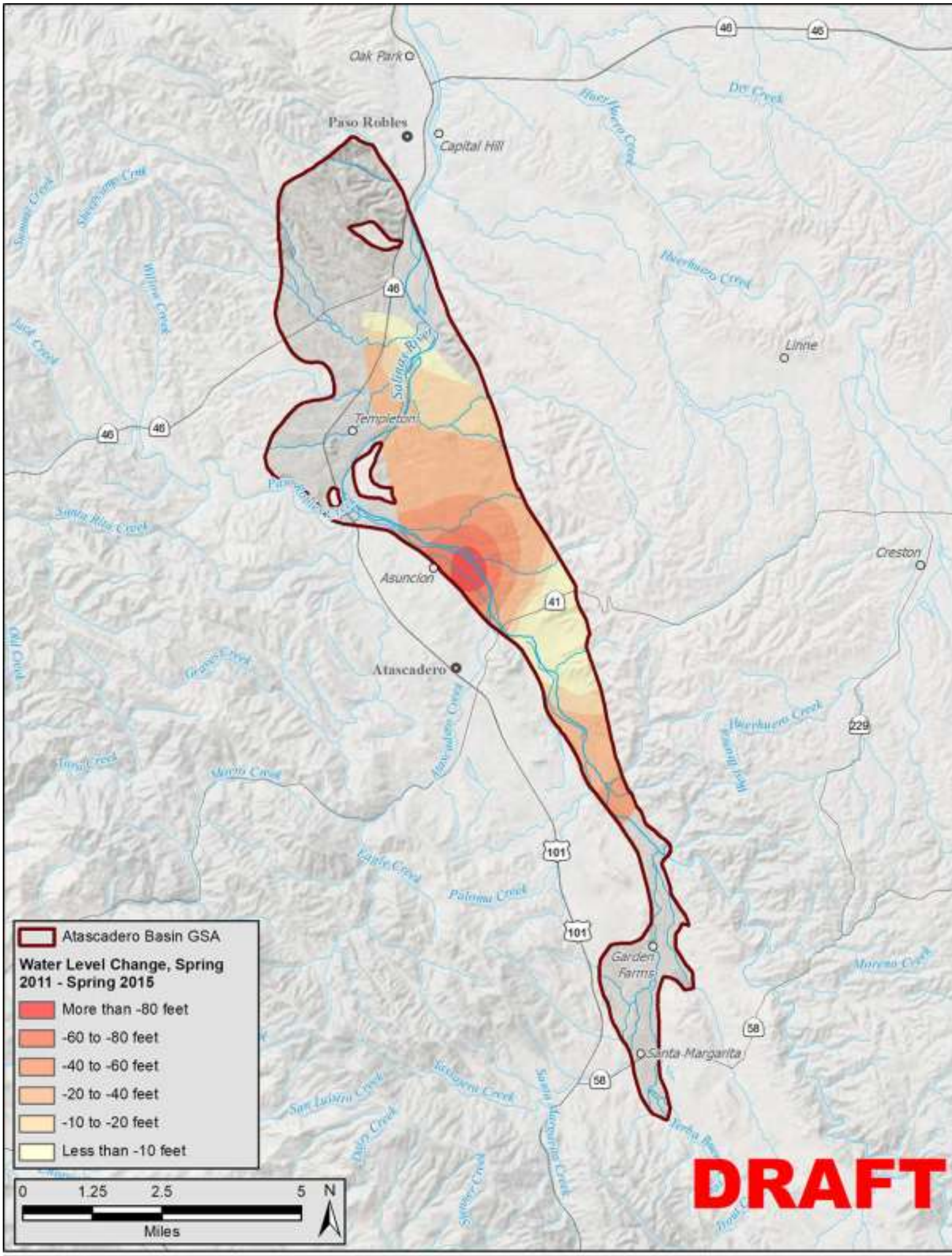
5.1.2.2 Paso Robles Formation Aquifer Changes in Groundwater Elevations

Figure 5-13 depicts the change in spring groundwater elevations in the Paso Robles Formation Aquifer between 1997 and 2011. Groundwater elevations are generally lower in 2011 than 1997 in the area east of Templeton and in the area near the intersection of HWY 101 and HWY 46 West (by as much as 45 feet). The decline in water levels in the northern part of the Basin is inferred to be related to increased agricultural pumping in the bedrock areas west of the Basin which may be resulting in decreased subsurface recharge to the Basin from the northwest. Groundwater elevations are higher in 2011 than 1997 in the Atascadero area north of the HWY 41 bridge by as much as 5 feet. The increase in water levels may be related to reductions in groundwater pumping in the area.

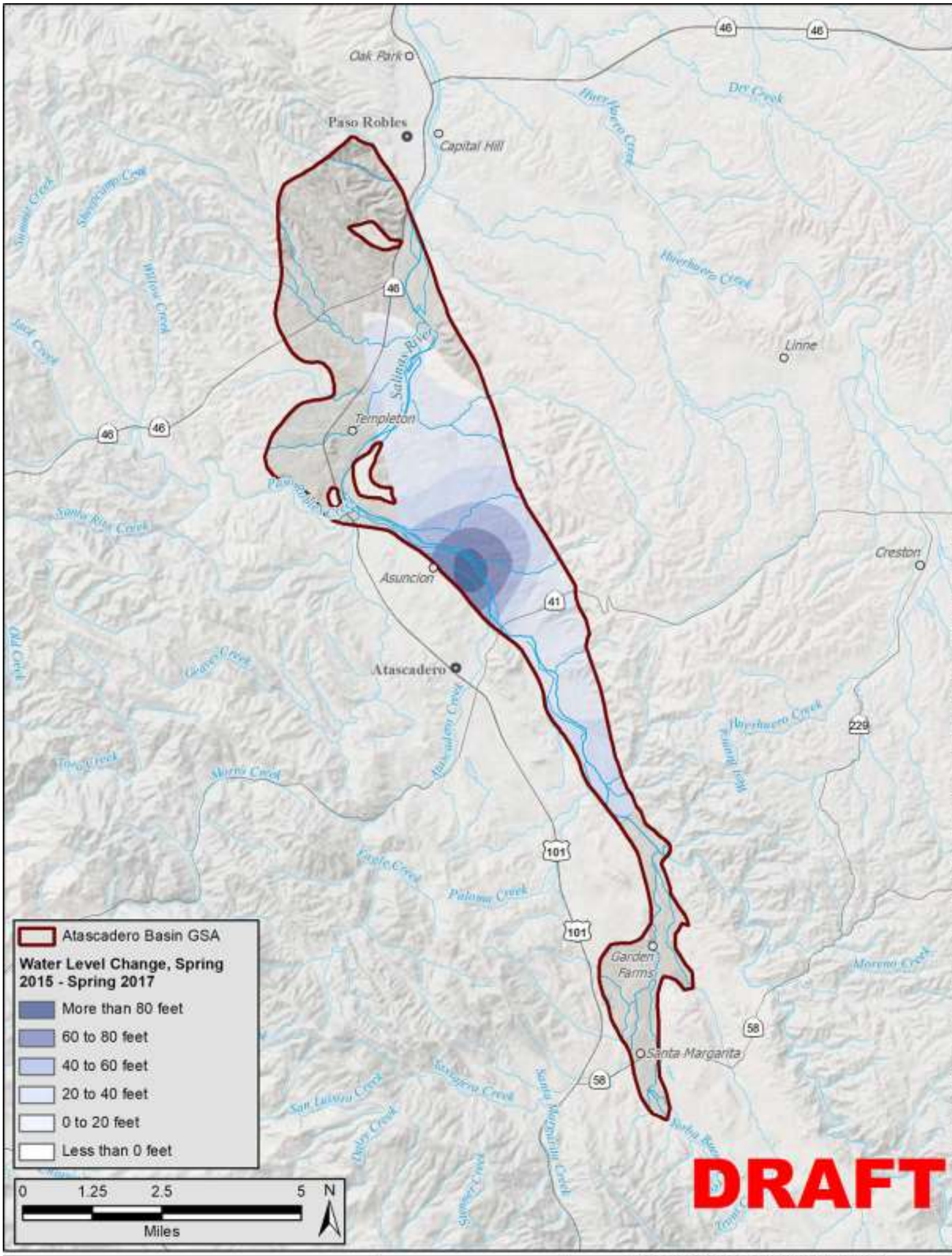
Figure 5-14 depicts the change in spring groundwater elevations in the Paso Robles Formation Aquifer between 2011 and 2015 and Figure 5-15 depicts the change in spring groundwater elevation between 2015 and 2017. Together, these effectively cover the time period of the recent drought. Groundwater elevations were significantly lower in 2015 than 2011 throughout the Basin, most notably in the Atascadero area. The relatively large decrease in water elevations in the Atascadero area are likely related to consistent groundwater production through the drought



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Paso Robles Formation Aquifer Change in Groundwater Elevation Spring 1997 to Spring 2011
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-13



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Paso Robles Formation Aquifer Change in Groundwater Elevation Spring 2011 to Spring 2015
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-14



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Paso Robles Formation Aquifer Change in Groundwater Elevation Spring 2015 to Spring 2017	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-15

period coupled with an interruption of imported surface water delivery from the Nacimiento Water Project[2] (NWP) (John Neil, per. comm., August 23, 2019).

Groundwater elevations in the Paso Robles Formation Aquifer generally increased between spring 2015 and spring 2017, most significantly in the Atascadero area (Figure 5-15). This recovery to 2011 water levels in the Atascadero area is likely related to decreased groundwater production in 2015 and 2016, percolation of a nearly full allocation of NWP water in 2015, and above average precipitation in 2017.

The groundwater level contours and groundwater level change maps in this GSP are based on a reasonable and thorough analysis of the currently available data. The Basin has generally very good coverage in its existing groundwater monitoring network. However, the northwest end of the Basin, especially the area north of HWY-46, does not. A better understanding of water levels in the Paso Robles Formation in this area is important to the future understanding of the groundwater conditions in the north end of the Basin. Expanding the monitoring network and acquiring more groundwater elevation data will allow the GSA to refine and modify this GSP in the future based on a more complete understanding of Basin conditions. There are many existing private wells in the northwest area so there may be opportunities to bring one or more of them into the monitoring program through an outreach program. This is discussed further in Section 8.

5.1.2.3 Paso Robles Formation Aquifer Hydrographs

Appendix 5A includes ten hydrographs for wells in the Paso Roble Formation Aquifer. These wells were chosen because they have sufficient periods of record to identify trends and/or responses to climatic conditions, they are distributed throughout the Basin, and they have publicly available, non-confidential data.

Similar to the Alluvial Aquifer hydrographs, the Paso Robles Formation Aquifer hydrographs show periods of climatic variations grouped by the following designations: drought, wet period, or variable (see Figure 5-7). Generally, the hydrographs illustrate the overall stability of water levels throughout the Basin. All hydrographs but three demonstrate long-term stability of water levels, albeit with some showing seasonal fluctuations as much as 100 feet. The three exceptions include well 27S/12E-17B02 and 27S/12E-17E01, which are both located west of the intersection of HWY 101 and HWY 46 West, and well 27S/12E-22M01, which is located east of the Salinas River in the Templeton area. As discussed earlier, it is likely that the decline in water levels in the area near the intersection of HWY 101 and HWY 46 West is due to reduced subsurface inflow to the Basin as a result of increased agricultural activity in the bedrock regime to the west. Although well 27S/12E-22M01, east of Templeton, has shown a decline in water levels since the late

[2] The Nacimiento Water Project construction was completed by the San Luis Obispo County Flood Control and Water Conservation District in early 2010, and participating agencies, including City of Paso Robles, TCSD, and AMWC, have been taking deliveries of these imported surface water supplies from Nacimiento Reservoir to manage the Basin with imported water to augment the natural Basin supplies, especially during drought periods.

1990s, current water elevations are higher than water elevations prior to the 1980s, and have also shown an overall stability in the past decade.

5.1.3 *Vertical Groundwater Gradients*

Limited data exist to assess vertical groundwater gradients. Vertical groundwater gradients can be estimated from nested or clustered wells. Previous hydrologic studies of the Basin indicate that groundwater elevations are generally higher in the Alluvial Aquifer than the underlying Paso Robles Formation Aquifer, resulting in groundwater flow from the Alluvial Aquifer to the underlying Paso Robles Formation aquifer (Fugro, 2005). The lack of nested or clustered monitoring wells in the Basin is a data gap that will be addressed further in Section 8.

5.2 Change in Groundwater Storage

Changes in groundwater storage for the Alluvial Aquifer and Paso Robles Formation Aquifer are addressed in the Water Budget Section (Section 6).

5.3 Seawater Intrusion

Seawater intrusion is not an applicable sustainability indicator for the Basin. The Basin is not adjacent to the Pacific Ocean, a bay, or inlet.

5.4 Subsidence

Land subsidence is the lowering of the land surface. While several human-induced and natural causes of subsidence exist, the only process applicable to the GSP is subsidence due to lowered groundwater elevations caused by groundwater pumping.

Direct measurements of subsidence have not been made in the Basin using extensometers or repeat benchmark calibration; however, interferometric synthetic aperture radar (InSAR) has been used in the area to remotely map subsidence. This technology uses radar images taken from satellites that are used to create maps of changes in land surface elevation. One study done in the area shows that a localized area east of US HWY-101 and the Salinas River had a downward displacement of 1 to 2 inches between spring 1997 and fall 1997 (Valentine, D. W. et al., 2001). A second InSAR study completed for the time period of May 2015 to August 2016 showed 0 to 3 inches of downward displacement in the Basin (NASA JPL, 2018). It should be noted that neither study indicated that the change in ground surface elevation is attributed to extraction of groundwater.

Subsidence as a sustainability indicator will be addressed further in Section 8.

5.5 Interconnected Surface Water

The spatial extent of interconnected surface water in the Basin was evaluated using water level data from confidential and non-confidential Alluvial Aquifer and Paso Robles Formation Aquifer wells adjacent to the Salinas River[3]. In accordance with the SGMA emergency regulations §351 (o), "Interconnected surface water refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted". The interconnected surface water analysis consisted of comparing average springtime water level elevations[4] in wells adjacent to the Salinas River with the elevation of the adjacent Salinas River thalweg. In cases where average springtime water levels were greater than the elevation of the adjacent Salinas River thalweg the stream reach was considered as potentially 'gaining'. In cases where average springtime water levels were below the adjacent thalweg elevation the stream reach was considered 'losing' and potentially 'disconnected'.

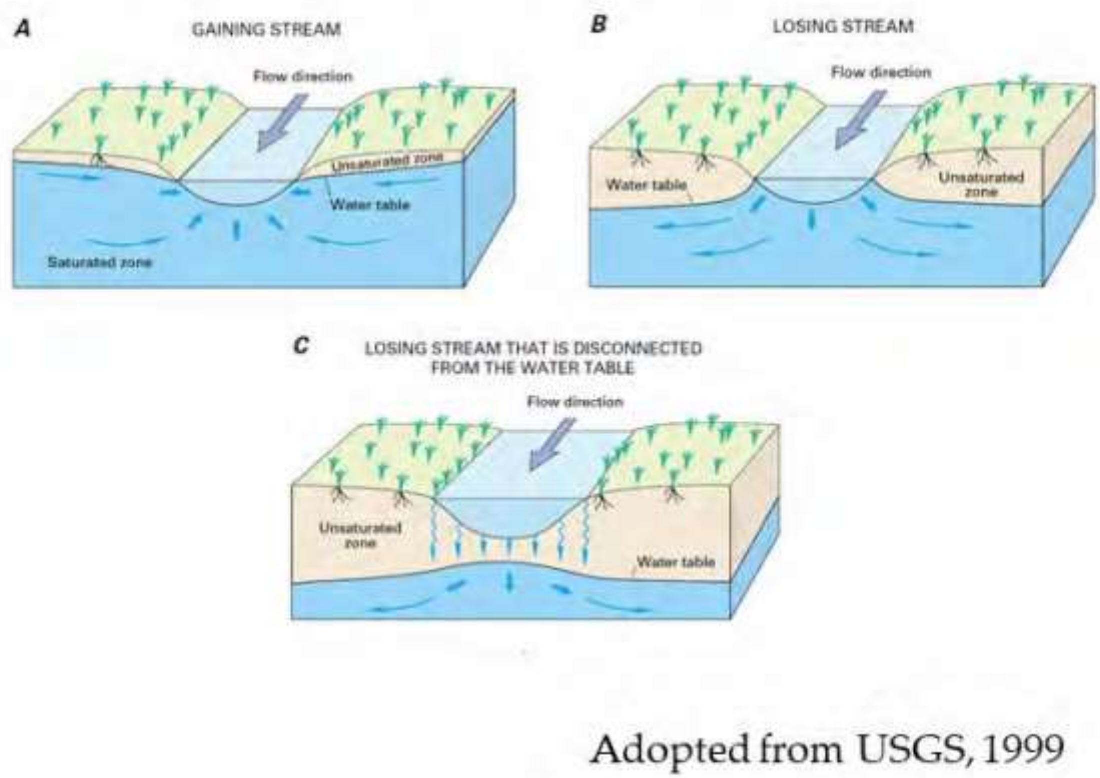
Paso Robles Formation Aquifer water levels were further evaluated based on their occurrence within confined or semi-confined zones of the aquifer or within areas known to be in direct communication with the overlying Alluvial Aquifer. Proximity to wastewater percolation and NWP infiltration basins was also considered in the analysis.

It is important to recognize that the results of these analyses reflect conditions that occur occasionally, in response to precipitation events. They are not representative of long-term average conditions. Figure 5-16 is a schematic illustrating types of interconnected and disconnected surface waters. In this figure, both diagrams A and B represent interconnected surface waters ('gaining' and 'losing', respectively) and diagram C shows disconnected 'losing' surface water.

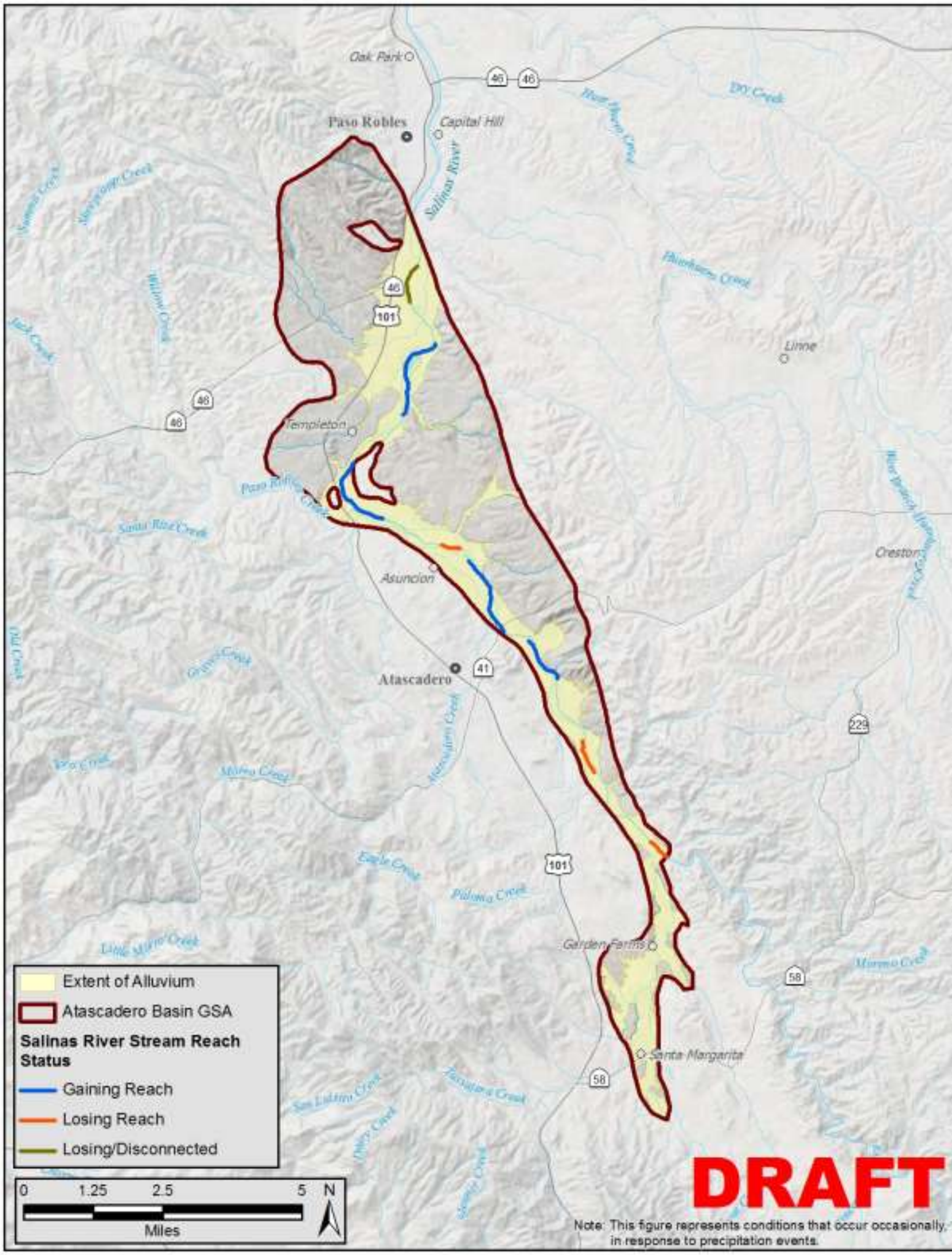
The analysis outlined above resulted in identification of four reaches of the Salinas River that occasionally 'gain' water from the Alluvial Aquifer and four reaches that occasionally 'lose' water to the Alluvial Aquifer, one of which, located in the area just south of the City of Paso Robles, is likely also 'disconnected'. These identified reaches account for approximately 7.5 miles of the Salinas River course within the Basin, leaving approximately 8 miles of river with unknown interconnected surface water status. The results of the interconnected surface water analysis, for the Alluvial Aquifer are shown on Figure 5-17A.

[3] The interconnected surface water analysis was restricted to the Salinas River, which is the only significant surface water body in the Subbasin.

[4] Average springtime water elevations were selected for the analysis because they represent the most commonly observed annual high water elevation over the period of record and because they generally correspond with periods of flow (or "Live Stream" events) in the Salinas River. As stated in Section 4, the Salinas River is ephemeral, and during most of the year, it either runs dry or loses water to the underlying aquifers.



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	**INTERCONNECTED AND NON-INTERCONNECTED SURFACE WATERS SCHEMATIC**
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-16



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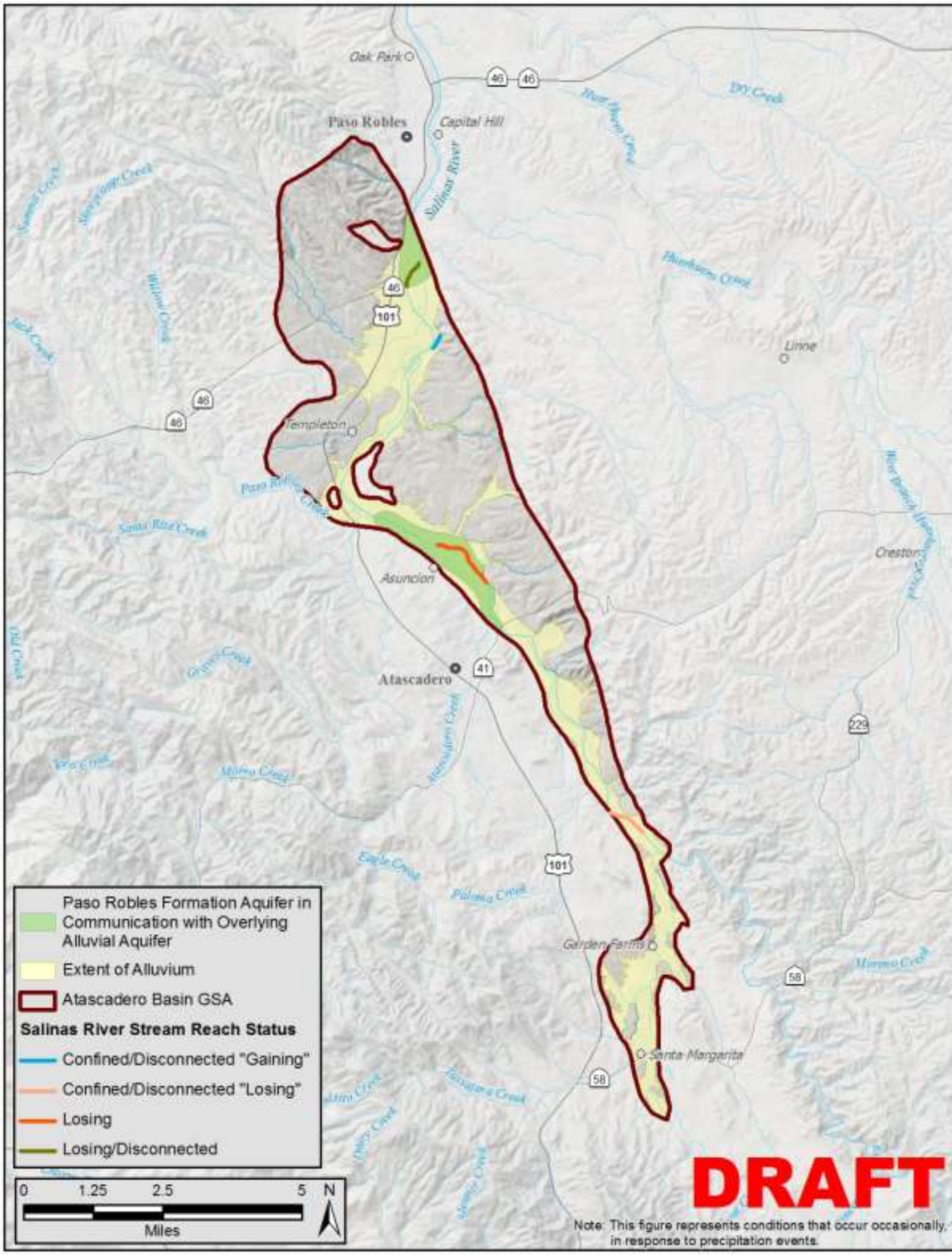
Locations of Potentially Interconnected Surface Waters - Alluvial Aquifer

OCTOBER 2019 FIGURE 5-17A

The Paso Robles Formation Aquifer water level analysis resulted in identification of one ‘losing’ reach of the Salinas River, located downstream of the HWY-41 bridge where the Paso Robles Formation is known to be in direct communication with the overlying Alluvial Aquifer, and one ‘losing’/’disconnected’ reach, located in the area just south of the City of Paso Robles. Water levels in the Paso Robles Formation Aquifer were also analyzed for two areas where the aquifer is confined. In one of these areas, in the Templeton area, the average springtime water levels are higher than the elevation of the adjacent Salinas River thalweg; however, this relationship is because of the presence of a documented clay aquitard in this area (Torres, 1979). Despite the elevation of the potentiometric surface in the Paso Robles Formation Aquifer at or above the thalweg, the aquifer is fully disconnected because of the documented confining clay layer. A second area analyzed within the assumed confined zone of the Paso Robles Formation Aquifer, located near the Atascadero State Hospital, shows water levels that are well below the elevation of the adjacent Salinas River thalweg. It is assumed that groundwater in the Paso Robles Formation Aquifer is disconnected from the Salinas River in this area. The results of the interconnected surface water analysis, for the Paso Robles Formation Aquifer are shown on Figure 5-17B.



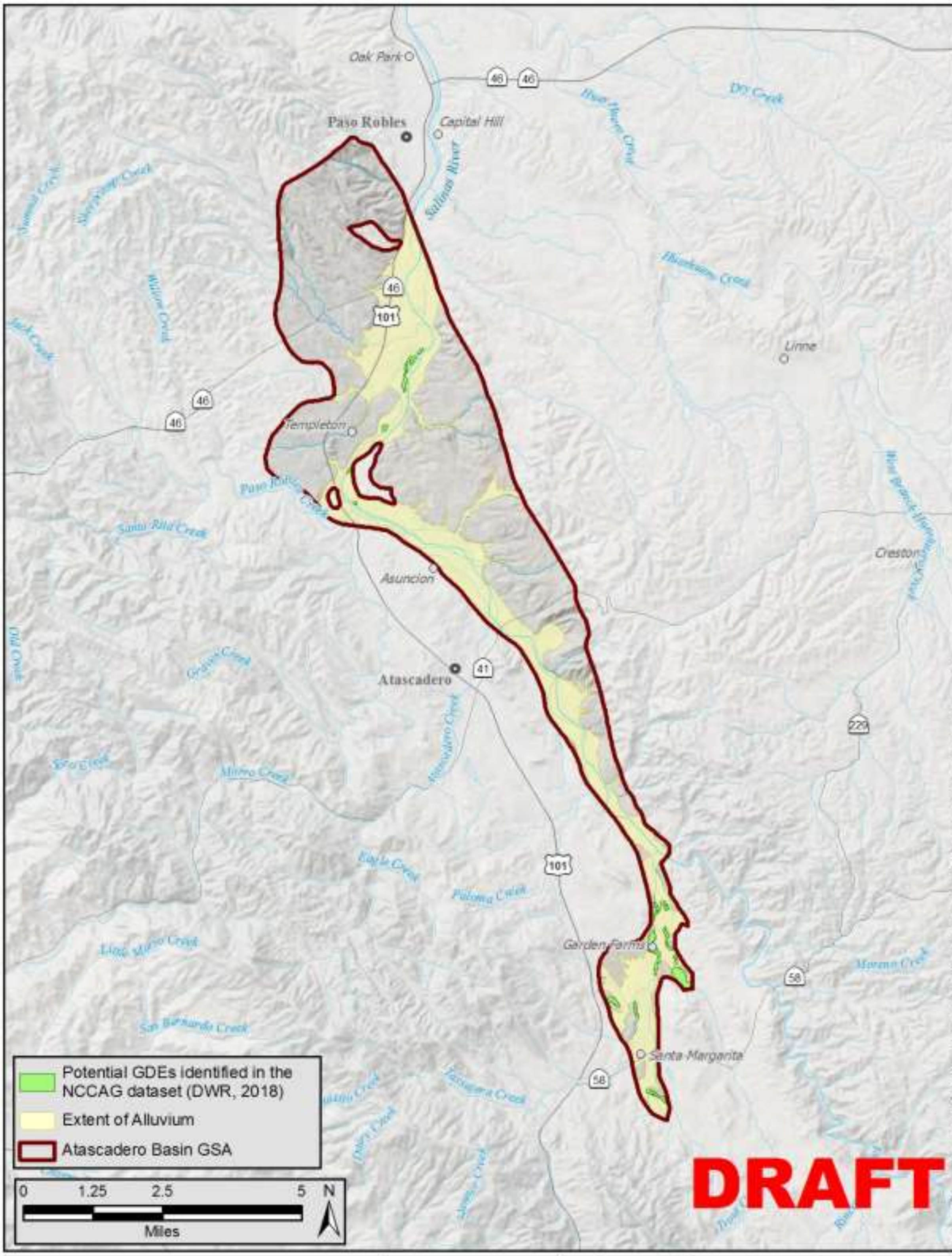
Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Locations of Potentially Interconnected Surface Waters - Paso Robles Formation	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-17B

5.5.1 *Depletion of Interconnected Surface Water*

Groundwater withdrawals are balanced by a combination of reductions in groundwater storage and changes in the rate of exchange across hydrologic boundaries. In the case of surface water depletion, this rate change could be due to reductions in rates of groundwater discharge to surface water, and increased rates of surface water percolation to groundwater. Variation in rates of groundwater discharge to surface water or surface water percolation to groundwater occur naturally throughout any given year, as driven by the natural hydrologic cycle, but they can also be affected by anthropogenic actions. The potential for depletion of interconnected surface waters in the Basin is discussed further in Section 6.

5.6 Potential Groundwater Dependent Ecosystems

The SGMA emergency regulations §351.16 require identification of groundwater dependent ecosystems within the Basin. The Natural Communities Commonly Associated with Groundwater (NCCAG) dataset (DWR, 2018) was utilized to identify the spatial extent of potential groundwater dependent ecosystems (GDEs) in the Basin. In accordance with the SGMA emergency regulations §351 (o), “groundwater dependent ecosystems refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface”. In areas where the water table is sufficiently high, groundwater discharge may occur as evapotranspiration (ET) from phreatophyte vegetation within these GDEs. The NCCAG dataset identifies a concentration of potential GDEs in the southern part of the Basin and several potential GDEs in the Templeton area. The overall distribution of potential GDEs within the Basin, as specified in the NCCAG dataset, is shown in Figure 5-18. There has been no verification that the locations shown on this map constitute GDEs. Additional field reconnaissance is necessary to verify the existence and extent of these potential GDEs. Appendix 5B describes methods that may be relied upon to improve the understanding of the extent and type of potential GDEs in the Basin (in progress).



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Potential Groundwater-Dependent Ecosystems	
Atascadero Basin GSA		OCTOBER 2019	FIGURE 5-18

5.7 Groundwater Quality Distribution and Trends

Groundwater quality samples have been collected and analyzed throughout the Basin for various studies and programs and are collected on a regular basis for compliance with regulatory programs. A broad survey of groundwater quality sampling was conducted for the Paso Robles Groundwater Basin Study, Phase I (Fugro, 2002), and historical groundwater quality data were compiled for use in the Salt and Nutrient Management Plan (SNMP) (RMC, 2015). In addition to the cited, published studies, water quality data surveyed for this GSP were collected from:

- The California Safe Drinking Water Information System (SDWIS), a repository for public water system water quality data,
- The National Water Quality Monitoring Council water quality portal (this includes data from the recently decommissioned EPA STORET database, the USGS, and other federal and state entities [Note: in the Basin the agencies include USGS, California Environmental Data Exchange Network (CEDEN), and Central Coast Ambient Monitoring Program {CCAMP}]), and
- The California State Water Resources Control Board (SWRCB) GeoTracker GAMA database.

The main source of recharge to the Basin is the percolation of streamflow from the Salinas River, which drains the Cretaceous-age granitic rocks and Cretaceous and Tertiary-age sedimentary beds of the northwestern La Panza Range. This recharge, typically a calcium and magnesium bicarbonate water, has the greatest influence on water quality in the basin (Fugro, 2002). Significant inflow from Santa Margarita, Atascadero, and Paso Robles creeks also provides recharge to the Basin. Santa Margarita Creek (including Trout, Yerba Buena, and upper Santa Margarita creeks) water quality is typically magnesium-calcium-bicarbonate, whereas Atascadero and Paso Robles creek waters are typically calcium-bicarbonate (Fugro, 2002).

In general, the quality of groundwater in the Basin is good. Water quality trends in the Basin are dominantly stable, with some areas of improving water quality and few significant trends of ongoing deterioration of water quality. The distribution, concentrations, and trends of several major water quality constituents are presented in the following sections.

5.7.1 *Groundwater Quality Suitability for Drinking Water*

Groundwater in the Basin is generally suitable for drinking water purposes. Groundwater quality data was evaluated from the SDWIS and GeoTracker GAMA datasets. The data reviewed includes 4,500 sampling events from 149 wells in the Basin, collected between June 1953 and June 2019. Drinking water standards Maximum Contaminant Levels (MCLs) and Secondary MCLs (SMCLs) are established by Federal and State agencies. MCLs are legally enforceable standards, while SMCLs are guidelines established for nonhazardous aesthetic considerations such as taste, odor, and color. Water quality standard exceedances in the Basin include exceedance of the MCL for nitrate, which equaled or exceeded the standard in 108 samples out of 1,959 samples (with 98 of the exceedances occurring in one well), and exceedance of the SMCL for total dissolved solids, which equaled or exceeded the standard in 24 samples from 11 wells out of 1,148 samples. Gross alpha samples from two wells exceeded the corresponding MCL in 3 out of 363 samples collected and selenium samples from two different wells exceeded the corresponding MCL in 3 out of 380 samples collected. Sulfate samples from three wells exceeded the corresponding SMCL in 4 out of 645 samples collected. The most common water quality exceedances observed in the Basin are exceedance of the MCL for arsenic, which equaled or exceeded the standard in 214 out of 983 samples (with 193 of the exceedances occurring in one well), and exceedance of the SMCL for iron, which equaled or exceeded the standard in 131 out of 1,021 samples (with 109 of the exceedances occurring in one well). In the case of public water supply systems, these water quality exceedances are effectively mitigated with seasonal well use and water blending practices to reduce the constituent concentrations to below their respective water quality standard.

5.7.2 *Groundwater Quality Suitability for Agricultural Irrigation*

Groundwater in the Basin is generally suitable for agricultural purposes, with some restrictions as described below. The primary water quality constituents of interest for evaluating agricultural irrigation uses are the sodium adsorption ratio (SAR), electrical conductivity (EC), sodium, boron, and chloride. Groundwater quality data was evaluated from the SDWIS and GeoTracker GAMA datasets. The data reviewed includes over 4,300 sampling events from 164 wells in the Basin, collected between June 1953 and June 2019. Approximately a quarter of the samples evaluated show no restriction for use in agricultural irrigation, based on evaluation of the above parameters. Electrical conductivity (EC) results from over 500 water samples taken from wells located throughout the Basin indicate that some caution should be used if irrigating salt sensitive crops. In general, seasonal monitoring of root zone soil salinity may be advisable to identify and prevent any developing soil salinity accumulation. Results of 77 water samples indicate some caution should be used if irrigating trees and vines due to potential sodium ion toxicity. Ten samples from four wells located in the northern part of the Basin indicate severe restriction for tree and vine irrigation due to potential sodium ion toxicity. Results of 284 water samples indicate some caution should be used if irrigating trees and vines due to potential chloride ion toxicity. The majority of these water samples were taken from wells located in the northern part of the Basin. None of the water samples indicate severe irrigation restrictions due to potential chloride ion toxicity. Results of 12 water samples taken from four wells located in the northern part of the Basin indicate slight to moderate restrictions for irrigation of vegetable and field crops and severe restrictions for tree and vine crops due to potential boron ion toxicity. Results of 120 water samples suggest potential soil water infiltration restrictions as indicated by a combination of SAR and EC parameters. Seventeen water samples taken from 13 wells indicate potentially severe soil water infiltration restrictions. All but one of these wells are located in the northern part of the Basin, the other is located in the Santa Margarita area.

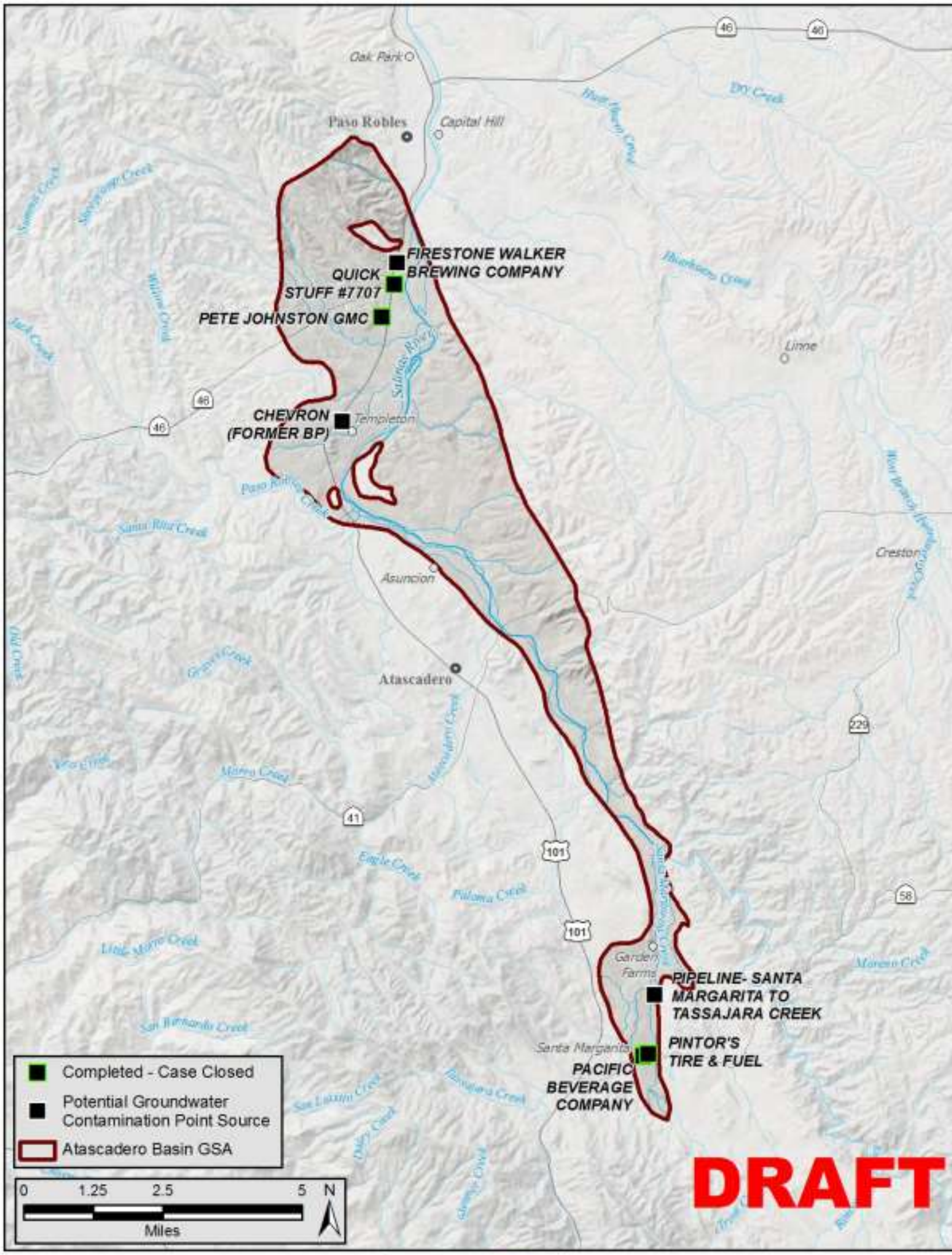
5.7.3 *Distribution and Concentrations of Point Sources of Groundwater Constituents*

Potential point sources of groundwater quality degradation were identified using the State Water Resources Control Board (SWRCB) Geotracker website. Waste Discharge permits were also reviewed from on-line regional SWRCB websites. **Table 5-*1*** summarizes information from these websites for open/active sites. Figure 5-19 shows the locations of these potential groundwater contaminant point sources and the locations of completed/case closed sites. Based on available information there are no mapped ground-water contamination plumes at these sites.

Table 5-1. Potential Point Sources of Groundwater Contamination

Site ID/ Site Name	Site Type	Constituent(s) of Concern (COCs)	Status
SL0607989492 – Pipeline-Santa Margarita to Tassajara Creek	Cleanup Program Site	Crude Oil	Open – Verification Monitoring
T0607900001 – Chevron (Former BP)	LUST Cleanup Site	Gasoline, MTBE, TBA/Other Fuel Oxygenates	Open – Eligible for Closure as of 10/26/2018
T10000009038 – Firestone Walker Brewing Company	Cleanup Program Site	PCE, TCE, Vinyl Chloride, Other Chlorinated Hydrocarbons	Open - Remediation

Notes: LUST – Leaking Underground Storage Tank, MTBE – Methyl Tertiary Butyl Ether, TBA – Tertiary Butyl Alcohol, PCE – Tetrachloroethylene, TCE – Trichloroethylene



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI GSI	Location of Potential Point Sources of Groundwater Contaminants
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-19

5.7.4 *Distribution and Concentrations of Diffuse or Natural Groundwater Constituents*

The distribution and concentration of several constituents of concern are discussed in the following subsections. Groundwater quality data was evaluated from the SDWIS and GeoTracker GAMA datasets. The data reviewed includes 4,500 sampling events from 149 wells in the Basin, collected between June 1953 and June 2019. Each of the constituents are compared to their drinking water standard, if applicable, or their Basin Plan Median Groundwater Quality Objective (RWQCB Objective) (CCRWQCB, 2017). This GSP focuses only on constituents that might be impacted by groundwater management activities. The constituents discussed below are chosen because:

1. The constituent has either a drinking water standard or a known effect on crops.
2. Concentrations have been observed above either the drinking water standard or the level that affects crops.

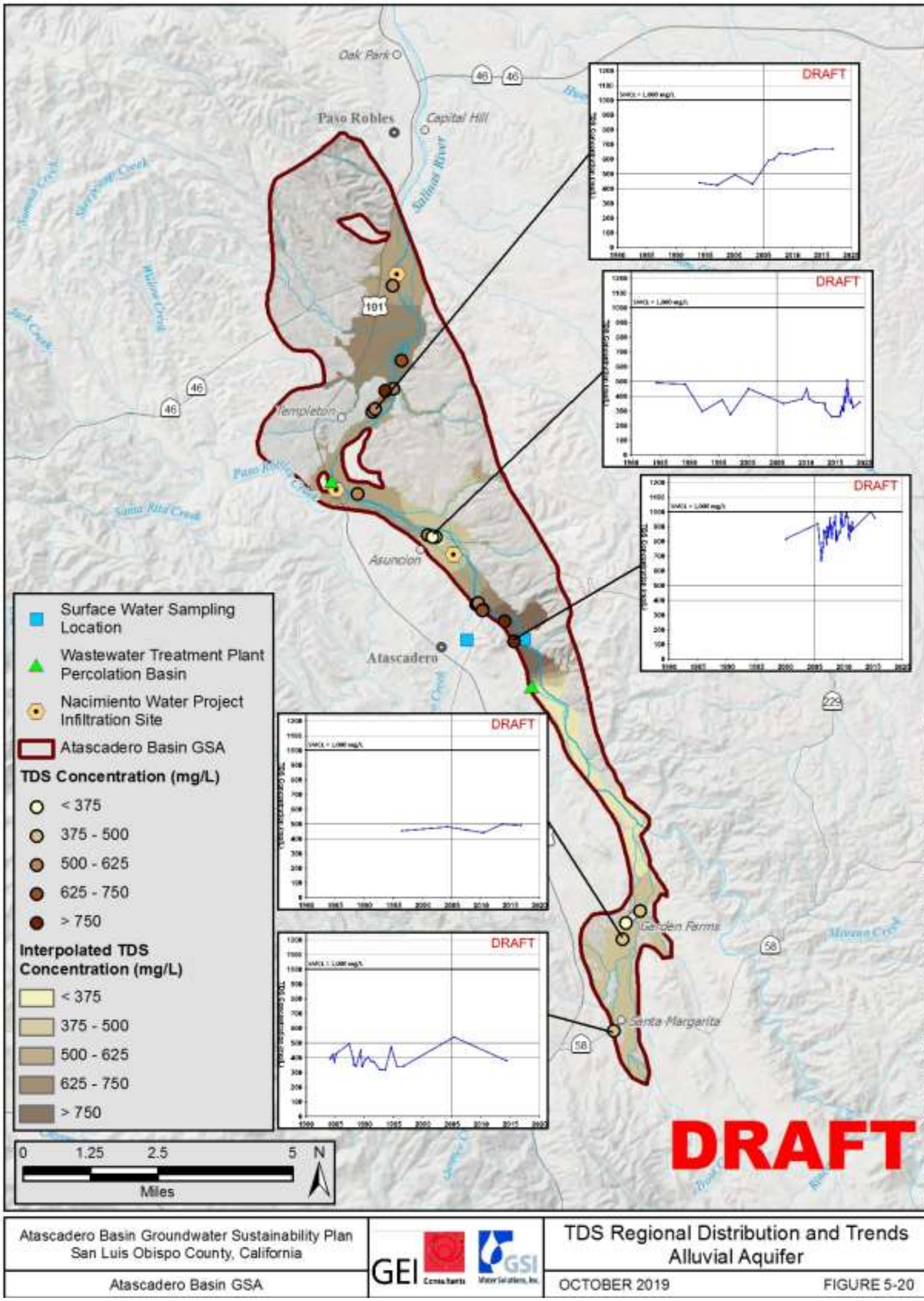
5.7.4.1 Total Dissolved Solids

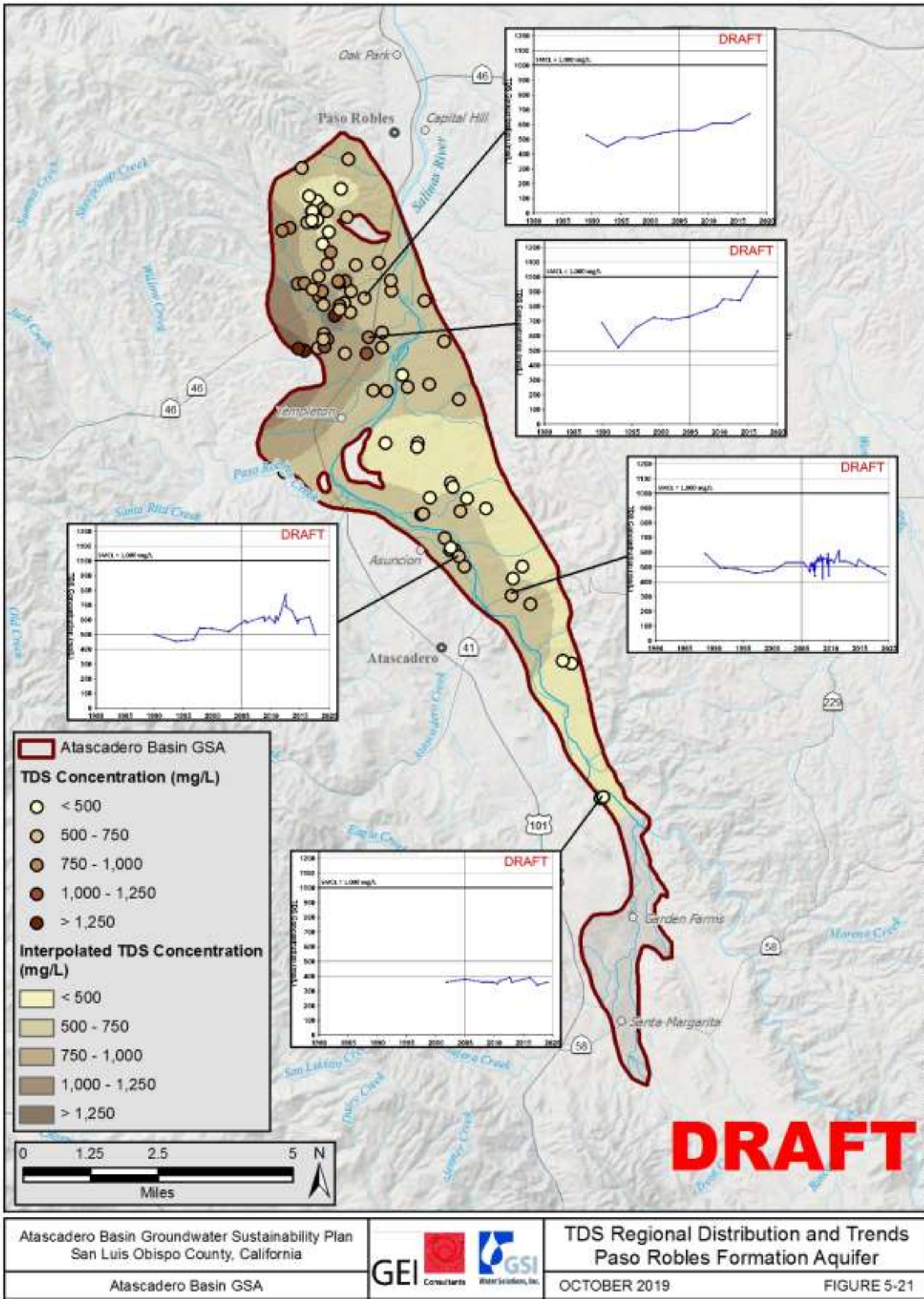
TDS is defined as the total amount of mobile charged ions, including minerals, salts or metals, dissolved in a given volume of water and is commonly expressed in terms of milligrams per liter (mg/L). TDS is a constituent of concern in groundwater because it has been detected at concentrations greater than its RWQCB Objectives of 550 mg/l in the Atascadero area and 730 mg/l in the Templeton area. The TDS Secondary MCL has been established for color, odor and taste, rather than human health effects. This Secondary MCL includes a recommended standard of 500 mg/L, an upper limit of 1,000 mg/L and a short-term limit of 1,500 mg/l. TDS water quality results ranged from 187 to 1,000 mg/l with an average of 600 mg/l in the Alluvial Aquifer and ranged from 300 to 2,090 mg/l with an average of 615 mg/l in the Paso Robles Formation Aquifer.

Fugro (2002) identified a slight trend of increasing TDS in alluvial and shallow Paso Robles Formation deposits along the Salinas River in the central portion of the Basin. This trend continues today, with the most visible trend of increasing TDS occurring in alluvial wells located in the Salinas River valley just downstream of both the City of Atascadero’s and Templeton CSD’s wastewater percolation ponds. There is also a trend of increasing TDS in Paso Robles Formation wells in the northwestern part of the Basin. This could be related to increased pumping in the northwestern highland areas within and adjacent to the Basin which may be resulting in decreased subsurface recharge to the Basin from the northwest. There are also some areas in the Basin with decreasing TDS concentrations. Several wells located in the Salinas River valley just downstream of NWP infiltration basins have shown decreasing TDS concentrations in response to introduction of NWP water.

The distribution and trends of TDS concentrations in the Alluvial Aquifer and the Paso Robles Formation Aquifer are shown on Figure 5-20 and Figures 5-21, respectively. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause TDS concentrations in groundwater in a well that would otherwise remain below the SMCL to increase above the SMCL.

Surface water samples have been collected from Atascadero Creek, about 1 mile upstream of its confluence with the Salinas River (located outside of the Basin), and from the Salinas River, about 1 mile upstream of the HWY-41 bridge (located within the Basin). Water samples from the Atascadero Creek site showed TDS levels ranging from 50 to 1,146 mg/l and averaging 497 mg/l, based on 120 sampling events between April 1999 and December 2012. Water samples from the Salinas River site showed TDS levels ranging from 74 to 777 mg/l and averaging 355 mg/l, based on 68 sampling events between February 1999 and June 2012. Concentrations of TDS in these surface water analyses do not show any long-term trends. The concentrations are generally higher in the summer and fall months, during times of typically lower stream flow, and lower in winter and spring months, during times of higher stream flow.


Oak Park
Paso Robles
Capital Hill
Salinas River
Templeton
Paso Robles Creek
Santa Rita Creek
Asuncion
Atascadero
Garden Farms
Santa Margarita
DRAFT
Surface Water Sampling Location
Wastewater Treatment Plant Percolation Basin
Nacimiento Water Project Infiltration Site
Atascadero Basin GSA
TDS Concentration (mg/L)
< 375
375 - 500
500 - 625
625 - 750
> 750
Interpolated TDS Concentration (mg/L)
< 375
375 - 500
500 - 625
625 - 750
> 750
0
1.25
2.5
5
N
Miles
Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California
Atascadero Basin GSA
TDS Regional Distribution and Trends
Alluvial Aquifer
OCTOBER 2019
FIGURE 5-20


DRAFT
Paso Robles
Atascadero
Templeton
Asuncion
Garden Farms
Santa Margarita
Atascadero Basin GSA
TDS Concentration (mg/L)
< 500
500 - 750
750 - 1,000
1,000 - 1,250
> 1,250
Interpolated TDS Concentration (mg/L)
< 500
500 - 750
750 - 1,000
1,000 - 1,250
> 1,250
0 1.25 2.5 5
Miles
N
Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California
Atascadero Basin GSA
TDS Regional Distribution and Trends
Paso Robles Formation Aquifer
OCTOBER 2019
FIGURE 5-21

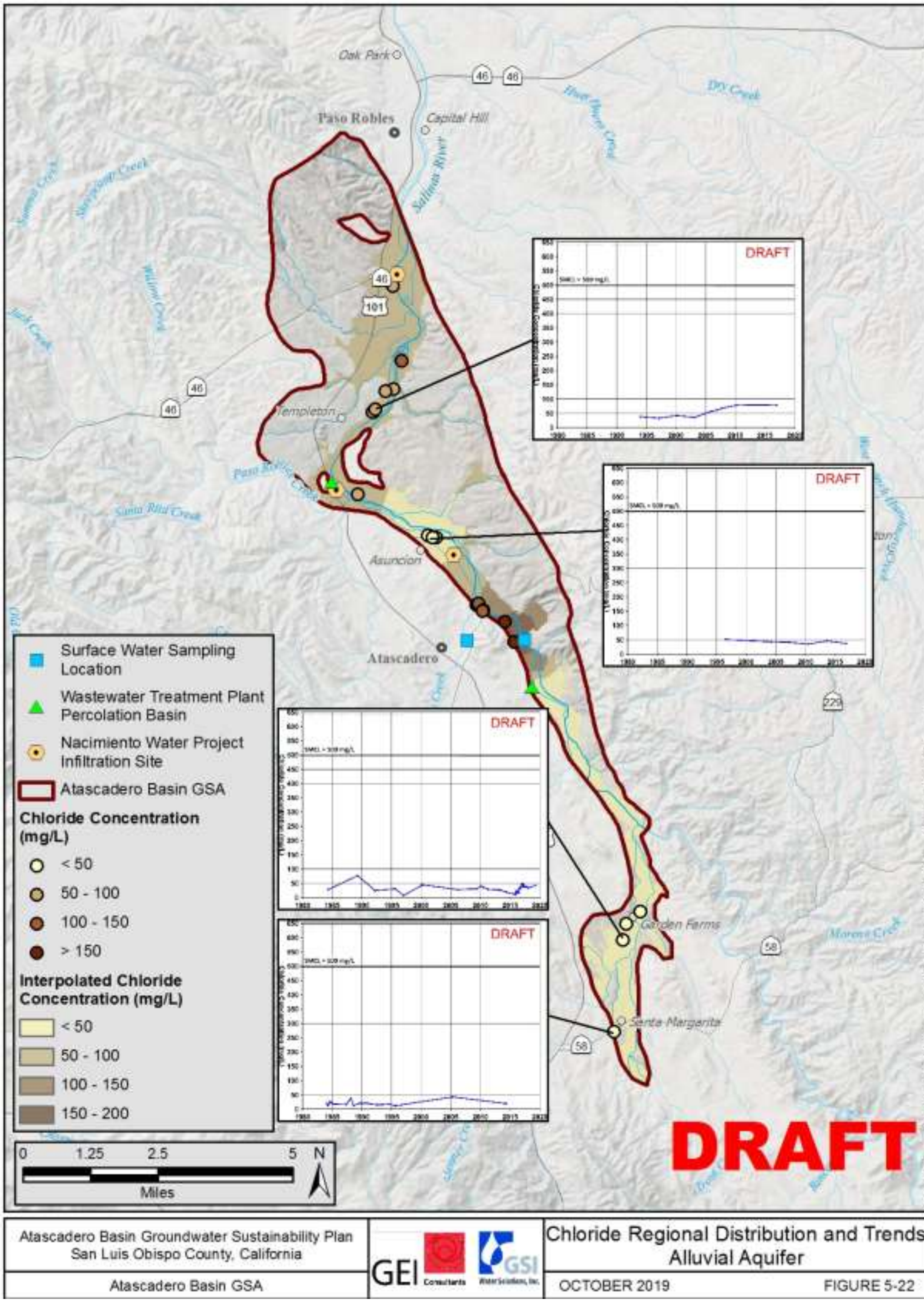
5.7.4.2 Chloride

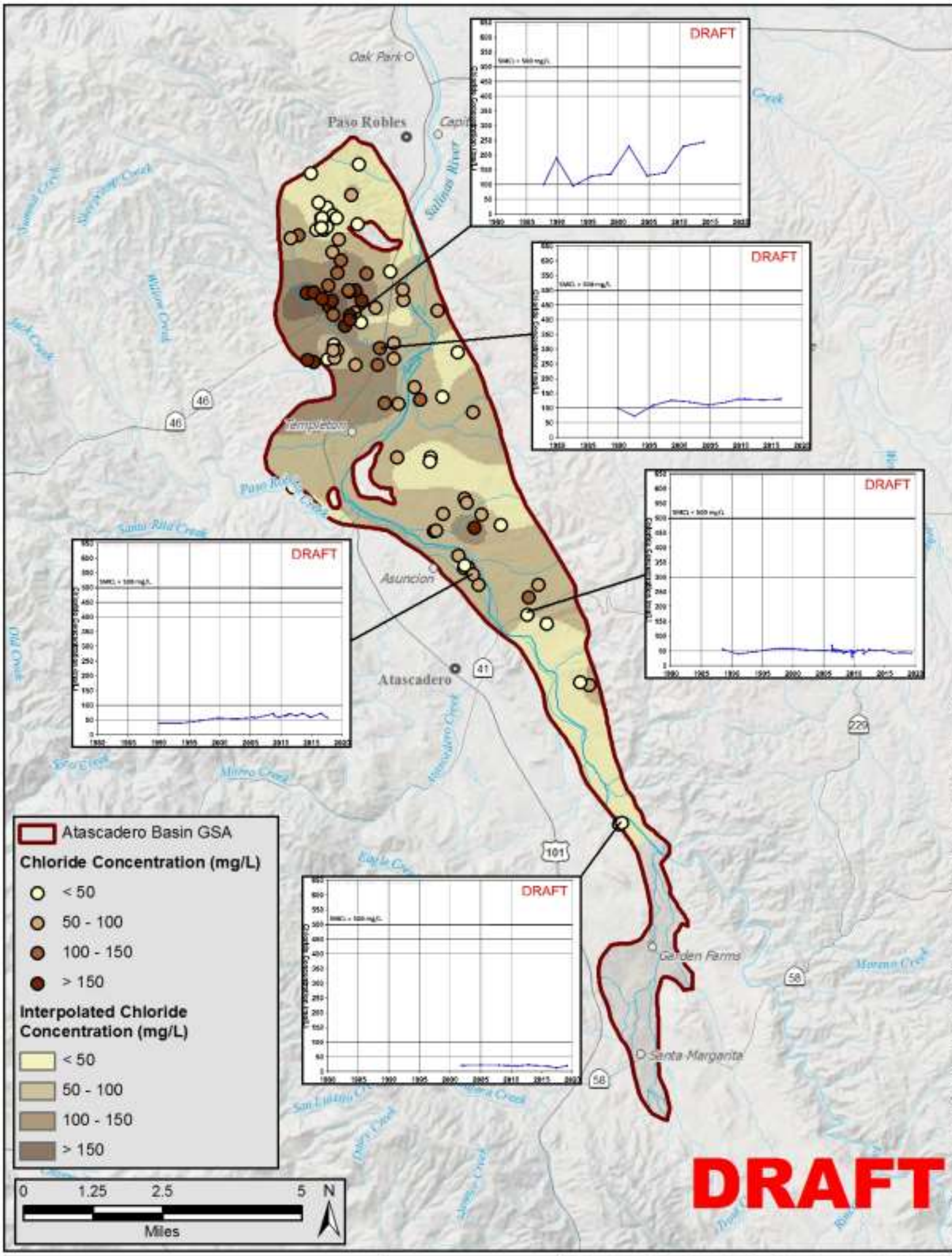
Chloride is a constituent of concern in groundwater because it has been detected at concentrations greater than its Basin Objectives of 70 mg/l in the Atascadero area and 100 mg/l in the Templeton area. The Chloride Secondary MCL has been established at 250 mg/l for taste, rather than human health effects. Chloride water quality results ranged from 4.8 to 392 mg/l with an average of 92 mg/l in the Alluvial Aquifer and ranged from 7.7 to 244 mg/l with an average of 76 mg/l in the Paso Robles Formation Aquifer.

Fugro (2002) identified a slight trend of increasing chlorides in alluvial and shallow Paso Robles Formation deposits along the Salinas River in the central portion of the Basin. This trend continues today, with the most visible trend of increasing chloride occurring in alluvial wells located in the Salinas River valley just downstream of both the City of Atascadero's and Templeton CSD's wastewater percolation ponds. There is also a slight trend of increasing chloride in Paso Robles Formation wells in the northwestern part of the Basin. Similar to TDS, this could be related to increased pumping in the northwestern highland areas within and adjacent to the Basin which may be resulting in decreased subsurface recharge to the Basin from the northwest. Elsewhere within the Basin, many wells exhibit stable or slightly decreasing chloride concentrations. Several wells located in the Salinas River valley just downstream of NWP infiltration basins have shown decreasing chloride concentrations in response to introduction of NWP water.

The distribution and trends of chloride concentrations in the Alluvial Aquifer and the Paso Robles Formation Aquifer are shown on Figure 5-22 and Figures 5-23, respectively. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause chloride concentrations in groundwater in a well that would otherwise remain below the SMCL to increase above the SMCL.

Surface water samples have been collected from Atascadero Creek, about 1 mile upstream of its confluence with the Salinas River (located outside of the Basin), and from the Salinas River, about 1 mile upstream of the HWY-41 bridge (located within the Basin). Water samples from the Atascadero Creek site showed chloride levels ranging from 13 to 97 mg/l and averaging 67 mg/l, based on 38 sampling events between April 1999 and December 2012. Water samples from the Salinas River site showed chloride levels ranging from 11 to 100 mg/l and averaging 53 mg/l, based on 23 sampling events between February 1999 and June 2012. Concentrations of chloride in these surface water analyses do not show any long-term trends. The concentrations are generally higher in the summer and fall months, during times of typically lower stream flow, and lower in winter and spring months, during times of higher stream flow.


Oak Park
Paso Robles
Capital Hill
Salinas River
Dry Creek
Templeton
Paso Robles Creek
Santa Rita Creek
Asuncion
Atascadero
Garden Farms
Santa Margarita
DRAFT
Surface Water Sampling Location
Wastewater Treatment Plant Percolation Basin
Nacimiento Water Project Infiltration Site
Atascadero Basin GSA
Chloride Concentration (mg/L)
< 50
50 - 100
100 - 150
> 150
Interpolated Chloride Concentration (mg/L)
< 50
50 - 100
100 - 150
150 - 200
0 1.25 2.5 5 N
Miles
Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California
Atascadero Basin GSA
Chloride Regional Distribution and Trends
Alluvial Aquifer
OCTOBER 2019
FIGURE 5-22



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Chloride Regional Distribution and Trends Paso Robles Formation Aquifer
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-23

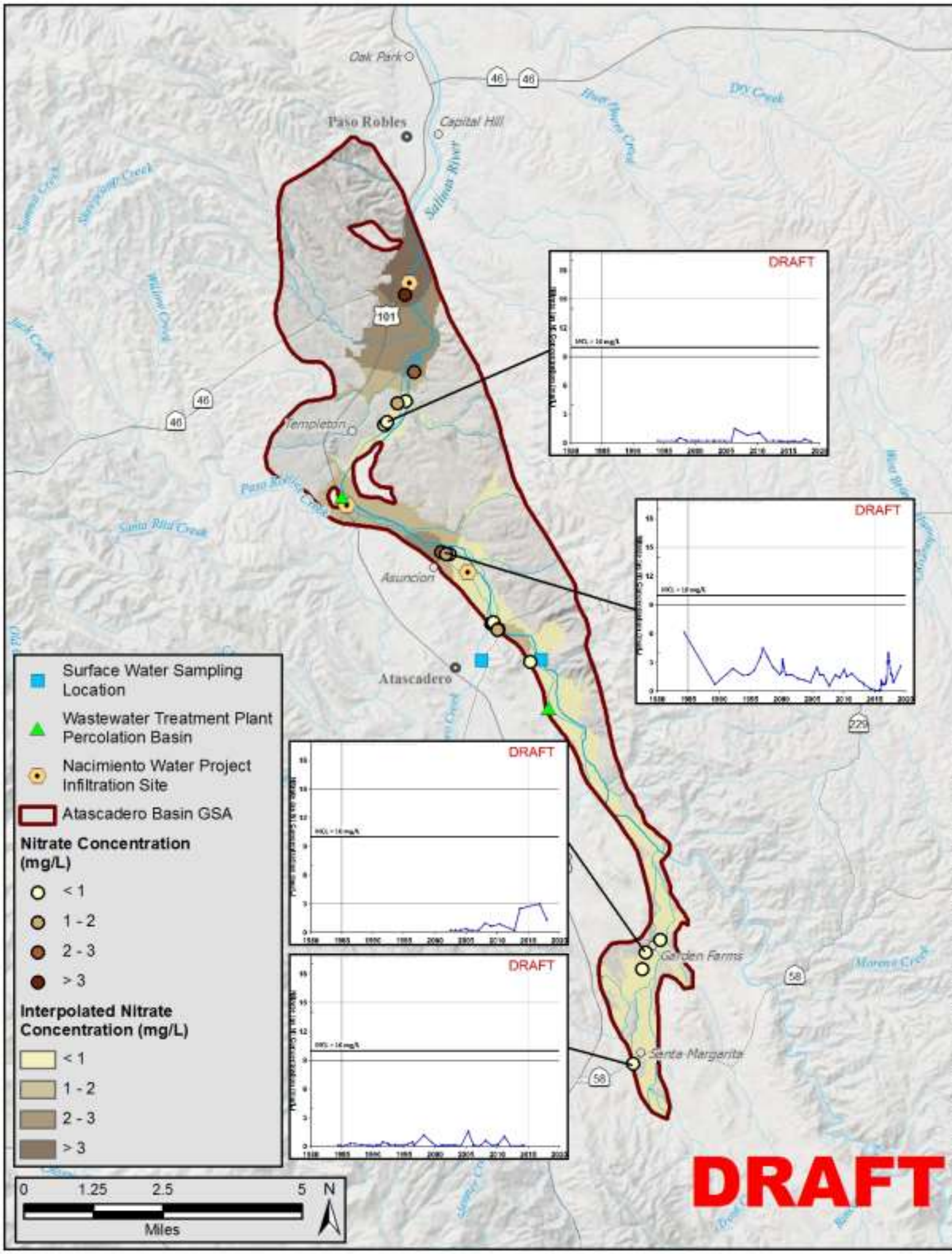
5.7.4.3 Nitrate

Nitrate is a widespread contaminant in California groundwater. High levels of nitrate in groundwater are associated with agricultural activities, septic systems, confined animal facilities, landscape fertilizers and wastewater treatment facilities. Nitrate is the primary form of nitrogen detected in groundwater. It is soluble in water and can easily pass through soil to the groundwater table. Nitrate can persist in groundwater for decades and accumulate to high levels as more nitrogen is applied to the land surface each year.

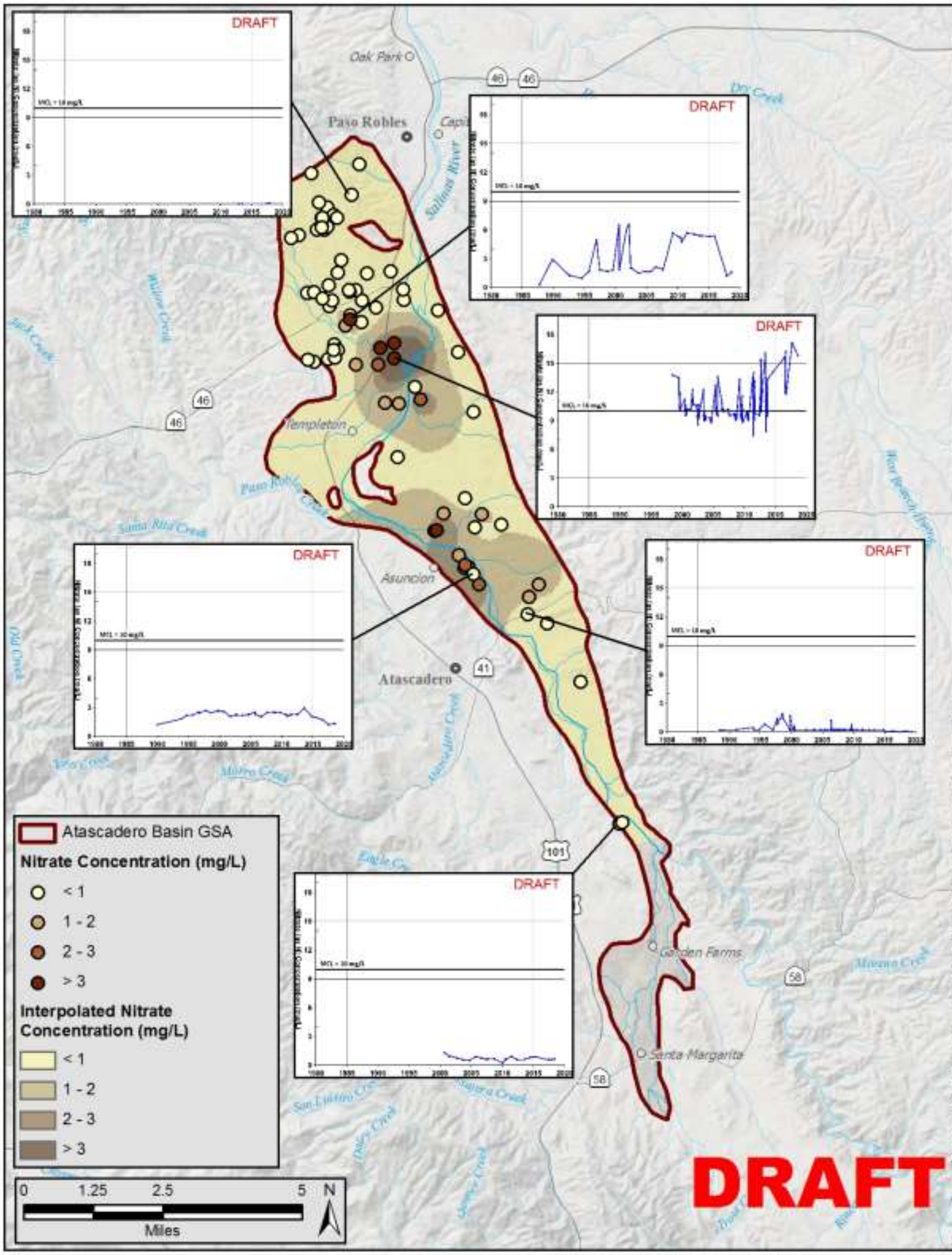
Nitrate is a constituent of concern in groundwater because it has been detected at concentrations greater than its Basin Objectives of 2.3 mg/l (as N) in the Atascadero area and 2.7 mg/l (as N) in the Templeton area. The Nitrate MCL has been established at 10 mg/l (as N). Overall, nitrate water quality results ranged from non-detect to 18 mg/l (as N) with an average of 1.3 mg/l (as N) in the Alluvial Aquifer and ranged from non-detect to 22 mg/l (as N) with an average of 4.2 mg/l (as N) in the Paso Robles Formation Aquifer.

Nitrate concentrations in the Alluvial Aquifer were relatively high in the 1990's (2.2 mg/l [as N] on average), declined in the 2000's (1.2 mg/l [as N] on average), continued to decline and reached a low of 0.5 mg/l (as N) on average in 2015. Nitrate concentrations in the Alluvial Aquifer have since increased and are back at levels seen in the 2000's. Nitrate concentrations in the Paso Robles Formation Aquifer were climbing throughout the 1990's (3.4 mg/l [as N] on average) and the 2000's (4.9 mg/l [as N] on average), then began to decline and reached a low of 1.8 mg/l (as N) on average in 2014. Similar to the Alluvial Aquifer, nitrate concentrations in the Paso Robles Formation Aquifer have since increased and are now back at levels seen in the 1990's. The distribution and trends of Nitrate concentrations in the Alluvial Aquifer and the Paso Robles Formation Aquifer are shown on Figure 5-24 and Figures 5-25, respectively. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause nitrate concentrations in groundwater in a well that would otherwise remain below the MCL to increase above the MCL.

Surface water samples have been collected from Atascadero Creek, about 1 mile upstream of its confluence with the Salinas River (located outside of the Basin), and from the Salinas River, about 1 mile upstream of the HWY-41 bridge (located within the Basin). Water samples from the Atascadero Creek site showed nitrate levels ranging from 0.03 to 0.4 mg/l (as N) and averaging 0.1 mg/l (as N), based on 30 sampling events between May 1999 and December 2012. Water samples from the Salinas River site showed nitrate levels ranging from 0.2 to 1 mg/l (as N) and averaging 0.6 mg/l (as N), based on 23 sampling events between February 1999 and June 2012. Concentrations of nitrate in the Salinas River show a decreasing trend over the period of record. Concentrations of nitrate in Atascadero Creek do not show any long-term trends. In general, the concentrations are higher in the summer and fall months, during times of typically lower stream flow, and lower in winter and spring months, during times of higher stream flow.



Atascadero Basin Groundwater Sustainability Plan San Luis Obispo County, California	GEI Consultants / GSI Water Solutions, Inc.	Nitrate Regional Distribution and Trends Alluvial Aquifer
Atascadero Basin GSA		OCTOBER 2019 FIGURE 5-24



Atascadero Basin Groundwater Sustainability Plan
San Luis Obispo County, California

Atascadero Basin GSA

Nitrate Regional Distribution and Trends
Paso Robles Formation Aquifer

OCTOBER 2019 FIGURE 5-25

5.7.4.4 Boron

Boron is an unregulated constituent and therefore does not have a regulatory standard. However, boron is a constituent of concern because elevated boron concentrations in water can damage crops and affect plant growth. Boron has been detected at concentrations greater than its Basin Objective of 300 micrograms per liter (ug/l). Boron water quality results ranged from non-detect to 520 ug/l with an average of 74 ug/l in the Alluvial Aquifer and ranged from non-detect to 1,100 ug/l with an average of 104 ug/l in the Paso Robles Formation Aquifer.

Boron concentrations in the Alluvial Aquifer have been relatively consistent throughout the period of record. Boron concentrations in the Paso Robles Formation Aquifer have generally remained steady or declined slightly over the period of record. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause boron concentrations in groundwater in a well to increase.

Surface water samples have been collected from Atascadero Creek, about 1 mile upstream of its confluence with the Salinas River (located outside of the Basin), and from the Salinas River, about 1 mile upstream of the HWY-41 bridge (located within the Basin). Water samples from the Atascadero Creek site showed boron levels ranging from 52 to 220 ug/l and averaging 97 ug/l, based on 41 sampling events between May 1999 and December 2012. Water samples from the Salinas River site showed boron levels ranging from 61 to 170 ug/l and averaging 109 ug/l, based on 20 sampling events between September 1999 and June 2012. Concentrations of boron in these surface water analyses do not show any long-term trends. The concentrations are generally higher in the summer and fall months, during times of typically lower stream flow, and lower in winter and spring months, during times of higher stream flow.

5.7.4.5 Sodium

Sodium is an unregulated constituent and therefore does not have a regulatory standard. However, sodium is a constituent of concern because elevated sodium concentrations in water can damage crops and affect plant growth. Sodium has been detected at concentrations greater than its Basin Objectives of 65 mg/l in the Atascadero area and 75 mg/l in the Templeton area. Sodium water quality results ranged from 8.5 to 130 mg/l with an average of 46 mg/l in the Alluvial Aquifer and ranged from 14 to 281 mg/l with an average of 57 mg/l in the Paso Robles Formation Aquifer.

Sodium concentrations in the Alluvial Aquifer and Paso Robles Formation Aquifer have been relatively consistent throughout the period of record. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause boron concentrations in groundwater to increase.

Surface water samples have been collected from Atascadero Creek, about 1 mile upstream of its confluence with the Salinas River (located outside of the Basin), and from the Salinas River, about 1 mile upstream of the HWY-41 bridge (located within the Basin). Water samples from the Atascadero Creek site showed sodium levels ranging from 17 to 51 mg/l and averaging 41 mg/l, based on 37 sampling events between April 1999 and December 2012. Water samples from the Salinas River site showed sodium levels ranging from 19 to 74 mg/l and averaging 48 mg/l, based on 20 sampling events between September 1999 and June 2012. Concentrations of sodium in these surface water analyses do not show any long-term trends. The concentrations are generally higher in the summer and fall months, during times of typically lower stream flow, and lower in winter and spring months, during times of higher stream flow.

5.7.4.6 Other Constituents

Other constituents found in exceedance of their respective regulatory standard include arsenic, iron, gross alpha, manganese, selenium, and sulfate. Each of these exceedances occurred in samples from a small number of wells, indicating isolated occurrences of these elevated constituent concentrations rather than widespread occurrences, affecting the entire Basin. Isolated concentrations of arsenic, iron, gross alpha, and sulfate in the Basin have been relatively consistent throughout the period of record. Selenium concentrations have generally declined since 2007. There are not enough data to determine the trend of the elevated manganese concentrations in the Basin. Sustainability projects and management actions implemented as part of this GSP are not anticipated to directly cause concentrations of any of these constituents in groundwater to increase.

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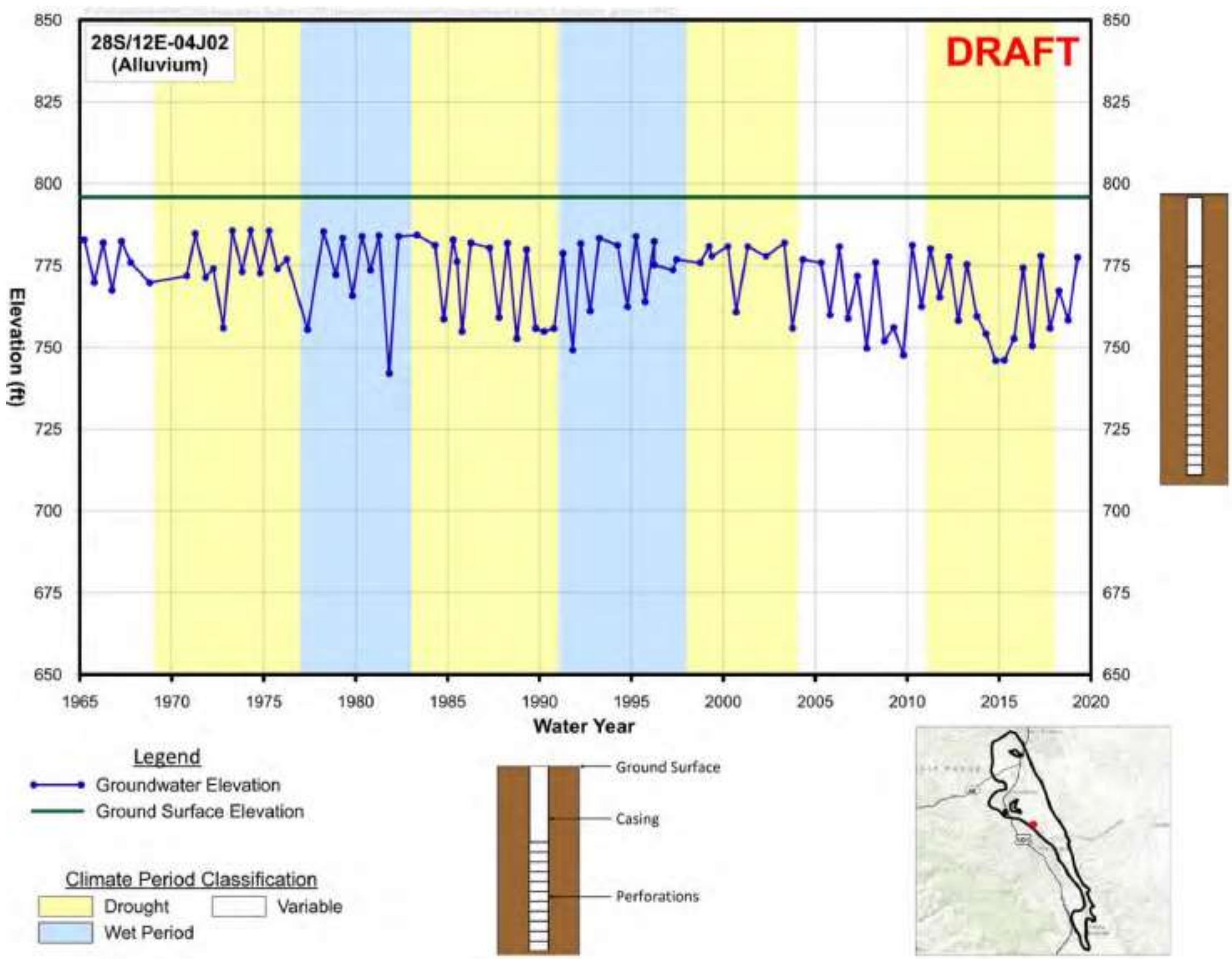
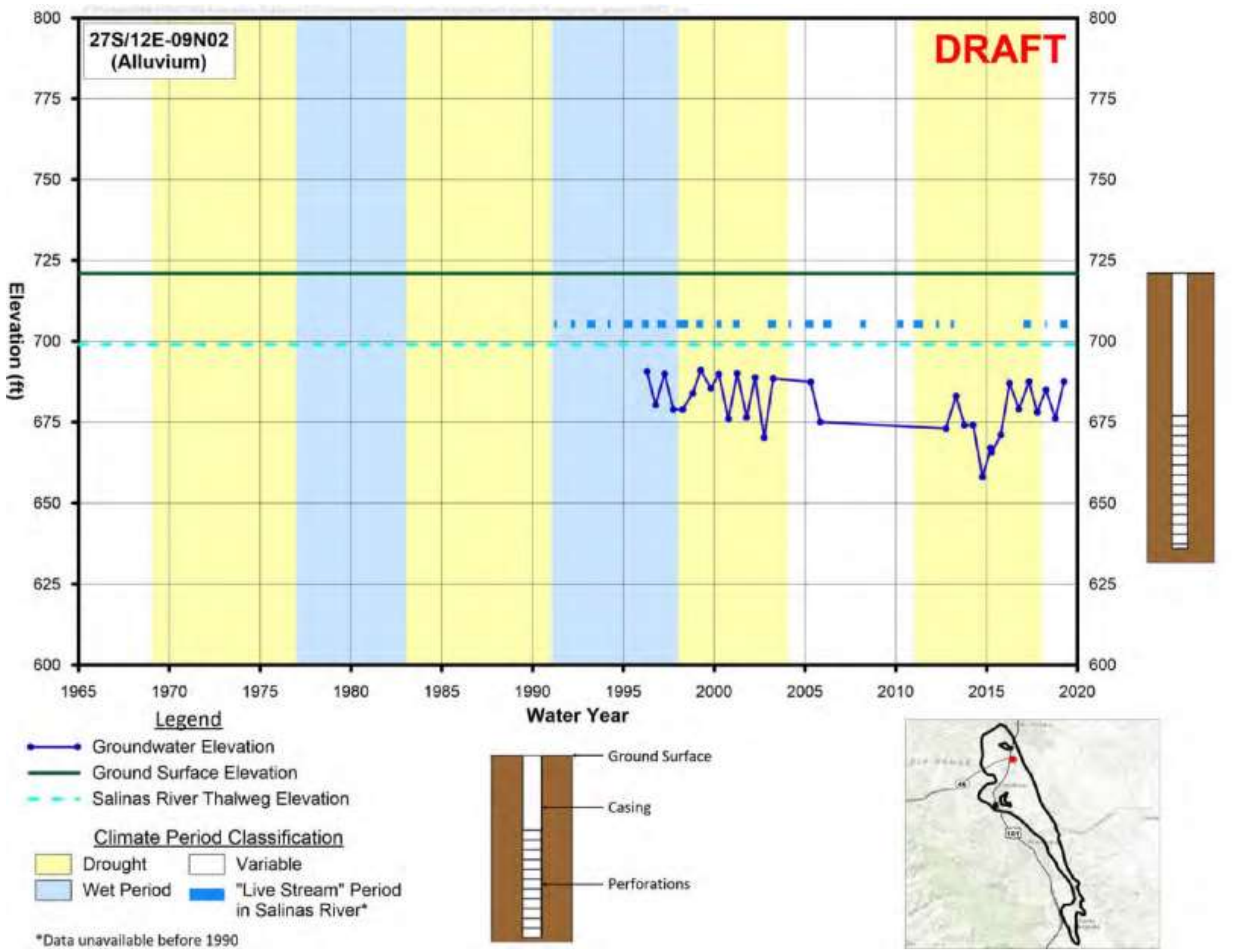
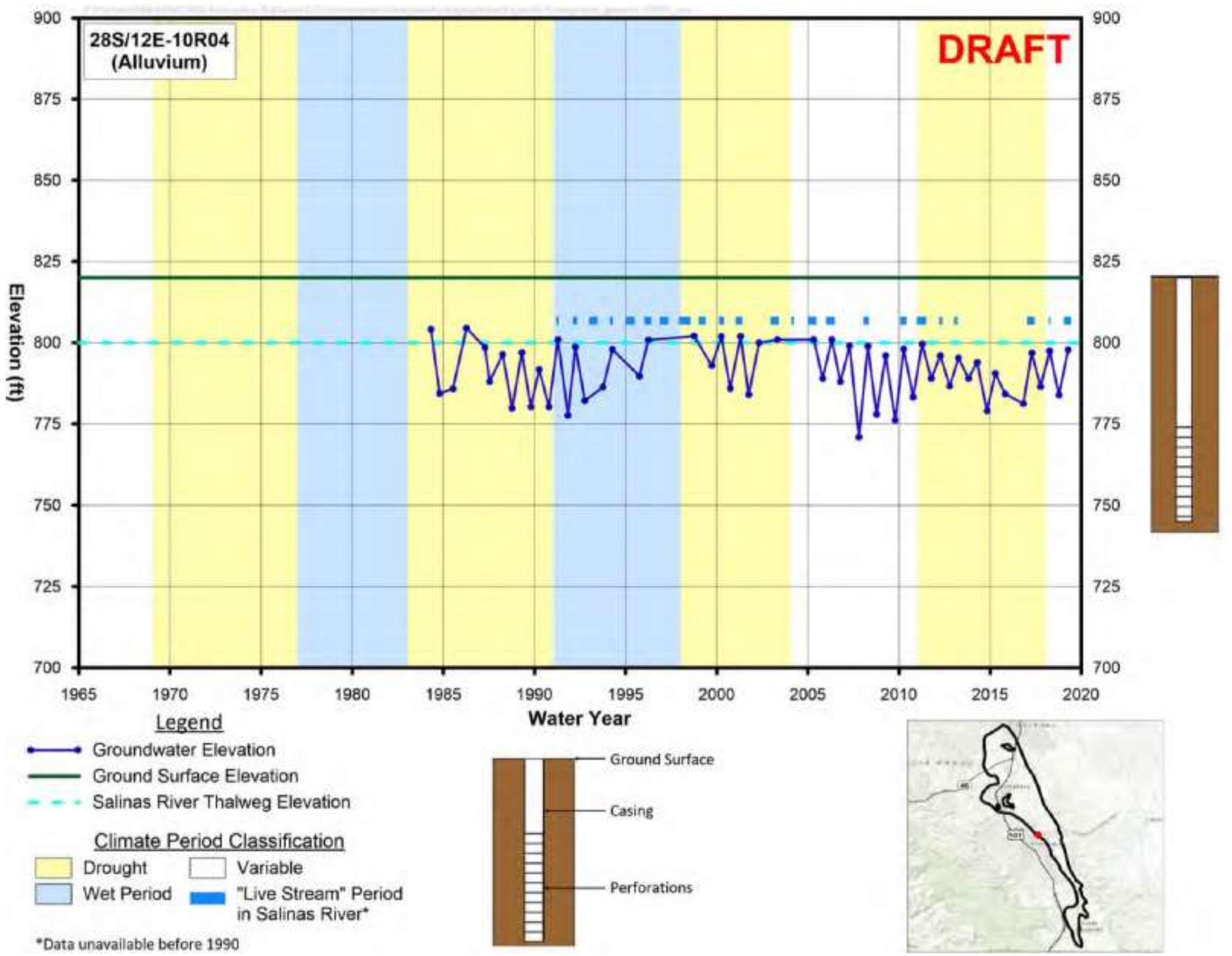
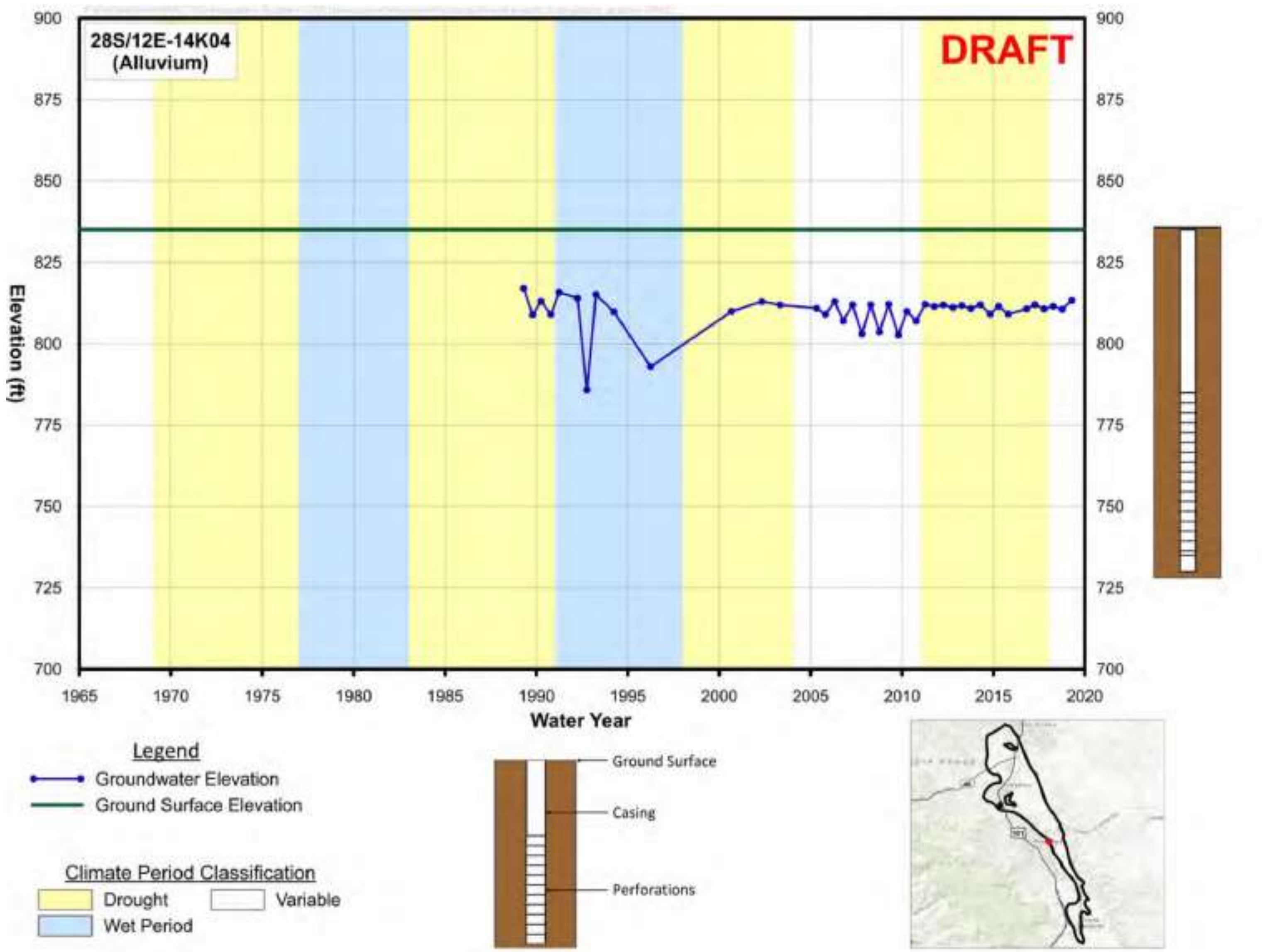
APPENDIX 5A
Hydrographs

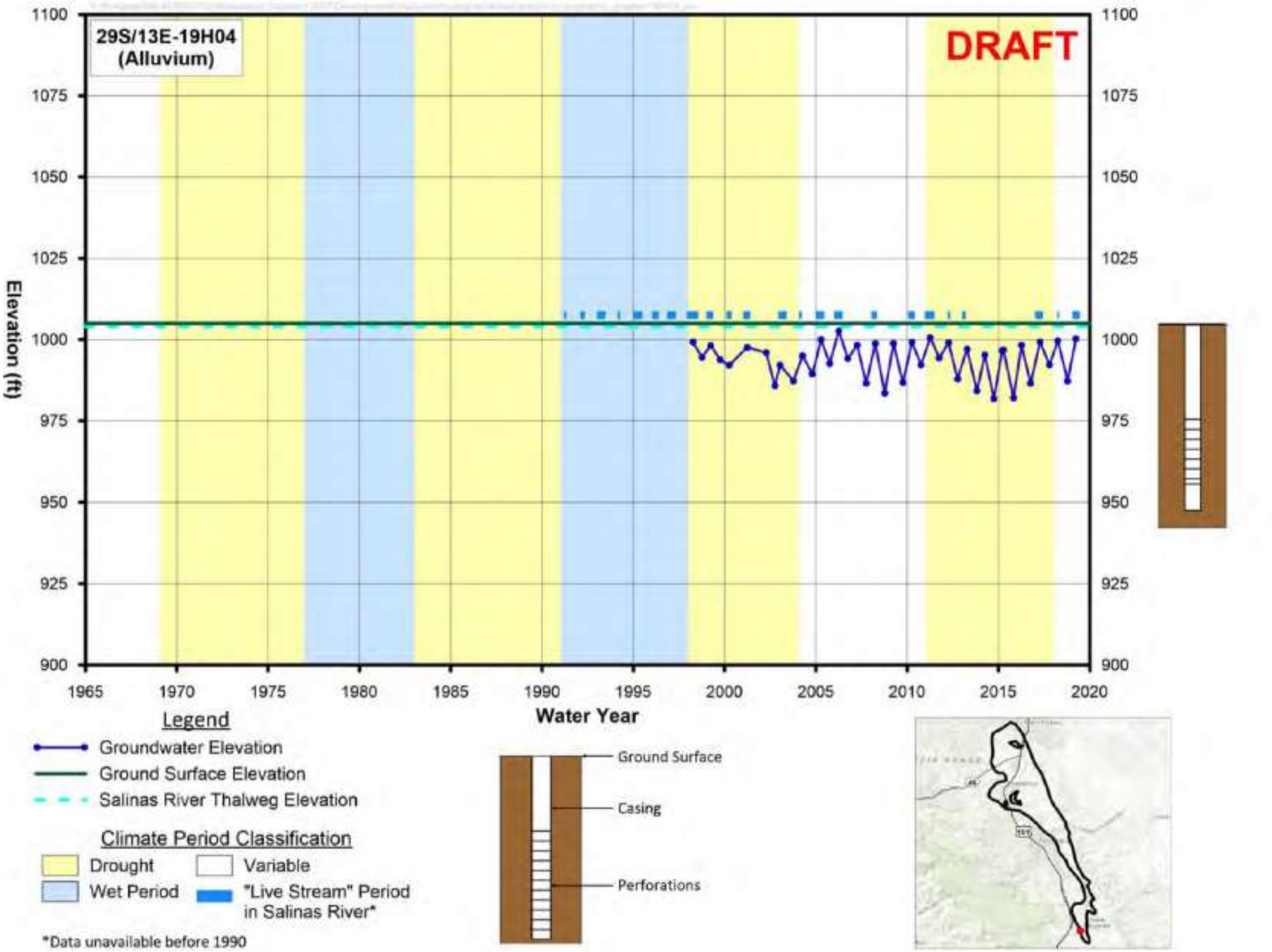
Alluvial Aquifer Hydrographs

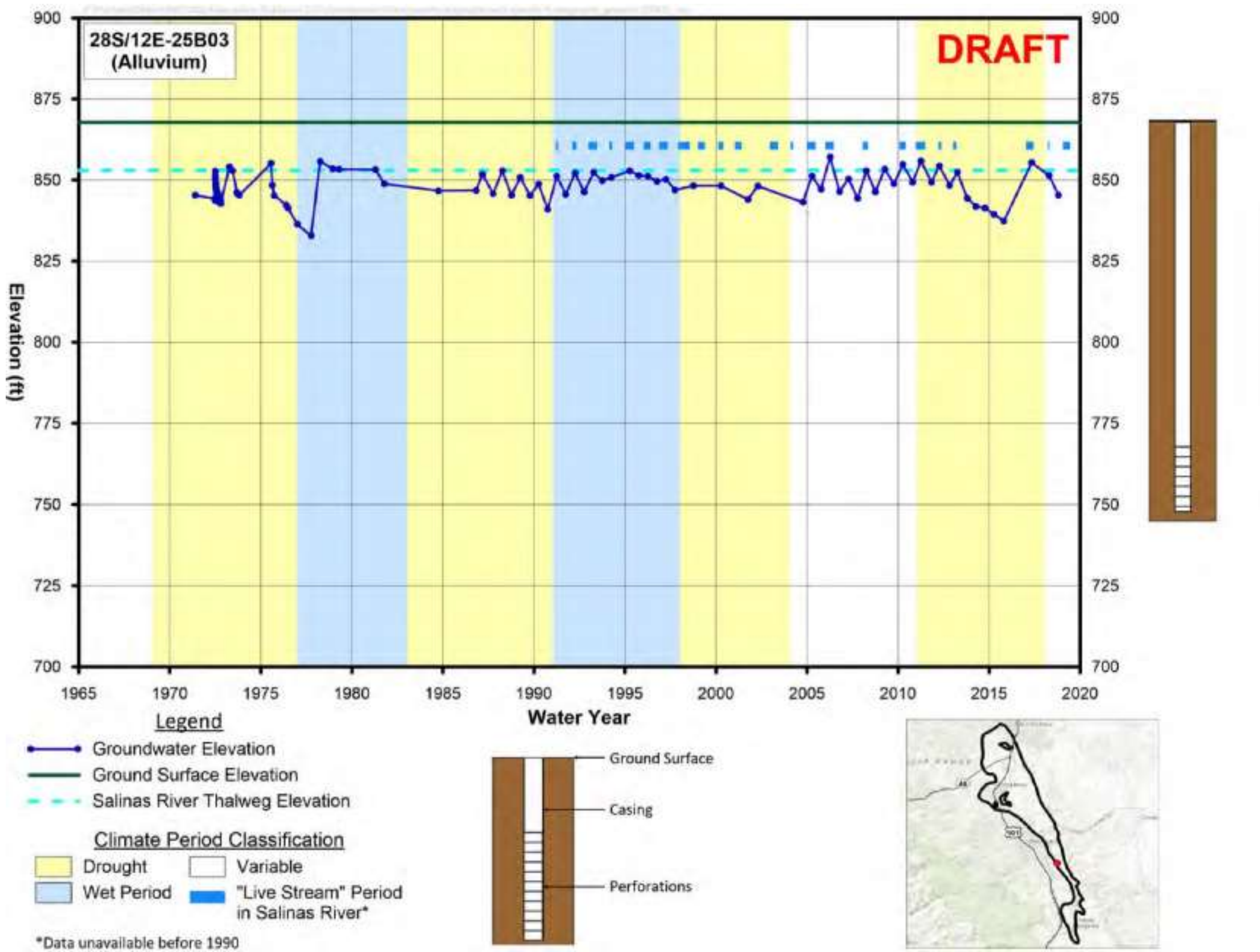

28S/12E-04J02
(Alluvium)
DRAFT
Elevation (ft)
850
825
800
775
750
725
700
675
650
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

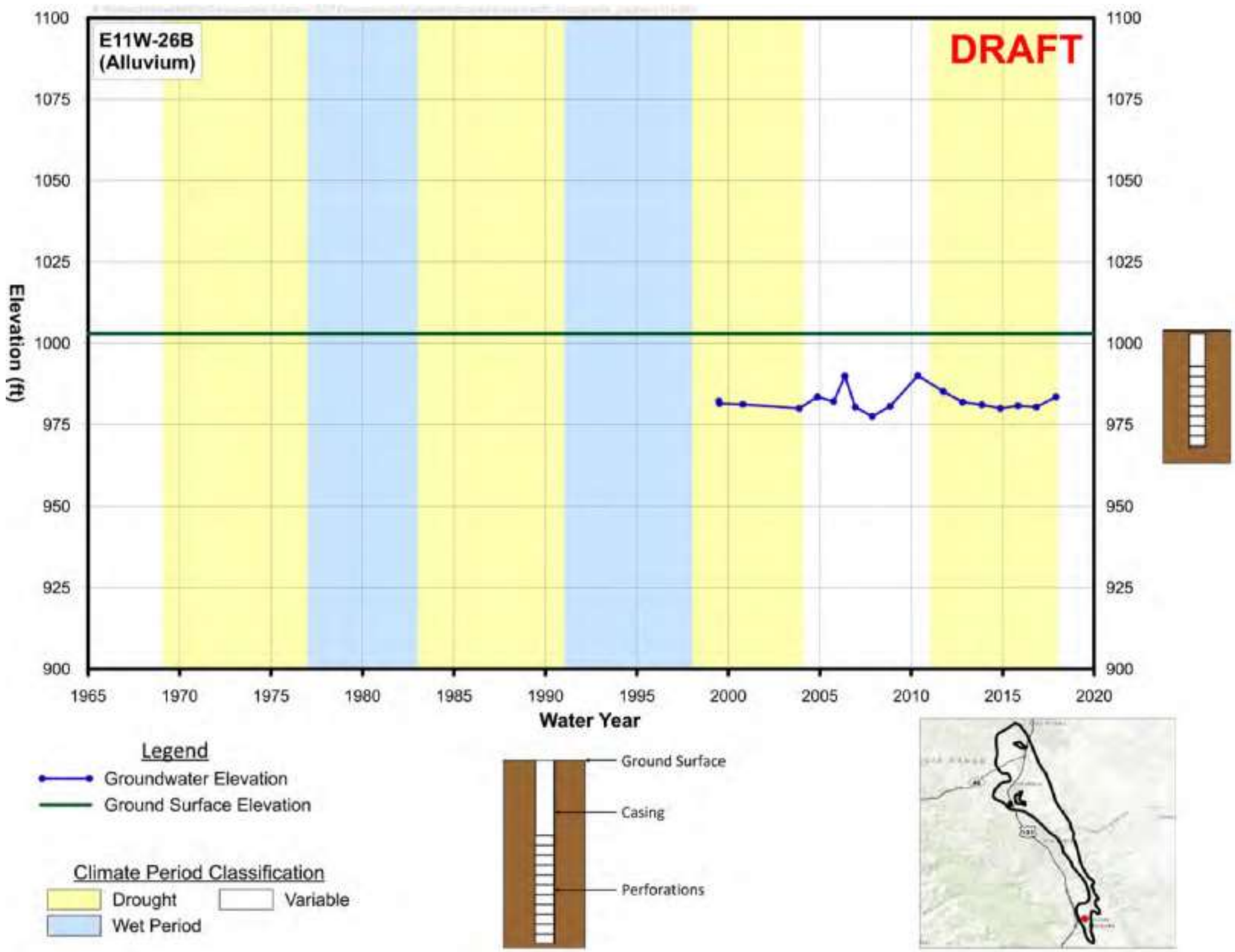

27S/12E-09N02
(Alluvium)
DRAFT
Elevation (ft)
800
775
750
725
700
675
650
625
600
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations


28S/12E-10R04
(Alluvium)
DRAFT
Elevation (ft)
900
875
850
825
800
775
750
725
700
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations

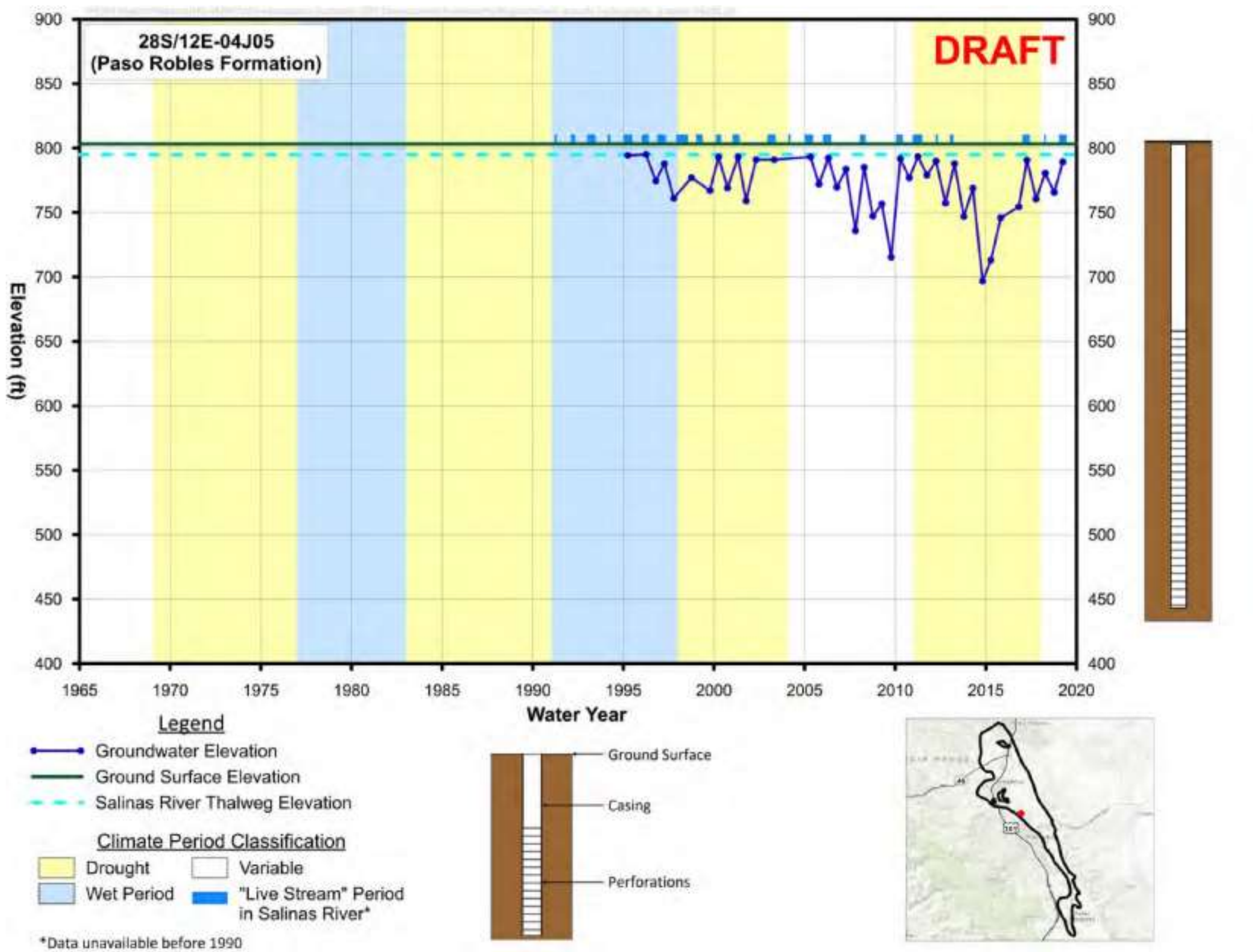

28S/12E-14K04
(Alluvium)
DRAFT
Elevation (ft)
900
875
850
825
800
775
750
725
700
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

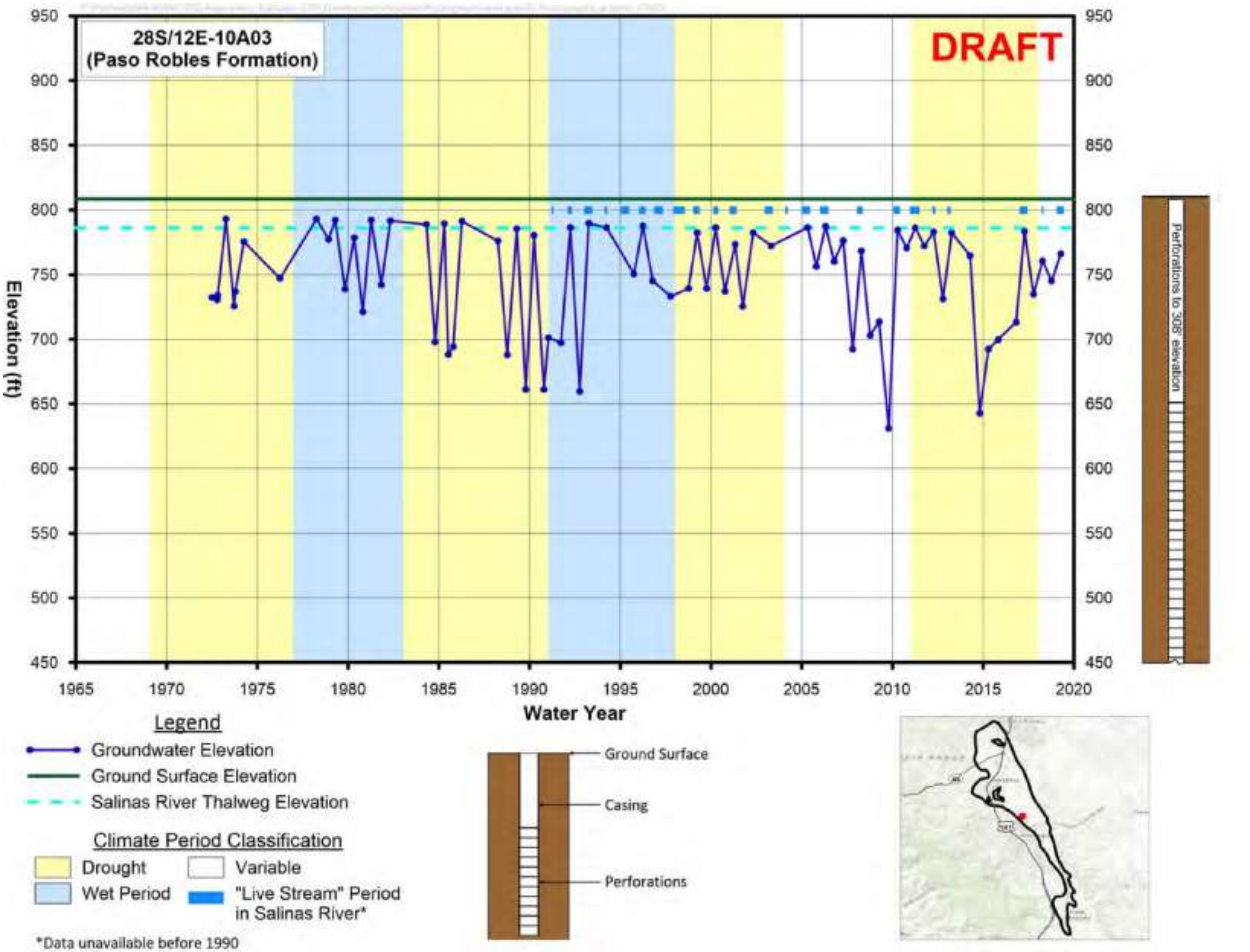

29S/13E-19H04
(Alluvium)
DRAFT
Elevation (ft)
1100
1075
1050
1025
1000
975
950
925
900
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations

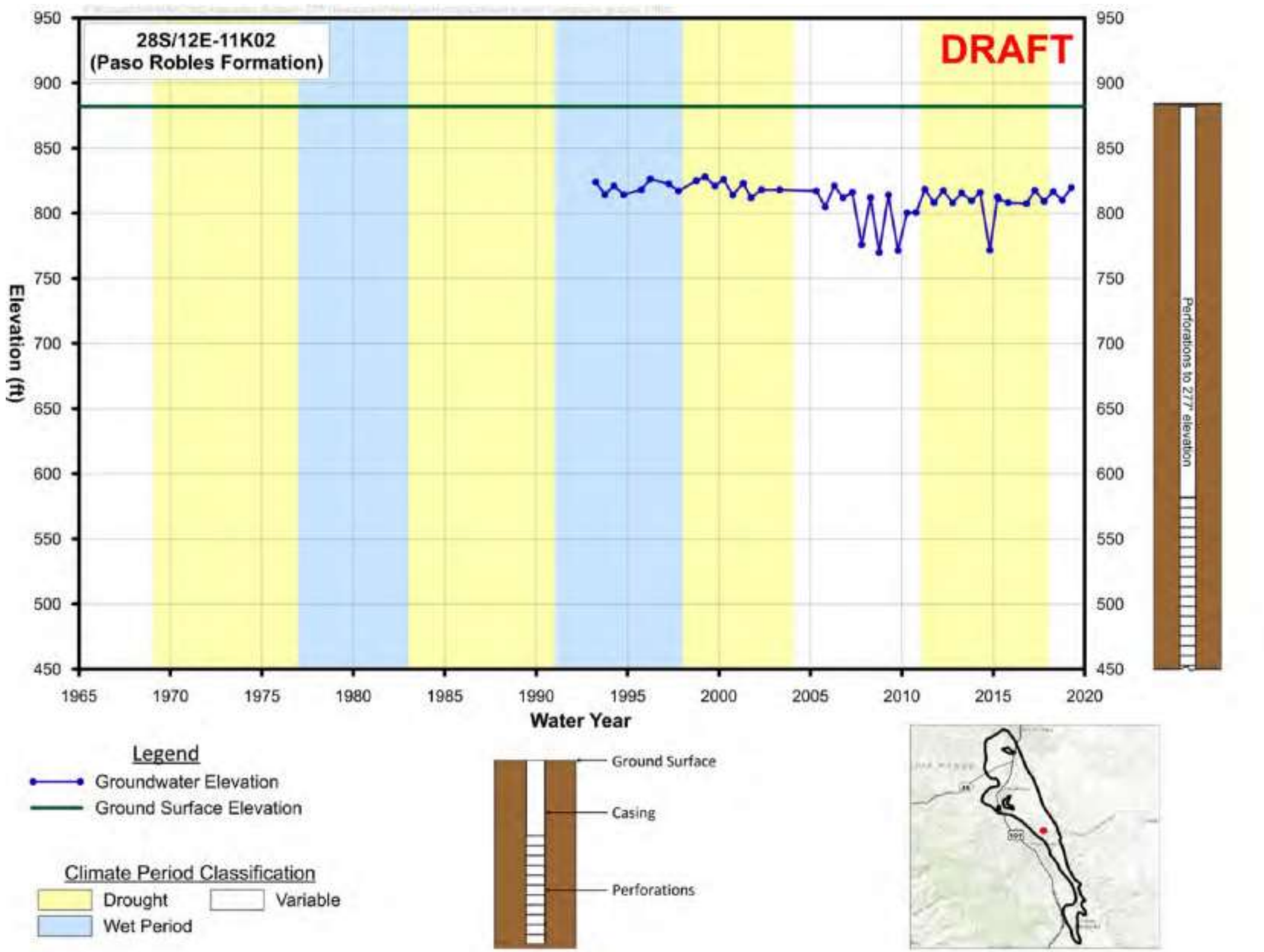

28S/12E-25B03
(Alluvium)
DRAFT
Elevation (ft)
900
875
850
825
800
775
750
725
700
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations

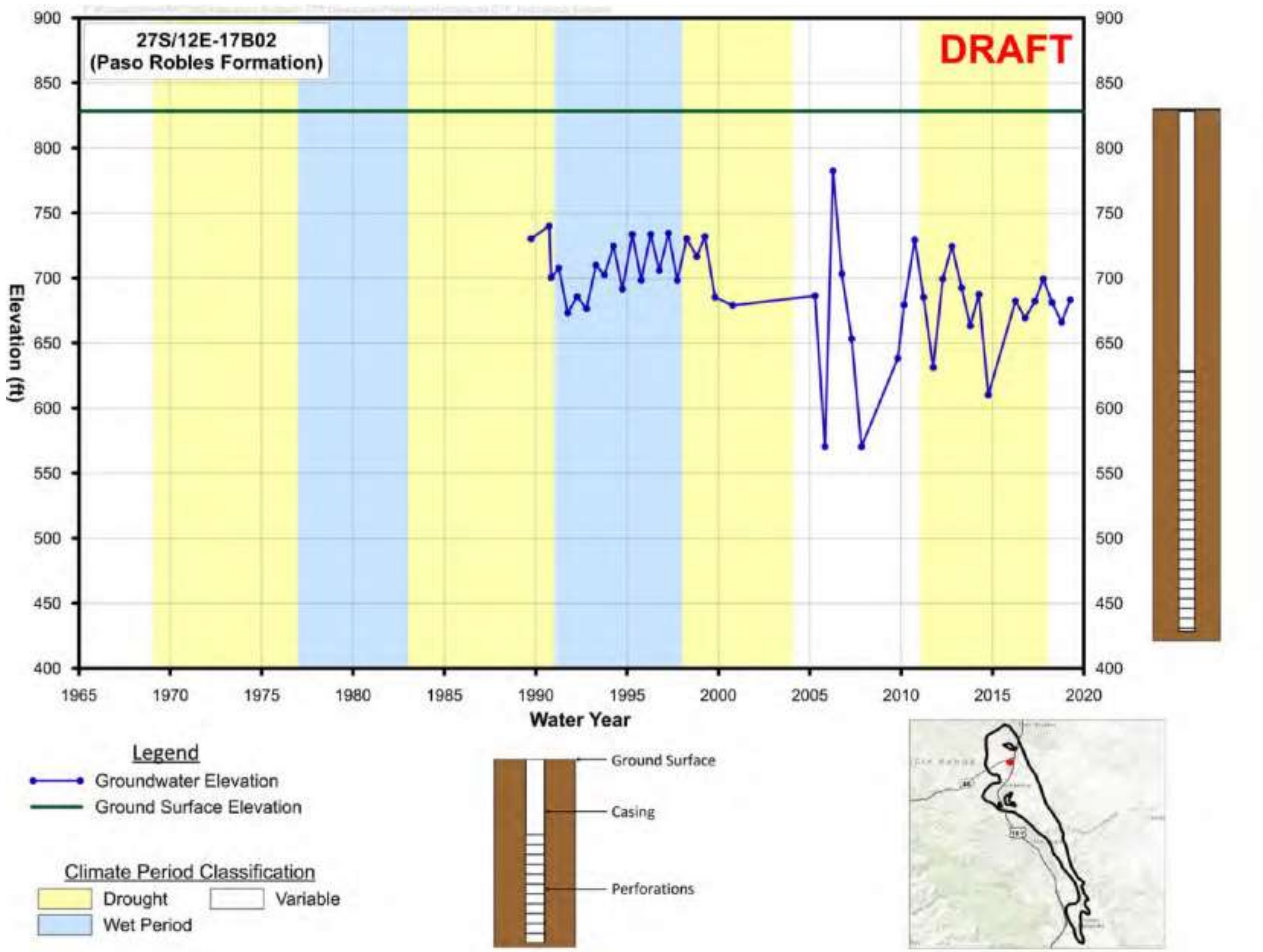

E11W-26B
(Alluvium)
DRAFT
Elevation (ft)
1100
1075
1050
1025
1000
975
950
925
900
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

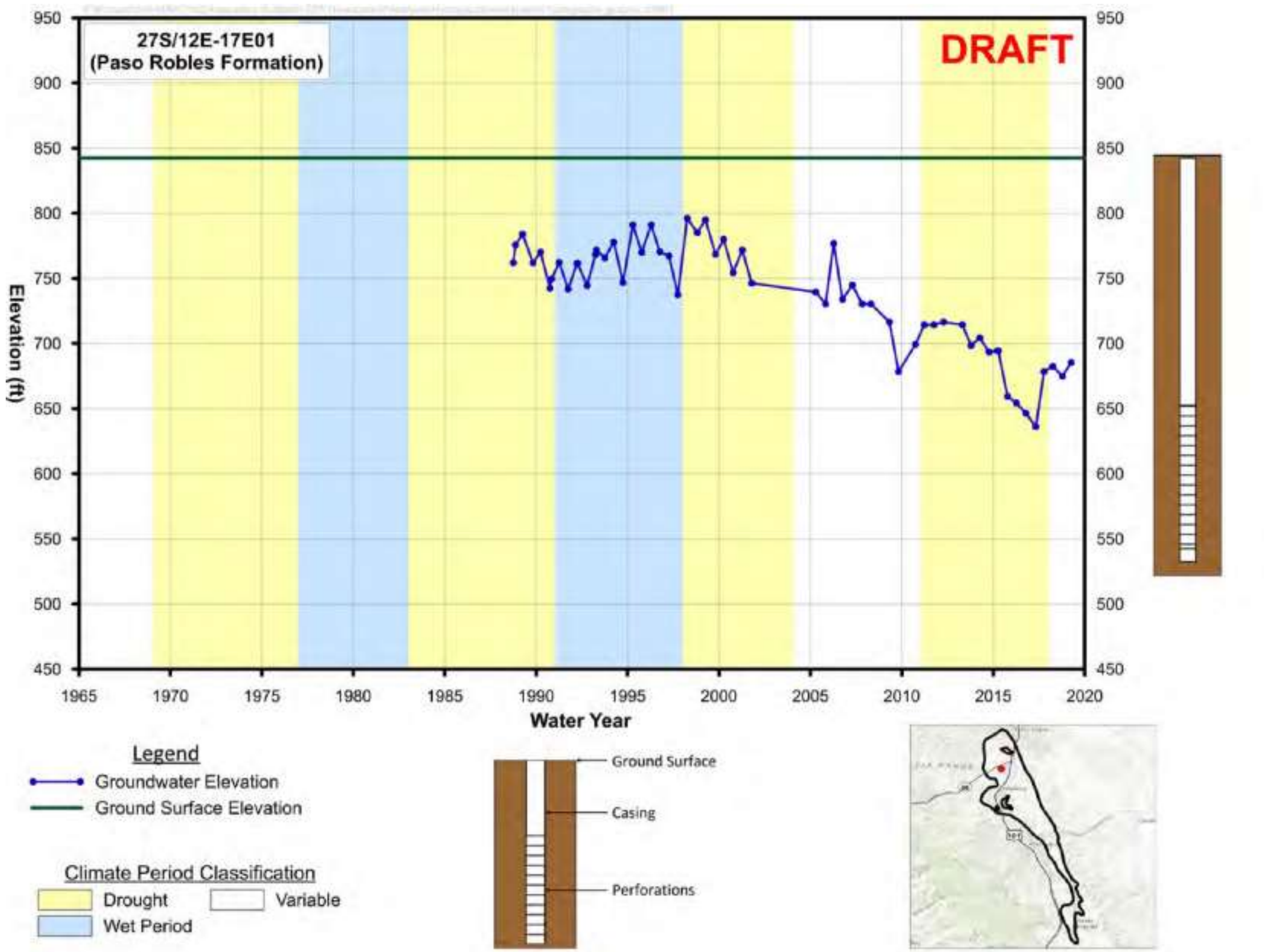
Paso Robles Formation Aquifer Hydrographs

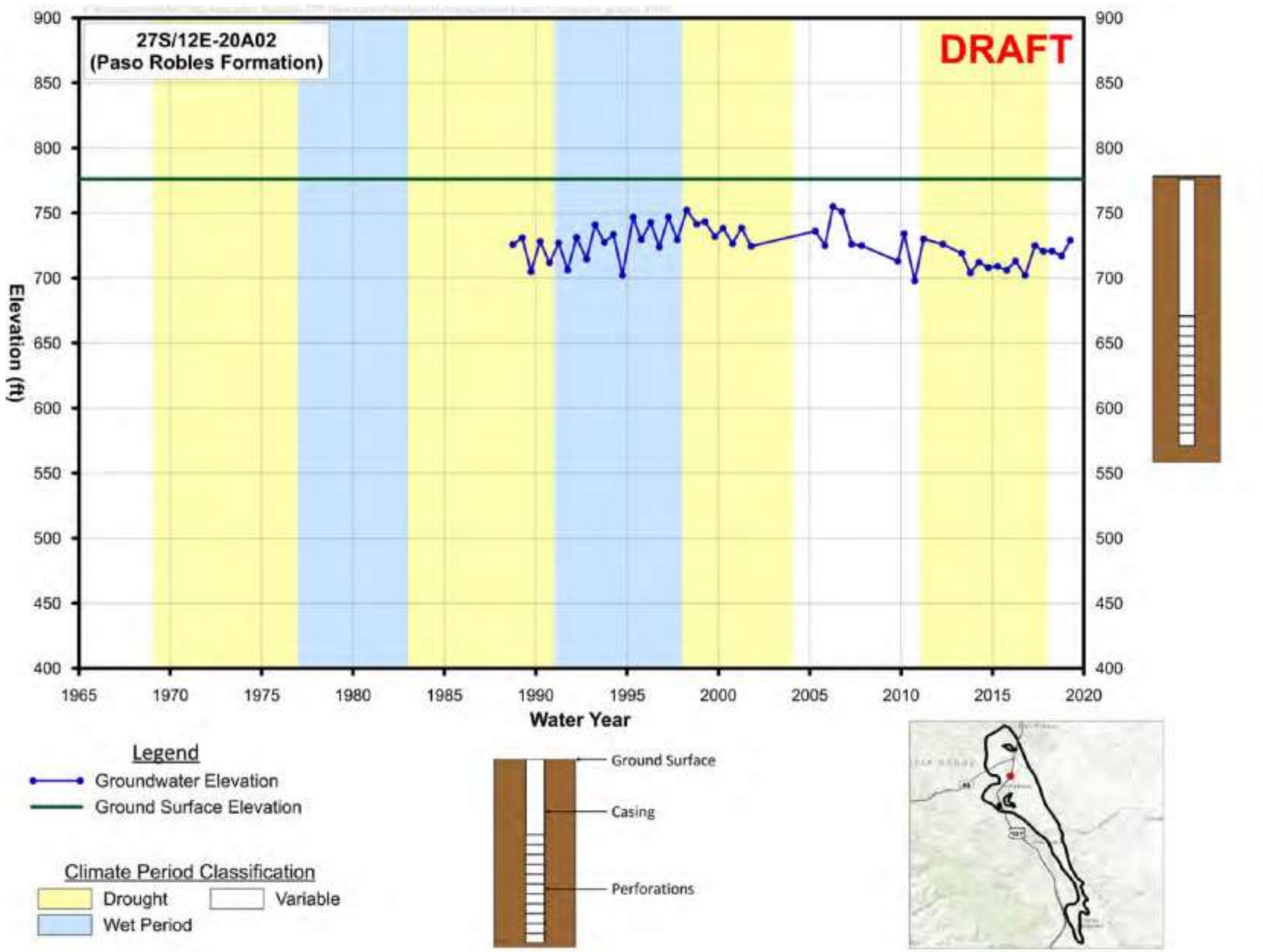

28S/12E-04J05
(Paso Robles Formation)
DRAFT
Elevation (ft)
900
850
800
750
700
650
600
550
500
450
400
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations

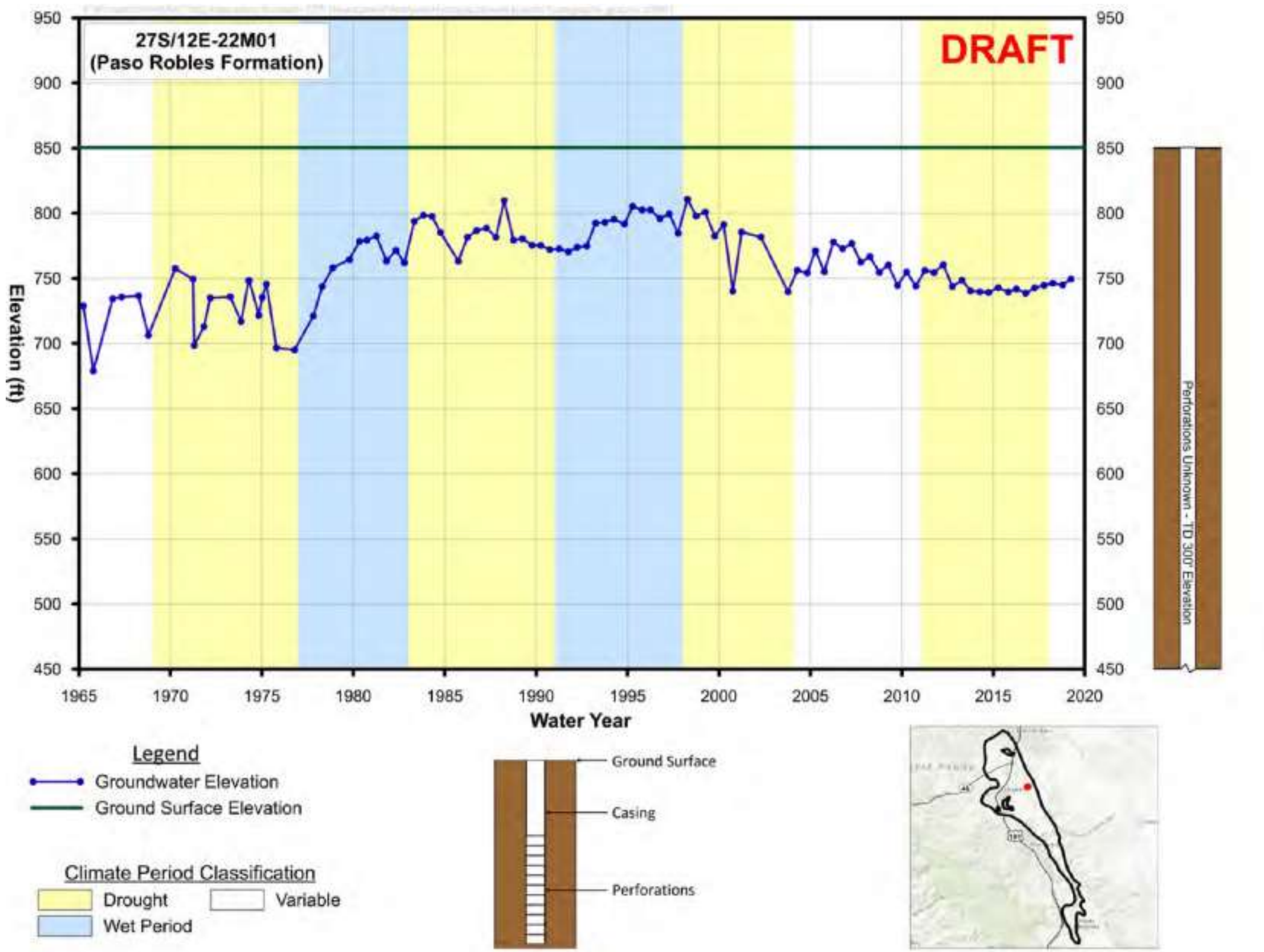

28S/12E-10A03
(Paso Robles Formation)
DRAFT
Elevation (ft)
950
900
850
800
750
700
650
600
550
500
450
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Perforations to 308' elevation
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations

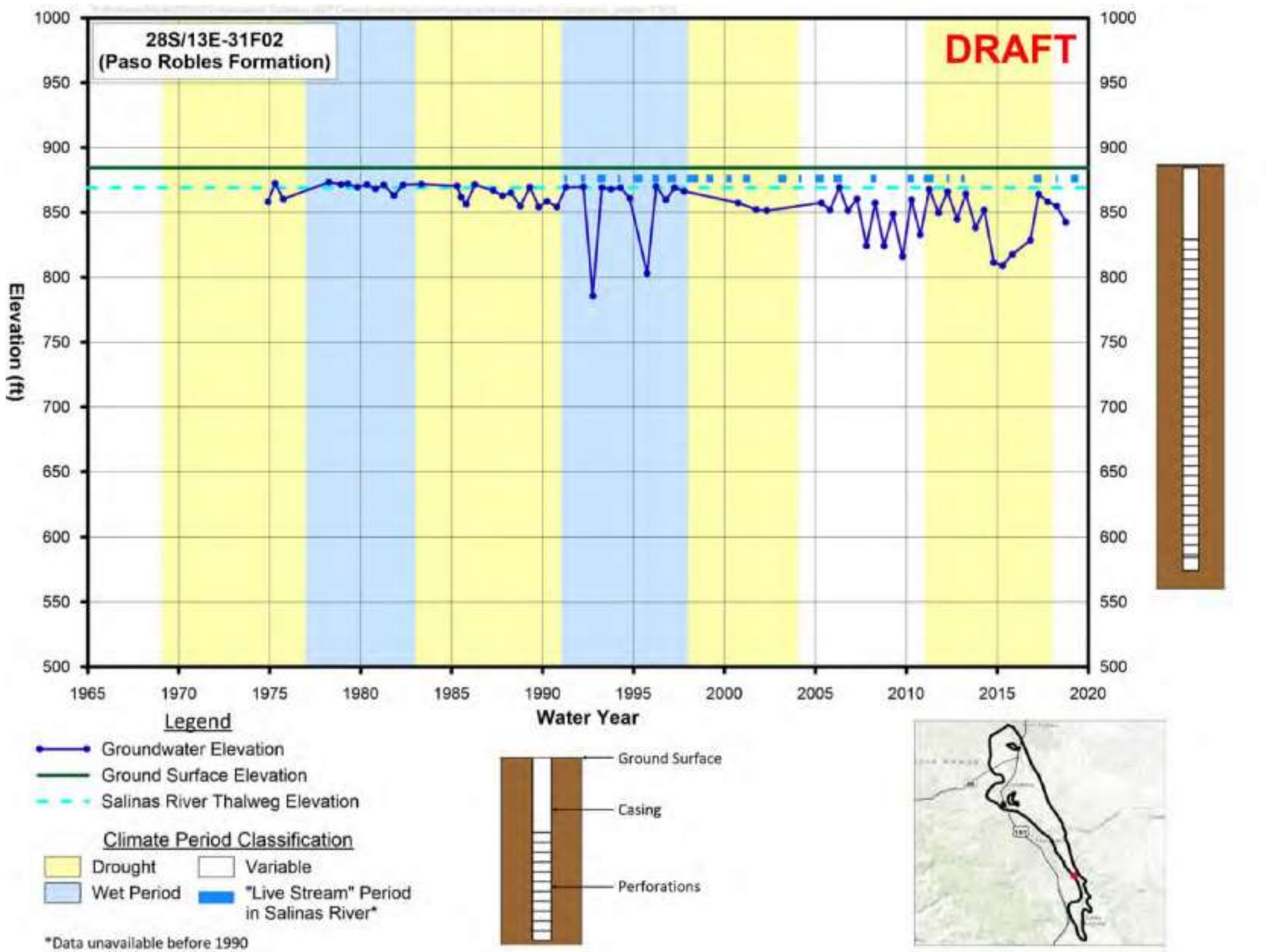

28S/12E-11K02
(Paso Robles Formation)
DRAFT
Elevation (ft)
Water Year
Perforations to 277' elevation
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

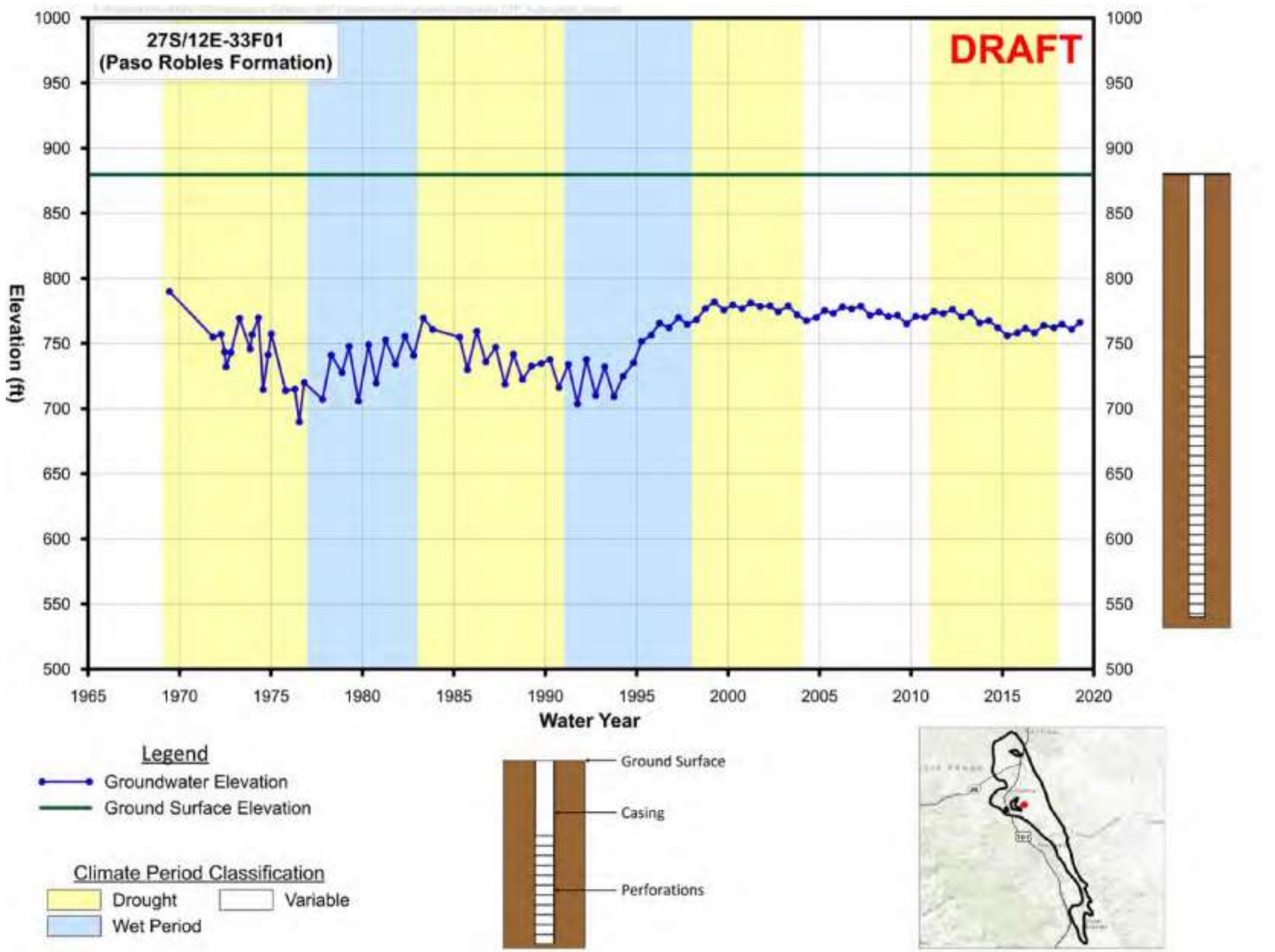

27S/12E-17B02
(Paso Robles Formation)
DRAFT
Elevation (ft)
900
850
800
750
700
650
600
550
500
450
400
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

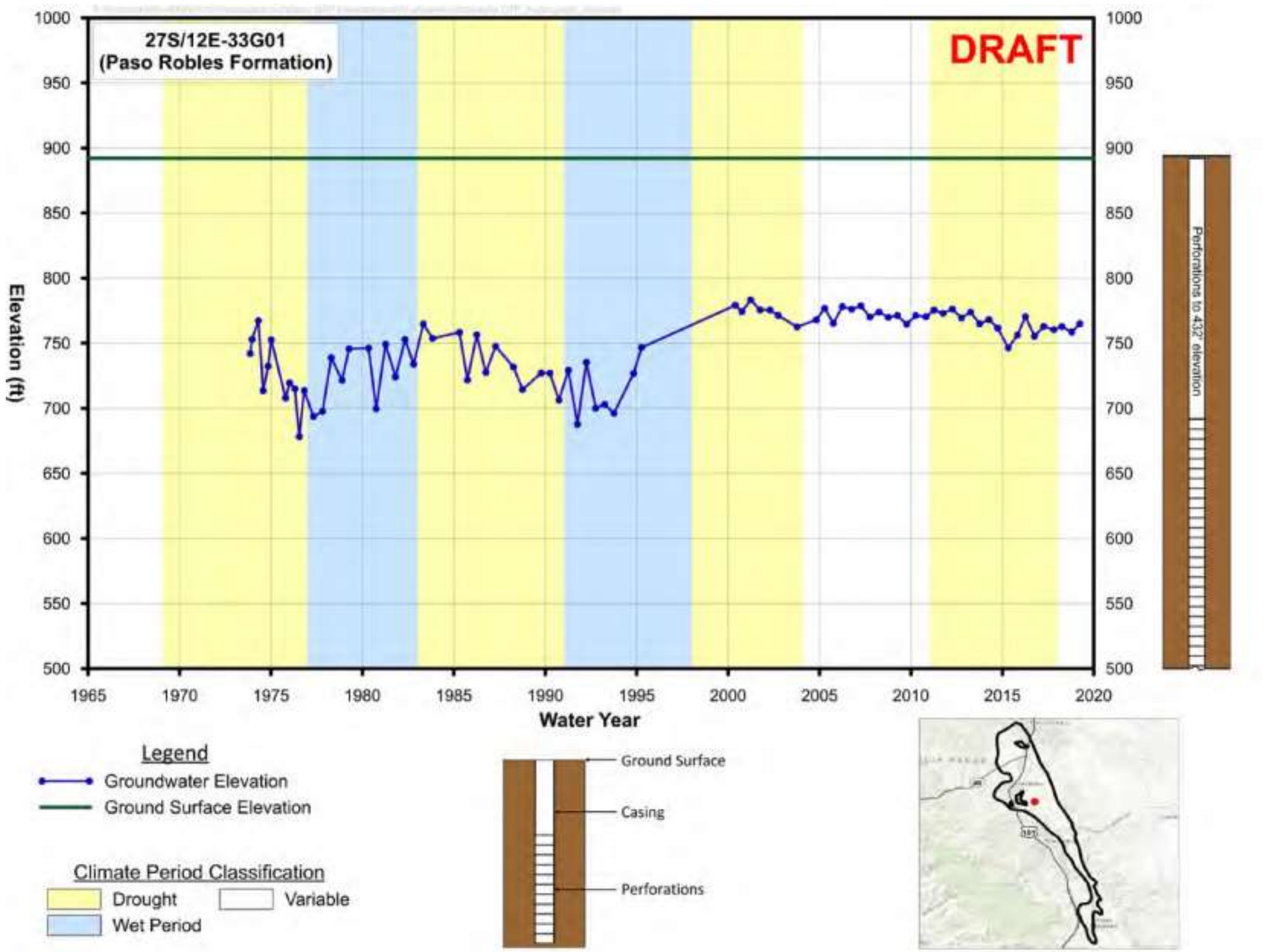

27S/12E-17E01
(Paso Robles Formation)
DRAFT
Elevation (ft)
950
900
850
800
750
700
650
600
550
500
450
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations


27S/12E-20A02
(Paso Robles Formation)
DRAFT
Elevation (ft)
900
850
800
750
700
650
600
550
500
450
400
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations


27S/12E-22M01
(Paso Robles Formation)
DRAFT
Elevation (ft)
Water Year
950
900
850
800
750
700
650
600
550
500
450
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Perforations Unknown - TD 300' Elevation
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations


28S/13E-31F02
(Paso Robles Formation)
DRAFT
Elevation (ft)
1000
950
900
850
800
750
700
650
600
550
500
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Salinas River Thalweg Elevation
Climate Period Classification
Drought
Variable
Wet Period
"Live Stream" Period in Salinas River*
*Data unavailable before 1990
Ground Surface
Casing
Perforations


27S/12E-33F01
(Paso Robles Formation)
DRAFT
Elevation (ft)
1000
950
900
850
800
750
700
650
600
550
500
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Water Year
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations


27S/12E-33G01
(Paso Robles Formation)
DRAFT
Elevation (ft)
Water Year
1000
950
900
850
800
750
700
650
600
550
500
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Perforations to 432' elevation
Legend
Groundwater Elevation
Ground Surface Elevation
Climate Period Classification
Drought
Variable
Wet Period
Ground Surface
Casing
Perforations

APPENDIX 5B

Groundwater Dependent Ecosystems tech memo (in progress)