Executive Summary

ES 1.0 Introduction

On September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package, composed of AB 1739 (Dickinson), SB 1168 (Pavley), and SB 1319 (Pavley) collectively known as the Sustainable Groundwater Management Act (SGMA). This legislation provides for the local control of groundwater while requiring the sustainable management of the groundwater resource. One of the first requirements under SGMA was to establish a local governance body, a Groundwater Sustainability Agency (GSA), with the local authority to develop, adopt, and implement a Groundwater Sustainability Plan (GSP or Plan). Further, under SGMA law, groundwater basins throughout California were classified as "high", "medium" or "low" priority by California Department of Water Resources (DWR). The Yolo Subbasin is classified as a "high" priority basin, which requires the Subbasin to prepare, adopt, and submit a GSP by January 31, 2022.

GSPs must document conditions and establish management criteria to avoid undesirable results and identify potential actions that will maintain and/or achieve sustainable groundwater management by 2042, or 20 years from the date of the adoption of the GSP. Through a Joint Powers Agreement (JPA), the Yolo Subbasin Groundwater Agency (YSGA) is the recognized GSA for the entire Yolo Subbasin (**Figure ES-1**) and responsible for developing and implementing a GSP.

The YSGA JPA was officially executed on June 19, 2017 by 19 member agencies and five affiliated parties via memoranda of understandings (MOU). Since the YSGA was formed, three additional member agencies have signed onto the JPA; three other member agencies consolidated into one; and one affiliated party has entered into an MOU with the JPA, which has resulted in 20 member agencies and six affiliated parties for a total of 26 YSGA members (**Figure ES-2**). The YSGA covers approximately 540,700 acres, spanning nearly 845 square miles. **Table ES-1** lists each member agency involved in the development of this GSP. The YSGA adopted this GSP on January 24, 2022.

ES 2.0 Plan Area Description

The Yolo Subbasin (Subbasin) is located in the southwestern side of the Sacramento Valley Groundwater Basin and is about 27 miles wide from west to east and up to 45 miles long from north to south (**Figure ES-1**). The current Subbasin boundaries are the result of the consolidation of portions of the Capay Valley, Colusa, and Solano subbasins *via* two applications for jurisdictional modifications of the Subbasin's boundary. Land use designations within the YSGA jurisdictional boundary are predominately agriculture and native vegetation, accounting for approximately 60 and 31 percent, respectively. Approximately 6 percent of the Subbasin contains managed wetlands, which provide migratory bird habitat and other ecosystem services. Source of water for agricultural

lands is a combination of surface water and groundwater. Urban and incorporated land use areas are scattered throughout the Subbasin and account for approximately 5 percent of the Subbasin.

Table ES-1. Yolo Subbasin Groundwater Agency Members.

Member Agencies	
City of Davis	Reclamation District 307
City of Woodland	Reclamation District 537
City of West Sacramento	Reclamation District 730
City of Winters	Reclamation District 765
County of Yolo	Reclamation District 787
Dunnigan Water District	Reclamation District 999
Esparto Community Service District	Reclamation District 1600
Madison Community Service District	Reclamation District 2035
Reclamation District 108	Yocha Dehe Wintun Nation
Reclamation District 150	Yolo County Flood Control & Water Conservation District
Affiliated Parties	
California American Water Company, Dunnigan	University of California, Davis
Colusa Drain Mutual Water Company	Environmental Representative
Private Pumper Representative – Yolo County Farm Bureau appointed	Rumsey Water Users Association

Figure ES-3 provides an overview of the disadvantaged communities within the Subbasin designated by DWR. Three census-designated places within the Yolo Subbasin are identified as disadvantaged communities. These include the town of Dunnigan (disadvantaged), Knights Landing (severely disadvantaged), and the main campus of University of California, Davis (severely disadvantaged). Dunnigan is an unincorporated town with a population of 1,278. Domestic water to the community is provided by California American Water and by domestic wells. The town of Knights Landing is served by Knights Landing Community Services District (CSD). Knights Landing CSD relies entirely on groundwater to serve its 869 residents. The area within the University of California, Davis (UC Davis) campus is populated by 7,379 residents. The campus uses a mix of groundwater and surface water for its water supply. California American Water and UC Davis are affiliated parties of the YSGA with voting seats on the Board, and at the time of formation, the Knights Landing CSD was not interested in participating as a YSGA member.

Yocha Dehe Wintun Nation (YDWN) owns and/or manages approximately 5,000 acres within the Capay Valley MA, including trust land held by the federal government and fee land owned by the Tribe. While YDWN federal trust lands are shown in **Figure ES-2**, the entirety of Capay Valley is within the Tribe's ancestral territory. Their water demand is supplied from a combination of surface water from Cache Creek and groundwater pumping.

Section 2.0 – Basin Setting, provides an extensive overview of the physical features and water resources conditions of the Yolo Subbasin. Included in Section 2.0 of the GSP is the following information.

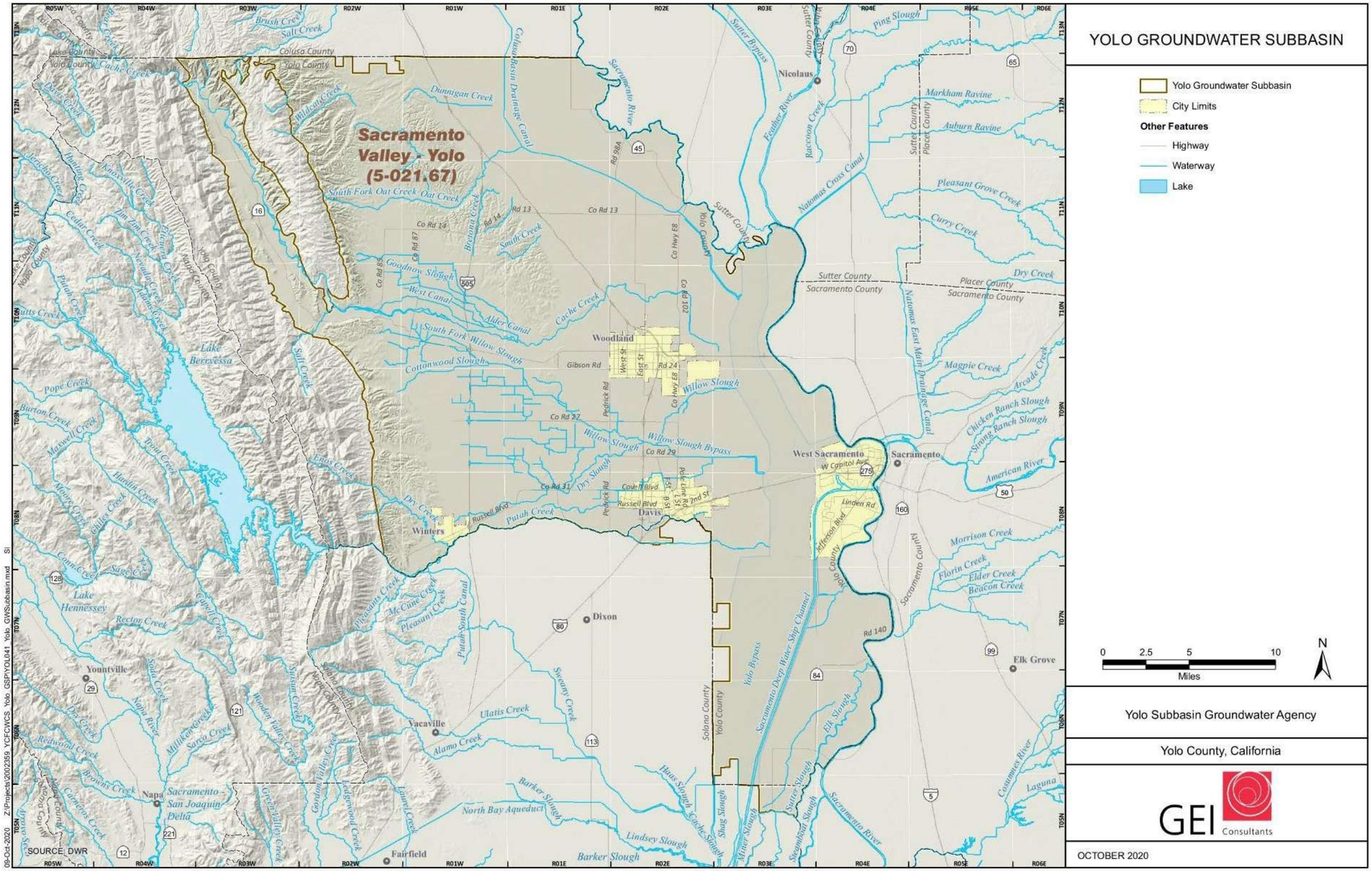

Figure ES-1.Yolo Subbasin.

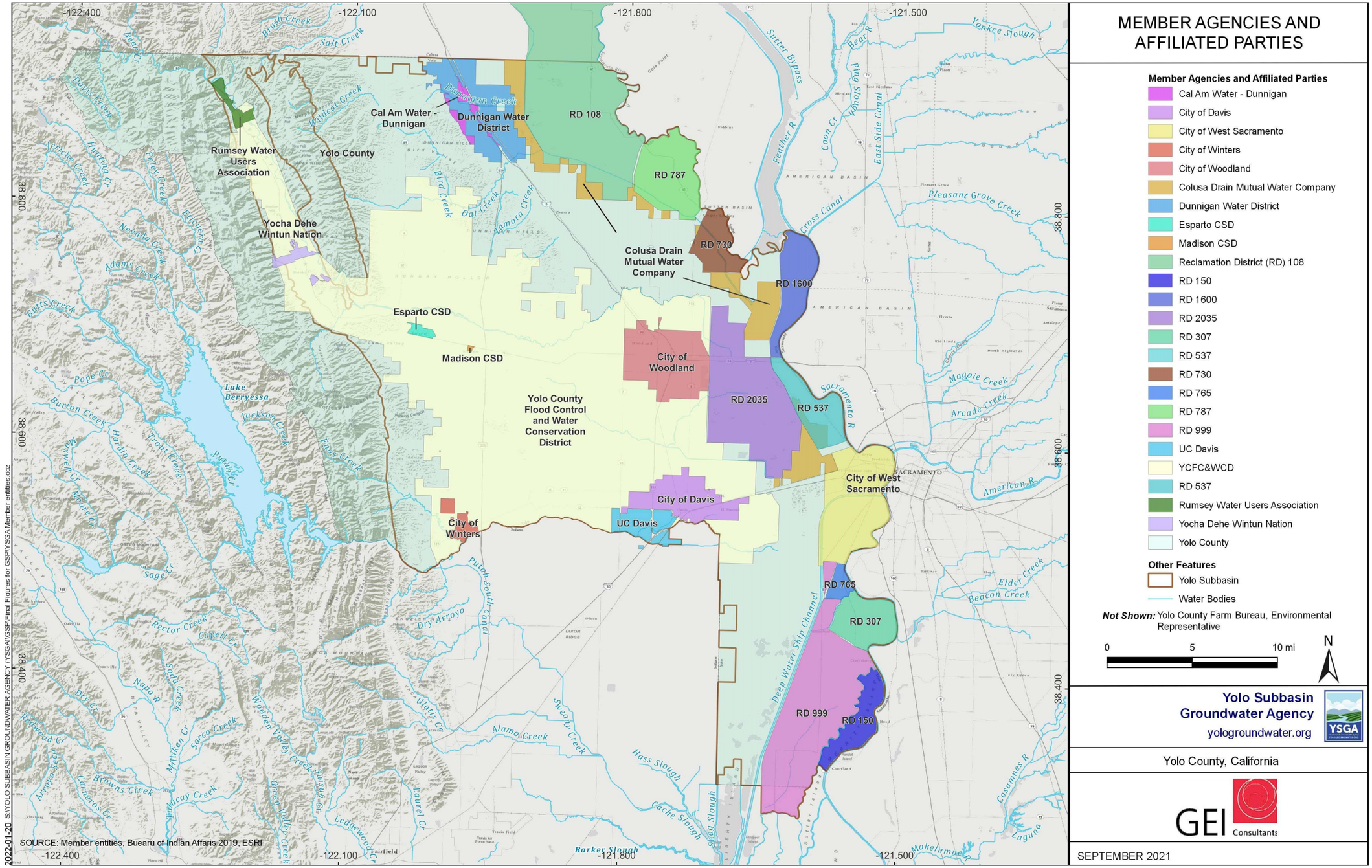

Figure ES-2.Yolo Subbasin Groundwater Agency Member Agencies and Affiliated Parties.

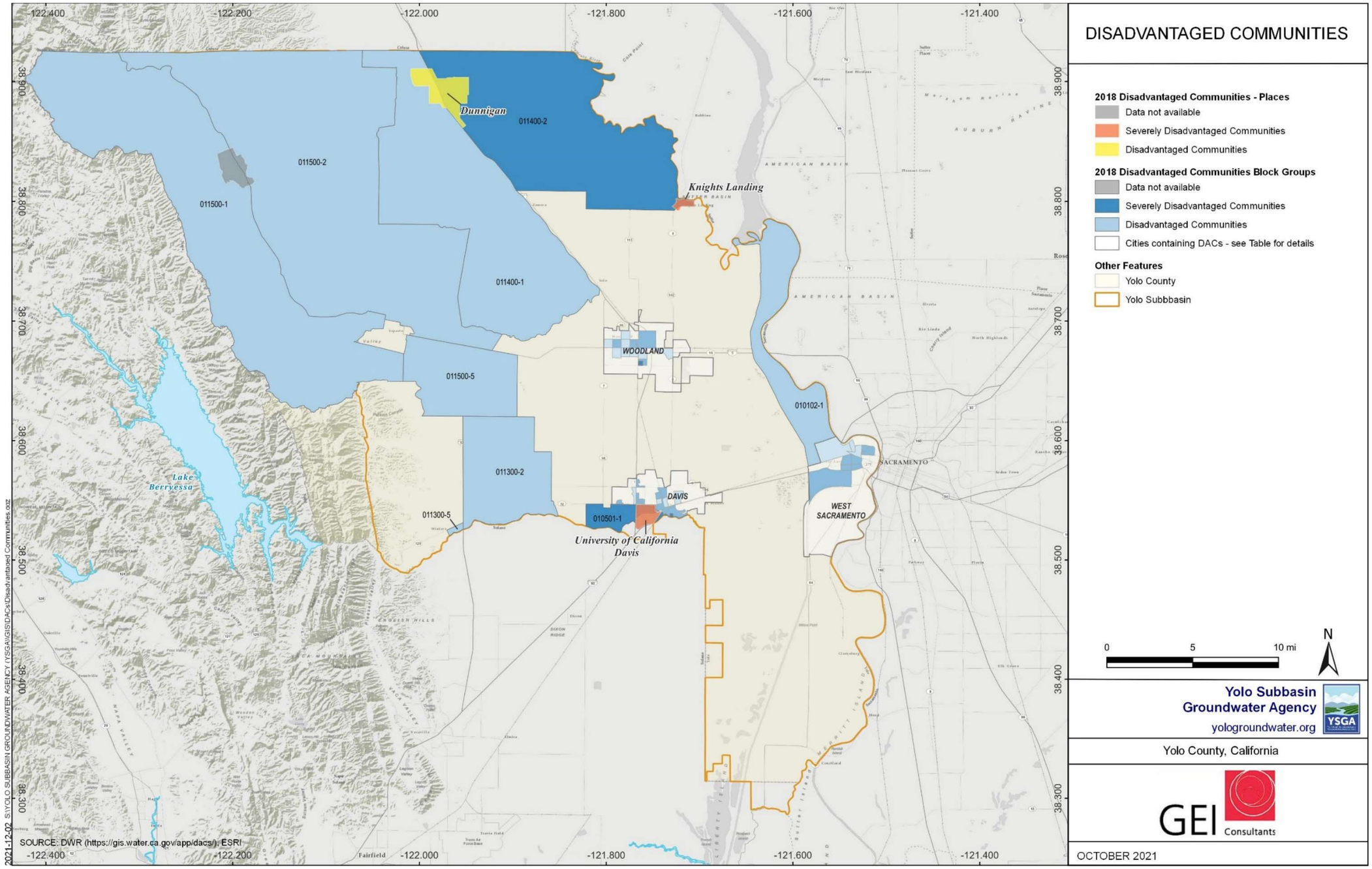

Figure ES-3.Disadvantaged Communities.

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Section 2.1 – Hydrological Conceptual Model contains detailed descriptions of the physical features of the groundwater basin, identifying principal aquifers, sources and areas of recharge, along with a description of water bodies and sources of local and imported surface waters.

Section 2.2 – Groundwater Conditions provides a description of conditions related to the six sustainability indicators: groundwater levels, groundwater storage, seawater intrusion, groundwater quality, land subsidence; and interconnected surface waters. This section also includes a description of groundwater dependent ecosystems.

Section 2.3 – Water Budget Information provides an overview of the Subbasin's water budget as evaluated through an extensive groundwater modeling exercise that considered current and future conditions with DWR-provided climate change conditions.

Section 2.4 – Management Areas describes the six management areas (MAs) that have been established in the Subbasin for management of the SGMA sustainability indicators. Each management area is unique in either its level of groundwater use, land uses, overlying jurisdictions, or access to surface waters. In some cases, these differences require a unique approach to groundwater management. In the Clarksburg management area, for example, there is very little groundwater use and an abundance of available surface water supplies, for the mostly rural landscape. In contrast, the Central and North Yolo management areas consist of a well-developed agricultural and municipal landscape with a heavy reliance on groundwater. These, and the remaining management areas, require different approaches to groundwater management that are driven by local stakeholders and at the same time integrated with the Subbasin as a whole.

As described in **Section 2.0 – Basin Setting** of the GSP, the ***Yolo Subbasin is a relatively stable basin, with groundwater levels maintaining a relatively consistent long-term average elevation or depth to groundwater.*** While groundwater levels decline during dry conditions due to reduced recharge from precipitation, local runoff, and seepage, and continued reliance on groundwater for agricultural and municipal demands, groundwater levels substantially recover during wet years.

ES 3.0 Sustainable Management Criteria

Under SGMA, the sustainable management criteria (SMC) define conditions for sustainable groundwater management that will be used to guide sustainability in the Yolo Subbasin. SMC includes characterization of the sustainability goal for the Subbasin and the establishment of undesirable results, minimum thresholds, measurable objectives and interim milestones for applicable Subbasin sustainability indicators. The SMC concepts are outlined below and provide a basis of understanding for the development of sustainable groundwater management in the Subbasin.

- **Sustainability Goal:** The sustainability goal guides sustainable groundwater management across all MAs in the Subbasin by providing qualitative descriptions of the objectives and desired conditions.
- **Undesirable Results:** Undesirable results are established for each applicable sustainability indicator and constitute as significant and unreasonable groundwater conditions in the Subbasin.
- **Minimum Thresholds:** Minimum thresholds are the quantitative values that represent groundwater conditions at a representative monitoring site that, when exceeded, in combination with exceeded minimum thresholds at other representative monitoring sites, may cause an undesirable result in the subbasin. Minimum thresholds are set for each applicable sustainability indicator at each representative monitoring site using the same metrics as the measurable objectives. This section defines the minimum thresholds at each representative monitoring site for applicable sustainability indicators considering interests of beneficial uses and users of groundwater in the Subbasin.
- **Measurable Objectives:** Measurable objectives are quantitative goals that reflect the Subbasins' desired groundwater conditions and allows the MAs within the Yolo Subbasin to be managed sustainably through the 20-year Implementation Period. In the Subbasin, the quantitative goals expressed as the measurable objectives are currently met and are intended to continue to be met. Measurable objectives are set for each applicable sustainability indicator. Measurable objectives are set such that there is a reasonable margin of operational flexibility that will anticipate recoverable fluctuations due to droughts, climate change, conjunctive use operations, or other groundwater management activities.
- **Interim Milestones:** Interim milestones are target values representing measurable groundwater conditions, in increments of 5 years, set to ensure that the Subbasin moves towards its sustainability goal over the 20-year Implementation Period. As the Subbasin is already meeting its sustainability goal, the interim milestones are set at the measurable objective for the applicable sustainability indicators.

  In the Yolo Subbasin, interim milestones are set equal to measurable objectives for all sustainability indicators for which minimum thresholds and measurable objectives have been set. As described in this plan, the YSGA is establishing SMCs to be equal to recent historical conditions. Therefore, provided a normal range of hydrology, the groundwater basin is expected to maintain its historical regime and from the outset of the plan is expected to operate within a reasonable range of established measurable objectives.
- **Undesirable Results Watch Area:** An undesirable result watch area is a MA which has triggered the exceedance criteria for an undesirable result for a given sustainability indicator, but where the number of MAs exceeding the criteria has not been reached. An undesirable result watch area triggers responses from the YSGA and its member agencies to address the local exceedance of minimum threshold values to avoid triggering the criteria for a basin-wide undesirable result.

ES 3.1 Sustainability Goal

As required by SGMA, a sustainability goal is to be defined for the basin (CWC §10727(a)). This is further clarified as a basin-wide goal in DWR's GSP emergency regulations. The sustainability goals for the Yolo Subbasin are as follows:

- *Achieve sustainable groundwater management in the Yolo Subbasin by maintaining or enhancing groundwater quantity and quality through the implementation of projects and management actions to support beneficial uses and users.*
- *Maintain surface water flows and quality to support conjunctive use programs in the Subbasin that promote increased groundwater levels and improved water quality.*
- *Operate within the established sustainable management criteria and maintain sustainable groundwater use through continued implementation of a monitoring and reporting program.*
- *Maintain sustainable operations to maintain sustainability over the implementation and planning horizon.*

ES 3.2 Chronic Lowering of Groundwater Levels

The basin-wide definition of "undesirable results" for the chronic lowering of groundwater levels is as follows:

> *The point at which significant and unreasonable impacts over the planning and implementation horizon, as determined by depth or elevation of ground water, affect the reasonable beneficial use of, and access to, groundwater by overlying users.*
>
> *An undesirable result occurs when the minimum threshold criteria is exceeded in* ***51 percent or more*** *of representative monitoring wells in* ***two (2) MAs****.*

The 51 percent value was established to allow for interim projects and management actions to take place within the Subbasin to mitigate negative groundwater trends. This value was selected and agreed to by the YSGA member entities and the YSGA Board.

Minimum thresholds for the chronic lowering of groundwater levels were established through a collaborative process with local stakeholders and interested parties. ***While groundwater levels decline during dry conditions due to reduced groundwater recharge from lower amounts of precipitation and local runoff, groundwater levels substantially recover during wet years.*** Based on historic, current, and projected groundwater conditions in the Subbasin, the YSGA developed several methodologies for establishing the minimum threshold value for each representative monitoring well, based on management area boundaries. The resulting minimum thresholds for each management area is described below and shown in **Table ES-2**.

Capay Valley, Dunnigan Hills, Central Yolo, and South Yolo:

> *A well violates the minimum threshold when the groundwater elevation exceeds the historic (pre-2016) minimum elevation in the period of record of each Representative Well in two consecutive fall measurements.*

North Yolo:

A well violates the minimum threshold when the groundwater elevation exceeds the historic minimum elevation in the period of record (pre-2016) of each Representative Well ***plus*** *20 percent of the depth between the historic maximum and historic minimum elevation for the period of record (pre-2016) of the Representative Well in two consecutive fall measurements.*

Clarksburg:

No minimum threshold has been established for the Clarksburg MA due to the lack of groundwater usage in the MA. The YSGA will annually monitor groundwater conditions in the Clarksburg MA to determine if groundwater conditions or usage changes to the degree that minimum thresholds are required to ensure sustainable management of this portion of the Subbasin.

To establish the measurable objectives for the Yolo Subbasin, the YSGA utilized the representative wells identified for minimum thresholds, shown in **Table ES-2** and **Figure ES-4**, to determine the measurable objectives for chronic lowering of groundwater levels. Based on historic, current, and projected groundwater conditions in the Subbasin, the following criteria were used to establishing measurable objectives at all MAs, with the exception of the Clarksburg MA:

Measurable objective is equal to the average fall (Sep.-Dec.) groundwater elevation for the water year period of 2000 to 2011 at each Representative Well. Performance of the measurable objective will be measured as the five (5) year running average of the minimum fall (Sep.-Dec.) groundwater elevation.

Table ES-2. Yolo Subbasin Representative Wells and Minimum Threshold and Measurable Objective Values.

Management Area	YSGA Representative Well Number	State Well Number	Measurable Objective (ft)		Minimum Threshold (ft)	
			Depth to Water	*Groundwater elevation*	*Depth to Water*	*Groundwater elevation*
Capay Valley	276	10N02W16R001M	14.4	215.0	21.9	207.7
	277	10N02W18F001M	20.4	315.6	31.8	304.2
	280	10N03W02R002M	18.7	319.5	29.9	308.2
	285	11N03W09Q001M	20.4	383.7	48.3	355.8
	287	11N03W23L001M	15.2	296.0	23.6	287.6
	288	11N03W23N001M	32.9	287.3	49.1	271.0
	289	11N03W33F001M	19.8	351.2	29.6	341.2
	293	12N03W20D001M	19.8	382.8	26.2	376.4
	415	11N03W35D003M	28.6	280.7	36.3	273.0
	416	10N03W24B002M	65.4	324.8	109.1	281.1
Central Yolo	114	08N02E15A002M	71.5	-25.1	107.7	-61.3
	132	08N03E07N500M	58.3	-22.0	114.3	-78.0
	151	09N03E33B002M	16.2	4.7	56.1	-35.3
	170	08N02E18M002M	48.1	20.4	67.0	1.5
	220	08N01E07R001M	25.3	82.3	91.0	16.5

Management Area	YSGA Representative Well Number	State Well Number	Measurable Objective (ft)		Minimum Threshold (ft)	
			Depth to Water	*Groundwater elevation*	*Depth to Water*	*Groundwater elevation*
	222	08N01W09C001M	57.3	110.9	127.9	40.3
	224	08N01W13G003M	37.7	80.0	69.9	47.8
	229	08N01W20R005M	79.8	72.8	116.2	36.4
	230	09N01E03C003M	81.7	19.3	157.4	-56.4
	231	09N01E07D001M	13.4	111.1	56.2	68.3
	233	09N01E20E001M	10.0	104.8	47.7	67.1
	234	09N01E24D001M	17.2	52.2	61.7	7.6
	235	09N01E31D001M	13.4	104.6	49.8	68.3
	239	09N01W08Q001M	13.8	185.1	46.7	152.2
	240	09N01W21E001M	11.9	163.4	30.5	144.7
	246	09N02E07L001M	46.1	24.7	116.2	-45.4
	248	09N02E32M001M	31.9	29.1	68.0	-7.0
	250	09N03E19R002M	17.6	6.7	38.3	-14.1
	254	10N01E23Q002M	65.0	26.8	134.8	-43.0
	256	10N01E29K001M	34.9	77.8	54.4	58.4
	261	10N01W08B001M	41.3	139.5	107.6	73.3
	265	10N01W21J001M	33.8	127.5	70.4	90.9
	268	10N01W32E001M	18.9	169.9	44.3	144.5
	269	10N01W35Q001M	20.8	120.5	48.4	93.0
	275	10N02W14A001M	69.9	137.8	116.5	91.1
	279	10N02W26P001M	112.6	241.7	141.7	212.7
	406	10N02E29A001M	21.5	35.7	47.4	9.9
	400	09N02E22H002M	16.1	22.9	63.8	-24.8
	401	10N02E36E001M	8.1	22.1	21.2	9.0
	403	09N01E26N001M	8.4	71.7	48.0	32.2
	404	09N01W23D001M	10.5	135.8	63.4	82.9
	419	08N01W22G500M	59.6	71.9	125	6.5
North Yolo	127	11N01E02D001M	41.5	-13.3	116.5	-88.3
	128	11N01E16P001M	88.6	-33.1	185.3	-129.8
	129	12N01E03R002M	23.2	9.1	76.6	-44.3
	131	12N01E26A002M	30.1	-4.2	72.0	-46.1
	153	10N03E33B011M	21.0	3.8	98.0	-73.3
	178	12N01W14M001M	37.0	10.5	78.4	-30.9
	180	12N01W36K002M	48.2	-7.7	90.2	-49.7
	251	10N01E02Q002M	45.2	32.1	109.8	-32.6
	405	10N02E06B001M	34.7	26.0	146.4	-85.7
	411	12N01W05B001M	94.4	49.5	169.2	-25.3

Management Area	YSGA Representative Well Number	State Well Number	Measurable Objective (ft)		Minimum Threshold (ft)	
			Depth to Water	*Groundwater elevation*	*Depth to Water*	*Groundwater elevation*
	410	10N02E09N001M	48.5	12.9	125.0	-63.7
	420	10N02E03R002M	30.6	12.2	81.9	-39.2
	421	11N02E20K004M	24.7	28.8	85.1	-31.6
South Yolo	122	08N03E32L001M	30.5	-1.9	100.3	-71.8
	160	06N03E07M001M	9.0	9.9	29.7	-10.8
	422	08N03E31N001M	40.6	-7.0	82.8	-49.3
	423	07N03E04Q001M	24.0	0.5	51.6	-27.1
Dunnigan Hills	253	10N01E18C001M	51.4	143.1	61.6	132.8
	260	10N01W02Q001M	66.5	128.3	121.2	73.6
	402	10N01E15D001M	76.9	17.5	164.0	-69.6

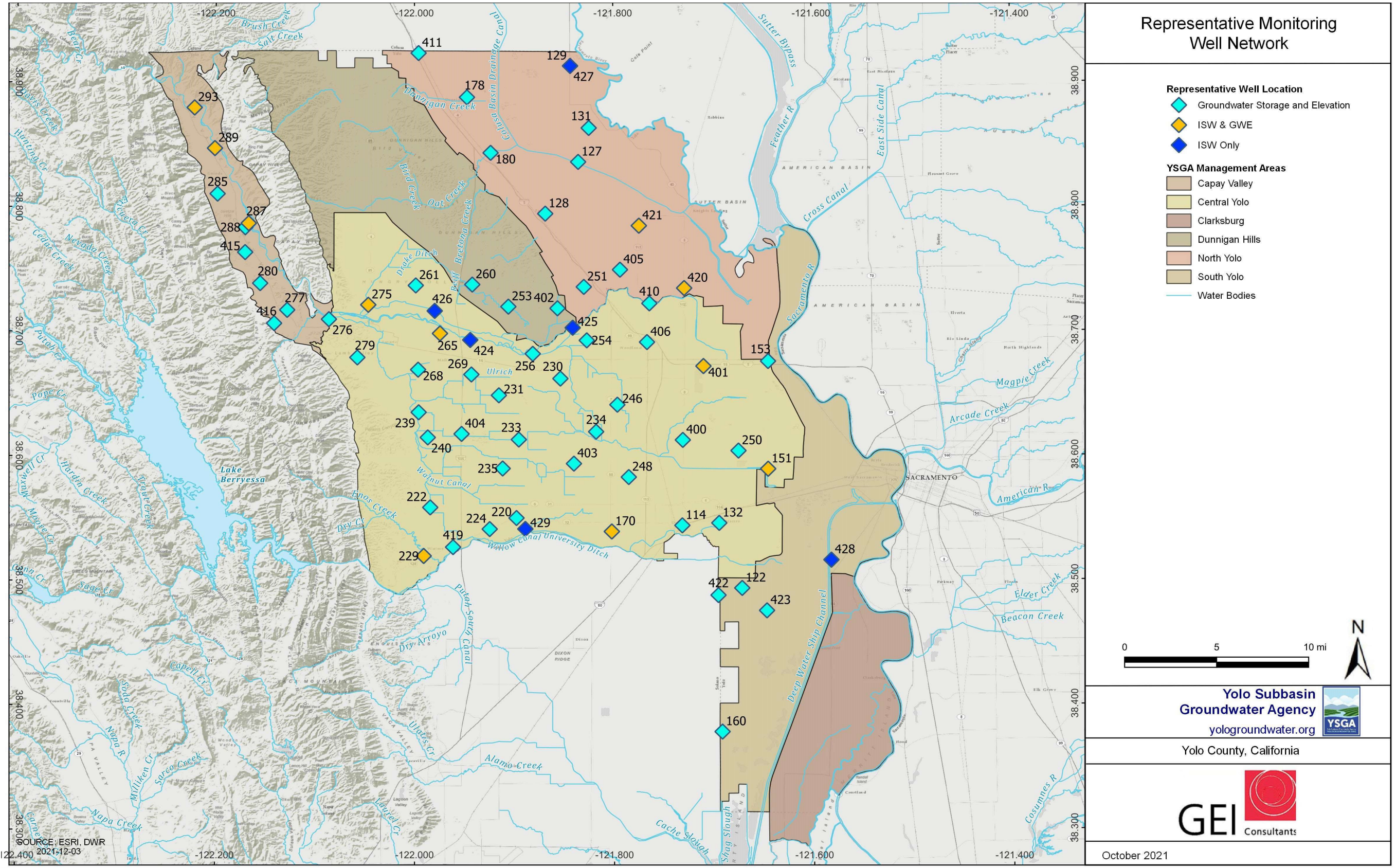

Figure ES-4.Yolo Subbasin Representative Wells.

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Due to the lack of significant groundwater use in the Clarksburg MA no measurable objective has been established in the MA.

Interim milestones for the Chronic Lowering of Groundwater Levels are set equal to measurable objectives.

ES 3.3 Reduction in Groundwater Storage

The basin-wide definition of "undesirable results" for the reduction of groundwater storage is as follows:

> *The point at which significant and unreasonable impacts over the planning and implementation horizon, as determined by the amount of groundwater storage in the Yolo Subbasin, affect the reasonable and beneficial use of, and access to, groundwater by overlying users. In the Subbasin groundwater elevations serve as a proxy for groundwater storage.*

A groundwater storage undesirable result occurs under the same definition as the chronic lowering of groundwater levels. As with the chronic lowering of groundwater levels, no sustainable management criteria are established for the Clarksburg management area, due to the lack of significant groundwater use in the management area.

The minimum threshold values for reduction of groundwater storage have been established for each management area and are based on and identical to the minimum threshold values established for chronic lowering of groundwater elevations.

The measurable objective values for reduction of groundwater storage have been established for each management area and are based on and identical to the measurable objective values established for chronic lowering of groundwater elevations.

Interim milestones for the reduction of groundwater storage are set equal to measurable objectives.

ES 3.4 Degraded Water Quality

The YSGA is only establishing sustainable management criteria for total dissolved solids and has elected to not established specific sustainable management criteria for other constituents of concern identified within the Subbasin. For all constituents of constituents of concern, except total dissolved solids, the Subbasin will rely on current and future water quality standards established for drinking water and agricultural water uses by state and County regulatory agencies. The YSGA will annually review water quality monitoring data, in collaboration with regulating agencies, to determine if water quality is being negatively affected by groundwater management activities. In the future, where significant negative impacts to water quality associated with groundwater management activities are identified, the YSGA will coordinate with stakeholders and regulatory agencies to establish appropriate sustainable management criteria that can be used to define the occurrence of basin-wide undesirable results for specific water quality constituents.

The YSGA has identified a list of water quality constituents of concern, including those constituents whose presence, distribution, or concentration can be influenced by groundwater management activities. The list of water quality constituents of concern for the Subbasin includes:

- Total Dissolved Solids
- Nitrate
- Arsenic
- Boron
- Hexavalent Chromium (VI)

The basin-wide definition of "undesirable results" for degraded water quality is as follows:

> *The point at which water quality is degraded to the extent of causing significant and unreasonable impacts from groundwater management actions in the Yolo Subbasin, that affect the reasonable and beneficial use of, and access to, groundwater by overlying users.*
>
> *An undesirable result occurs when the minimum threshold criteria is exceeded in* ***50 percent or more*** *of representative monitoring wells monitored for total dissolved solids.*

The YSGA has established a minimum threshold for total dissolved solids as follows:

> *A representative monitoring well violates the minimum threshold when the total dissolved solids concentration exceeds 1,000 ppm over a three (3) year rolling average.*

The YSGA has established a measurable objective for total dissolved solids as follows:

> *A representative monitoring well violates the measurable objective when the total dissolved solids concentration exceeds 750 ppm over a three (3) year rolling average.*

ES 3.5 Land Subsidence

The basin-wide definition of "undesirable results" for land subsidence is as follows:

> *The point at which the rate and extent of subsidence in the Subbasin causes significant and unreasonable impacts to surface land uses or critical infrastructure.*
>
> *An undesirable result occurs when the minimum threshold value is exceeded over 25 percent of the management or sub-management areas in three (3) or more management or sub-management areas in the same reporting year.*

Within the Yolo Subbasin, a management or sub-management area will be considered an undesirable result watch area when that management exceeds its minimum threshold value, identified below. If three or more undesirable result watch areas exist, as defined above, the Subbasin would be considered to be experiencing an undesirable result relative to land subsidence.

The YSGA reviewed the level of subsidence in the Subbasin based on a number of studies. Land deformation occurs as both surface subsidence and surface uplifting and the Subbasin experiences both processes. In the east portion of the Central Yolo management area and nearly the entire

North Yolo management area steady levels of subsidence have been documented. In the western portion of the Central Yolo management area a slight amount of uplift has been observed.

Subsidence in the Subbasin has occurred at a steady rate according to available studies and occurs even in years when groundwater levels are stable or increasing. The rate of subsidence does not substantially increase during years when groundwater levels are declining. The cause of subsidence can be attributed to other tectonic activities, and not solely groundwater extractions. To fully understand the exact causes of subsidence additional data is needed to identify where in the substrata subsidence occurs.

The YSGA recognizes that, while the exact causes of subsidence in the Subbasin are not fully understood, subsidence can cause significant impacts to surface infrastructure and is often caused by increasing groundwater extractions.

The minimum threshold values for land subsidence have been established for each management or sub-MA as shown in **Table ES-3**.

Table ES-3. Minimum Thresholds for Land Subsidence.

Management / Sub-Management Area	Running Average	Max Subsidence Rate	Max Percent of Area
Capay Valley	TBD	TBD	TBD
Dunnigan Hills	5-year	1.8 cm/year	25%
North Yolo	5-year	3.0 cm/year	25%
East Central Yolo	5-year	2.5 cm/year	25%
West Central Yolo	5-year	1.8 cm/year	25%
South Yolo	5-year	0.0 cm/year	25%
Clarksburg	5-year	0.0 cm/year	25%

The measurable objectives values for land subsidence have been established for each management and sub-MA as shown in **Table ES-4**.

Table ES-4. Measurable Objective Thresholds for Land Subsidence.

Management / Sub-Management Area	Running Average	Max Subsidence Rate	Max Percent of Area
Capay Valley	TBD	TBD	TBD
Dunnigan Hills	3-year	1.8 cm/year	25%
North Yolo	3-year	3.0 cm/year	25%
East Central Yolo	3-year	2.5 cm/year	25%
West Central Yolo	3-year	1.8 cm/year	25%
South Yolo	3-year	0.0 cm/year	25%
Clarksburg	3-year	0.0 cm/year	25%

ES 3.6 Seawater Intrusion

Seawater intrusion has been determined not to be a concern in the Yolo Subbasin with no potential for seawater intrusion to occur under water quality management objectives in the Sacramento-San Joaquin Delta or changes in water management activities in the Subbasin. Accordingly, no definitions of undesirable results, minimum thresholds, or measurable objectives have been developed.

ES 3.7 Depletion of Interconnected Surface Water

Development of SMC for the depletion of interconnected surface waters was constrained by limited groundwater data and the lack of previous studies of stream-aquifer interaction. Additional investigations of stream-aquifer interactions and additional groundwater monitoring data in the Yolo Subbasin may necessitate a future change in the SMC for this sustainability indicator.

The YSGA intends to use groundwater levels at shallow near-stream representative monitoring wells as a proxy for the rate and volume of depletion of interconnected surface waters caused by groundwater use.

The basin-wide definition of "undesirable results" for interconnected surface water is as follows:

> *The point at which significant and unreasonable impacts to the surface waters affect the reasonable and beneficial use of those surface waters by overlying users, including associated ecosystems.*
>
> *An undesirable result occurs when the Minimum Threshold is exceeded in over 50 percent of the interconnected surface water representative monitoring wells in two (2) or more interconnected surface water management areas in the same reporting year.*

Based on historic, current, and projected conditions in the Subbasin, the YSGA developed several methodologies for establishing the minimum threshold value for each representative well. The primary sustainability criteria for establishing minimum thresholds for interconnected surface waters is to maintain interconnection of the local groundwater system to the critical surface water body at levels consistent with recent conditions (1971-2018). In this manner the YSGA is establishing SMCs that protect the existing level and frequency of interconnection, which in turn supports existing habitat and ecosystem conditions associated with critical surface water bodies, while preventing further degradation. The habitat associated with interconnected surface water bodies is supported by both surface flows (much of which is managed) and periodic connection to groundwater. ***The goal of the YSGA is to maintain conditions experienced in the past and to cause no degradation of habitat relative to the Subbasin's current baseline. Historically this condition included periods when groundwater elevations were below the level needed to support connection to surface water bodies. However, groundwater elevations recover during wet periods to reestablish connections between groundwater and surface water bodies. This regime of fluctuating and periodic recovery of groundwater levels maintains the current level of habitat in interconnected surface water bodies needed to support GDEs.***

Lower Cache Creek

The Minimum Threshold for depletion of interconnected surface water is the recurrence of the spring (March-May) average measurement for 1975 to present in at least one spring in every seven (7) years.

Lower Cache Creek is an intermittent water body with a known connection to groundwater that supports sensitive ecosystems, recreation, and surface water uses. The creek experiences connection to, and disconnection from, groundwater that varies in space and time. The intention of the established minimum threshold is to ensure that no depletion occurs in excess of what has been experienced since 1975, and to ensure that groundwater levels rise at regular intervals to maintain the stream's periodic connection to groundwater.

Upper Cache Creek, Putah Creek, and Lower Sacramento River:

Minimum Threshold value is equal to the minimum elevation for the period of record at the RMW, exceeded in 2 consecutive years.

Upper Cache Creek, Putah Creek, and the Sacramento River are perennial waterways that support a variety of beneficial uses. The effect of groundwater extraction on streamflow is difficult to determine due to flow management practices. However, hydrographs of monitoring wells adjacent to perennial water bodies display much less inter-annual variation than those of Lower Cache Creek. Generally, water levels are more stable, reflecting both the availability of surface water in the area and the replenishment of groundwater levels by the water body. Because groundwater levels at these wells generally rebound every spring, it is not appropriate to set a multi-year threshold. The minimum threshold is a single value aimed at limiting the rate of depletion from the water body. No undesirable results have been documented within the historical period of evaluation. Therefore, the minimum threshold is set to the historic minimum elevation for the period of evaluation at the representative monitoring well.

Upper Sacramento River:

Exceedance of the historic minimum elevation in the period of record of each RMW plus 20 percent of the depth between the historic maximum and historic minimum elevation for the period of record of the RMW in 2 consecutive years.

The minimum thresholds for the North Yolo management area are set lower than historical conditions recognizing that water districts, such as RD 108, in this area may experience reductions in surface water deliveries from the Sacramento River as potential Voluntary Agreements with the State Water Board are implemented. The Voluntary Agreements are expected to reduce surface water deliveries to Sacramento River Settlement Contractors during certain year types, requiring that water users increase their reliance on local groundwater during the same year types.

The minimum threshold is lower in this reach to provide operational flexibility to the beneficial users of groundwater in the region. However, the YSGA intends to manage the North Yolo management area towards the measurable objective, which seeks to maintain historical groundwater levels. In the long-term, groundwater levels will stay at their historically sustainable levels, and no undesirable results are predicted to occur.

The values for minimum thresholds at each of the representative wells is provided in **Table ES-5.**

Table ES-5. Interconnected Surface Water Minimum Thresholds.

YSGA Representative Well Number	Interconnected Surface Water Management Zone	Minimum Thresholds Value Depth to Water (Ft)	Minimum Thresholds Value Groundwater Elevation (Ft msl)	Minimum Thresholds Evaluation
265	Lower Cache	29.7	131.6	1 in 7 years
275	Lower Cache	64.4	143.2	1 in 7 years
424	Lower Cache	28.6	116.7	1 in 7 years
425	Lower Cache	29.4	55.1	1 in 7 years
426	Lower Cache	36.1	132.6	1 in 7 years
151	Lower Sacramento	56.1	-35.3	Single exceedance
401	Lower Sacramento	21.2	9.0	Single exceedance
428	Lower Sacramento	19.3	-1.3	Single exceedance
170	Putah Creek	67.0	1.5	Single exceedance
229	Putah Creek	116.2	36.4	Single exceedance
429	Putah Creek	47.7	56.1	Single Exceedance
287	Upper Cache	23.6	287.6	Single Exceedance
289	Upper Cache	29.6	341.2	Single exceedance
293	Upper Cache	26.2	376.4	Single exceedance
420	Upper Sacramento	81.9	-39.2	Single exceedance
427	Upper Sacramento	73.7	-35.4	Single exceedance
421	Upper Sacramento	85.1	-31.6	Single exceedance

To establish the measurable objectives for the Yolo Subbasin, the YSGA utilized the representative wells identified for minimum thresholds, shown in **Table ES-6**, to determine the measurable objectives for chronic lowering of groundwater levels. Based on historic, current, and projected groundwater conditions in the Subbasin, the used the following criteria for establishing measurable objectives at representative monitoring wells:

Measurable Objective is equal to the average spring (March-May) groundwater elevation for water years 2000-2011 at the RMW. Performance of the Measurable Objective will be measured as the five (5) year running average of the maximum spring (March-May) groundwater elevation.

This measurable objective ensures that groundwater levels continue to rebound in spring, maintaining connection to and preventing undesirable depletion of interconnected surface waters.

The measurable objective for depletion of interconnected surface waters has been established for each RMW in the interconnected surface water management zone, as described above. The

Measurable Objectives will be measured at specific RMWs representative of the surrounding area and capture groundwater conditions in the area that influence surface waters

Table ES-6. Interconnected Surface Water Measurable Objectives.

YSGA Representative Well Number	Interconnected Surface Water Management Zone	Measurable Objectives Value Depth to Water (Ft)	Measurable Objectives Value Groundwater Elevation (Ft msl)
265	Lower Cache	28.6	132.7
275	Lower Cache	62.2	145.4
424	Lower Cache	29.5	115.8
425	Lower Cache	23.3	61.2
426	Lower Cache	30.6	138.0
151	Lower Sacramento	5.1	15.7
401	Lower Sacramento	3.3	26.8
428	Lower Sacramento	9.3	8.7
170	Putah Creek	38.8	29.7
229	Putah Creek	61.0	91.6
429	Putah Creek	27.8	76.0
287	Upper Cache	12.5	298.7
289	Upper Cache	16.5	354.3
293	Upper Cache	17.4	385.2
420	Upper Sacramento	18.9	23.9
427	Upper Sacramento	9.0	29.3
421	Upper Sacramento	20.0	33.5

ES 4.0 Monitoring Networks

The monitoring network and protocols adopted by the YSGA are designed to collect data of sufficient quality, frequency, and distribution to characterize groundwater conditions and water budget components in the Yolo Subbasin, and to evaluate changing conditions due to local hydrology, water management actions, and water supply projects. The YSGA has established this SGMA representative monitoring network with those wells or sites that will be used to report the Subbasin's performance for each of the sustainability indicators (this includes the representative wells (RMW) along with additional monitoring sites). Within the Subbasin many hundreds of additional wells are also monitored for purposes other than SGMA reporting.

Since 2004, the Yolo Subbasin has maintained an established groundwater-level and water quality monitoring database known as the Water Resources Information Database (WRID) that includes more than 190,000 records from thousands of agricultural, domestic, municipal and dedicated

monitoring wells that have been monitored for groundwater levels, water quality and subsidence. In addition, members of the YSGA and more than 40 other agencies also maintain and monitor wells throughout the Subbasin. Not all monitoring wells are included in the SGMA monitoring network. They are, nevertheless, important for monitoring conditions in the Subbasin and will continue to be monitored. All current and historic monitoring data on the WRID is available online for scientists and engineers.

The representative monitoring network identified for the Subbasin is designed to meet the following objectives of this GSP:

- Monitor impacts of groundwater pumping on beneficial uses and users of groundwater
- Monitor progress toward measurable objectives and minimum thresholds
- Collect data to quantify annual changes in water budget components of the Subbasin
- Monitor changes in groundwater conditions relative implementation of projects and management actions

The representative monitoring network design relative to these four objectives are discussed in **Section 4 – Monitoring Networks**. The representative monitoring network will monitor the following pertinent sustainability indicators:

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Degraded groundwater quality
- Land subsidence
- Depletion of interconnected surface waters

ES-5.0 Projects and Management Actions

The GSP describes projects and management actions proposed by the YSGA and its member agencies to meet the sustainability goal for the Yolo Subbasin. The projects and management actions presented in the GSP represent the best available engineering and analysis completed to-date. This list will be updated throughout the planning and implementation period (2022 to 2042) to reflect additional analyses and new and emerging opportunities.

As described in the Subbasin water budget in **Section 2.3 – Water Budget Information**, the Subbasin has an estimated Sustainable Yield of 346 TAF annually. Annual groundwater pumping under future scenarios supports urban and agricultural demands and is as follows:

- Future baseline 320 TAF
- Future 2030 337 TAF

- Future 2070 358 TAF
- Future 2070 DEW 400 TAF
- Future 2070 WMW 325 TAF

Throughout the course of the implementation period (2022 to 2042), the YSGA and its member agencies will implement a variety of management actions to protect groundwater sustainability. These management actions will include capital investment projects to develop additional water supplies to off-set groundwater pumping, a data collection and analysis program to better understand and manage the Subbasin, and improved outreach activities.

Many of the management actions will require additional planning, engineering, and environmental/regulatory analysis before they can be implemented. The possibility exists that some projects will not be feasible to implement. If the identified management actions cannot be implemented, the YSGA will consider additional management actions as needed to protect groundwater sustainability.

There are existing and on-going projects and management actions that contribute to sustainability in the Yolo Subbasin. Proposed future, existing, and ongoing projects and management actions are described in the GSP, including a brief description of the relevant sustainability indicator, status, expected benefits, and ongoing costs. These projects and management actions are proposed by the YSGA for development over the 20-year implementation period. A full table of projects and management actions identified by the YSGA is provided in **Appendix J** of this GSP