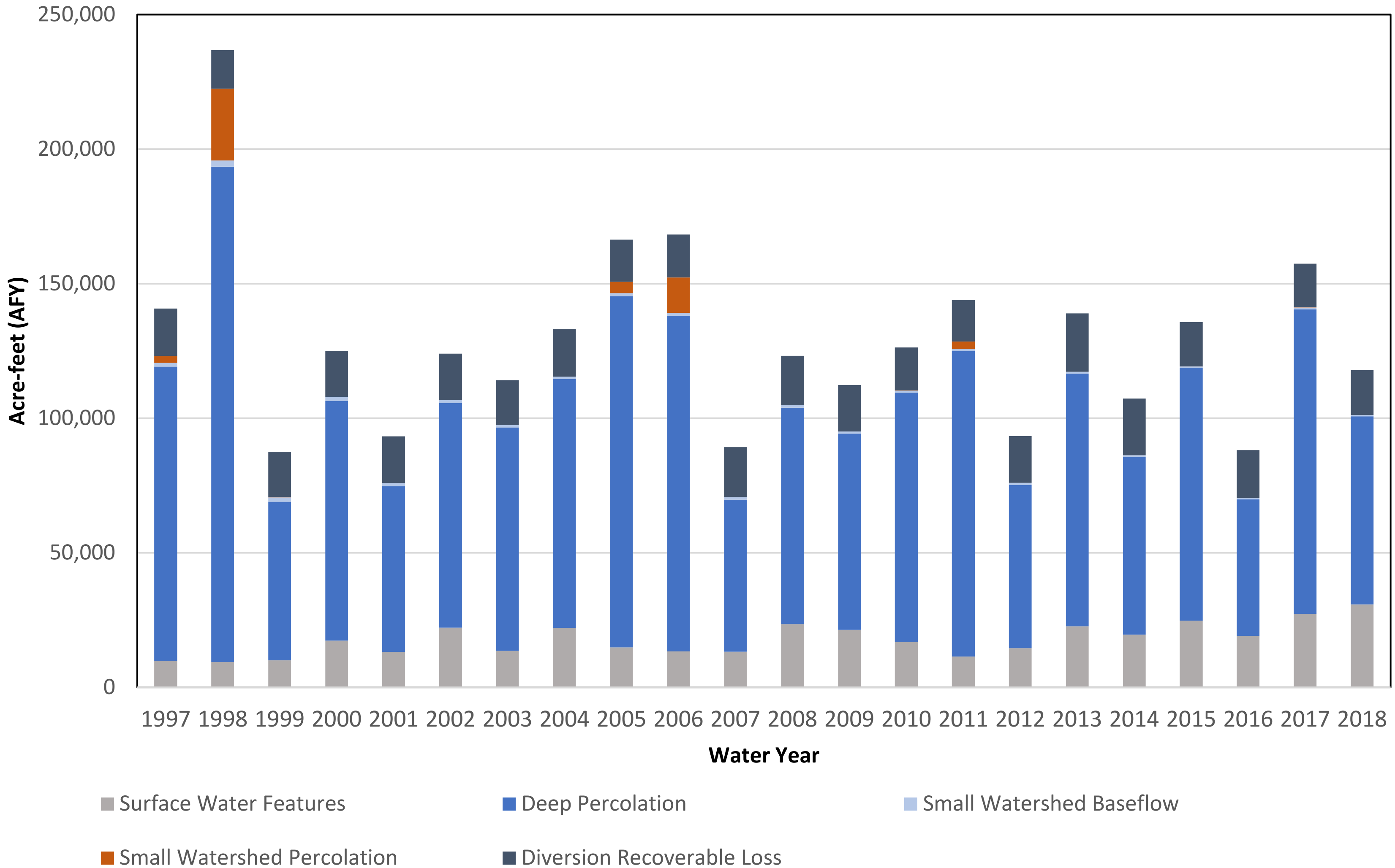

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Groundwater Budget Inflow Components
East Contra Costa Subbasin Base Period (1997-2018)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

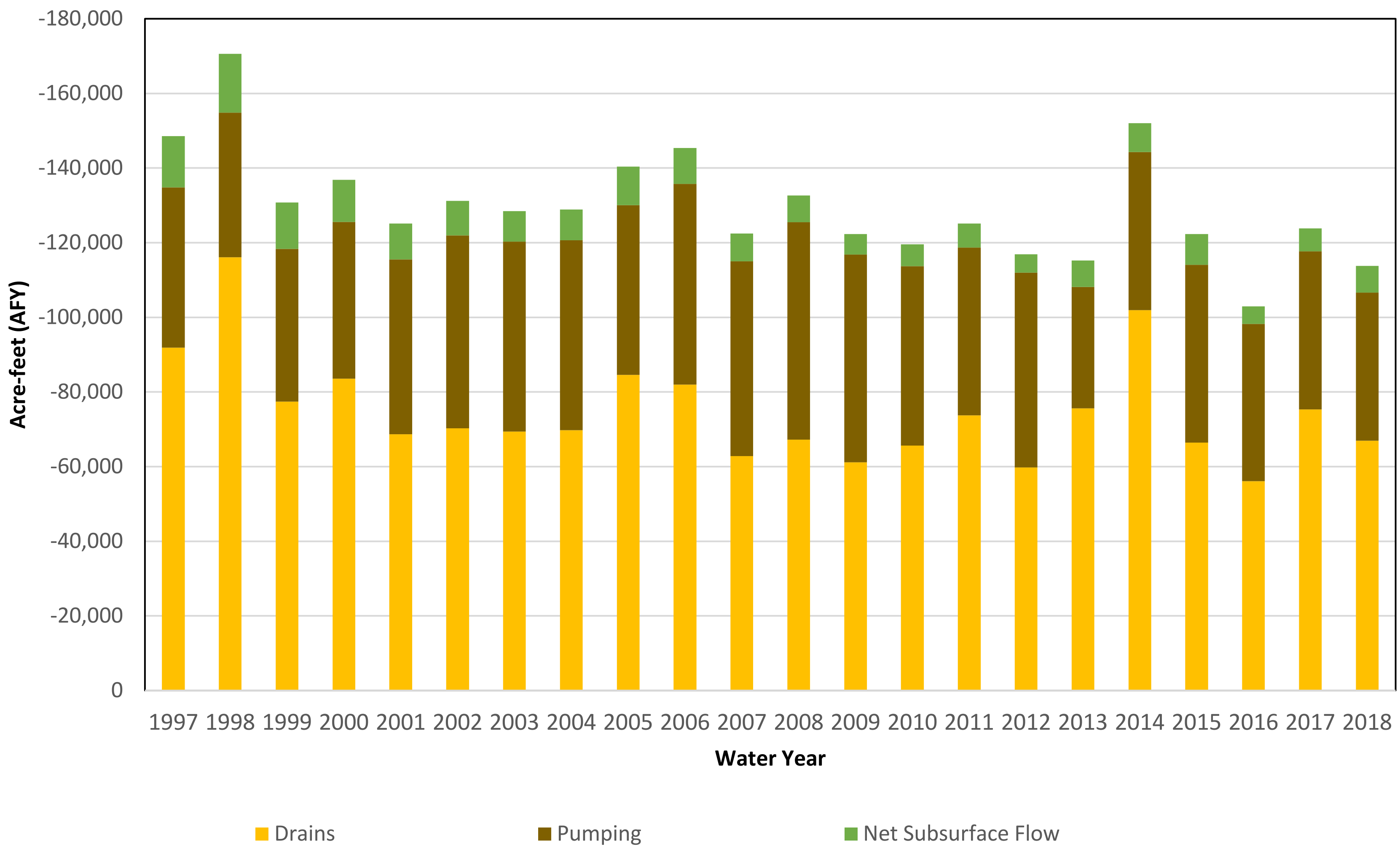
Figure 5-4

5.6.4 Quantification of Groundwater Outflow

The simulated groundwater budget described and quantified in **Section 5.6.3** indicates that the groundwater outflow components of the water budget consist of drains, groundwater pumping, and the net of subsurface lateral flow. These groundwater outflows are presented in tabular form in **Table 5-8** and graphically in **Figure 5-5**. The largest groundwater outflow components are tile drains and pumping. Net subsurface lateral flow makes up the remaining groundwater outflow components.

Table 5-8. Simulated Groundwater Outflows for Base Period, WY 1997-2018 (Units are in Acre-Feet per Year, AFY)

Water Year	Drains	Pumping	Net Subsurface Flow
1997	-91,890	-42,906	-13,738
1998	-116,071	-38,747	-15,817
1999	-77,389	-40,910	-12,461
2000	-83,593	-41,971	-11,243
2001	-68,650	-46,860	-9,614
2002	-70,279	-51,636	-9,302
2003	-69,411	-50,844	-8,204
2004	-69,792	-50,891	-8,218
2005	-84,609	-45,417	-10,363
2006	-82,001	-53,745	-9,590
2007	-62,782	-52,240	-7,426
2008	-67,260	-58,251	-7,163
2009	-61,145	-55,642	-5,523
2010	-65,629	-48,070	-5,897
2011	-73,746	-44,965	-6,426
2012	-59,777	-52,196	-4,888
2013	-75,616	-32,504	-7,131
2014	-101,955	-42,315	-7,768
2015	-66,415	-47,640	-8,290
2016	-56,081	-42,173	-4,664
2017	-75,304	-42,407	-6,123
2018	-66,938	-39,680	-7,161
Average	-74,833	-46,455	-8,500



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Groundwater Budget Outflow Components
East Contra Costa Subbasin Base Period (1997-2018)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

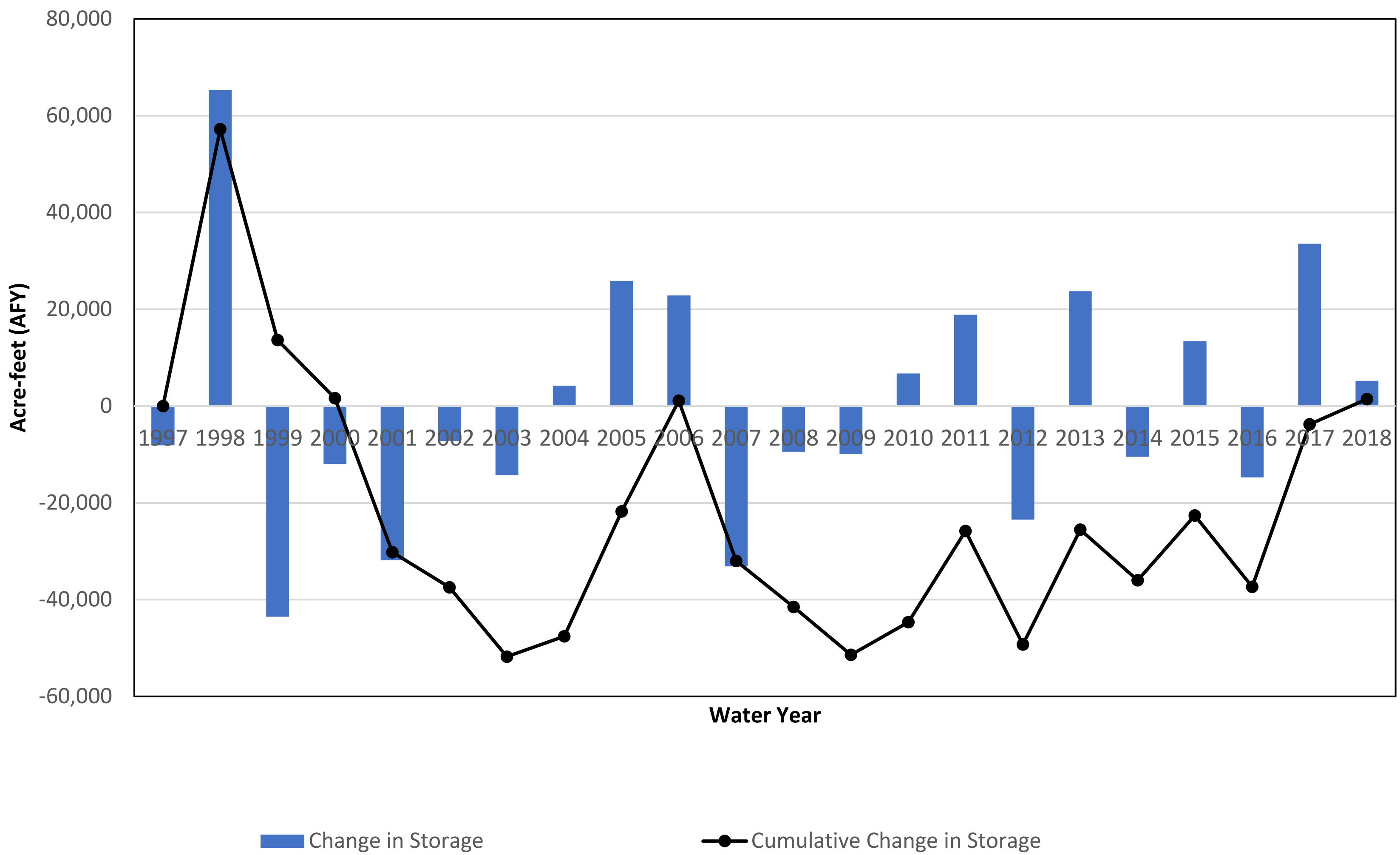
Figure 5-5

5.6.5 Change in Groundwater Storage

Quantification of the change in annual groundwater storage is presented on a water year annual basis in **Table 5-9**. The net annual simulated change in storage and the cumulative change in storage are plotted graphically in **Figure 5-6**. This figure illustrates that the basin is not in overdraft over the model Base Period (water years 1997-2018). The average change in storage over this period is almost 70 AFY. This represents 0.05% of the groundwater inflows and outflows that comprise the groundwater budget for the groundwater Subbasin.

Table 5-9. Simulated Groundwater Storage Component for Base Period,WY 1997-2018 (Units are in Acre-Feet per Year, AFY)

Water Year	Net Storage Change	Cumulative Change In Storage
1997	-8,095	0
1998	65,310	57,214
1999	-43,556	13,659
2000	-12,012	1,647
2001	-31,853	-30,206
2002	-7,272	-37,478
2003	-14,293	-51,771
2004	4,180	-47,591
2005	25,834	-21,757
2006	22,896	1,139
2007	-33,147	-32,008
2008	-9,469	-41,477
2009	-9,933	-51,410
2010	6,732	-44,679
2011	18,871	-25,807
2012	-23,432	-49,239
2013	23,716	-25,523
2014	-10,493	-36,016
2015	13,411	-22,605
2016	-14,713	-37,319
2017	33,549	-3,769
2018	5,216	1,447
Average	66	



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Groundwater Budget Storage Component
East Contra Costa Subbasin Base Period (1997-2018)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-6

5.6.6 Water Year Types

The ECCSim model Base Period of water years 1997 through 2018 contain wet, above normal, below normal, dry, and critical water year types (see **Table 5-10** below). This modeling tool can be used to quantify water budget components according to water year types. Water budget components including the annual supply, demand, and change in groundwater storage can vary according to water year type. The simulated agricultural and urban supply and demand amounts are averaged for the various water year types that occur during the base period. These values are quantified in **Table 5-11**, and show that during drier years, agricultural and urban demand is higher than in wetter years. Due to the reliably available agricultural surface water deliveries in the Subbasin, surface water supplies have not been impacted during dry years. The reliability of surface water is reflected in the fact that over half the available supply is based on pre-1914 water rights owned by City of Antioch, ECCID, and BBID (see **Section 4**, **Table 4-5**).

The change in groundwater storage can also be quantified based on water year type using the ECCSim tool. There is variability associated with groundwater storage changes that are not directly attributable to water year types. Changes in land use and supply mechanisms can have an impact on groundwater storage that may or may not have to do with the water year type. The box plot of average change in groundwater storage by water year type (**Figure 5-7)** shows that there is a general relationship of replenishing groundwater storage in wet years, and storage depletion in drier years. However, these relationships are not completely consistent. For example, in 1999 and 2000, storage depletion is indicated by the simulation (negative change in storage), despite being categorized as "above normal" water year type. Similarly, 2013 and 2015, which are considered "critical" water year types, have storage replenishment being simulated. These exceptions are due to the amount of surface water deliveries reported during those years and the amount of groundwater pumping needed to satisfy the demand.

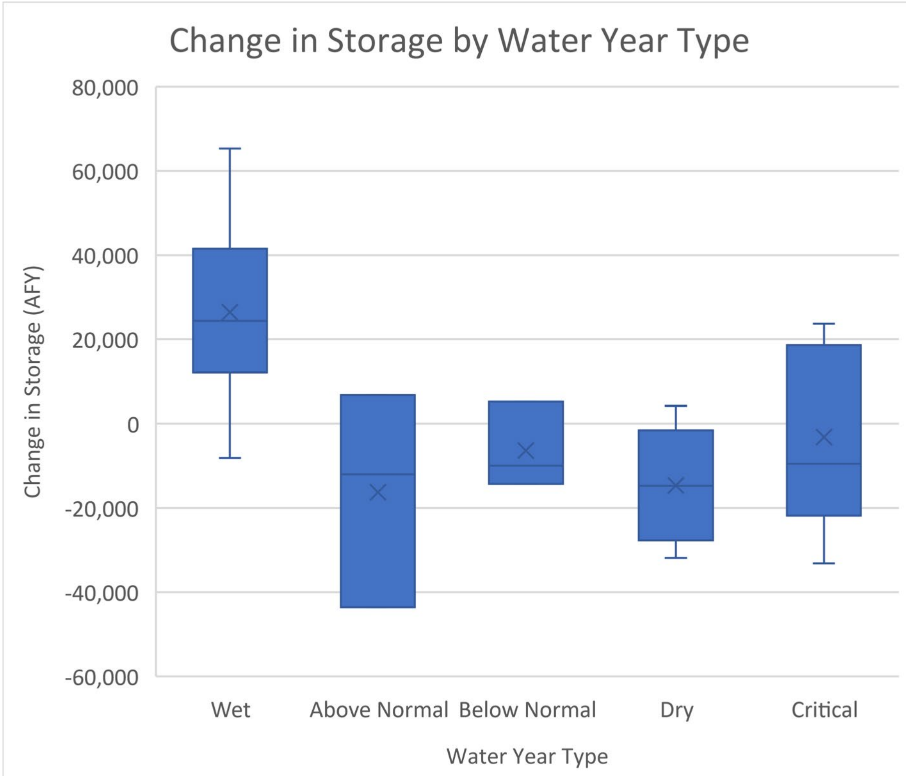
Table 5-10. Water Year Types During the Base Period

Water Year	Water Year Type	Water Year	Water Year Type
1997	W	2013	C
1998	W	2014	C
1999	AN	2015	C
2000	AN	2016	D
2001	D	2017	W
2002	D	2018	BN
2003	BN		
2004	D	W = Wet	
2005	W		
2006	W	D = Dry	
2007	C		
2008	C	AN = Above Normal	
2009	BN		
2010	AN	BN = Below Normal	
2011	W		
2012	D	C = Critical	

Table 5-11. Simulated Agricultural and Urban Supply and Demand (Units in Acre-Feet Per Year, AFY)

Water Year Type	Average Agricultural Demand	Average Agricultural Pumping	Average Agricultural Sw Deliveries	Average Agricultural Effective Precipitation	Average Urban Demand	Average Urban Pumping	Average Urban Sw Deliveries
Wet (6 simulated years in the base period)	155,221	35,690	119,603	46,141	29,321	9,007	19,925
Above Normal (3 simulated years in the base period)	162,181	35,028	126,851	41,878	28,946	8,623	19,473
Below Norma (3 simulated years in the base period)	167,090	40,020	127,388	36,044	29,958	8,702	21,288
Dry (5 simulated years in the base period)	173,905	40,385	132,664	32,680	29,990	8,367	21,389
Critical (5 simulated years in the base period)	184,415	36,520	147,764	27,339	32,847	10,070	21,773

Figure 5-7. Average Simulated Change in Storage by Water Year Type



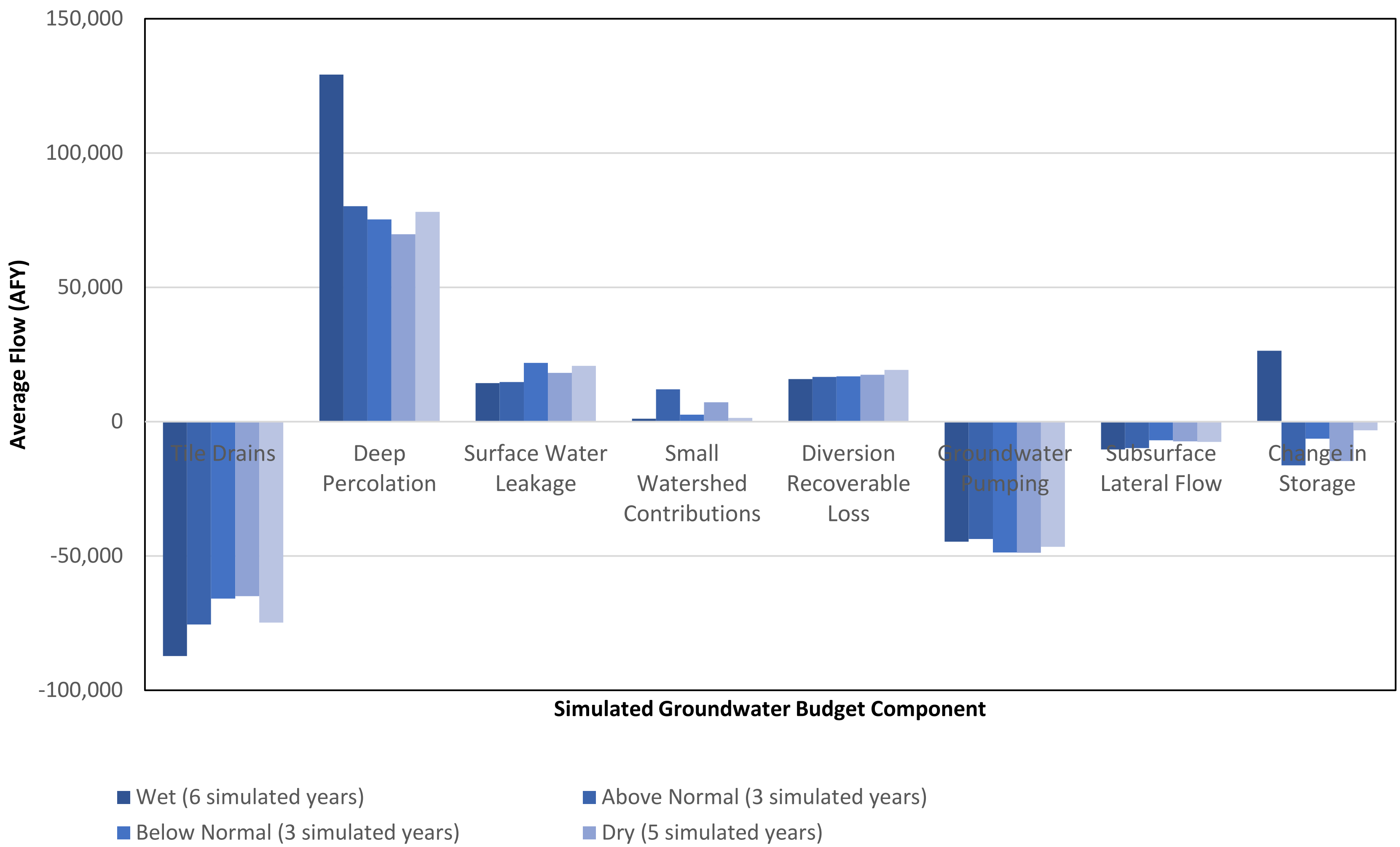
5.6.7 Historical Water Budget

The historical water budget quantified during the model Base Period extends from the most recently available information (water year 2018) to 1997, or 22 years. This period is sufficient to calibrate and reduce uncertainty with the ECCSim model, and therefore reduce the uncertainty of the future aquifer response to planned or anticipated changes in land use or hydrology (e.g., climate change or sea level rise). Historical conditions of hydrology, water demand, and surface water supply availability and reliability are the factors that have enabled the ECC Subbasin to operate well within the sustainable yield. In fact, the Subbasin has had stable groundwater levels with no apparent undesirable results as discussed in **Section 3**, **Basin Setting**.

The historical water budget can be summarized based on water year type, as quantified in the above section and further detailed below. **Table 5-12** quantifies the average groundwater budget components based on water year type. These values are also plotted in **Figure 5-8**. The historical groundwater budget by water year type indicates that tile drains increase the amount of flow leaving the Subbasin during wetter years. The data also show that deep percolation (groundwater recharge) typically increases during wetter years. Surface water leakage (downward migration of surface water) and recoverable losses from diversions increase during drier years as the hydraulic gradient between the water table and surface water bodies increases. The contribution from small watersheds decreases during drier years. Groundwater pumping remains relatively constant regardless of water year type. Subsurface lateral flow also remains generally constant between water year types but shows a slight increase in the amount of water leaving the Subbasin during wetter years. The change in storage does not seem to be directly correlated with water year type, as the basin is full, with stable groundwater levels, and thus operating sustainably.

Table 5-12. Average Simulated Groundwater Budget Components by Water Year Type (Units in Acre-Feet Per Year, AFY)

Water Year Type	Tile Drains	Deep Percolation	Surface Water Leakage	Small Watershed Contributions	Diversion Recoverable Loss	Groundwater Pumping	Subsurface Lateral Flow	Change In Storage
Wet (6 simulated years)	-87,270	129,214	14,358	1,101	15,855	-44,698	-10,343	26,394
Above Normal (3 simulated years)	-75,537	80,228	14,769	12,067	16,628	-43,651	-9,867	-16,279
Below Normal (3 simulated years)	-65,831	75,248	21,920	2,558	16,895	-48,722	-6,963	-6,337
Dry (5 simulated years)	-64,916	69,809	18,202	7,198	17,506	-48,751	-7,337	-14,618
Critical (5 simulated years)	-74,806	78,152	20,758	1,387	19,266	-46,590	-7,556	-3,196



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Average Groundwater Budget Components During the Base Period (1997-2018) by Water Type

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-8

5.6.8 Summary of Water Year 2015 Water Budget Results

For the representative recent water year 2015, the following simulated water budget results are presented. The groundwater budget components for the entire ECC Subbasin are presented in **Table 5-13**; the root zone budget components are presented in **Table 5-14**; and the land and water use budget components are presented in **Table 5-15**.

Table 5-13. Groundwater Budget Components for Water Year 2015 (AFY)

Water Year	Change In Storage	Inflow Components					Outflow Components		
		Surface Water Features	Deep Percolation	Small Watershed Baseflow	Small Watershed Percolation	Diversion Recoverable Loss	Drains	Pumping	Net Subsurface Flow
2015	13,411	24,787	93,960	572	0	16,452	-66,415	-47,640	-8,290

Table 5-14. Root Zone Budget for Water Year 2015

Land Use Type	Land Use Area (Acres)	Precipitation (Afy)	Applied Water (Afy)	Evapotranspiration (Afy)	Percolation (Afy)
Agricultural	41,329	42,671	166,759	163,801	46,733
Urban	22,585	24,714	25,660	18,676	32,463
Native and Riparian Vegetation	45,236	46,561	0	35,228	11,194

Table 5-15. Land and Water Use Budget Components for Water Year 2015

Agricultural Supply Requirement	Agricultural Pumping	Agricultural Deliveries	Agricultural Shortage	Urban Supply Requirement	Urban Pumping	Urban Deliveries	Urban Shortage
166,604	39,747	127,011	-155	25,924	7,893	17,768	264

5.6.9 Projected 50-Year Water Budget

Six different future scenarios were developed to estimate the projected 50-year water budget as follows:

- The first future scenario relies on county-provided land use changes to accommodate anticipated urban growth for the year 2036. This future condition is maintained for all the projected 50-year scenarios, refer to **Figure 5-9**.
- The second future scenario uses both the anticipated land use change as well as adjustments for climate change. Following DWR's guidance document (DWR, 2018), climate adjustments were made to simulated evapotranspiration, precipitation, and surface water levels and delivery model input files using the 2070 central tendency climate change model, refer to **Figure 5-10**.
- The third future scenario uses the anticipated land use change and sea level rise based on repeated hydrology (no climate change) and sea level rise adjustments based on DWR's guidance documentation. Sea level rise is only applied to model elements in the northern surface water body areas that are below sea level, refer to **Figure 5-11**.
- The fourth future scenario combines all three changes; land use change to accommodate urban growth, climate change (using the 2070 central tendency), and sea level rise, refer to **Figure 5-12**.
- The fifth and sixth future scenarios incorporate the anticipated land use change as well as two extreme climate change models, using climate adjustments for evapotranspiration, precipitation, and surface water levels and delivery model input files. The two scenarios were developed to test the effects of 1) the 2070 wetter with moderate warming climate scenario, and 2) the 2070 drier with extreme warming climate scenario, refer to **Figure 5-13**, and **Figure 5-14**, respectively.

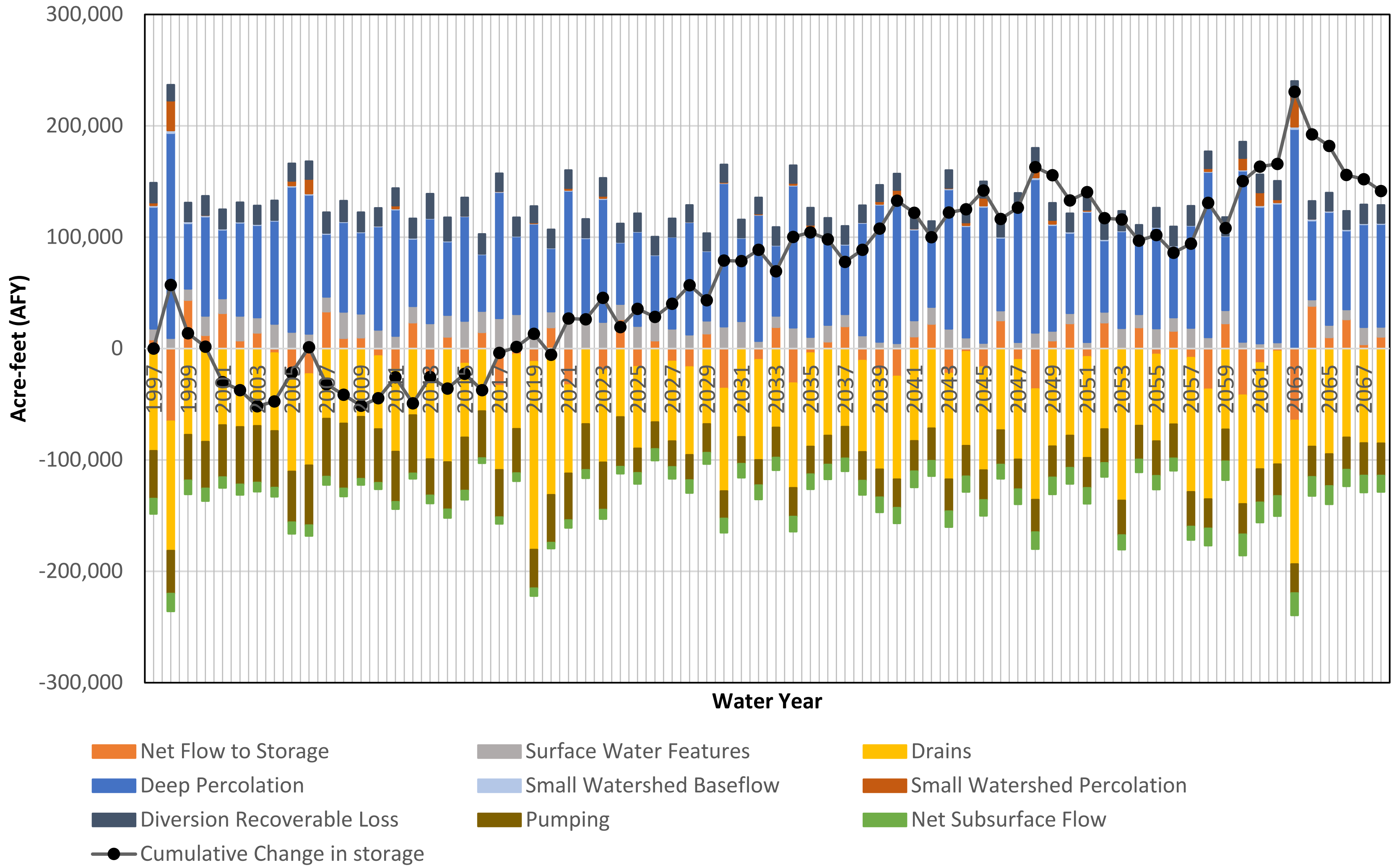
Projected water demand, surface water supply, and metered urban pumping were based on previously developed amounts presented in **Section 4**, **Table 4-5**. ECCSim was used to estimate agricultural and urban demands based on population growth and land use changes and estimated groundwater pumping that would be necessary to meet demands that anticipated surface water deliveries were unable to supply. Hydrology was repeated (or adjusted for climate change) using existing base period model inputs from the historic period of 1954 to 2003. Water year types and patterns of preceding water year types were developed to repeat base period hydrology for the 50-year time period and applying those hydrology values to the future period of 2019-2068 (**Table 5-16**).

Table 5-16. Future Scenario Water Year Types for Repeated and Adjusted Hydrology

Future Scenario Water Year	Assigned Historic Simulated Water Year	DWR Reference Year for Adjusted Hydrology	Projected Water Year Type[16]
2019	2011	1954	W
2020	2012	1955	D
2021	2017	1956	W
2022	2018	1957	BN
2023	2017	1958	W
2024	2012	1959	D
2025	2013	1960	C
2026	2014	1961	C
2027	2009	1962	BN
2028	2010	1963	AN
2029	2012	1964	D
2030	2017	1965	W
2031	2018	1966	BN
2032	2011	1967	W
2033	2012	1968	D
2034	2017	1969	W
2035	2010	1970	AN
2036	2009	1971	BN
2037	2012	1972	D
2038	2010	1973	AN
2039	2011	1974	W
2040	2011	1975	W
2041	2013	1976	C
2042	2014	1977	C
2043	2017	1978	W
2044	2010	1979	AN
2045	2011	1980	W
2046	2012	1981	D
2047	2011	1982	W

[16] W indicates "wet", AN indicates "above normal", BN indicates "below normal", D indicates "dry", and C indicates "critical."

Future Scenario Water Year	Assigned Historic Simulated Water Year	DWR Reference Year for Adjusted Hydrology	Projected Water Year Type[16]
2048	2017	1983	W
2049	2010	1984	AN
2050	2001	1985	D
2051	2011	1986	W
2052	2007	1987	C
2053	2008	1988	C
2054	2007	1989	C
2055	2008	1990	C
2056	2007	1991	C
2057	2008	1992	C
2058	2005	1993	W
2059	1994	1994	C
2060	1995	1995	W
2061	1996	1996	W
2062	1997	1997	W
2063	1998	1998	W
2064	1999	1999	AN
2065	2000	2000	AN
2066	2001	2001	D
2067	2002	2002	D
2068	2003	2003	BN



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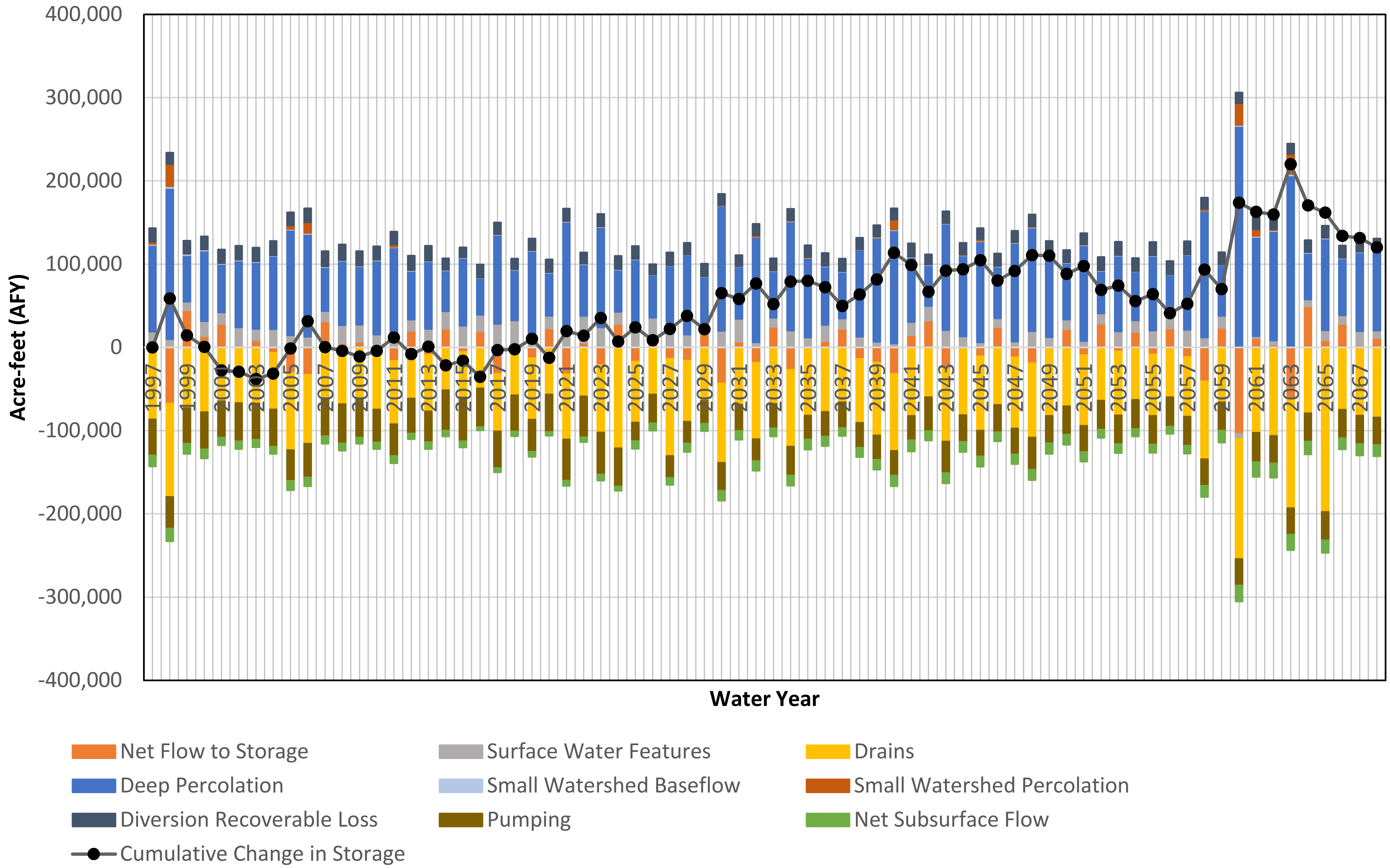
Groundwater Budget for East Contra Costa Subbasin Future Land Use Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-9



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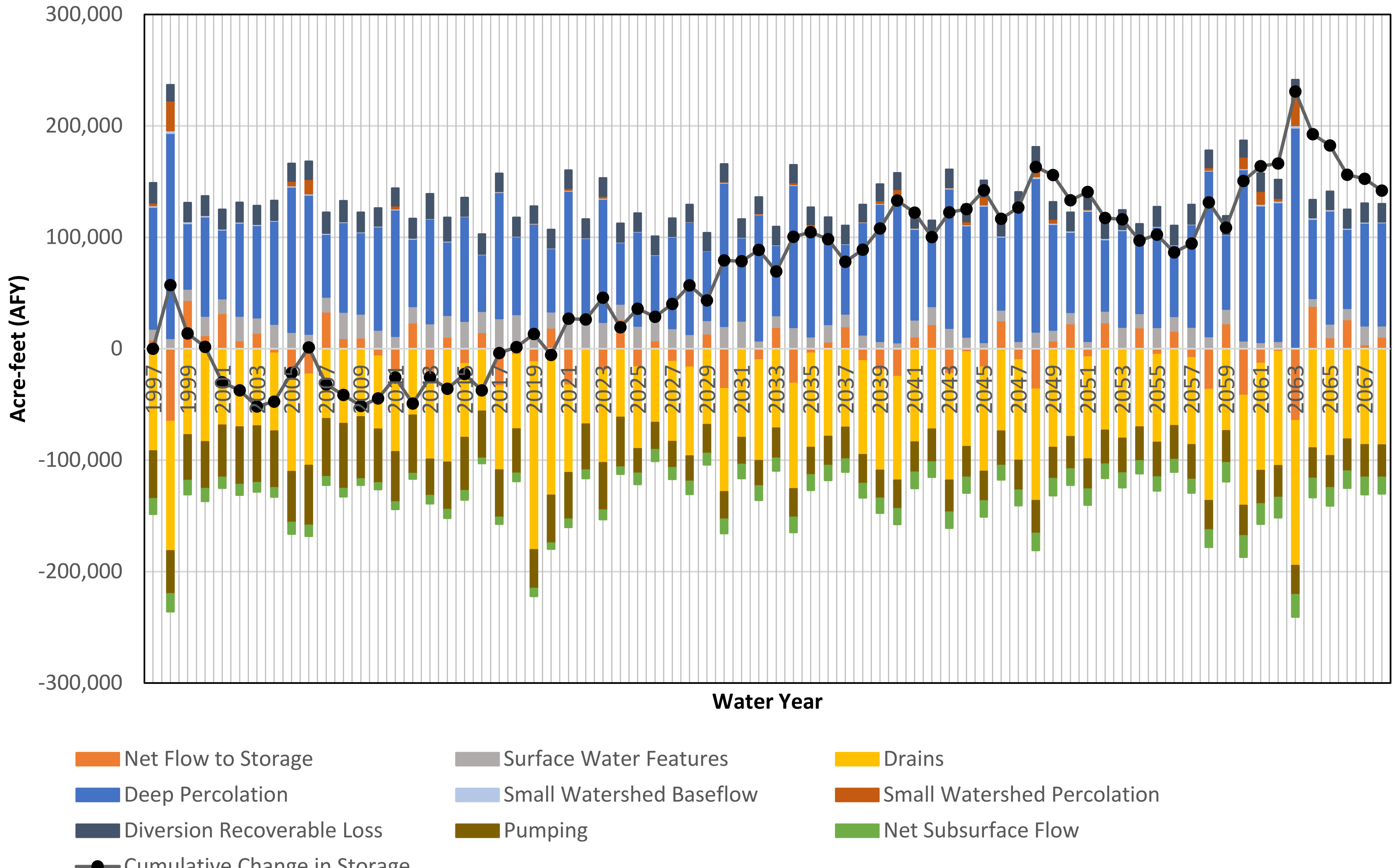
Groundwater Budget for East Contra Costa Subbasin Future Land Use and Climate Change Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-10



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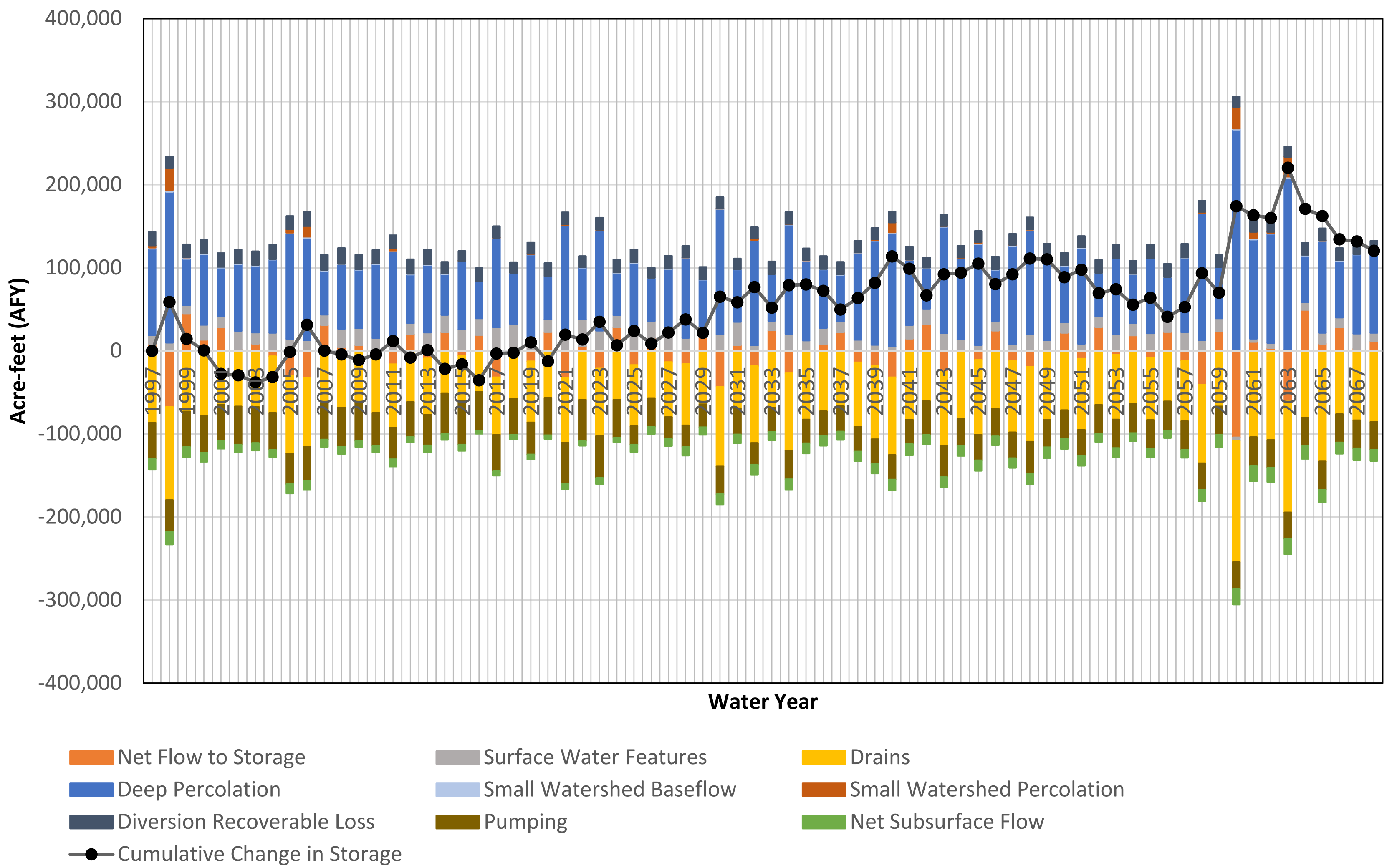
Groundwater Budget for East Contra Costa Subbasin
Future Land Use and Sea Level Rise Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-11



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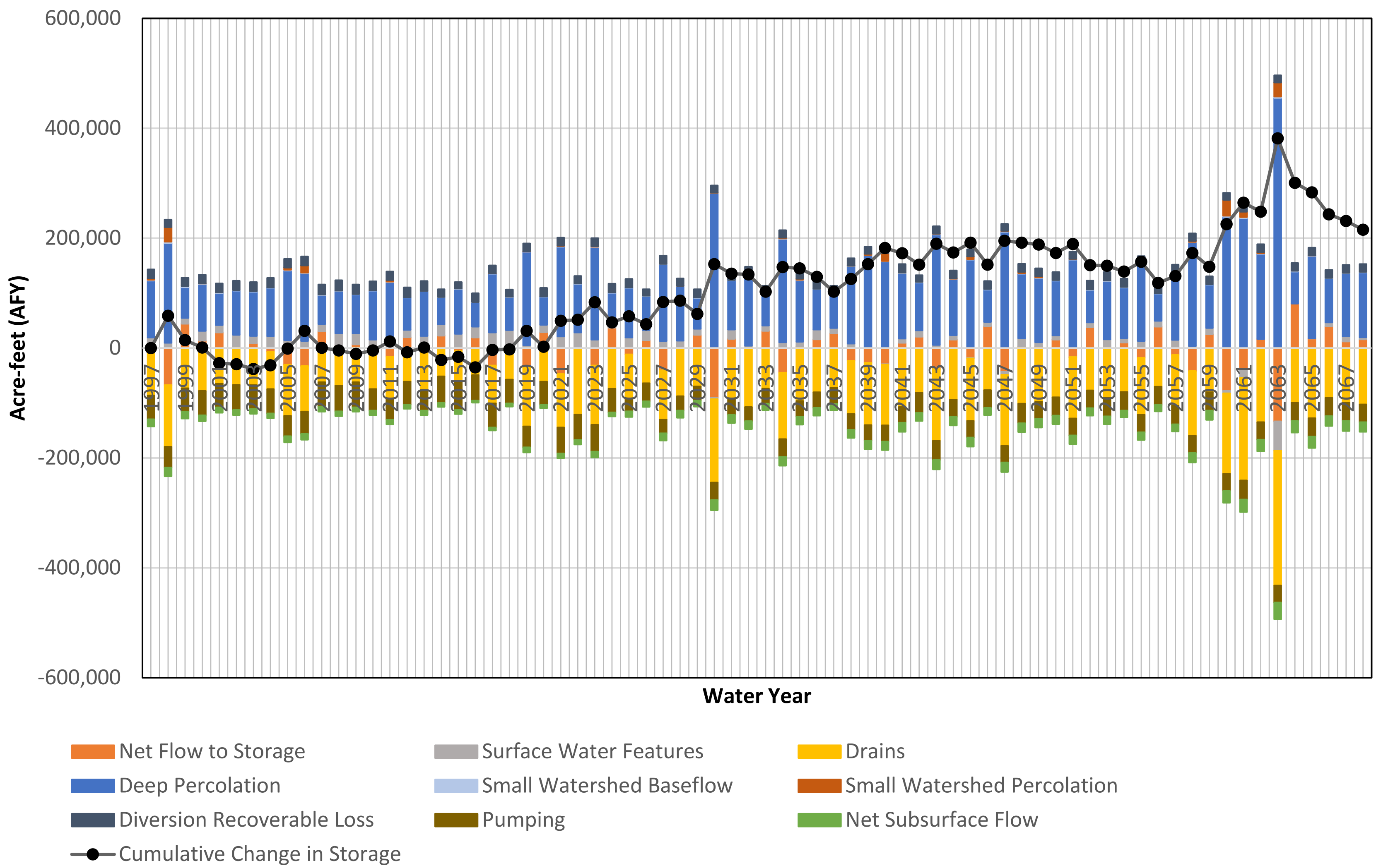
Groundwater Budget for East Contra Costa Subbasin
Future Land Use, Climate Change, and Sea Level Rise Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-12



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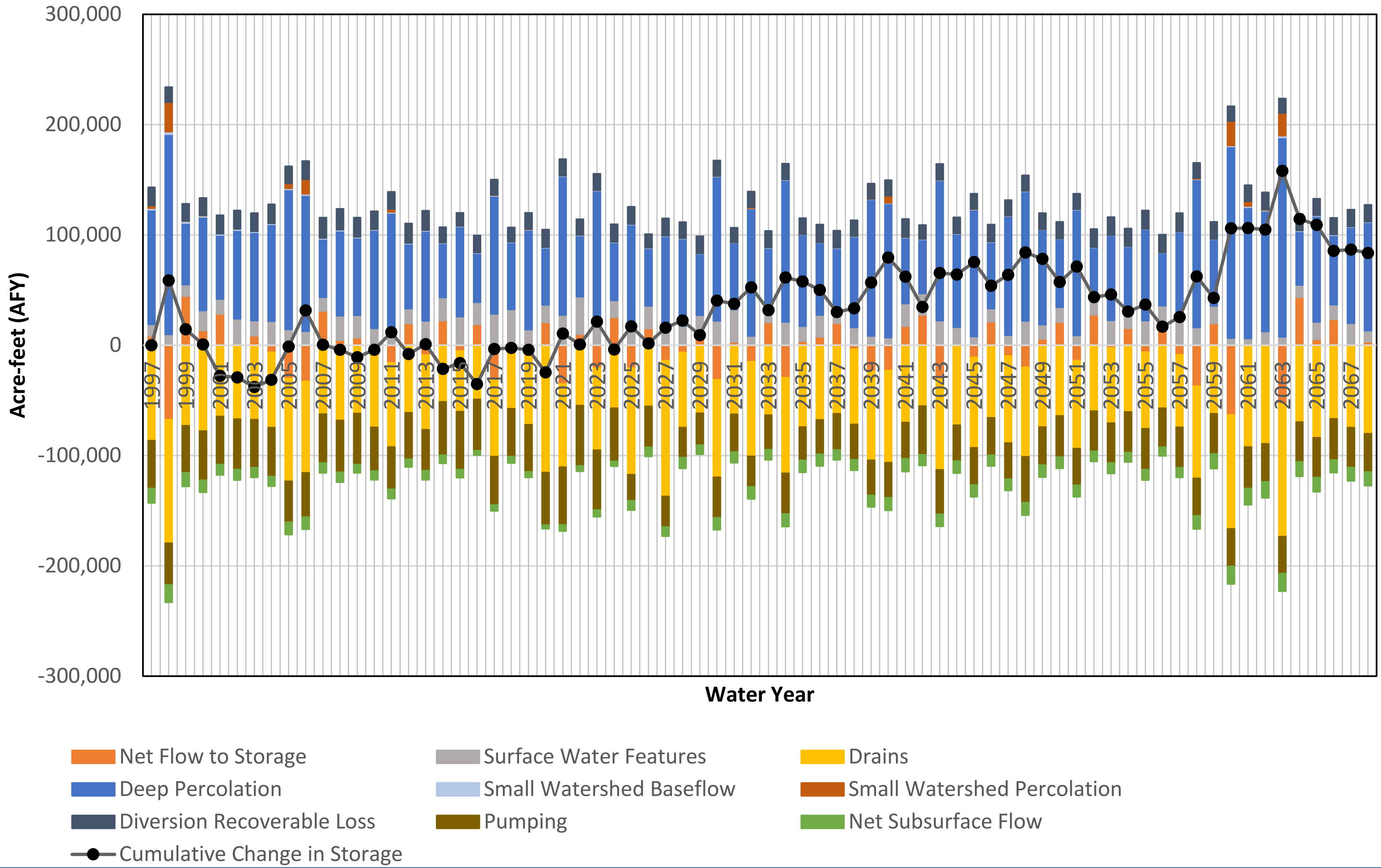
Groundwater Budget for East Contra Costa Subbasin Future Land Use and Climate Change (Wet) Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-13



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Groundwater Budget for East Contra Costa Subbasin
Future Land Use and Climate Change (Dry) Scenario (1997-2068)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-14

5.6.10 Water Budget Summaries for Future Scenarios

The average simulated land and water use budget components are presented in **Table 5-17** for the four 50-year future scenarios and the model Base Period. The simulated root zone water budget components are presented in **Table 5-18**, and the simulated average groundwater budget components are presented in **Table 5-19**. These tables indicate that land use changes have the most impact on water budget components relative to the Base Period. The future land use change (urban growth), climate change, and sea level rise result in changes in the water budget as follows:

- Groundwater pumping is lower on average during the future scenarios due to less agricultural demand as urban growth replaces agricultural land.
- There are less surface water contributions to groundwater, but more water leaving the groundwater systems via drains in the future scenarios compared to the baseline scenario.
- There is slightly more precipitation during the climate change scenarios, which reduces the amount of applied water for agricultural and outdoor landscaping urban demands.
- Sea level rise has very little impact to the groundwater budget, causing a slight decrease in the amount of groundwater exiting the system through drains; increasing the contribution of surface water to groundwater; no major changes to groundwater storage or subsurface lateral flow result from this scenario of sea level rise.

Table 5-17. Simulated Average Future Land and Water Use Budget Components (Units in Acre-Feet per Year, AFY)

Land And Water Use Budget Flow Component	Base Period (Wy 1997-2018)	Future Land Use Scenario (Wy 2019-2068)	Future Land Use and Climate Change Scenario (Wy 2019-2068)	Future Land Use and Sea Level Rise Scenario (Wy 2019-2068)	Future Land Use, Climate Change, And Sea Level Rise (Wy 2019-2068)	Future Land Use and Wet Climate Change Scenario (Wy 2019-2068)	Future Land Use and Dry Climate Change Scenario (Wy 2019-2068)
Ag. Supply Requirement	162,135	133,678	152,255	133,678	151,626	146,011	161,986
Ag. Pumping	35,742	14,627	12,832	14,627	12,829	11,488	13,120
Ag. Deliveries	126,223	117,735	110,862	117,735	110,236	108,385	120,305
Ag. Demand Shortage	170	1,315	28,561	1,315	28,561	26,138	28,561
Urban Supply Requirement	28,268	35,543	35,543	35,543	35,543	35,543	35,543
Urban Pumping	8,449	14,339	21,124	14,339	21,124	21,111	21,124
Urban Deliveries	19,352	22,759	15,843	22,759	15,843	15,883	15,843
Urban Water Demand Shortage	468	-1,554	-1,424	-1,554	-1,424	-1,450	-1,424

Table 5-18. Simulated Average Root Zone Budget Components (Area in acres, Flows in AFY)

Root Zone Budget Flow Component	Base Period (Wy 1997-2018)	Water Year 2015	Future Land Use Scenario (Wy 2019-2068)	Future Land Use and Climate Change Scenario (Wy 2019-2068)	Future Land Use and Sea Level Rise Scenario (Wy 2019-2068)	Future Land Use, Climate Change, And Sea Level Rise Scenario (Wy 2019-2068)	Future Land Use and Wet Climate Change Scenario (Wy 2019-2068)	Future Land Use and Dry Climate Change Scenario (Wy 2019-2068)
Agricultural Land Use Area (acres)	48,057	41,329	36,171	36,171	36,171	36,171	36,171	36,171
Ag. Precipitation (+)	55,998	42,671	43,681	46,131	43,681	46,131	57,301	40,900
Ag. Applied Water (+)	161,965	166,759	132,363	123,694	132,363	123,065	119,872	129,561
Ag. ET (-)	170,998	163,801	137,764	134,522	137,764	133,841	131,369	137,784
Ag. Percolation (-)	47,182	46,733	38,275	35,302	38,275	35,354	45,803	32,678
Urban Land Use Area (acres)	20,045	22,585	36,038	36,038	36,038	36,038	36,038	36,038
Urban Precipitation (+)	22,929	24,714	43,088	45,517	43,088	45,517	58,384	40,416
Urban Applied Water (Landscaping) (+)	27,800	25,660	37,098	36,967	37,098	36,967	36,993	36,558
Urban ET (-)	19,516	18,676	31,714	31,638	31,714	31,638	31,823	30,143
Urban Percolation (-)	31,539	32,463	48,654	51,029	48,654	51,029	63,737	47,014

Root Zone Budget Flow Component	Base Period (Wy 1997-2018)	Water Year 2015	Future Land Use Scenario (Wy 2019-2068)	Future Land Use and Climate Change Scenario (Wy 2019-2068)	Future Land Use and Sea Level Rise Scenario (Wy 2019-2068)	Future Land Use, Climate Change, And Sea Level Rise (Wy 2019-2068)	Future Land Use and Wet Climate Change Scenario (Wy 2019-2068)	Future Land Use and Dry Climate Change Scenario (Wy 2019-2068)
Native & Riparian Veg. Land Use Area (acres)	41,048	45,236	36,942	36,942	36,942	36,942	36,942	36,942
Native & Riparian Veg. Precipitation (+)	46,290	46,561	44,317	46,669	44,317	46,669	58,689	41,146
Native & Riparian Veg. ET (-)	37,142	35,228	35,783	36,255	35,783	36,255	39,236	32,700
Sum of Native & Riparian Veg. Percolation (-)	9,042	11,194	8,535	10,414	8,535	10,414	19,454	8,447

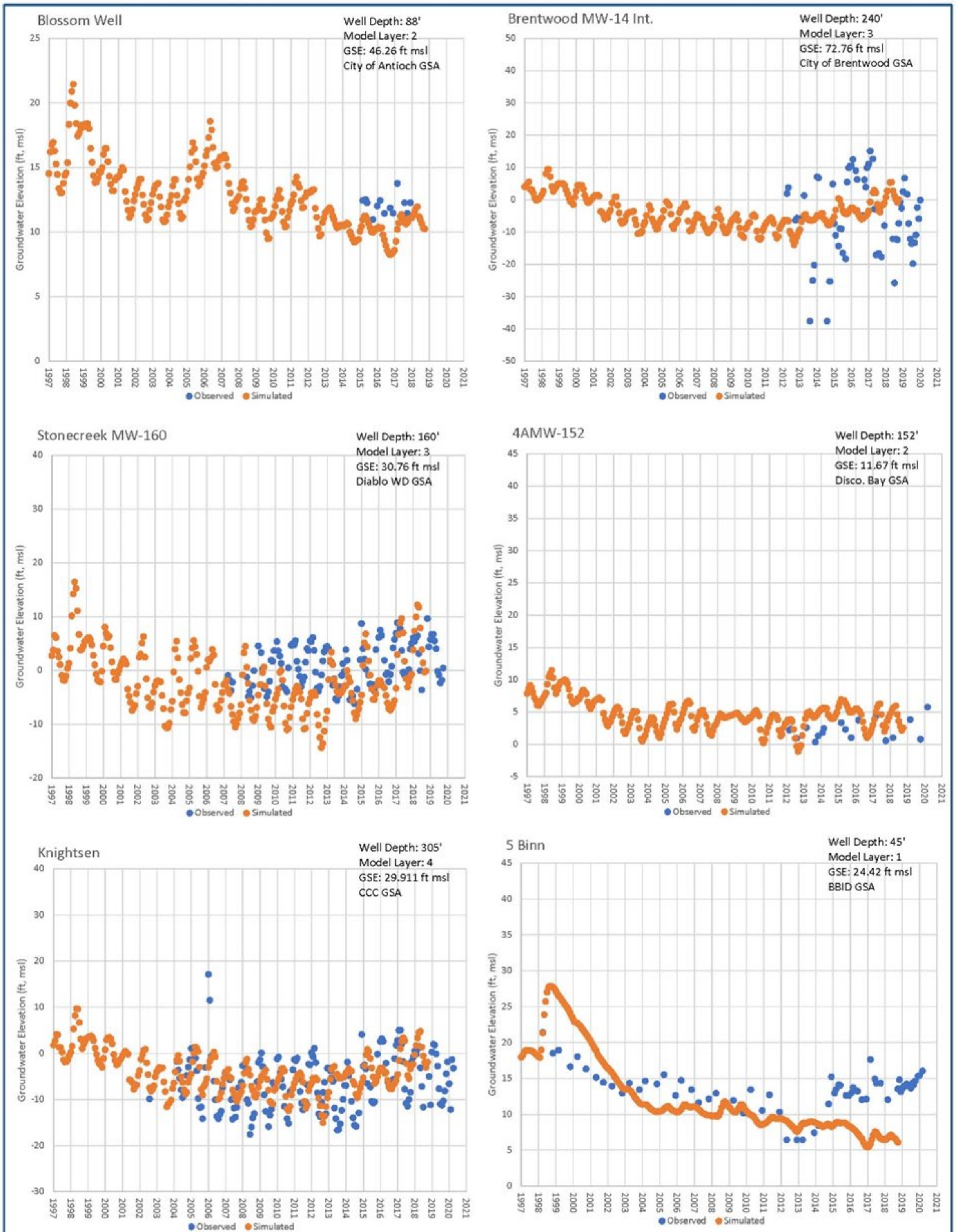
Table 5-19. Simulated Average Groundwater Budget Component Flows (Units in Acre-Feet per Year, AFY)

Groundwater Budget Flow Component	Base Period (Wy 1997-2018)	Water Year 2015	Future Land Use Scenario (Wy 2019-2068)	Future Land Use and Climate Change Scenario (Wy 2019-2068)	Future Land Use and Sea Level Rise Scenario (Wy 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (Wy 2019-2068)	Future Land Use and Wet Climate Change Scenario (Wy 2019-2068)	Future Land Use and Dry Climate Change Scenario (Wy 2019-2068)
Drains	-74,833	-87,732	-87,732	-84,026	-86,521	-81,068	-103,007	-75,807
Surface Water Features	17,773	12,517	12,517	13,859	13,300	14,644	6,880	16,148
Deep Percolation	90,069	95,701	95,701	97,002	95,702	97,054	129,520	88,301
Small Watershed Baseflow	976	880	880	647	880	647	787	452
Small Watershed Percolation	2,260	2,051	2,051	1,645	2,051	1,645	2,124	1,132
Diversion Recoverable Loss	17,253	15,965	15,965	14,398	15,965	14,327	14,121	14,774
Pumping	-46,455	-28,966	-28,966	-33,956	-28,966	-33,952	-32,599	-36,106
Net Subsurface Flow	-8,500	-12,975	-12,975	-11,423	-12,985	-11,432	-14,847	-10,013
Net Storage Change	66	2,799	2,799	2,451	2,807	2,457	4,360	1,721

5.7 Model Calibration and Uncertainty

The ECCSim model was calibrated to match measured groundwater levels at various monitoring locations and depths throughout the model domain and Subbasin area. Due to the engineered nature of surface water features in this area and therefore their simulation, calibration using surface water elevations and flows were not performed. Matching simulated groundwater levels to actual observed groundwater levels in specific wells with known depths is a useful measure of the appropriateness of the model to be used as a tool for determining sustainability under various stresses. Thirty-three wells were used to calibrate the model. Most wells were calibrated to match measured water levels within 10 feet. Many wells were calibrated to match with even less uncertainty. Some wells have better matches than others, and attempts were made to adjust aquifer parameters to accommodate better matches on a regional scale. Local changes to aquifer parameters just to improve those results were avoided; rather, the best assessment of hydrogeologic conditions was made leaving the opportunity for future data acquisition to update the model and possibly improve calibration in those areas.

The full set of simulated and observed groundwater levels for all calibration wells is provided in the model report found in **Appendix 5a**. A subset of these calibration plots are provided here (**Figure 5-15**) to illustrate favorable matches throughout the model domain both vertically and laterally. Another plot that shows the scatter plot of measured versus simulated groundwater levels using all measurements over the entire simulation period (**Figure 5-16**).



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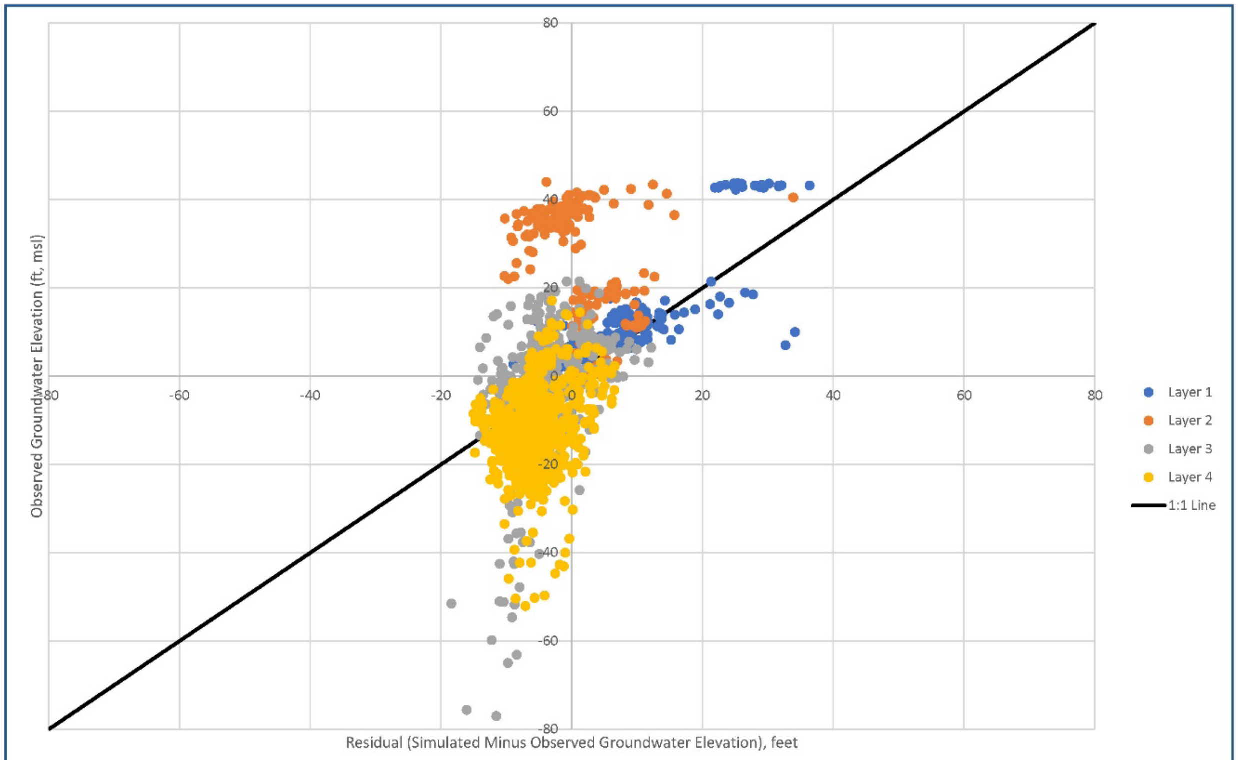
Subset of Calibration Plots from ECCSim

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-15



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Simulated vs. Observed Groundwater Elevations, By Layer

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-16

5.7.1 Verification of Shallow Zone Results

- Examination of DuPont site data as requested by DWD (TBD)

5.8 Sensitivity Analysis (TBD)

- Development and explanation of model sensitivity runs for the integrated hydrologic model in order to help determine sustainable yield.
- Testing the hydraulic connectivity between layers during a high pumping scenario (the sustainable yield model run) by decreasing the vertical hydraulic conductivity.
- Results of sensitivity runs.

5.9 Sustainable Yield Scenario

In order to estimate the sustainable yield of the ECC Subbasin, the future land use change scenario was utilized with the ECCSim tool. Surface water diversions were reduced and substituted with increased groundwater extraction. This trial-and-error process was repeated until the following negative impacts occurred in relation to the historical baseline:

- The average change in storage indicated aquifer depletion;
- The surface water contributions to groundwater indicated stream depletion;
- The gradient for subsurface lateral flow changed such that flow out of the Subbasin reversed with flow into the ECC Subbasin from neighboring subbasins.

With regard to surface water interactions, it is possible to identify the range of stream depletion that has been occurring in the past and use those quantities to identify a significant change in the sustainability scenario. This does not necessarily mean that a change from the historic baseline represents undesirable results, only that greater pumping is offset by a contribution from the stream depletion source that is outside the historic range. The range of historical surface water contribution to the ECC Subbasin in the Base Period was estimated at between: 9,481 to 30,852 AFY. Here, a positive value indicates a contribution to groundwater storage from stream surface water sources.

Similar to the stream depletion factor, the range of historic simulated annual flow to other basins, or subsurface lateral flow, is between -4,664 to -15,817 AFY. Here, a negative value indicates flow out of the ECC Subbasin. To estimate sustainable yield, the average surface water contribution water budget component and subsurface lateral flow attempted to be within the range of approximate simulated historic values.

The quantification of cumulative change in storage combined with the criteria for surface water contribution and subsurface lateral flow, allow for a better understanding of what levels of groundwater pumping amounts could result in adverse effects such as storage depletion. Average annual groundwater pumping in the model Base Period accounts was approximately 46,500 AFY.

As a perspective on historic and current basin conditions, this annual average pumping rate has occurred with no apparent undesirable results as defined under SGMA. In fact, the Subbasin relies heavily on drains to remove excess groundwater which is a function of the Delta setting in which land is largely near sea level, groundwater is encountered at shallow depths, sometimes only a few feet, and streams and rivers are hydraulically connected to the aquifer system. Reducing the surface water deliveries and increasing groundwater pumping allows the basin to be stressed in a manner that alters the historic balance in the water budget components.

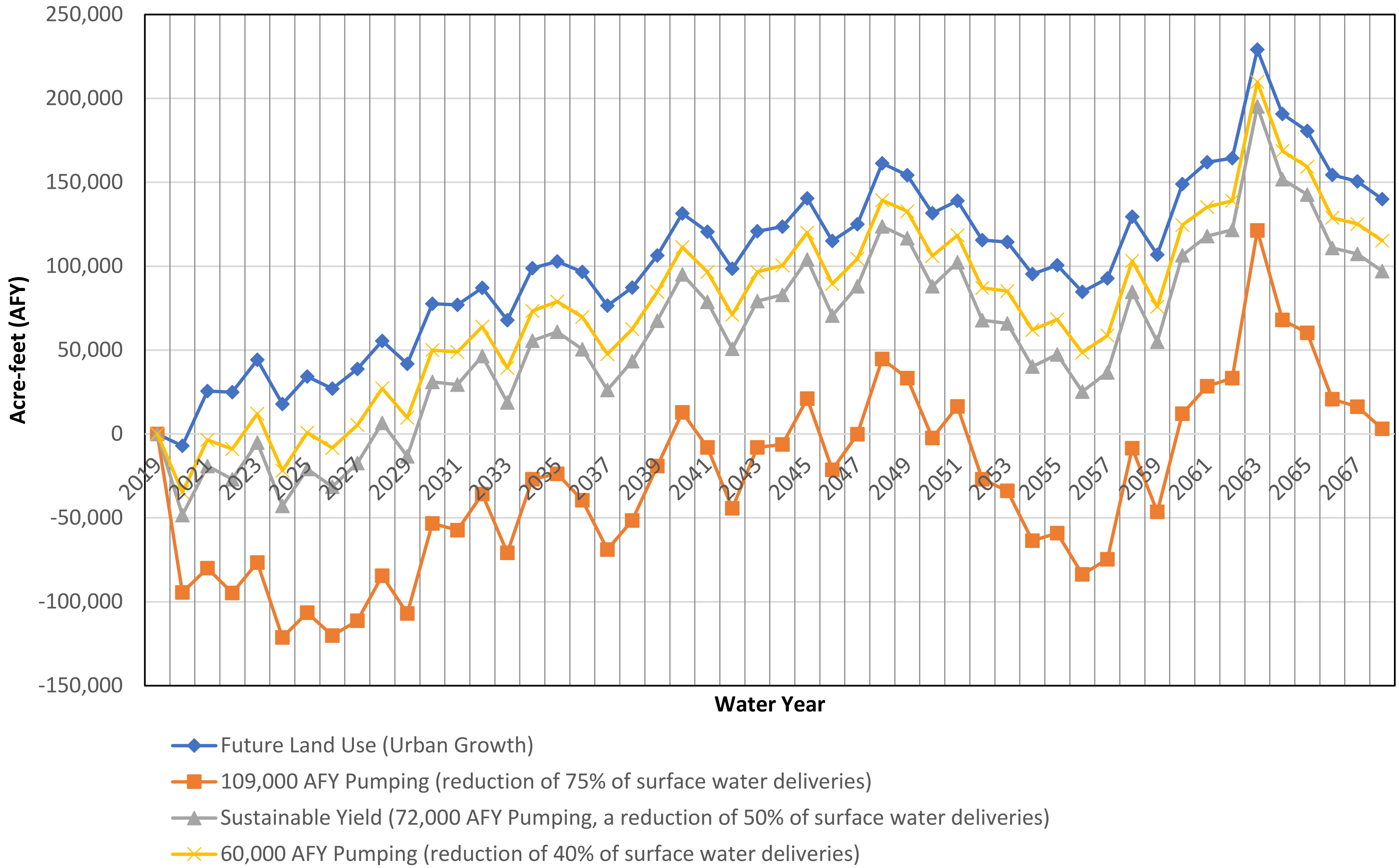
Table 5-20 shows average groundwater budget components for a subset of the sustainable yield model runs used to develop an estimate of sustainable yield, using groundwater budget terms within the range of values seen during the Base Period. The cumulative change in storage is plotted for selected sustainable yield scenario runs to test the Increased pumping to levels to aquifer storage depletion or replenishment (**Figure 5-17**). The sustainable yield value of 72,000 AFY satisfies the criteria for not negatively impacting surface water features or altering flow patterns between neighboring subbasins, but still results in aquifer replenishment over time. Sustained pumping of 72,000 AFY will result in slightly less reliance on drains, while maintaining a cumulative change in storage above zero without depleting surface water or negatively impacting neighboring subbasins.

5.9.1 ECC Subbasin Sustainable Yield

In summary, the sustainable yield for the ECC Subbasin is approximately 72,000 AFY. This amount of groundwater extraction does not result in storage depletion, does not result in surface water depletion beyond levels seen in the model Base Period, reduces the drain outflow, and reduces reliance on surface water deliveries. At higher levels of pumping, the modeling indicates the potential to increase streamflow depletion and inter-basin flow beyond historical baselines. Like the Base Period scenario, a chronic decline in groundwater storage was not a factor in the sustainable yield threshold. The margin between the average pumping rate in the subbasin during the base period (46,455 AFY) and the quantified sustainable yield of 72,000 AFY provides an ability to meet short-term surface water supply shortages in dry to critically dry years through increased groundwater pumping. This margin is a hallmark of effective conjunctive use of surface water and groundwater resources which is based on the fact that surface water and groundwater resources vary in availability, quality, and costs. In the ECC Subbasin, the margin between sustainable yield and average pumping provides a storage buffer in critically dry years. Some GSAs have implemented groundwater exchanges (East Contra Costa Irrigation District) and supplemental groundwater capacity (Diablo Water District). These and similar programs can mitigate impacts to overall water supply in not only dry and critically dry periods, but also as a result of unforeseen climate change consequences.

Table 5-20. Average Simulated Groundwater Budget Components Used to Develop the Sustainable Yield of the ECC Subbasin

Groundwater Budget Flow Component	Base Period (Wy 1997-2018)	Water Year 2015	Minimum Annual Base Period Value	Maximum Base Period Value	Future Land Use Scenario (Wy 2019-2068)	Sustainable Yield Run: Reduce Sw Deliveries By 75%	Sustainable Yield Run: Reduce Sw Deliveries By 50%	Sustainable Yield Run: Reduce SW Deliveries By 45%	Sustainable Yield Run: Reduce SW Deliveries By 40%
Drains	-74,833	-66,415	-116,071	-56,081	-87,732	-34,458	-56,883	-59,623	-61,157
Surface Water Features	17,773	24,787	9,481	30,852	12,517	26,851	19,167	18,096	17,081
Deep Percolation	90,069	93,960	50,799	184,027	95,701	95,567	95,982	96,023	96,057
Small Watershed Baseflow	976	572	498	2,320	880	880	880	880	880
Small Watershed Percolation	2,260	0	0	26,702	2,051	2,051	2,051	2,051	2,051
Diversion Recoverable Loss	17,253	16,452	14,255	21,747	15,965	6,879	11,132	11,824	12,490
Pumping	-46,455	-47,640	-58,251	-32,504	-28,966	-109,353	-71,992	-65,915	-60,064
Net Subsurface Flow	-8,500	-8,290	-15,817	-4,664	-12,975	8,313	-3,658	-5,189	-6,594
Net Storage Change	66	13,411	-43,556	65,310	2,799	63	1,940	2,130	2,303



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Simulated Cumulative Change in Groundwater Storage for Sustainable Yield Development

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-17

5.10 GSA Area Water Budget Results

The seven GSAs that comprise the ECC Subbasin have their own water budgets as simulated using the ECCSim tool. The average groundwater budget terms are quantified for each GSA for the model Base Period (water years 1997-2018) in **Table 5-21**. The average simulated groundwater budget components are illustrated graphically in **Figure 5-18**.

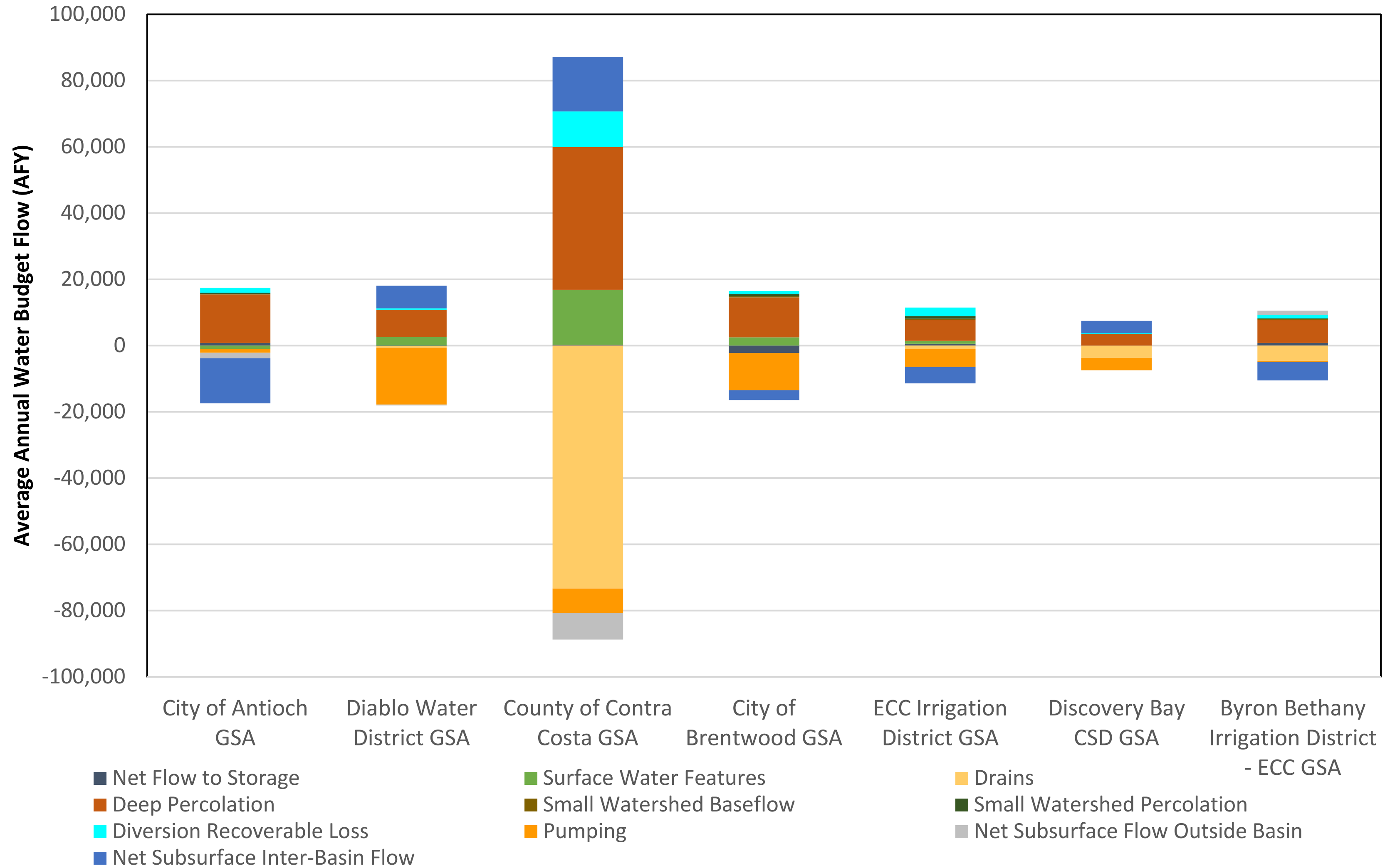
The projected water budgets for GSA areas were determined for the four 50-year water budget scenarios:

- future land use scenario (repeated hydrology);
- future land use plus climate change scenario (using 2070 central tendency climate change adjustments, the 2070 wet climate change adjustments, and the 2070 dry climate change adjustments);
- future land use plus sea level rise scenario; and
- future land use plus climate change and sea level rise scenario.

Simulated groundwater budget components are presented below in **Table 5-22**.

Table 5-21. Simulated Groundwater Budget Components for GSAs in the ECC Subbasin for Base Period, WY 1997-2018 (Units are in Acre-Feet per Year, AFY)

GSAS	Net Storage Change	Drains	Surface Water Features	Deep Percolation	Small Watershed Baseflow	Small Watershed Percolation	Diversion Recoverable Loss	Pumping	Net Subsurface Flow Outside Basin	Net Subsurface Inter-Basin Flow
City of Antioch GSA	-785	0	-1,036	14,663	129	406	1,472	-1,152	-1,647	-13,621
Diablo Water District GSA	86	-559	2,572	8,151	0	82	423	-17,216	-208	6,836
County of Contra Costa GSA	-210	-73,302	16,665	43,071	0	0	10,699	-7,408	-8,021	16,533
City of Brentwood GSA	2,276	0	2,478	12,036	330	741	915	-11,226	0	-2,999
ECC Irrigation District GSA	-524	-1,083	900	6,363	348	773	2,536	-5,370	0	-4,991
Discovery Bay CSD GSA	-9	-3,735	0	3,540	0	0	111	-3,747	0	3,822
Byron Bethany Irrigation District - ECC GSA	-806	-4,582	0	6,994	168	258	1,096	-334	1,196	-5,580



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Average Water Budget Components During the Historical Calibration Period (1997-2018)

East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) Report

Figure 5-18

Table 5-22. Simulated Future Scenario Groundwater Budgets for Individual GSAs

GSA Groundwater Budget Component Flows Summary					
City of Antioch GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario[17] (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change[18], and Sea Level Rise (WY 2019-2068)
Net Storage Change	-785	142	171	142	171
Drains	0	0	0	0	0
Surface Water Features	-1,036	-1,920	-1,833	-1,923	-1,836
Deep Percolation	14,663	14,914	15,630	14,914	15,630
Small Watershed Baseflow	129	99	76	99	76
Small Watershed Percolation	406	327	279	327	279
Diversion Recoverable Loss	1,472	1,322	1,313	1,322	1,313
Pumping	-1,152	-255	-278	-255	-278
Net Subsurface Flow Outside Basin	-1,647	-3,261	-2,864	-3,259	-2,863
Net Subsurface Inter-Basin Flow	-13,621	-11,084	-12,152	-11,083	-12,150

[17] 2070 Central Tendency Climate Change Scenario

[18] 2070 Central Tendency Climate Change Scenario

GSA Groundwater Budget Component Flows Summary					
Diablo Water District GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	86	176	151	176	151
Drains	-559	-2,495	-2,255	-2,492	-2,262
Surface Water Features	2,572	-321	389	-338	372
Deep Percolation	8,151	10,224	10,881	10,224	10,881
Small Watershed Baseflow	0	0	0	0	0
Small Watershed Percolation	82	42	70	42	70
Diversion Recoverable Loss	423	404	398	404	398
Pumping	-17,216	-6,141	-6,465	-6,141	-6,465
Net Subsurface Flow Outside Basin	-208	-677	-613	-675	-612
Net Subsurface Inter-Basin Flow	6,836	-861	-2,255	-847	-2,233

GSA Groundwater Budget Component Flows Summary					
County of Contra Costa GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	-210	90	115	99	124
Drains	-73,302	-80,933	-76,509	-79,771	-73,513
Surface Water Features	16,665	14,906	15,740	15,721	16,556
Deep Percolation	43,071	42,783	40,623	42,784	40,624
Small Watershed Baseflow	0	0	0	0	0
Small Watershed Percolation	0	0	0	0	0
Diversion Recoverable Loss	10,699	10,399	9,373	10,399	9,373
Pumping	-7,408	-10,137	-7,693	-10,137	-7,693
Net Subsurface Flow Outside Basin	-8,021	-11,880	-11,567	-11,892	-11,619
Net Subsurface Inter-Basin Flow	16,533	29,466	25,726	29,449	25,691

GSA Groundwater Budget Component Flows Summary					
City of Brentwood GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	2,276	2,078	1,728	2,079	1,729
Drains	0	0	0	0	0
Surface Water Features	2,478	1,982	2,035	1,982	2,035
Deep Percolation	12,036	14,213	14,738	14,213	14,738
Small Watershed Baseflow	330	278	199	278	199
Small Watershed Percolation	741	604	475	604	475
Diversion Recoverable Loss	915	902	117	902	117
Pumping	-11,226	-4,605	-11,592	-4,605	-11,592
Net Subsurface Flow Outside Basin	0	0	0	0	0
Net Subsurface Inter-Basin Flow	-2,999	-11,295	-4,245	-11,294	-4,244

GSA Groundwater Budget Component Flows Summary					
ECCID GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	-524	116	48	116	48
Drains	-1,083	-1,512	-1,696	-1,513	-1,698
Surface Water Features	900	666	740	666	740
Deep Percolation	6,363	5,337	5,988	5,337	5,988
Small Watershed Baseflow	348	332	241	332	241
Small Watershed Percolation	773	924	607	924	607
Diversion Recoverable Loss	2,536	2,106	2,284	2,106	2,284
Pumping	-5,370	-794	-869	-794	-869
Net Subsurface Flow Outside Basin	0	0	0	0	0
Net Subsurface Inter-Basin Flow	-4,991	-6,942	-7,246	-6,941	-7,245

GSA Groundwater Budget Component Flows Summary					
Discovery Bay CSD GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	-9	14	17	14	17
Drains	-3,735	-4,969	-5,268	-4,969	-5,267
Surface Water Features	0	0	0	0	0
Deep Percolation	3,540	5,743	6,149	5,743	6,149
Small Watershed Baseflow	0	0	0	0	0
Small Watershed Percolation	0	0	0	0	0
Diversion Recoverable Loss	111	1	1	1	1
Pumping	-3,747	-6,626	-6,626	-6,626	-6,626
Net Subsurface Flow Outside Basin	0	0	0	0	0
Net Subsurface Inter-Basin Flow	3,822	5,866	5,761	5,866	5,760

GSA Groundwater Budget Component Flows Summary					
Byron Bethany Irrigation District - ECC GSA					
	Base Period (WY 1997-2018)	Future Land Use Scenario (WY 2019-2068)	Future Land Use and Climate Change Scenario (WY 2019-2068)	Future Land Use and Sea Level Rise Scenario (WY 2019-2068)	Future Land Use, Climate Change, and Sea Level Rise (WY 2019-2068)
Net Storage Change	-806	194	232	194	230
Drains	-4,582	-4,220	-4,764	-4,220	-4,747
Surface Water Features	0	0	0	0	0
Deep Percolation	6,994	7,399	8,223	7,399	8,273
Small Watershed Baseflow	168	171	131	171	131
Small Watershed Percolation	258	154	214	154	214
Diversion Recoverable Loss	1,096	831	912	831	841
Pumping	-334	-407	-433	-407	-429
Net Subsurface Flow Outside Basin	1,196	1,475	1,598	1,475	1,599
Net Subsurface Inter-Basin Flow	-5,580	-5,149	-5,589	-5,149	-5,579

5.11 Model Documentation

Appendix 5a contains model documentation and complete scenario results.

5.12 References

California Department of Water Resources (DWR). December 2016. Guidance Document for the Sustainable Management of Groundwater: Modeling.

California Department of Water Resources (DWR). December 2016. Guidance Document for the Sustainable Management of Groundwater: Water Budget.

California Department of Water Resources (DWR). July 2018. Sustainable Groundwater Management Program: Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development.

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SECTION 6 CONTENTS

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6. MONITORING NETWORK AND DATA MANAGEMENT SYSTEM

SGMA regulations require that each GSP develop a monitoring network to collect data of sufficient accuracy and quantity to evaluate changing conditions and trends in groundwater and related surface water, as well as to provide representative information about groundwater conditions. The monitoring network and associated data shall be used to demonstrate that the basin is sustainably managed. SGMA also requires that monitoring networks specifically target the six sustainability indicators[1] either directly or indirectly through a proxy monitoring parameter. The six sustainability indicators are: chronic lowering of groundwater levels, reduction in groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletion of interconnected surface water. This section describes the monitoring networks, monitoring protocols, data management system, and data reporting requirements for the ECC Subbasin GSP.

The ECC Subbasin monitoring networks shall be assessed every five years. Through these assessments, needed changes and/or data gaps may be identified. The GSAs shall adaptively manage and modify the monitoring networks, projects, management actions, and/or interim milestones to achieve the sustainability objectives for the Subbasin. This process is intended to conform to Monitoring Networks and Identification of Data Gaps, Best Management Practices, (DWR, 2016).

6.1. Monitoring Network Objectives (CCR § 354.34, § 354.38)

In accordance with GSP Regulations, monitoring networks shall be developed to produce a data set of sufficient accuracy, measurement frequency, and spatial distribution to characterize groundwater and related surface water conditions in the plan area and to evaluate conditions through implementation of the GSP all with the purpose of sustainable groundwater management. The monitoring network shall accomplish the following (GSP Reg. § 354.34(b)(1)-(4)):

(1) Demonstrate progress towards achieving measurable objectives described in the GSP.

(2) Monitor impacts to the beneficial uses and users of groundwater.

(3) Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.

(4) Quantify annual changes in water budget components.

The ECC GSP monitoring network is designed to meet the above regulatory requirements through implementation of monitoring described in this section. As discussed in this section, designated monitoring sites throughout the Subbasin, with appropriate monitoring protocols and measurement frequency, will provide a means to quantify current and future hydrogeological conditions of the ECC Subbasin, as well as within individual GSA jurisdictions.

[1] Sustainability indicator in SGMA refers to "any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results…" (DWR, BMP, 2016)

6.2. Monitoring Networks

Under SGMA, monitoring networks shall be established for each of six sustainability indicators as applicable. The six sustainability indicators are: chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletion of interconnected surface water. The groundwater level monitoring network will act as a proxy for the groundwater storage sustainability indicator. Existing groundwater, surface water and subsidence monitoring programs conducted by DWR, SWCRB, DDW, USGS and UNAVCO, are described in **Section 2.2**. In addition to these programs, five ECC GSAs (City of Brentwood, BBID, TODB and DWD, and ECCID) have independent groundwater monitoring programs. These existing programs are integrated into the GSP monitoring program where applicable to the monitoring objectives. **Table 6-1**, below, summarizes the sustainability indicators and related monitoring in the ECC GSP.

Table 6-1. Sustainability Indicators and Applicable Representative Monitoring Network

Sustainability Indicator	Representative Monitoring Network	Proxy Network
Chronic Lowering of Groundwater Levels	Groundwater Levels	NA
Reduction of Groundwater Storage	See Proxy	Groundwater Levels
Seawater Intrusion	Groundwater Quality	NA
Degraded Groundwater Quality	Groundwater Quality	NA
Land Subsidence	PBO Station	Groundwater Levels
Surface Water Depletion due to Groundwater Pumping	Stream Flow	Groundwater Levels

NA = Not Applicable

6.2.1. Basin-Wide and Representative Monitoring Networks

The GSP monitoring program includes basin-wide and representative networks. The basin-wide network provides a broad source of relevant data by which to evaluate conditions in the Subbasin. The representative network is a subset of the basin-wide network for which minimum thresholds and measurable objectives shall be defined in accordance with *CCR §354.36 (a)* (see **Section 7** of this GSP). For each monitoring network (i.e., basin-wide, and representative monitoring site), the following information is discussed below: the site locations, spatial density, monitoring frequency, monitoring protocols, data gaps, and a plan to fill the data gaps.

6.2.2. Groundwater Level Monitoring Network

Groundwater level monitoring is a fundamental component of data collection for sustainable groundwater management. Groundwater level data from a network of groundwater monitoring wells serve to show groundwater occurrence, flow direction, hydraulic gradients between principal aquifers, and interaction between groundwater and surface water features (*CCR §354.34 (C)*). Each GSA has dedicated monitoring wells in its area of jurisdiction. GSA monitoring wells have existing historical records dating to the 1950s (e.g., ECCID monitoring network for shallow groundwater). The various GSA networks were initially coordinated through the State CASGEM program in 2013. The basin-wide and representative groundwater level networks are summarized below and enumerated in **Table 6-2**:

- **Basin-wide Monitoring Network** - The basin-wide monitoring network for groundwater level evaluation provides a broad dataset for basin evaluation.
- **Representative Monitoring Network** - A subset of basin-wide monitoring wells is selected to monitor sustainability indicators in the Subbasin and to demonstrate sustainable management in accordance with defined minimum thresholds and measurable objectives for the chronic lowering of groundwater levels sustainability indicator.

Table 6-2. GSA Groundwater Level Monitoring Network

GSA	Number of Wells			
	Basin-Wide Network			Representative Network
	Existing	New	Total	
BBID	5		5	1
City of Antioch		3	3	2
City of Brentwood	6		6	2
Contra Costa County		2	2	1
Diablo Water District	10	2	12	3
Town of Discovery Bay	9	2	11	2
ECCID	16		16	1
Total	**46**	**9**	**55**	**12**

Note: multiple completion monitoring wells are counted as separate wells for each depth.

6.2.2.1. Basin-wide Groundwater Level Monitoring Network

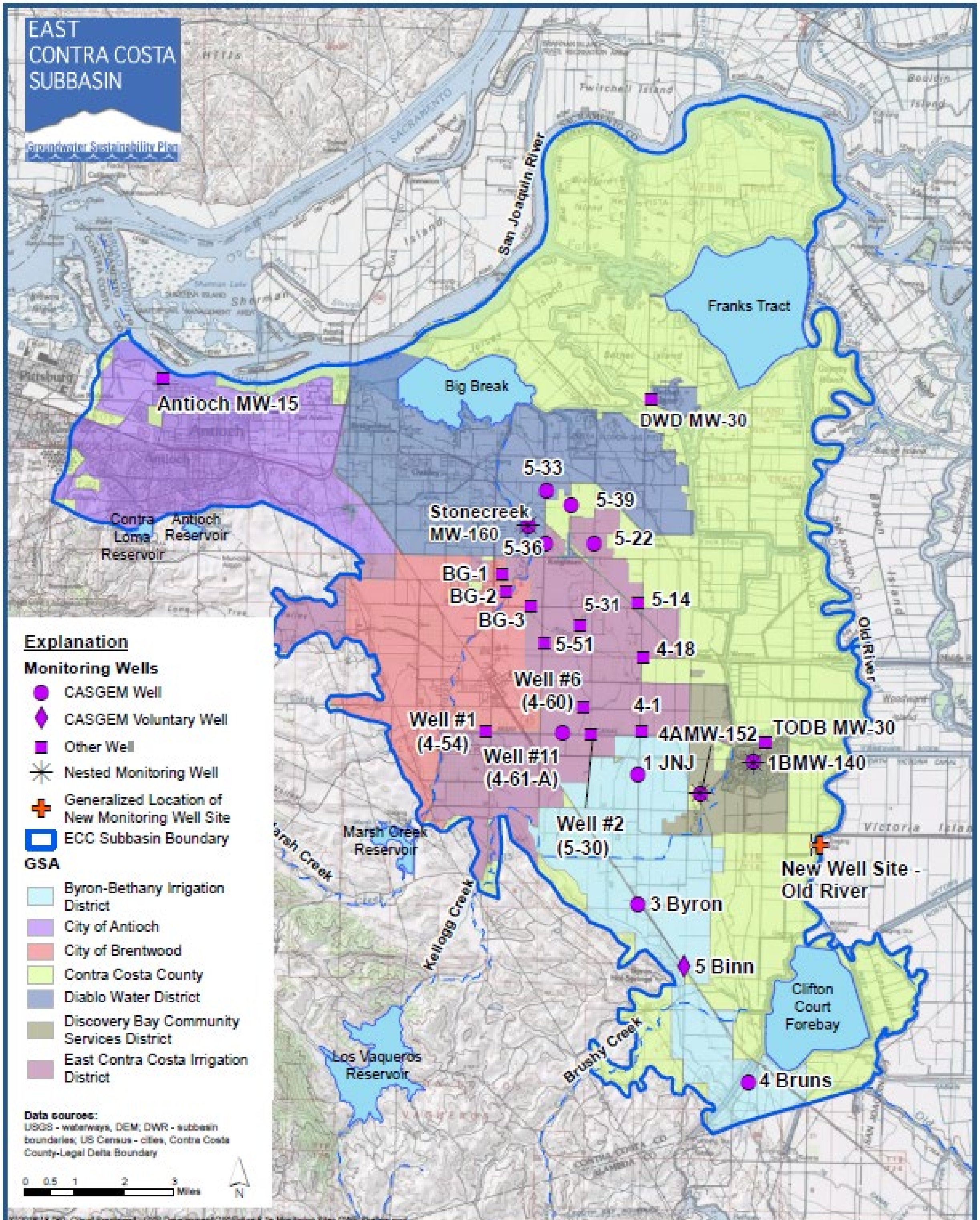
As indicated in **Table 6-2**, 55 wells are included in the basin-wide monitoring network. Well selection criteria included the following:

1. Are representative of groundwater level conditions in the Subbasin and provide monitoring in the two principal aquifers in the Subbasin: Shallow Zone and Deep Zone.
2. GSAs are committed to semiannual monitoring and are typically part of an existing monitoring program.
3. A historical data record exists.

Well locations for the basin-wide groundwater level monitoring network are shown on **Figures 6-1a** and **6-1b**. **Figure 6-1a** show wells that monitor the Shallow Zone aquifer and **Figure 6-1b** shows wells that monitor the Deep Zone. These principal aquifers are described under Basin Setting **Section 3.2.5** and reflect the vertical discretization of groundwater occurrence in the ECC Subbasin.

Figures 6-1a and **6-1b** include new wells to be installed as part of the GSP implementation. These wells are intended to fill data gaps and are discussed in **Section 6.2.3**.

Details of the monitoring network are provided in **Table 6-3** including name, owner, coordinates, reference point elevation (RPE), and perforation depths. Of the 55 basin-wide monitoring wells, 31 are perforated in the Shallow Zone and 19 wells are perforated in the Deep Zone. In addition, 14 nested (two or more casings within the same borehole) or multi-completion, monitoring wells located at 6 different sites are in the network (**Figure 6-1b**). CASGEM wells form a substantial part of monitoring network with 26 wells from this program. With a few exceptions, basin-wide network wells are dedicated groundwater monitoring wells with known construction features and screened only in the designated aquifer zone. Wells that are perforated through both the shallow and deep aquifer zones are not included in the monitoring network nor are wells with unknown construction features. The exceptions to this are three composite wells listed in **Table 6-3** and show on **Figure 6-1b** that are included to improve groundwater level contouring in areas lacking well control.



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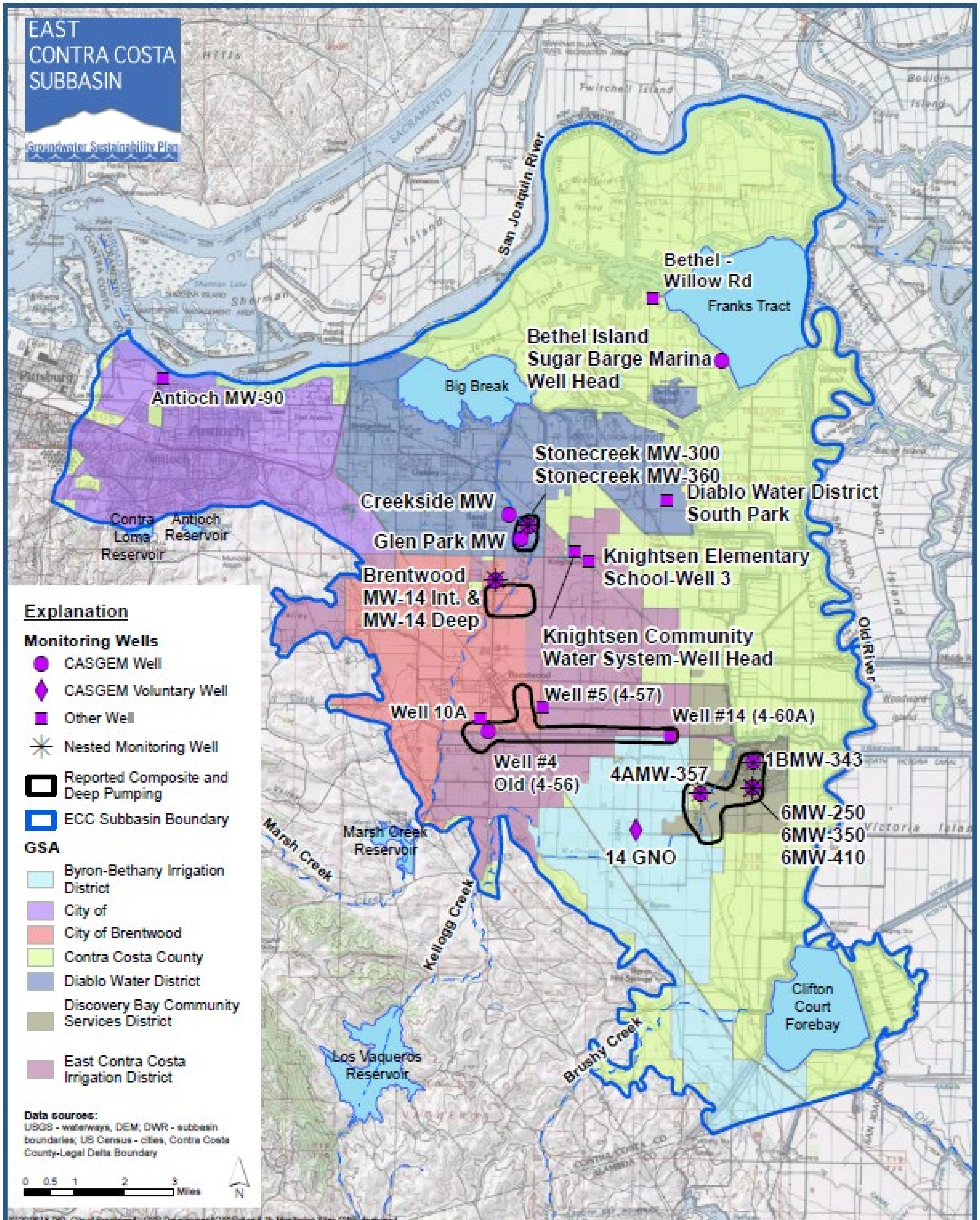
Basin-wide Groundwater Level Monitoring Network - Shallow Zone

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-1a



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Basin-wide Groundwater Level Monitoring Network-Deep Zone

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-1b

Table 6-3. Basin-wide and Representative Groundwater Level Monitoring

Local Well Name	Well Owner/GSA	Latitude	Longitude	Reference Point Elevation (ft)	Perforation Depths (ft bgs)	CASGEM Well	Frequency	Representative Well
Shallow Zone Wells								
Antioch MW-15‡	Antioch	38.018901	-121.819755	4.12	5-15	No	daily*	X
Antioch MW-30‡	Antioch	38.018887	-121.819753	4.12	20-30	No	daily*	
1 JNJ	BBID	37.906128	-121.6419204	26.63	105-120	Yes	monthly	
3 Byron	BBID	37.8684118	-121.6412186	32.28	50-70	Yes	monthly	
4 Bruns	BBID	37.8168913	-121.5991577	35.87	45-65	Yes	monthly	
5 Binn	BBID	37.8506993	-121.6238007	24.42	45 (TD)	Yes-Voluntary	monthly	X
New Well	CCC/CCWD					No	daily*	X
New Well	CCC/CCWD					No	daily*	
BG-1	CofB	37.9638969	-121.6933943	71.22	40-55	No	monthly	
BG-2	CofB	37.9589412	-121.6917498	62.09	22.5-37.5	No	monthly	X
BG-3	CofB	37.9546062	-121.6824842	55.6	20-35	No	monthly	
DWD MW-15‡	DWD	38.015495	-121.639343	7.31	5-15	No	daily*	
DWD MW-30‡	DWD	38.015531	-121.639343	7.26	20-30	No	daily*	X
Stonecreek MW-160	DWD	37.978122	-121.683968	30.76	100-110, 140-150	Yes	monthly?	
4-1	ECCID	37.91888889	-121.6408333	13	0-10	No	semi-annual	
4-18	ECCID	37.94027778	-121.6408333	24.6	NA	No	semi-annual	
5-14	ECCID	37.96527778	-121.6455556	18.7	NA	No	semi-annual	
5-22	ECCID	37.97305556	-121.6594444	17.2	0-10	Yes	semi-annual	
5-31	ECCID	37.94944444	-121.6641667	45.5	0-10	No	semi-annual	
5-33	ECCID	37.98833333	-121.6775	13.3	0.01 - 20	Yes	monthly	
5-36	ECCID	37.97277778	-121.6775	27.4	0-10	Yes	monthly	
5-39	ECCID	37.98444444	-121.6683333	12.5	0.01 - 20	Yes	monthly	
5-51	ECCID	37.95777778	-121.6777778	54.1	0-11	No	semi-annual	
Well #1 (4-54)	ECCID	37.91805556	-121.6983333	85.9	85-165	No	monthly	
Well # 2 (5-30)	ECCID	37.91777778	-121.6594444	40.3	0-30	No	monthly	
Well #6 (4-60)	ECCID	37.92555556	-121.6625	49.5	30-50	No	monthly	
Well #11 (4-61-A)	ECCID	37.91777778	-121.67	55.5	50-100	Yes	monthly	X
TODB MW-15	TODB				5-15	No	daily*	
TODB MW-30	TODB				20-30	No	daily*	X
1BMW-140	TODB	37.9102996	-121.5993985	4.31	100-130	Yes	semi-annual	
4AMW-152	TODB	37.9009991	-121.6187989	11.67	122-142	Yes		

Local Well Name	Well Owner/GSA	Latitude	Longitude	Reference Point Elevation (ft)	Perforation Depths (ft bgs)	CASGEM Well	Frequency	Representative Well
Deep Zone Wells								
Antioch MW-90[‡]	Antioch	38.01887	-121.819748	4.77	78-88	No	daily*	X
14 GNO	BBID	37.889861	-121.642331	30.32	207-212, 229-238, 244-253, 273-279, 349-356	Yes - Voluntary	monthly	
Brentwood MW-14 Deep	CofB	37.9620001	-121.6957004	72.76	284-315	Yes	monthly	
Brentwood MW-14 Int.	CofB	37.9620001	-121.6957004	72.76	200-210, 220-230	Yes	monthly	X
Bethel-Willow Rd	DWD	38.045117	-121.639464	4.69	230-260	No	semi-annual	X
Creekside MW	DWD	37.9812138	-121.6911215	29.54	230-240	Yes	monthly	
Diablo Water District-South Park	DWD	37.9860934	-121.6330831	-3.5	204-264, 284-299	No	monthly	
Glen Park MW	DWD	37.9740743	-121.6866247	35.54	220-230, 260-290	Yes	monthly	
Stonecreek MW-300	DWD	37.978122	-121.683968	30.47	230-240, 280-290	Yes	monthly	X
Stonecreek MW-360	DWD	37.978122	-121.683968	30.7	340-350	Yes	monthly	
Knightsen Community Water System-Well Head	DWD	37.9709328	-121.6667157	29.911	235-255, 275-295	No	monthly	
Knightsen Elementary School-Well 3	DWD	37.9679868	-121.6613267	29.59	395-415	No	monthly	
Bethel Island (Sugar Barge Marina-Well Head)	DWD	38.027155	-121.613661	-6	317-333	Yes	monthly	
Well #14 (4-60A)	ECCID	37.92526	-121.67739	55.5	200-330	No	monthly	
1BMW-343	TODB	37.9102996	-121.5993985	4.38	270-289, 309-338	Yes	daily	
4AMW-357	TODB	37.9009991	-121.6187989	11.54	307-347	Yes	daily	X
6MW-250	TODB	37.9028008	-121.5994988	6.6	200-210, 230-240	Yes	daily	
6MW-350	TODB	37.9028008	-121.5994988	6.6	280-290, 330-340	Yes	daily	
6MW-410	TODB	37.9028008	-121.5994988	6.54	390-400	Yes	semi-annual	
Composite Wells								
Well 10A	CofB	37.92166667	-121.7008333	91.85	52-72, 135-182	No	monthly	
Well #4 Old (4-56)	ECCID	37.9178	-121.697222	83.8	68-125, 175-195	Yes	monthly	
Well #5 (4-57)	ECCID	37.92526	-121.67722	60.9	115-125, 170-175, 195-200, 220-245, 270-290	No	monthly	

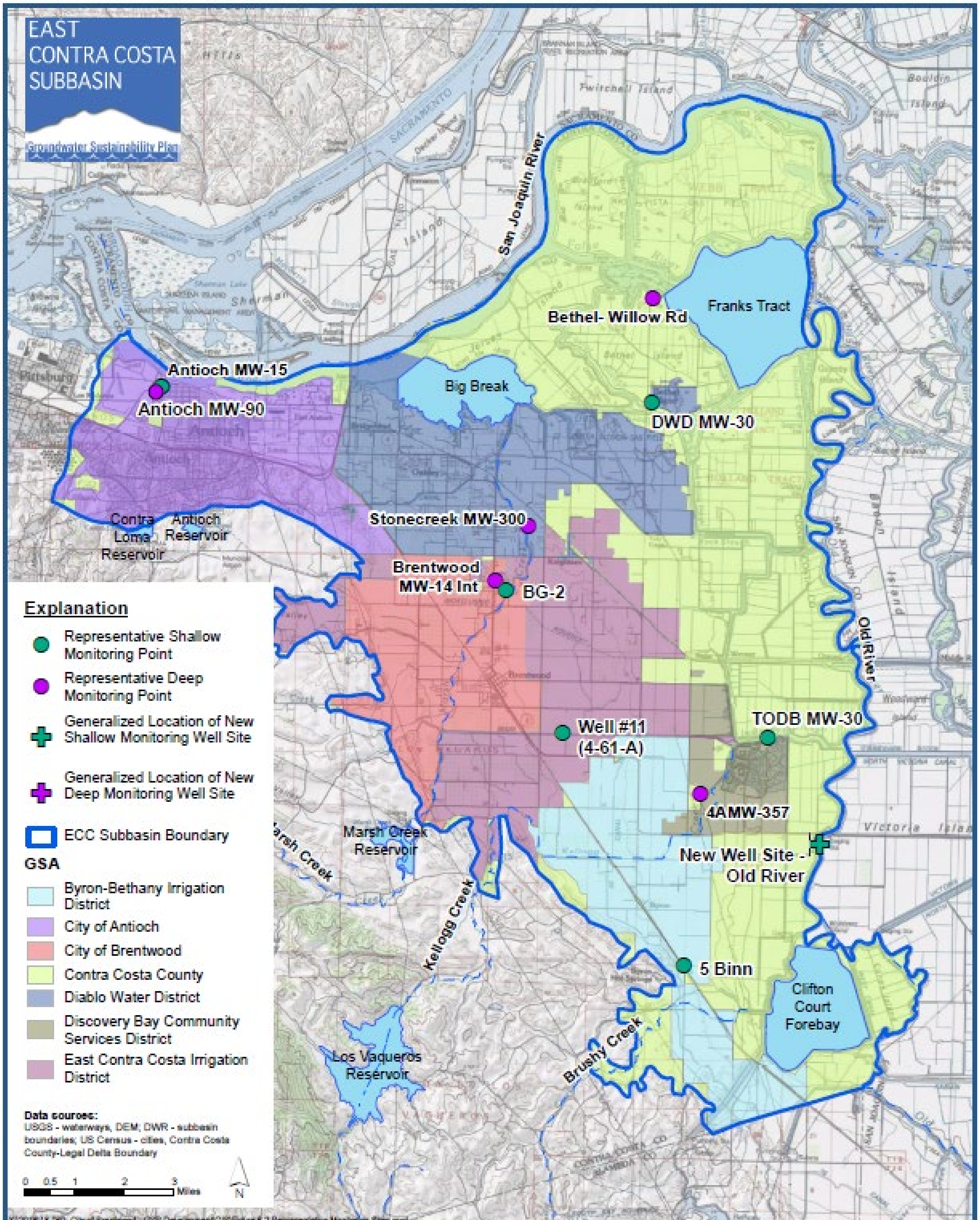
Blue indicates New Monitoring Well

[‡]Well installed August 2021

* New wells will be fitted with a SCADA system that will record water level measurements at least daily.

A subset of wells in the basin-wide groundwater level monitoring network was selected for the representative groundwater level monitoring network. The representative wells are intended to represent regional conditions with respect to chronic lowering of groundwater levels (sustainability indicator) and for which minimum thresholds and measurable objectives are defined. The representative monitoring wells for groundwater levels are shown on **Figure 6-2** for the Shallow Zone and Deep Zone, respectively. **Table 6-3** identifies the representative monitoring wells which are a subset of the basin-wide wells. The representative monitoring wells were selected based on the following criteria:

a. Show long term, regional trends (good historical record).
b. Dedicated monitoring wells (no production wells).
c. Known well construction features (construction date, well depth, perforation depths).
d. Monitored monthly or continuously (i.e., with transducers and data loggers).
e. Good horizontal and vertical spatial distribution.
f. Greater number for high pumping areas (i.e., representative of conditions in vicinity of high municipal and agricultural pumpage).
g. Professional judgment used where more than one suitable well is present.
h. Include areas of domestic wells and disadvantaged communities.



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Representative Groundwater Level Monitoring Network

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Contra Costa County, California

Figure 6-2

6.2.2.2. Spatial Density of Groundwater Level Monitoring Network

The ECC Subbasin monitoring networks have a well density that exceeds recommended practices contained in Monitoring Networks and Identification of Data Gaps, Best Management Practices, (DWR, 2016). This BMP states that "the network should contain an adequate number of wells to observe the overall static conditions and the specific project effects." It also states that there is no rule for the density of monitoring points but does provide a table of existing references (see **Table 6-4**, below**)** that lists density of monitoring wells per hundred square miles with ranges between 0.2 to 10 monitoring wells per 100 square miles. Given a maximum estimated ECC Subbasin groundwater pumping of approximately 14,000 af in the drought year of 2009 (12,700 af metered and 1,100 af unmetered), this converts to 8,300 acre-feet/year per 100 square miles resulting in about 2 monitoring wells per 100 square miles per the Hopkins (1984) guidance.

Table 6-4. Groundwater Level Monitoring Well Density Considerations[2]

Reference	Monitoring Well Density (wells per 100 miles^2)
Heath (1976)	0.2 - 10
Sophocleous (1983)	6.3
Hopkins (1984) Basins pumping more than 10,000 acre-feet/year per 100 miles^2	4.0
Basins pumping between 1,000 and 10,000 acre-feet/year per 100 miles^2	2.0
Basins pumping between 250 and 1,000 acre-feet/year per 100 miles^2	1.0
Basins pumping between 100 and 250 acre-feet/year per 100 miles^2	0.7

For a subbasin area of approximately 168 square miles and with 55 basin-wide monitoring wells and 12 representative monitoring network wells, the ECC basin-wide and representative monitoring well densities are 33 wells per 100 square miles and 7 wells per 100 square miles, respectively (see **Table 6-5**, below). These well densities exceed the Sophocleous and Hopkins recommendations and exceed or falls within the Heath recommendations in the BMP technical guidance represented in **Table 6-4**, above.

[2] Table 6-4 is a reproduction of Table 1 in the DWR BMP Monitoring *Networks and Identification of Data Gaps*.

Table 6-5. ECC Subbasin Groundwater Level Monitoring Networks Density

Monitoring Network	No. of Wells	Well Density (Wells per 100 square miles^2)
Basin-wide Monitoring Network	55	33
Representative Monitoring Network	12	7

6.2.2.3. Frequency and Timing of Groundwater Level Monitoring

Groundwater elevation measurements will be made at a minimum of semi-annually to capture seasonal high and seasonal low levels. Historic groundwater monitoring data indicate that seasonal high elevations occur in winter to spring months (February-April) and seasonal low elevations occur in the fall (September-October). **Table 6-3** includes the frequency of monitoring for each well in the basin-wide network. Historically through the present, chronic lowering of groundwater levels has not been observed in the ECC Subbasin; however, if conditions change in the future, the semi-annual monitoring frequency will be reevaluated to ensure that monitoring of this sustainability indicator complies with SGMA regulations.

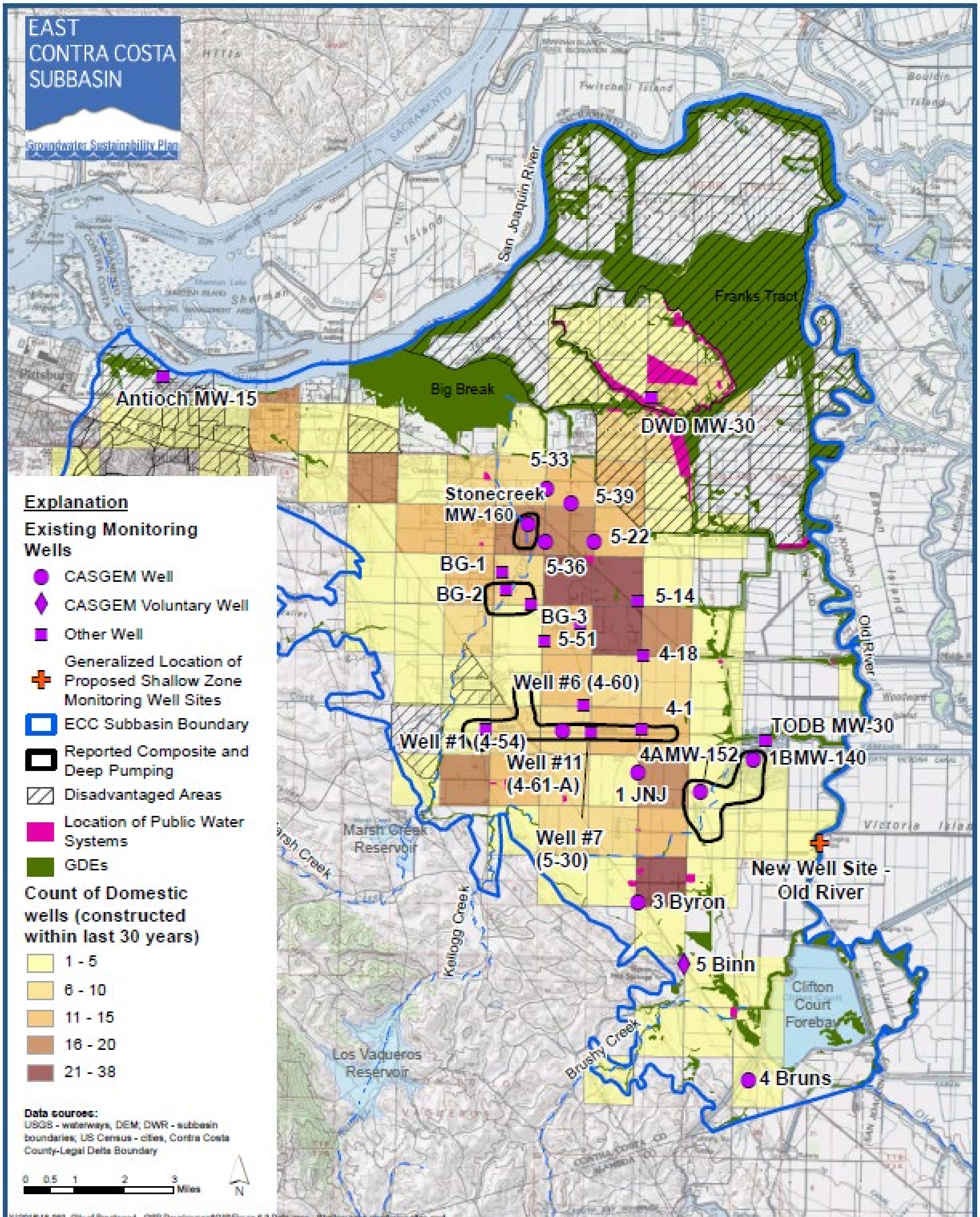
6.2.2.4. Groundwater Level Data Gaps

The existing ECC groundwater level monitoring network is sufficient to monitor areas near the major municipal pumping. However, data gaps were identified in areas where groundwater pumping is limited to only domestic and small water systems. Additional Shallow Zone wells will be installed to accomplish the following objectives:

- Increase density of groundwater level monitoring wells.
- Provide information on surface water and groundwater interaction and conditions near groundwater dependent ecosystems (GDEs).
- Provide information on boundary conditions.
- Ensure that long-term monitoring results are consistent and reliable.
- Improve understanding of impact of groundwater management to beneficial users.
- Improve characterization of groundwater flow regimes.

6.2.2.5. Plan to Fill Groundwater Level Data Gaps

The installation and instrumentation of 9 Shallow Zone groundwater level monitoring wells at four sites are planned as part of the preparation of this GSP and will be implemented under a Proposition 68 grant from DWR. **Figure 6-3** shows the new monitoring wells and existing Shallow Zone monitoring network in relation to other beneficial users of groundwater in the ECC Subbasin: Disadvantaged Areas, small public water systems, GDEs, and de minimis users (domestic well owners). These beneficial users were considered in siting the new monitoring wells. **Figure 6-1b** shows the deep monitoring well network in relation to the one new deep zone monitoring well location (Antioch) and areas of larger-scale pumping by municipal and agricultural users. The following **Table 6-6** lists the data gaps filled by each new well. The new monitoring wells will increase the density of the groundwater level monitoring network and enhance coverage of groundwater level data. It is recognized that additional data gaps may become evident during and after GSP implementation. As supported by data from the monitoring networks, such data gaps will be filled to ensure sustainable management of the Subbasin.



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Data Gap - Shallow Zone Groundwater Level Monitoring Network

East Contra Costa Subbasin Groundwater Sustainability Plan
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Figure 6-3

Table 6-6. Proposed New Monitoring Wells to Fill Data Gaps

Data Gap	Antioch[1] Shallow/Deep	Bethel Island[2] Shallow	TODB[3] Shallow	CCC/CCWD Shallow
Climate Change: Monitor Sea Level Rise, Increase in Chloride/TDS	x	x		
Expand Shallow Zone Network	x	x	x	x
Expand Deep Zone Network	x			
Groundwater Quality	x (esp. Cl and TDS)	x (esp. Cl and TDS)	x	x
Near GDEs and Monitors for Shallow Groundwater/Surface Water Interaction.	x	x	x	x
Located near Small Public Water Systems and Domestic Wells	x	x		
Located near Disadvantaged Areas	x	x		
Adjacent to Municipal Well Pumping			x	
Subbasin Boundary Conditions	x	x		x
Construction: Perforations (ft bgs)	10-15, 20-30, 85-95	5-10, 20-30	10-15, 20-30	5-15, 25-35

1. City of Antioch does not pump groundwater for municipal supply. Domestic supply source is surface water only.
2. Bethel Island is served by public water systems and domestic wells.
3. TODB pumps only groundwater for municipal supply.

6.2.3. Groundwater Quality Monitoring Network

The groundwater quality monitoring network includes municipal production wells that report groundwater quality as regulated by the State Division of Drinking Water under Drinking Water Programs. The objectives of the groundwater quality monitoring program for the ECC Subbasin include the following:

- Evaluate and determined a baseline of groundwater quality conditions in both Shallow Zone and Deep Zone aquifers in the Subbasin and in areas of higher groundwater use.
- Assess changes and trends in groundwater quality (seasonal, short- and long-term trends).
- Incorporate existing groundwater quality monitoring programs (i.e., monitoring of Public Water Systems under the state Drinking Water Programs).
- Provide means to assess groundwater quality impacts to beneficial uses and users including but not limited to effects on primary and secondary drinking water standards for domestic users, crop suitability for agricultural users, and groundwater dependent ecosystems.

- Identify natural (e.g., climate change) and anthropogenic factors that affect groundwater quality including the potential for mobilization of contamination through groundwater flow patterns that may be altered by sustainable management activities.

This section describes the basin-wide and representative monitoring networks, monitoring frequency, spatial density, and monitoring protocols for the degraded groundwater quality sustainability indicator. The monitoring networks are enumerated in **Table 6-7**, below. As discussed in **Section 7**, only representative monitoring wells are used to determine compliance with minimum thresholds or measurable objectives for the degraded water quality sustainability indicator.

Table 6-7. GSA Groundwater Quality Monitoring Network

GSA	Number of Wells				
	Basin-Wide Network				Total Representative Monitoring Network
	Existing Monitoring Wells	New Monitoring Wells	Production Wells	Total Basin-Wide	
BBID					
City of Antioch		2		2	2
City of Brentwood	1		8	9	3
Contra Costa County/CCWD		1		1	1
Diablo Water District	1	1	2	4	3
Town of Discovery Bay		1	5	6	2
ECCID					
Total	2	5	15	22	11

Note: Multiple completion monitoring wells are counted as separate wells for each depth.

6.2.3.1. Basin-wide Groundwater Quality Monitoring Network

The Basin-wide groundwater quality monitoring network is summarized in **Table 6-7**. Details of the basin-wide monitoring network are provided in **Table 6-8** including well name, owner, perforation depths, and monitoring frequency. The wells are grouped according to aquifer zone (Shallow Zone and Deep Zone). The network consists of consists of 22 wells of which 5 are completed in the Shallow Zone and 17 in the Deep Zone. The Shallow Zone and Deep Zone well locations are shown on **Figure 6-4**.

Other agencies track groundwater contamination including GeoTracker (online resource). **Section 3.3.6** discusses the groundwater contamination sites in the ECC Subbasin and **Appendix 3h** lists the 35 open sites and the 105 closed sites in the Subbasin. The lists and locations will be updated to identify any changes in plume movement

Table 6-8. Basin-wide and Representative Groundwater Quality Monitoring Network

Local Well Name	Owner/ GSA	Perforation	Data: First Date	Data: Last Date	Frequency	Seawater Intrusion Monitoring Network	Representative Monitoring Wells
Shallow Zone							
BG-1	Brentwood	40-55	2/17/2008	2/15/2015	Annual[1]		x
Antioch MW-15‡	Antioch	5-15			Annual[1]	x	x
DWD MW-30‡	DWD	20-30			Annual[1]	x	x
TODB MW-30	TODB	20-30			Annual[1]	x	x
New Well Old River 1 of 2	CCC/CCWD				Annual[1]	x	x
Deep Zone							
Antioch MW-90‡	Antioch	78-88			Annual[1]		x
City of Brentwood-Well 06	Brentwood	250-300	8/16/1990	8/7/2019	Variable[2]		
City of Brentwood-Well 07	Brentwood	265-295	5/5/1988	5/6/2019	Variable[2]		
City of Brentwood-Well 08	Brentwood	225-315	6/14/1993	5/6/2019	Variable[2]		
City of Brentwood-Well 09	Brentwood	210-230	7/19/2004	6/1/2016	Variable[2]		
City of Brentwood-Well 12	Brentwood	350-380, 430-450	12/18/1997	6/1/2016	Variable[2]		
City of Brentwood-Well 13	Brentwood	350-380, 430-480	12/17/1997	5/9/2019	Variable[2]		x
City of Brentwood-Well 14	Brentwood	285-315	11/3/2000	5/9/2019	Variable[2]		x
City of Brentwood-Well 15	Brentwood	239-259 289-324	7/26/2006	12/9/2019	Variable[2]		
Glen Park Well	DWD	230-245, 260-300	5/4/2004	6/19/2019	Variable[2]		x
Stonecreek Well	DWD	220-295	5/10/2010	6/19/2019	Variable[2]		

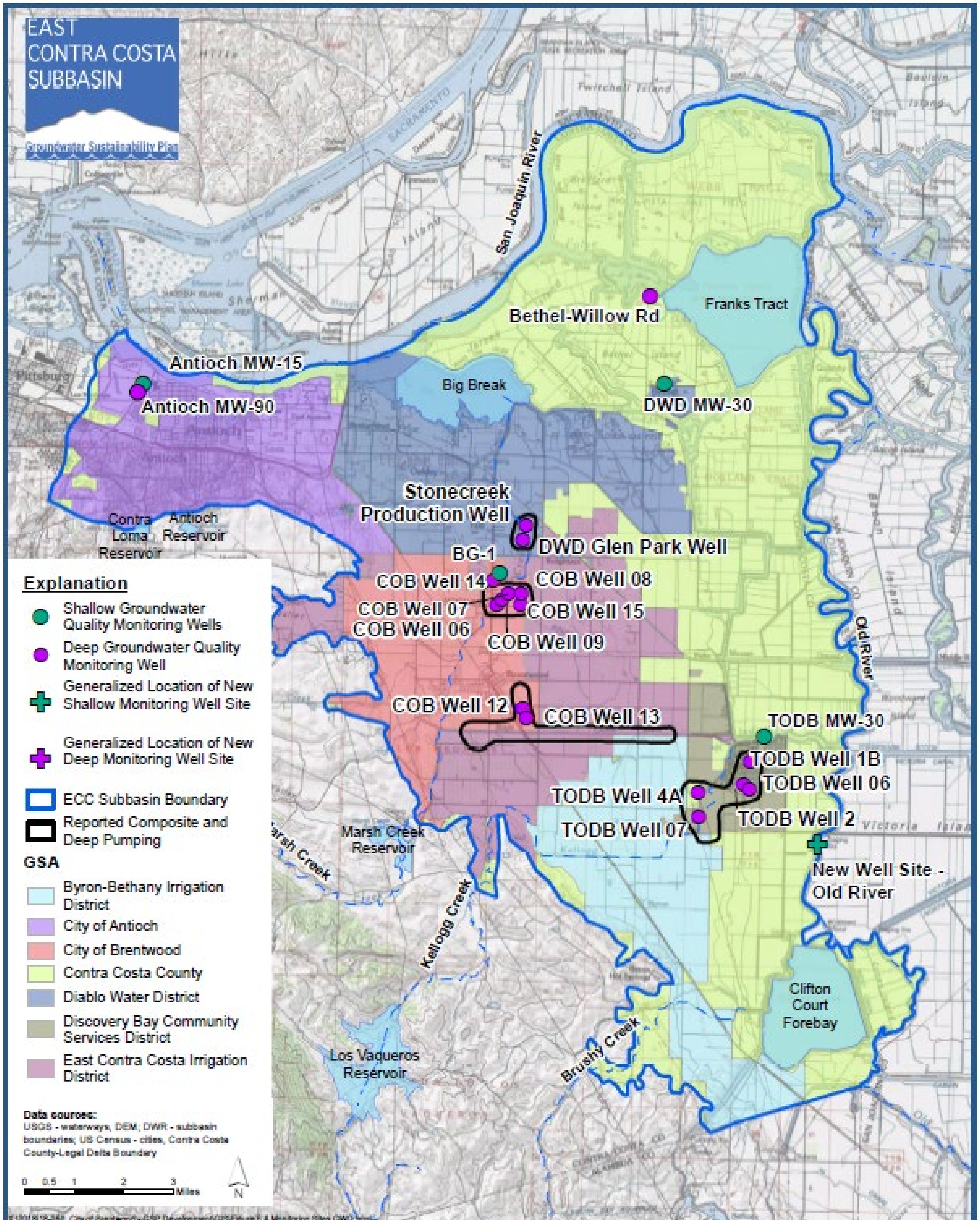
Local Well Name	Owner/ GSA	Perforation	Data: First Date	Data: Last Date	Frequency	Seawater Intrusion Monitoring Network	Representative Monitoring Wells
Bethel-Willow Rd	DWD	230-260			Annual[1]		x
Town of Discovery Bay Well 1B	TODB	271-289, 308-340	3/28/1995	5/23/2019	Variable[2]		
Town of Discovery Bay Well 2	TODB	245-335	11/19/1986	5/23/2019	Variable[2]		
Town of Discovery Bay Well 4A	TODB	307-347	8/1/1996	5/23/2019	Variable[2]		x
Town of Discovery Bay-Well 06	TODB	270-295, 305-350	8/24/2009	5/23/2019	Variable[2]		
Town of Discovery Bay-Well 07	TODB	282-292	7/30/2015	7/9/2019	Variable[2]		

Blue indicates New Monitoring Well

‡ Well installed August 2021

1. Sampling frequency is annual for first five years at which time it will be evaluated and potentially changed to align with typical compliance monitoring (e.g., 3 or 5 years depending on constituent).

2. Variable as per current compliance monitoring under state drinking water programs.



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Basin-wide Groundwater Quality Monitoring Network

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-4

6.2.3.2. Representative Groundwater Quality Monitoring Network

The representative monitoring network for the Shallow Zone is the same as the Basin-wide monitoring network (see **Figure 6-4**). The Deep Zone representative monitoring network is a subset of the Basin-wide Monitoring Network and consists of 4 existing wells in the zones of municipal pumping plus one new well (Antioch) and an existing deep well on Bethel Island (DWD) that are both areas of data gaps discussed under groundwater level monitoring (see **Figure 6-5**). **Table 6-8** lists features of the representative monitoring wells in both Shallow Zone and Deep Zone aquifers. For the Deep Zone, the selected representative wells in areas of high production are municipal wells that are completed solely in the deep aquifer zone and for which historical and ongoing water quality testing data are available.

6.2.3.3. Spatial Density, Frequency, and Data Gaps of Groundwater Quality Monitoring Network

Monitoring wells are distributed in both principal aquifer zones in the ECC Subbasin. Monitoring in the Deep Zone aquifer is focused on areas of highest groundwater production plus data gap areas in Antioch and on Bethel Island (see **Figure 6-5**). Sampling frequency will be consistent with typical compliance monitoring for municipal wells to provide sufficient data to evaluate groundwater quality trends over time in each aquifer zone. No additional monitoring wells are required at this time and the network will be reevaluated for the 5-year report. The groundwater quality monitoring network may be expanded if any of the following occurs: changes to groundwater quality restricting beneficial use, increase in groundwater development and/or shifts in pumping patterns, or if there is a change in groundwater management actions or projects. In such cases, the need to adapt monitoring frequency and/or sites shall be determined from the monitoring record.

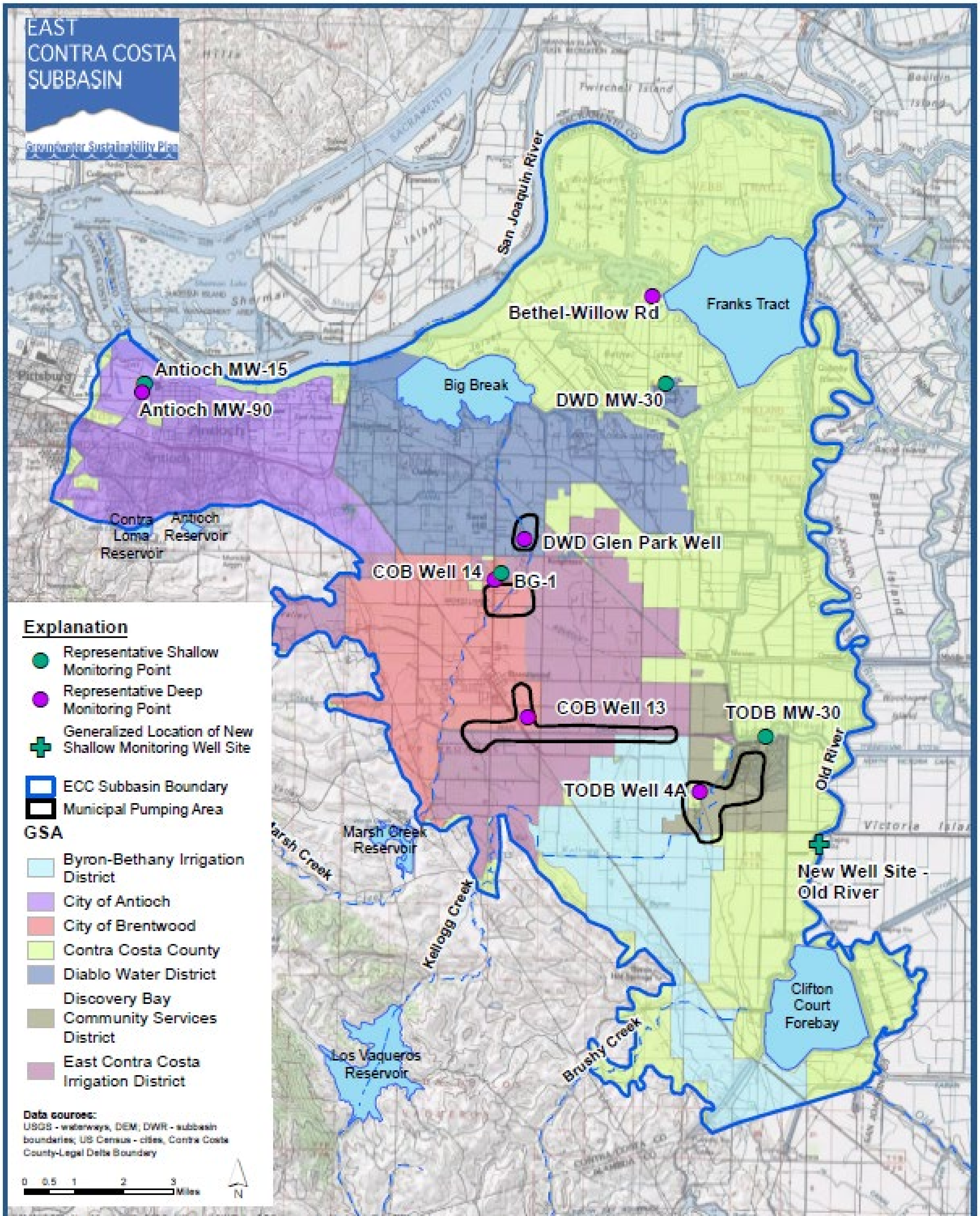
6.2.4. Seawater Intrusion Monitoring Network

The seawater intrusion monitoring network is designed to address a mechanism by which Delta baywater migrates into shallow groundwater (see discussion in **Section 3.3.4**). The potential for intrusion of saline water into the shallow zone may be exacerbated by sea level rise. These intrusion mechanisms could impact groundwater sustainability if saline water in the Shallow Zone migrated vertically into the Deep Zone supply source. At present, there is no evidence that saline intrusion from Delta baywaters has occurred or adversely affected groundwater resources in the ECC Subbasin.

The sustainability indicator for Seawater Intrusion (baywater for this Subbasin) is evaluated using a chloride concentration map that will include a new dedicated Shallow Zone monitoring wells that will act as sentinels for baywater intrusion and degradation. **Table 6-8** lists the Shallow and Deep Zone Wells used to monitor chloride concentration and **Figure 6-5** shows the locations of these wells. There is currently no Shallow Zone chloride concentration contour map since the four new monitoring well results are not yet available to provide the necessary well control. However, **Figure 3-16d** shows the average chloride (2008 to 2018) concentration in all Shallow Zone and Deep Zone wells.

Seawater Intrusion Monitoring Protocols are the same as for those used for groundwater quality (**Appendix 6a**). Chloride concentration contour intervals will be based on the ranges of recorded values, well control, and analytic considerations.

Seawater Intrusion Monitoring Data Gap: Currently there is no historic seawater intrusion in the Subbasin. The four new shallow monitoring well pairs will serve as sentinels and inform on the need for expanded monitoring at other locations. As data is collected and analyzed and if conditions change, additional wells can be installed with consideration of spatial and vertical control.



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Representative Groundwater Quality Monitoring Network

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-5

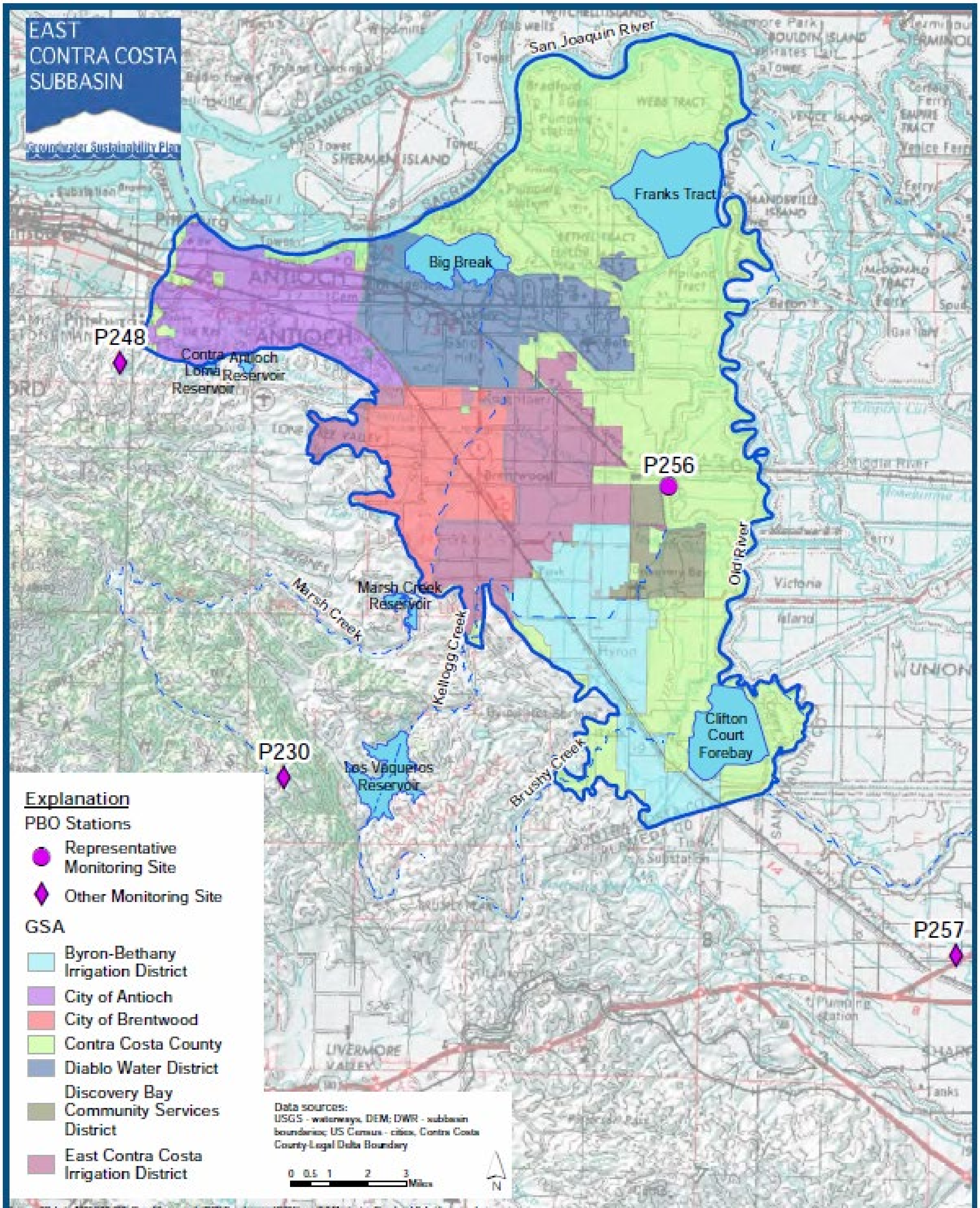
6.2.5. Land Subsidence Monitoring Network

The ECC Subbasin is not a locus for inelastic land subsidence due to groundwater extraction. This is a result of stable historic groundwater levels and lack of subsurface lithologies that would be susceptible to subsidence. However, the sustainability indicator for land subsidence will be monitored through an existing network as discussed below.

The existing land subsidence monitoring network applicable to the ECC Subbasin is comprised of four Plate Boundary Observatory (PBO) (see **Figure 6-6**) Stations. Details about the PBO network are presented in **Section 3.3.7**. PBO Station 256 is located within the ECC Subbasin and three others, P230, P248 and P257, are located in the same region but outside the Subbasin boundary. DWR has also published Interferometric Synthetic Aperture Radar (InSAR) results in partnership with the European Space Agency's Sentinel-1A satellite with the data processed by TRE ALTAMIRA[3]. These data present measurements of vertical ground surface displacement between two different dates. InSAR mapping of land surface elevation is particularly useful for complementing high spatial and temporal resolution data at CGPS station locations with observations of land subsidence over a large area for highlighting locations where change is occurring.

The representative monitoring network consists of Station 256 (P256). While land subsidence network spatial density recommendations are not provided in DWR technical guidance documents, the use of data from P256 is considered sufficient based on the lack of historical subsidence and lack of lithologies generally associated with subsidence caused by pumping. InSAR has been made available for the Subbasin and will provide coverage for the entire Subbasin and be used to compare results from the Station 256. In addition, the groundwater level monitoring will serve as a proxy to assess the sufficiency of the subsidence monitoring networks. Data from PBO Station 256 and InSAR will be reviewed annually. The land subsidence networks will be evaluated as part of the 5-year update and if there is evidence of subsidence at that time, additional monitoring will be considered.

[3] https://gis.water.ca.gov/arcgisimg/rest/services/SAR



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Land Subsidence Monitoring Network

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-6

6.2.6. Interconnected Surface Water Monitoring Network

The Monitoring Networks and Identification of Data Gaps BPM (DWR, 2016) states that an interconnected surface water and groundwater network should include stream gages and groundwater level monitoring in areas where there is a known surface water groundwater connection. These data are then used to estimate depletions.

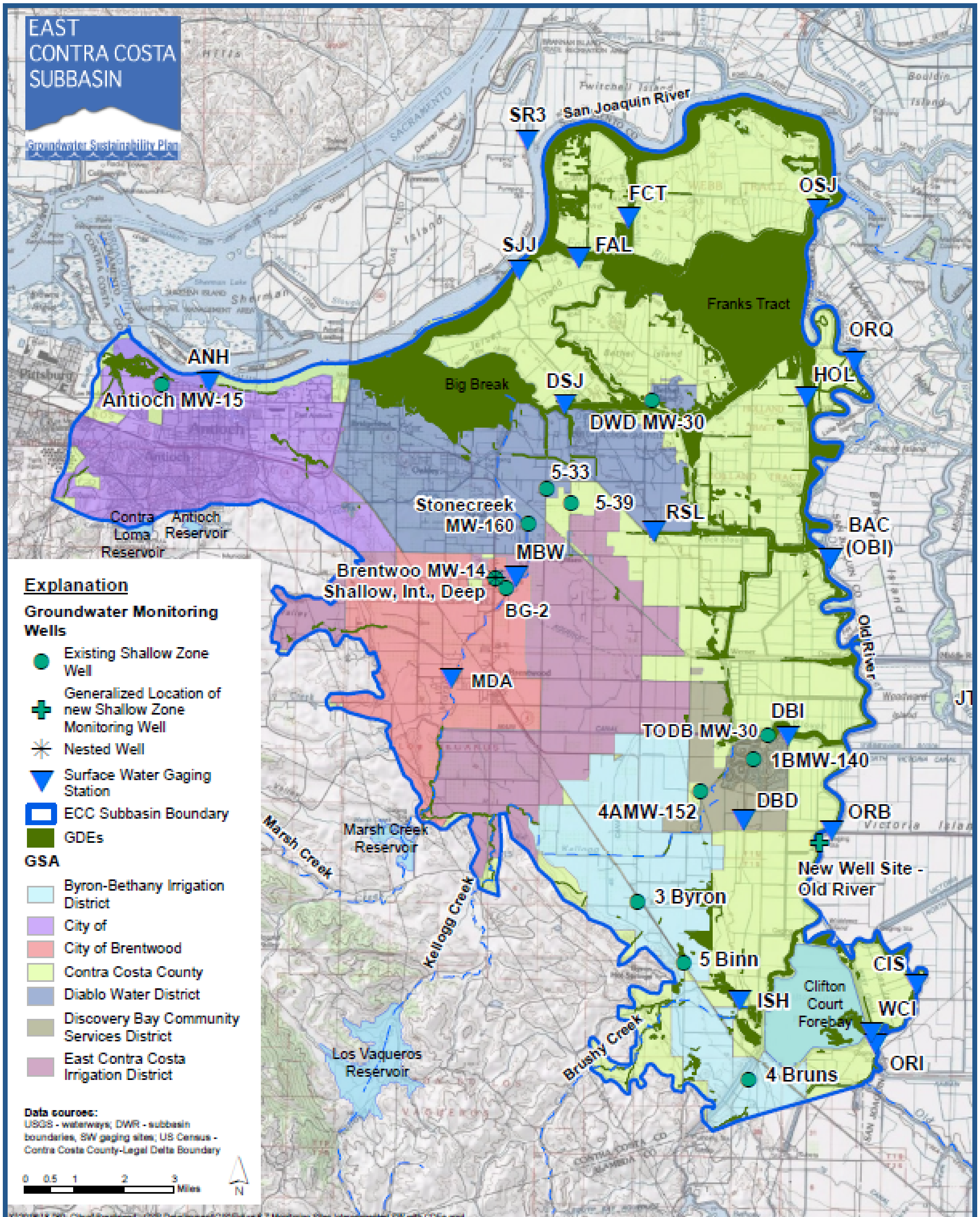
The interconnected surface water monitoring network for the ECC Subbasin consists of a subset of 15 Shallow Zone groundwater level monitoring network wells that are located adjacent to creeks, rivers and GDEs along with existing surface water flow monitoring stations (see **Figure 6-7** and **Table 6-9**). There are 19 surface water monitoring sites in the Subbasin or in the vicinity of the Subbasin boundary. These stations are independently or jointly operated by Contra Costa County Flood Control and Water Conservation District, DWR, and USGS. Most of the surface water monitoring stations at locations adjacent to the San Joaquin River, Old River, Middle River, Marsh Creek, and water conveying canals. Flow data collected at these stations (stage and/or flow rate) are publicly available. There is a range of historical data associated with these stations providing an ability to develop historical baselines to compare with future monitoring results.

A representative monitoring network is not necessary because the groundwater level monitoring network serves as a proxy for depletion of interconnected surface water. Surface water monitoring protocols are established by the monitoring entity (DWR and USGS in most cases). Spatial density for interconnected surface water monitoring networks is not specified in the Monitoring Networks and Identification of Data Gaps BMP (DWR, 2016), the incorporation of the active stations is considered sufficient for GSP implementation based on professional judgement. The special coverage for this initial GSP will be evaluated in the 5-year GSP update.

Currently there is an incomplete understanding of the interconnected surface water systems in the Subbasin. This is expected to be remedied through installation of shallow multiple completion monitoring wells (eight wells at four sites as part of this GSP) and future monitoring efforts related to this GSP.

6.2.6.1. Groundwater Dependent Ecosystem Monitoring

GSP Regulations do not require the monitoring of GDEs in a GSP, however, GDEs must be properly identified within the Plan area utilizing data available from DWR, as specified in GSP Regulation §353.2, or the best information available to the Agency. The subbasin will annually review remote sensing to monitor the health of GDEs. Landsat imagery is available at a resolution of 30 meters every 16 days, from which long-term temporal trends of vegetation metrics can be assessed on The Nature Conservatory's (TNC) GDE Pulse web app, allowing users to infer the relationships between groundwater levels, precipitation, and GDE vegetation metrics. As detailed on the GDE Pulse website, the methods in which TNC processed the satellite data results in a geospatial representation of the Normalized Derived Vegetation Index (NDVI) to estimate vegetation greenness and Normalized Derived Moisture Index (NDMI) to estimate vegetation moisture. TNC provides the average NDVI and NDMI for all Landsat pixels, masked to spatial data from the iGDE database, to present the average and trend geospatial layers representing positive and negative trends in the two-vegetation metrics.



Luhdorff & Scalmanini
Consulting Engineers

Interconnected Surface Water Monitoring Network

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 6-7

Table 6-9. Basin-wide Interconnected Surface Water Monitoring Network

Station Name	CDEC Code	Monitoring Entity	Monitoring Frequency
San Joaquin River at Antioch	ANH	CA Dept of Water Resources	Hourly
Bacon Island at Old River	BAC	CA Dept of Water Resources	Hourly
Old River at Coney Island	CIS	CA Dept of Water Resources	15 minutes
Discovery Bay at Discovery Bay Blvd	DBD	CA Dept of Water Resources	Hourly
Discovery Bay at Indian Slough	DBI	CA Dept of Water Resources	Hourly
Dutch Slough At Jersey Island	DSJ	US Geological Survey	15 minutes
False River Near Oakley	FAL	US Geological Survey and CA Dept of Water Resources	15 minutes
Fishermans Cut	FCT	CA Dept of Water Resources	15 minutes
Holland Cut Near Bethel Island	HOL	US Geological Survey and CA Dept of Water Resources	Hourly
Italian Slough Headwater Nr Byron	ISH	CA Dept of Water Resources	15 minutes
Marsh Creek at Brentwood	MBW	Contra Costa County Flood Control and Water Conservation District	15 minutes
Marsh Creek at Dainty Blvd	MDA	Contra Costa County Flood Control and Water Conservation District	15 minutes
Old River at Bacon Island (USGS)	OBI[4]	US Geological Survey and CA Dept of Water Resources	Hourly
Old River at Byron	ORB	CA Dept of Water Resources	15 minutes
Old River at Clifton Court Intake	ORI	CA Dept of Water Resources	15 minutes
Old River at Quimbly Is Near Bethel Is	ORQ	US Geological Survey and CA Dept of Water Resources	15 minutes
Old River at Franks Tract Near Terminus	OSJ	US Geological Survey and CA Dept of Water Resources	hourly
Rock Slough Abv Contra Costa Canal	RSL	CA Dept of Water Resources	15 minutes
San Joaquin River at Jersey Point (USGS)	SJJ	US Geological Survey	15 minutes
Three Mile Slough at San Joaquin River	SR3	CA Dept of Water Resources	15 minutes
West Canal at Clifton Court Intake	WCI	CA Dept of Water Resources	15 minutes

[4] Same as Bacon Island at Old River (BAC).

6.3. Protocols for Data Collection and Monitoring (§ 352.2)

The GSP monitoring protocols are consistent with the Groundwater Monitoring Protocols, Standards, and Sites Best Management Practice (DWR, 2016). The recommended monitoring protocols were adapted based on experience of the ECC GSAs with the final protocols meeting or exceeding the recommendations in the BMP guidance document.

Monitoring protocols for groundwater pumping were not given in the BMP document but accounting for groundwater pumping is an important part of managing sustainability in the ECC Subbasin. Therefore, monitoring protocols for measuring groundwater pumping are included in this GSP.

The monitoring protocols that are described in **Appendix 6a** will provide the necessary data to track minimum thresholds and measurable objectives for each sustainability indicator. The monitoring protocols established here are to be reviewed in 5 years as a part of periodic review of the GSP. The following protocols shall be employed at all monitoring sites:

- Document basic information for each monitoring point: a unique identifier, a description of the site location, geographical coordinates, elevation, date established, access instructions, and type(s) of data to be collected.
    - *A modification log shall be to be kept in order to track all modifications to the monitoring site.*
- Locations shall be reported in geographical coordinates to a minimum accuracy of 30 feet or relative to the North American Datum of 1983 (NAD83).
- Reference point elevations shall be measured in feet to an accuracy of at least 0.5 feet relative to the North American Vertical Datum of 1988 (NAVD 88).

6.4. Data Gaps

The ECC Subbasin monitoring networks consists of groundwater monitoring wells, stream gages and subsidence monitoring stations. The networks will be integrated into the GSP to monitor hydrological conditions for six SGMA sustainability indicators.

The number of groundwater monitoring wells in the ECC Subbasin networks exceeds the minimum number of wells recommended in the DWR BMP technical guidance. As per the method developed by Hopkins (1984) and included in the BMP, a basin that pumps groundwater between 1,000 and 10,000 AFY per 100 square miles should have two monitoring wells. The ECC Subbasin has four monitoring wells and a maximum historical annual groundwater pumpage of approximately 14,000 AF (12,700 af metered and 1,100 af non-metered). When prorated to the Subbasin area of 168 square miles, pumpage is 8,300 af and the number of wells is 2.4 per 100 square miles thus satisfying the Hopkins (1984) criterion for a basin that pumps between 1,000 and 10,000 AFY per 100 square miles.

Groundwater pumping and usage vary between the seven GSAs in the ECC Subbasin. As a result, the monitoring network was designed to provide a higher density of monitoring sites in areas where groundwater pumping is high, while providing a sufficient spatial coverage throughout the Subbasin. The monitoring schedule for each sustainability indicator was developed to utilize existing monitoring programs while ensuring that relevant seasonal, short-term, and long-term trends are captured. The monitoring sites meet the standards described in GSP Regulations § 352.4.

The rationales for selection of groundwater monitoring wells were their construction (penetrate only one aquifer zone), location relative to the Subbasin boundary, groundwater pumping wells and surface water features, being affiliated with current monitoring programs, and availability of historical data. Subsidence and surface water monitoring stations were selected based on their locations and availability of data. Data gaps have been initially evaluated and filled with new monitoring wells to be installed prior to implementation of the GSP. To the extent that other data gaps become evident through evaluation of hydrologic conditions and have the potential to impair sustainable groundwater management, additional wells shall be proposed and assessed to add to the networks.

6.4.1. Well Inventory Data Gap

To date, there have been no comprehensive efforts or procedures instituted to inventory active production wells in the ECC Subbasin. With the implementation of this GSP, a well inventory program shall be created with completion targeted for the 5-year Plan update. The well inventory will be developed as a tool to better understand how management of the Subbasin affects groundwater users should adverse impacts occur.

The process of creating a well inventory will be coordinated with the Contra Costa County Environmental Health Division which is the permitting agency for new wells in the ECC Subbasin. A procedure for sharing information on all new wells constructed under the County's permitting authority with the ECC Subbasin Data Management System shall be developed. The well inventory system will track various parameters including the following:

- Well location and GIS coordinates
- Date installed
- Permit number (County)
- Well Drillers Report number (DWR)
- Depth of well
- Well diameter
- Depths of perforations
- Use (domestic, industrial, commercial, agricultural, other)

A method to incorporate wells constructed prior to the new data exchange system is implemented will be evaluated with the objective that the DMS substantially accounts for active wells that serves sustainable management goal of the Subbasin as detailed in **Section 7**, **Sustainable Management Criteria**.

6.5. Ongoing Monitoring Network Evaluation

Monitoring network of the ECC GSP was established based on the ability to adequately monitor each sustainability indicator while utilizing all available monitoring sites. Each 5-year update of the GSP will include an analysis of the existing monitoring network and its ability to accurately characterize conditions and achieve sustainability. One data gap that has been currently identified is the monitoring of interconnected surface water, and it will be addressed before the next GSP update.

The monitoring network will be evaluated and potentially updated under any of the following conditions before a 5-year update:

- Exceedance of minimum threshold of a sustainability indicator.
- Highly variable spatial or temporal conditions that are inconsistent with historical baselines and the hydrogeological conceptual model.
- Adverse impacts to beneficial uses and users of groundwater.
- Determination of potential adverse effects on the ability of an adjacent basin to implement a GSP or impede achievement of sustainability goals in that basin.

6.6. Groundwater Data Management

The GSAs in the ECC Subbasin will measure the groundwater levels of wells according to the monitoring protocols set forth in the GSP **Appendix 6a**. Water level data will be submitted to a designated GSA or directly to a database manager for the GSP.

Groundwater quality samples will be collected by GSAs and sent for analysis by a certified laboratory per local practice. Quantitative testing results shall be submitted either to the designated GSA or directly to the GSP database manager. The database manager will annually transmit to the GSAs hydrographs for wells, analytical plots, brief overview of data and field reports.

Groundwater levels of the wells that are in the CASGEM network are typically collected in mid-March and mid-October of each year. All semi-annual data is sent to the database manager for review and uploading to the DWR website by March 31 (spring data) and October 31 (fall data). The database manager will upload the data according to procedures specified by DWR. In accordance with GSP Regulation §354.4, copies of monitoring data stored in the DMS shall be included in annual reports and submitted electronically on forms provided by DWR. The ECC GSAs have established guidelines to ensure that data are managed according to permissions granted by each well owner and/or as relating to applicable permit conditions.

6.7. Data Management System (§ 352.6)

In accordance with GSP Regulation § 352.6, the ECC Subbasin Data Management System (DMS) has been developed to incorporate existing and new data related to groundwater resources in the Subbasin. Site-specific information for monitoring points (identification, owner, location, construction details, measurement types, measurement method, measurement frequency, affiliated monitoring programs, permission, and other comments) and time series data shall be securely stored and backed-up in the DMS. The DMS is also capable of processing data and producing reports to meet the reporting requirements under GSP implementation. The current DMS platform is Microsoft Access and the database manager can control the access to data by DMS users.

6.8. Data Use and Disclosure

Some wells in the monitoring network are privately-owned. Monitoring and data reporting associated with those wells are conducted with the permission of well owners. Exact location information of private wells will be redacted from submittals, while water level and quality data will be published with the well owner's permission. Groundwater quality of public supply wells will be publicly available.

6.9. Data Submittals

Monitoring data will be submitted to DWR in electronic formats utilizing the forms provided by the DWR (GSP Reg. § 353.4).

6.10. Reporting

Annual reporting and periodic evaluation for the ECC GSP monitoring networks are detailed in **Section 9**.

6.11. References

California Department of Water Resources (DWR). December 2016. Guidance Document for the Sustainable Management of Groundwater: Monitoring Networks and Identification of Data Gaps, Best Management Practice.

SECTION 7 CONTENTS

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APPENDICES

7. SUSTAINABLE MANAGEMENT CRITERIA

Sustainable groundwater management is the management and use of groundwater in a manner that can be maintained for the next 50 years without causing undesirable results[1]. The avoidance of undesirable results is critical to the success of a Groundwater Sustainability Plan (GSP). Management of the basin through this GSP will be conducted using the best available science and it will be periodically updated through an adaptive process in response to various factors including climate change.

Consistent with the principles described above, the East Contra Costa (ECC) GSP has tailored sustainable management criteria (SMC) specific to the conditions found in the ECC Subbasin. The development and implementation of these SMCs, (e.g., sustainability goal, undesirable results, minimum thresholds, and measurable objectives[2]) ensures the continued sustainability of groundwater resources in the ECC Subbasin by committing the seven overlying GSAs to future management actions.

This section defines sustainable management criteria for the ECC Subbasin including the data and methods used in their development and how they relate to beneficial uses and users of groundwater. The SMC are based on current available data and analyses of the basin setting and groundwater conditions as detailed in (**Section 3)**.

GSP regulations require that sustainable management criteria be developed for each sustainability indicator (note that the seawater intrusion indicator is characterized in the ECC Subbasin as significant and unreasonable intrusion of Delta and Bay waters):

- Chronic lowering of groundwater Levels
- Reduction of storage (ECC Subbasin GSP uses proxy of groundwater levels)
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water (ECC Subbasin GSP uses proxy of groundwater levels)

The Department of Water Resources prepared a Best Management Practice document[3] to assist GSAs in developing SMC and that defines the terminology used in the section. **Figure 7-1** illustrates the relationship between sustainability indicators, minimum thresholds, and undesirable results. For reference during the review process only,

[1] California Water Code 10721 (v) and (r)
[2] 23 CCR Groundwater Sustainability Plans § 354.22 et seq.
[3] BMP 6 Sustainable Management Criteria Best Management Practice https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents

Figure 7-1. Relationship between Sustainability Indicators, Minimum Thresholds, and Undesirable Results

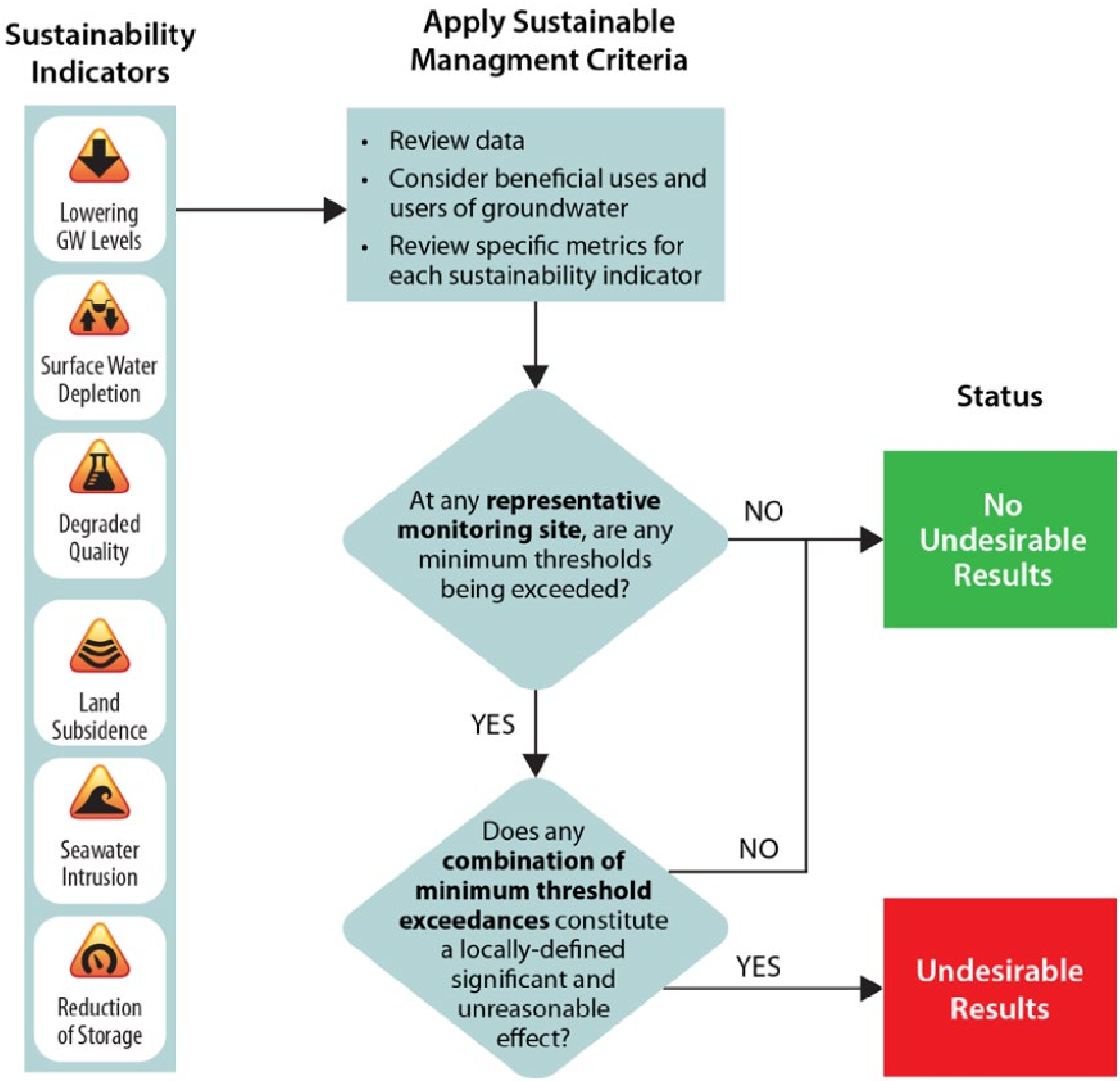
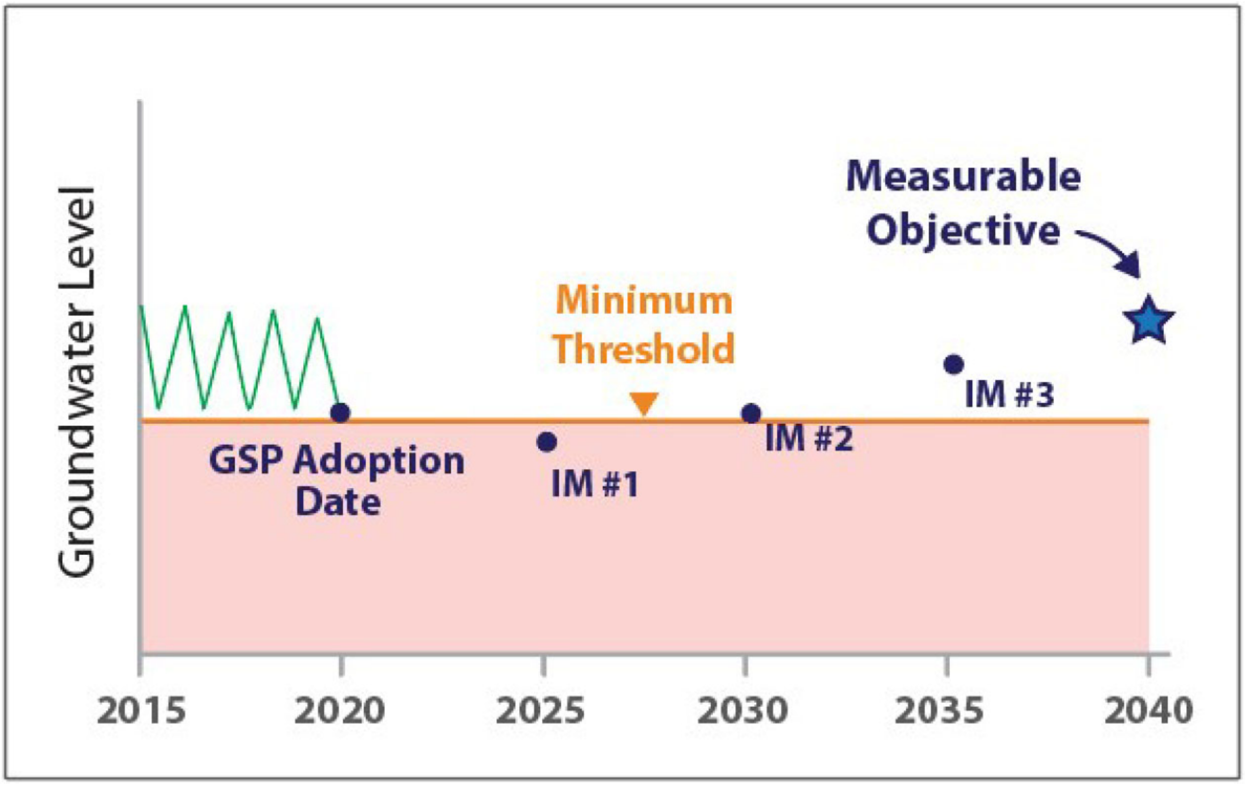


Figure 7-2. Sustainability Management Criteria Example-Groundwater Levels



7.1. Process to Establish Sustainable Management Criteria

The SMC developed for the ECC Subbasin were coordinated by the seven overlying GSAs, (City of Antioch and Brentwood, Byron Bethany Irrigation District, Contra Costa County, Diablo Water District, East Contra Costa Irrigation District, Town of Discovery Bay) and CCWD via an agreement to prepare a single GSP. SMC development was informed by hydrologic and hydrogeologic analyses leading to the ECC Hydrogeologic Conceptual Model presented in **Section 3**, **Basin Setting**. The process for establishing SMC included:

- GSA Working Group meetings.
- Public meetings on GSP development that introduced stakeholders to SMC.
- Additional public meetings on proposed methodologies to establish minimum thresholds and measurable objectives to receive additional public input.
- Public surveys to receive additional stakeholder input.
- Review of public input on preliminary SMC methodologies with GSA staff/technical experts.
- Preparation of a Draft GSP for public review and comment.
- Establishing and modifying minimum thresholds, measurable objectives, and definition of undesirable results based on feedback from public meetings, public/stakeholder review of the Draft GSP, and input from GSA staff/technical experts.

7.2. ECC Sustainability Goal

7.2.1. Goal Description

The ECC Subbasin is not experiencing undesirable results as defined under SGMA. The sustainability goal for the ECC Subbasin GSP is to manage the groundwater Subbasin to:

- Protect and maintain safe and reliable sources of groundwater for all beneficial uses and users.
- Ensure current and future groundwater demands account for changing groundwater conditions due to climate change.
- Establish and protect sustainable yield for the Subbasin by achieving measurable objectives set forth in this GSP in accordance with implementation and planning periods[4].
- Avoid undesirable results defined under SGMA.

The GSAs in the ECC Subbasin will manage the Subbasin under a single GSP. The GSAs and other water agencies have cooperatively engaged in water supply issues in the Subbasin including Integrated Regional Water Management plans, groundwater management plans, and California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring. Through coordinating agreements, the GSAs will continue to manage the ECC Subbasin while retaining groundwater management authority within their respective jurisdictions.

The following principles are incorporated into the GSP to guide implementation of the sustainability goal:

- Continued public outreach to all interested parties and stakeholders with transparency in all planning, evaluations, and findings regarding groundwater management activities.
- Adaptively manage the ECC monitoring networks, by expansion and/or modification, based on periodic evaluations to ensure a comprehensive understanding of basin hydrogeology and mechanisms that affect groundwater sustainability.
- Prioritize environmental justice and groundwater dependent ecosystems as beneficial uses.
- Protect the groundwater supply of potentially underrepresented communities such as disadvantaged communities (DACs).
- View the use and protection of groundwater as an integral part of long-term water management strategies for the Subbasin.
- Protect and maintain sufficient groundwater storage to provide operational flexibility for all water year types and with consideration of climate change.
- Acknowledge that within the ECC Subbasin there are criteria and solutions that are regionally appropriate by each GSA jurisdiction.

[4] As defined under SGMA, the GSP implementation period is 20 years. The planning and implementation horizon is a 50-year time period over which the GSAs determine that plans and measures will be implemented to ensure that the basin or subbasin is operated within its sustainable yield.

- Continued cooperative water resources management by GSAs and other water agencies through updated MOUs or other agreements to ensure that all activities needed to maintain sustainability are identified, funded, and implemented.

7.2.2. Historical, Existing and Potential Future Conditions of Undesirable Results

Groundwater conditions in the ECC Subbasin exhibit stability and sustainability. Historic and current use of the groundwater basin show no signs of chronic lowering of groundwater levels, reduction of groundwater storage, land subsidence, sea water intrusion, degraded water quality or depletion of interconnected surface water. Nonetheless, future potential undesirable results for each sustainability indicator were identified as required under GSP regulations. This was accomplished through a Sustainable Management Criteria survey, public meetings, and input from the GSP Working Group.

Table 7-1 illustrates the historical, existing, and potential future conditions of undesirable results for the six sustainability indicators in the ECC Subbasin.

Table 7-1. Summary of Undesirable Results Applicable to the Plan Area

Sustainability Indicator	Historical Period	Existing Conditions	Future Conditions with GSP Implementation
Chronic Lowering of Groundwater Levels	No	No	No
Reduction of Groundwater Storage	No	No	No
Land Subsidence	No	No	No
Seawater Intrusion	No	No	No
Degraded Water Quality	No	No	No
Depletion of Interconnected Surface Water	No	No	No

7.2.3. Measures to be Implemented

Projects and management actions that have been completed or are planned to be implemented over the 20-year GSP implementation period (2022 through 2042) are discussed in (**Section 8**). These measures are developed to ensure that the ECC Subbasin will continue to be managed sustainably during GSP implementation and throughout the 50-year planning and implementation horizon.

7.2.4. Explanation of How the Sustainability Goal will be Achieved

Undesirable results have not occurred historically and are not present in the ECC Subbasin. Furthermore, analyses of current monitoring data do not indicate undesirable results for the 20-year GSP implementation period. The GSAs will continue to work collaboratively and coordinate with other water supply entities, implement various projects and management actions to strengthen overall water supply reliability in the region that would have direct and indirect positive effects on groundwater sustainability.

The following projects and management actions, detailed in (**Section 8),** will be implemented to continue sustainability in the ECC Subbasin.

7.2.4.1. Projects

1. City of Antioch Brackish Water Desalination Project
2. Northeast Antioch Annexation Water and Sewer Facility Installation
3. City of Brentwood Non-Potable Storage Facility and Non-Potable Water Distribution
4. City of Brentwood Citywide Non-Potable Water Distribution System
5. Diablo Water District Treatment and Reuse of Alternative Water Supplies
6. ECCID-CCWD Dry-Year Water Sales

7.2.4.2. Management Actions

The proposed management actions in this GSP will be implemented by individual GSAs based on need and applicability. The management actions are consistent with authorities granted to GSAs through SGMA legislation and GSP regulations. Implementation of any action will be in coordination and consistent with the Contra Costa County well permitting process and regulations. Consistent with SGMA, these potential actions do not apply to de minimis extractors[5].

1. Well spacing control to mitigate potential impacts to existing wells
2. Oversight of well construction features such as completion intervals and seal depths to protect water quality and quantity using best management practices for the site conditions
3. Well metering, monitoring, and reporting to ensure accurate well and pumping data are provided to the GSAs
4. Pumping limits to protect existing supplies and avoid undesirable results
5. Pumping fees for implementing management actions

The projects and management actions will ensure that the ECC Subbasin is managed sustainably through the regulatory planning and implementation horizons.

7.3. ECC Sustainability Indicators

Each of the six sustainability indicators is defined by the following: undesirable results, minimum thresholds, and measurable objectives for the ECC Subbasin. The definitions of the sustainability indicators allow the GSAs, the State and the public to evaluate future conditions of the ECC Subbasin to ensure its managed sustainably and achieves the GSP sustainability goal.

The categories of groundwater use in the ECC Subbasin are:

[5] "De minimis extractor" means a person who extracts, for domestic purposes, two acre-feet or less per year. Section 10721, Water Code

- Agriculture
- Commercial
- Domestic Supply (Public Water Systems)
  - Small water system (2 to 199 connections)
  - Municipal supply (more than 200 connections)
- Industrial (may include process water)
- Environmental
  - Groundwater dependent ecosystems (see **Basin Setting**, **Section 3**, **Figures 3-26a and b**)
  - Other habitat protection including stream restoration projects

7.3.1. Chronic Lowering of Groundwater Levels

7.3.1.1. Undesirable Results

Chronic lowering of groundwater levels is absent from the ECC Subbasin. However, the potential of chronic lowering of groundwater levels in ECC Subbasin is an undesirable result as defined in California Water Code Section 10721(x)(1):

> *"Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods."*

7.3.1.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. The ECC GSP defines significant and unreasonable chronic lowering of groundwater levels as:

- Unreasonable reduction or loss of water well capacity that cannot be mitigated, applies to:
  - Agricultural wells
  - Commercial
  - Domestic supply wells
    - Municipal supply wells
    - Small water system wells
    - Private domestic wells
  - Industrial wells
- Adverse economic impacts and burdens on local agricultural and commercial enterprises
- Adverse economic impacts to existing well owners resulting in the need to: lower a well pump ("chasing the water"), to replace a pump, and/or to deepen or replace a well

- Loss of water source due to drop in water levels (wells going “dry”)
- Cause sustained water level impacts to neighboring wells (well pumping interference)
- Lack of prioritization of health and human safety over uses such as landscape irrigation
- Interference with other sustainability indicators

As indicated in the Water Code, water level declines in a drought, which may temporarily induce any of the above results, are not considered unsustainable if water levels recover in intervening non-drought periods.

Implementing the ECC GSP projects and/or management actions will prevent the chronic lowering of groundwater.

7.3.1.3. Potential Causes of Undesirable Results

There is no evidence that groundwater levels are chronically declining in the ECC Subbasin, and they are not expected to do so in the future. However, SGMA regulations require the GSP to identify future conditions (over 50 years) that may lead to chronically declining water levels, and they could include the following:

- Significantly worse hydrologic conditions than currently projected under climate change scenarios (see **Section 5**).
- Regulatory changes in streamflow requirements imposed by the SWRCB that reduce long standing surface-water rights and supplies.
- Expansion of pumping in place of existing surface water supply source. Expansion of pumping may induce localized drawdowns and groundwater level declines.
- Changes in the historical management of the Delta and salinity control point.

The above hypothetical causes are considered unlikely under projected land and water uses and the cooperative regional water supply coordination among GSAs and other agencies. In addition, factors such as climate change and sea level rise are included in the ECC Subbasin groundwater budget as described in (**Section 5)**.

7.3.1.4. Potential Effects of Undesirable Results

A potential effect for the chronic lowering of Shallow Zone groundwater levels is the potential impact to domestic well owners whose wells may go dry and decrease shallow water available to groundwater dependent ecosystems. These changes could impact property values, quality of life, and environment in the ECC Subbasin. Changes in groundwater levels in the Deep Zone where pumping for large systems serving municipalities occurs could impact groundwater supply reliability and increase costs for consumers throughout the Subbasin.

7.3.1.5. Minimum Thresholds

Section 354.28(c)(1) of the SGMA regulations states:

> *“The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.”*

Groundwater elevation data collected from existing and new groundwater monitoring wells, known as Representative Monitoring Site (RMSs), are used to measure the level of groundwater in the ECC Subbasin. Future groundwater level measurements will be evaluated against the defined minimum thresholds to ensure chronic lowering of groundwater levels does not occur. (**Figure 6-2 in Section 6)** shows the location of the RMSs in the ECC Subbasin and **Table 7-2**, below, lists the minimum thresholds at each RMS. **Appendix 7a** includes hydrographs of historical groundwater levels with minimum thresholds and measurable objectives for chronic lowering of groundwater levels.

The minimum thresholds for the chronic lowering of groundwater levels are informed by the Subbasin water budget quantified in (**Section 5)** using a groundwater flow model. Modeling scenarios were designed to quantify sustainable groundwater yield by successively reducing surface water deliveries and increasing pumping to the point that one or more sustainability indicators were adversely affected. These scenarios indicated that sustainable yield in the ECC Subbasin is likely constrained by changes in subsurface outflow to other subbasins and stream depletion. At the same time, groundwater levels and storage were not adversely affected. This is attributed to the direct connections to recharge sources tied to the Delta.

Based on the modeling results, minimum thresholds for chronic lowering of groundwater levels are quantified using the lowest historical water levels observed in a well plus 10 feet. If the MT in any well is exceeded over three consecutive years, indicating a trend, and do not recover in normal to wet years, undesirable results would be evaluated in terms of affects related to sustainable management activities. Since groundwater levels in the ECC Subbasin have been stable historically through the present and are projected to remain that way in the future, this is a conservative approach that will be adapted as additional groundwater level data and experience is accumulated. The modeling tool developed in (**Section 5)** provides additional support for the conservative nature of this approach.

Table 7-2. Minimum Threshold, Measurable Objectives, and Interim Milestones for Chronic Lowering of Groundwater Levels

Representative Monitoring Site (RMS)	Well Owner/ GSA	Well Depth (ft bgs)	Perforation Depths (ft bgs)	Minimum Threshold	Measurable Objective and Interim Milestones
				Groundwater Elevation (feet from mean sea level)	
Shallow Zone Wells					
Antioch MW-15‡	Antioch	15	5-15	-9	0.6
5 Binn	BBID	45	45 (TD)	-4	16
New Well	CCWD				
BG-2	COB	37.5	22.5-37.5	32	44
DWD MW-30‡	DWD	15	5-15	-9	1
Well #11 (4-61-A)	ECCID	100	50-100	12	40
TODB MW-30	TODB	30			
Deep Zone Wells					
Antioch MW-90‡	Antioch	90	75-85	-11	-1
Brentwood MW-14 Int.	COB	240	200-210, 220-230	-48	16
Bethel-Willow Rd	DWD	260	230-260	-15	-3
Stonecreek MW-300	DWD	300	230-240, 280-290	-37	-1.7
4AMW-357	TODB	357	307-347	-107	-21

Notes: Blue indicates New Monitoring Well, sustainability indicators will be set at the depth measured when the wells are installed.

‡ Well installed August 2021, MT and MO presented are interim until more data is available.

7.3.1.6. Information and Criteria Relied Upon to Establish the Minimum Threshold

Information used to establish the minimum threshold for the chronic lowering of groundwater levels includes:

1. Historical groundwater elevations from basin-wide monitoring wells in the ECC Subbasin.
2. Depths and locations of existing wells.
3. Current and historical groundwater elevation contour maps.
4. Modeling scenario for basin sustainable yield including climate change.
5. Other Information from GSAs and interested parties regarding significant and unreasonable conditions.

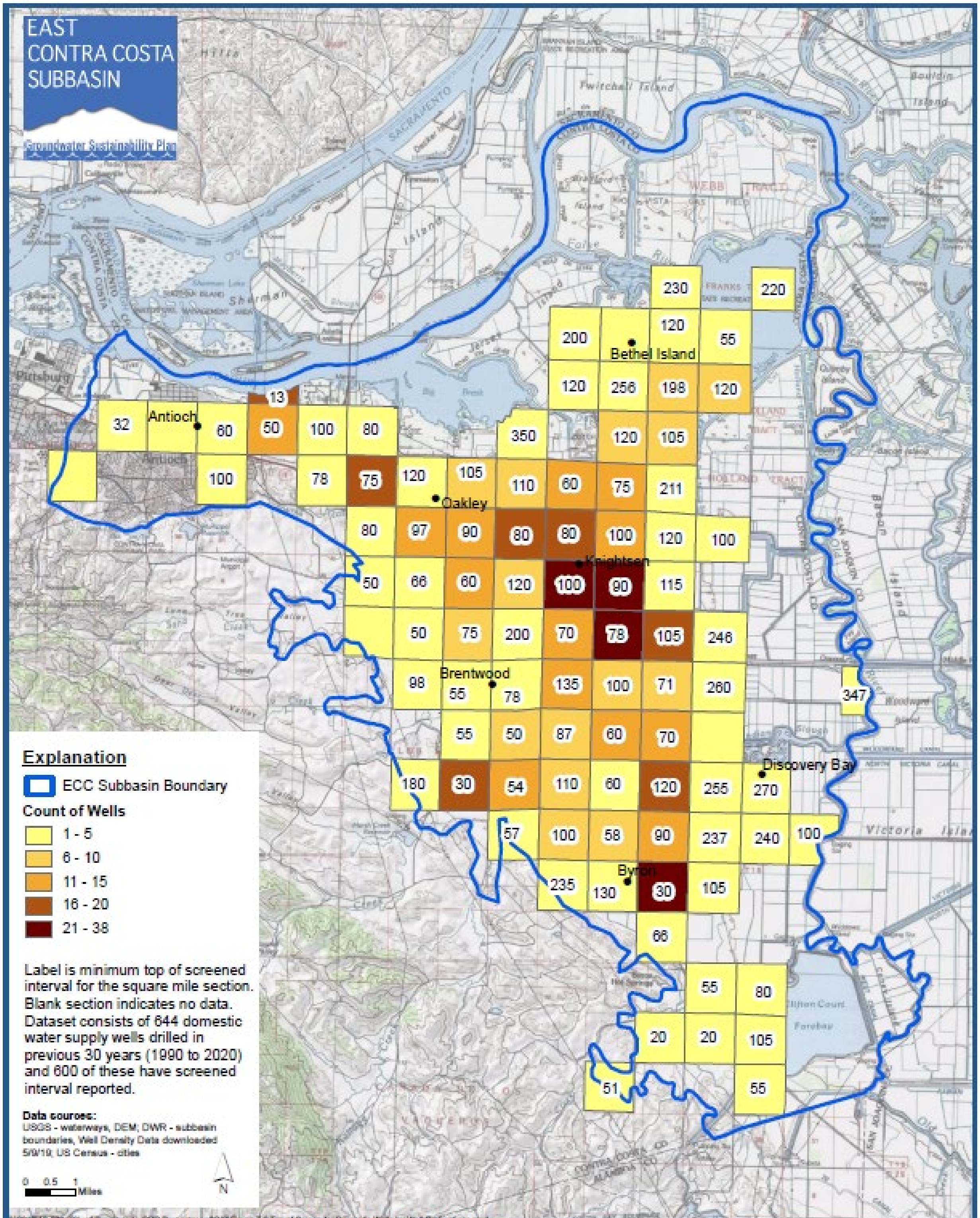
The minimum thresholds for chronic lowering of groundwater levels at each RMS is set at an elevation, when evaluated collectively, that could produce undesirable results in the ECC Subbasin. They are the following:

1. The minimum threshold for each RMS is set at a level for which the sustainable yield is exceeded based on groundwater flow model scenario (see **Section 5**).
2. Where chronic level declines do not exceed the sustainable yield, but otherwise cause undesirable results as described in this GSP.
3. For domestic wells, a minimum threshold which indicates that the 10th percentile of this category experiences a drop below the top perforations within the section where the RMS is located. This is considered protective of the water supply sustainability because it considers the most sensitive conditions of well operations.

Minimum thresholds were tentatively set for the four new monitoring well sites based on modeling results and professional judgement. Measurable objectives are also tentative and were set at the initial water levels measured in the wells. As additional data is available; these values may be revised.

The ECC Subbasin has not experienced chronic water level declines in the past. The initial MTs in this GSP may be considered as preliminary values which may change based on monitoring and annual reporting of groundwater conditions. Groundwater levels after the droughts of 2007-09 and 2013-16 recovered without even temporary undesirable results. This was due to multiple factors including water conservation and the diversification of supply sources (i.e., available surface water).

Information on domestic wells installed in the past 30 years and for which perforation intervals were listed was downloaded from DWR's Well Completion Report Map Application (DWR, 2019) dataset. **Figure 7-3** shows the number of wells (color coded) and the shallowest well perforations (numeric value in each square). There is a wide range of completion interval for this category of well with the shallowest perforations indicating that some wells pump, at least partially, from the Shallow Zone, while the deeper perforations target only the Deep Zone. Wells completed in the Shallow Zone are generally isolated from pumping in the Deep Zone, where most pumping occurs in the Subbasin, by confining zones that prevent propagation of impacts vertically. Wells that pump solely in the Shallow Zone will ultimately be protected through the MTs and MOs being developed through expansion of shallow monitoring throughout the Subbasin. The Deep Zone wells will be protected through the MTs and MOs assigned to the RMS in **Table 7-2**.



Top of Screen for Domestic Wells by Well Perforations

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 7-3

7.3.1.7. The Relationship of Minimum Thresholds for Other Sustainability Indicators

In accordance with the DWR Sustainable Management Criteria BMP (2017), the GSP must describe:

1. The relationship between each sustainability indicator's minimum threshold (how or why the MTs are the same or different).
2. The relationship between MTs for other sustainability indicators (e.g., how the water level minimum threshold would not trigger an undesirable result for land subsidence).

All sustainability indicators are intrinsically related and SGMA requires an assessment that a particular MT does not result in an undesirable result arising in another sustainability indicator. The minimum thresholds for chronic lowering of groundwater are established to avoid undesirable results for the remaining sustainability indicators, as described below.

- **Reduction in Groundwater Storage**. The groundwater level minimum thresholds are set with consideration that temporary exceedances during drought do not reflect an undesirable result if water levels recover in non-drought periods. The measurable objectives, which represent the anticipated long-term average groundwater levels, are not expected to result in significant or unreasonable change in groundwater storage based on historical conditions in the Subbasin.
- **Subsidence**. A significant and unreasonable condition for land subsidence is permanent (inelastic) subsidence that damages infrastructure as caused by compaction of clay-rich sediments in response to declining groundwater levels. No such subsidence has been recorded in the ECC Subbasin nor are geologic conditions susceptible to inelastic compaction present as represented in the hydrogeologic conceptual model of the Subbasin. Therefore, groundwater elevation minimum thresholds for subsidence in the ECC Subbasin are not initially being set. However, the GSP monitoring plan includes regular evaluation of groundwater levels, Plate Boundary Observation data, and potential infrastructure impacts within GSA jurisdictions will be conducted and reported.
- **Seawater Intrusion**. The groundwater level minimum threshold for shallow groundwater levels, will be protective of baywater intrusion in the Shallow Zone by avoiding downward vertical flow gradient that might otherwise induce saline water to migrate to water supply aquifers.
- **Degraded Water Quality**. A significant and unreasonable condition of degraded water quality is exceeding regulatory limits for constituents of concern in wells due to actions proposed in the GSP Water quality could be affected by chronic lowering of water levels through three processes.
  - Lowering groundwater levels could cause changes in groundwater flow gradients that result in commingling of poor-quality groundwater with supply sources.
  - Lowering groundwater levels could change groundwater gradients and cause poor quality groundwater from contaminant plumes to migrate to wells not previously impacted.
  - Potential projects consisting of surface water recharge through the vadose zone to the water table. Such projects have the potential to flush constituents of concern (e.g., TDS and nitrates) from the vadose zone to the water table. There may be a temporary increase in higher constituent concentrations prior to eventual dilution and reduction in these constituents.

At present, no such recharge projects are planned. However, the monitoring program developed for this GSP will be evaluated periodically to adapt to the GSP projects.

- **Depletion of interconnected surface waters**. It is recognized that shallow groundwater and surface water are interconnected in the delta region including portions of the ECC Subbasin. Changes in groundwater elevation could impact GDE areas as a result in decreased outflow of fresh groundwater due to chronic water level declines.

7.3.1.8. How the MT was Selected to Avoid Causing Undesirable Results in Adjacent Basins

The groundwater level minimum thresholds for the chronic lowering of groundwater levels established for the ECC Subbasin are expected to be protective of adjacent subbasins as there are no apparent direct connections between Deep Zone aquifers used for water supply in those basins. Further, the Delta provides a hydrologic buffer between the Solano, Eastern San Joaquin, and Tracy Subbasins such that Shallow Zone influences are not expected to propagate. The Pittsburg Plain Subbasin borders the City of Antioch between which there is either a groundwater divide or barrier to cross flow. New monitoring wells being installed in Antioch will provide more data on the relationship between the two subbasins. The modeling tool will be used to assess subsurface movement in and out of the subbasins to assess future changes and potential adverse conditions at the shared boundaries of those subbasins.

7.3.1.9. How the MT may Affect the Interests of Beneficial Uses and Users of Groundwater

Groundwater level minimum thresholds for the chronic lowering of groundwater levels may affect beneficial uses, users, and land uses in the Subbasin. RMS sites were selected to provide a basis for evaluating changes and impacts to the different uses and users of water wells throughout the Subbasin.

Rural residential land uses and users. The chronic lowering of groundwater level MT protects most domestic users of groundwater by considering the depths to which wells are completed and protection of reasonable operating margins for available pumping drawdown. A comparison of a hypothetical MT water surface was developed by interpolating MT values between RMS wells to potential domestic well locations based on DWR WCR data where construction in known. The precise locations and construction of wells that are currently active in the Subbasin is not known and some older WCRs may be associated with wells that are no longer active. If this hypothetical condition occurred with all wells experiencing the MT, less than 5% of the domestic wells in the Subbasin have the potential to go dry; i.e., the well would experience less than 10 feet of saturated screen. This comparison is highly conservative given the inclusion of wells that are 50 years old and that newer wells are likely not completed solely in the Shallow Zone. The proposed well inventory program discussed in Section 6 will aid the GSAs in refining the MT to maximize protection for this kind of user.

Agricultural land uses and users. Similar to rural residential uses and users, chronic lowering of groundwater level MTs are intended to protect agricultural users and their ability to meet existing and projected demands through typical well and pumping configurations (e.g., depths, perforation intervals, pumping lifts).

Urban land uses and users. The chronic lowering of groundwater level MTs are set so that existing and projected water demands can be met through typical well and pumping configurations (e.g., depths, perforation intervals, pumping lifts).

Environmental uses and users. Environmental uses include groundwater dependent ecosystems for which data gaps have been identified and new monitoring installations planned. Initially, a baseline shall be established to provide a basis for identifying effects of chronic lowering of groundwater and setting protective MTs.

7.3.1.10. How the MT Relates to the Federal, State, or Local Standards

There are no applicable federal, state, or local standards for MTs related to chronic lowering of groundwater levels in the plan setting.

7.3.1.11. How each MT will be Quantitatively Measured

The groundwater level minimum thresholds for the chronic lowering of groundwater levels will be directly and quantitatively measured at each RMS. Groundwater level monitoring will be conducted in accordance with the monitoring plan and protocols outlined in (**Section 6)** and will meet the requirements of the technical and reporting standards included in the SGMA regulations. The current representative monitoring network includes seven Shallow Zone wells and five Deep Zone wells.

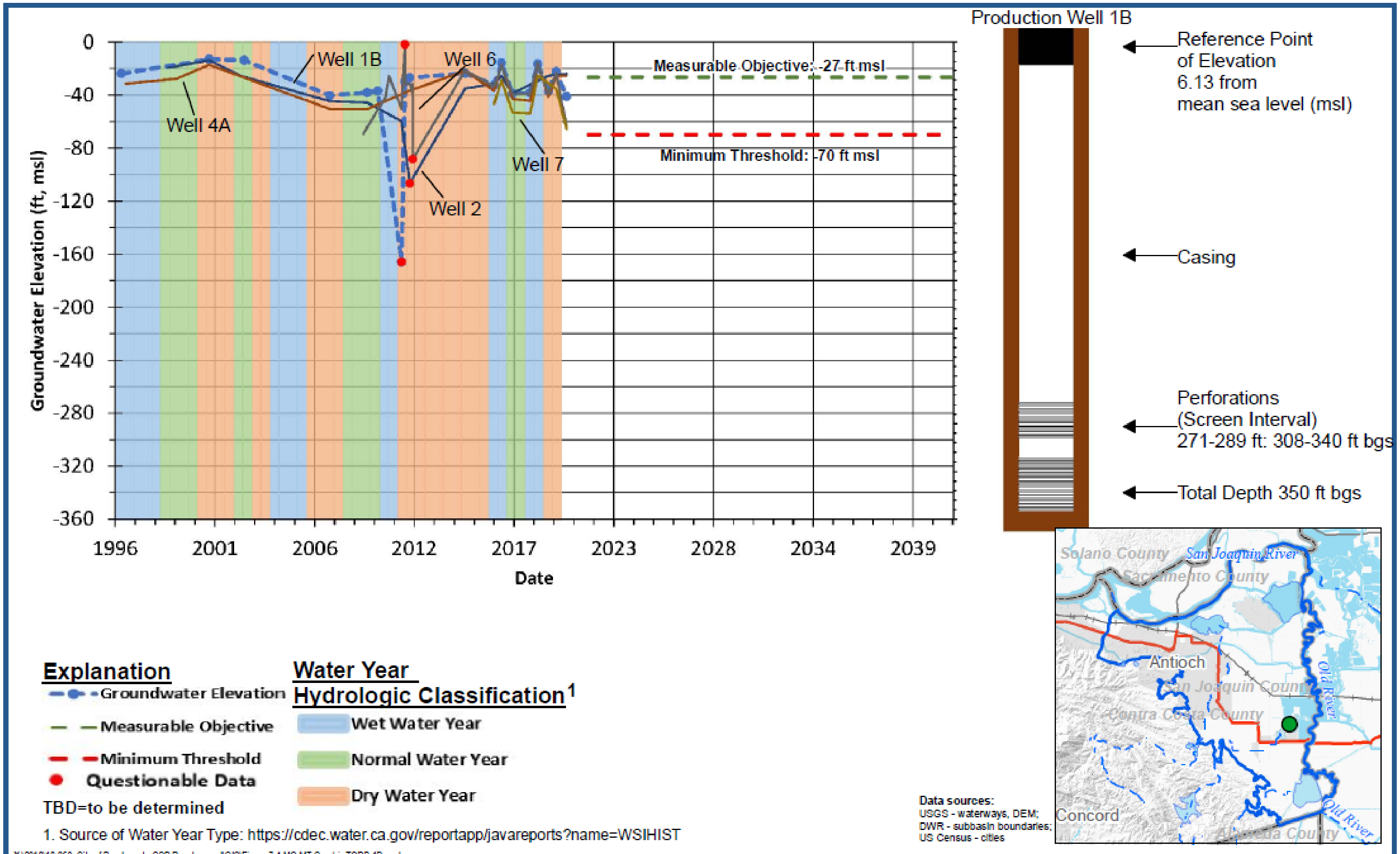
7.3.1.12. Measurable Objectives and Interim Milestones

Measurable objectives (MO) for the chronic lowering of groundwater levels are quantitative goals that reflect the Subbasin's desired groundwater conditions and goal to achieve sustainability within 20 years. It is set above the minimum threshold to allow a zone of operational flexibility that allows for drought, climate change, conjunctive use operations, and other groundwater management actions.

The measurable objective for chronic lowering of groundwater levels is the average spring elevation of groundwater at the RMS and its vicinity. Years in which drought caused temporary decline in water levels were excluded as outliers due to other causes (e.g., questionable field measurement). An example of setting MOs is illustrated for the RMS at the Town of Discovery Bay (**Figure 7-4**) in which measurements in Deep Zone production wells are shown with data from the RMS, which has a shorter period of record. In this situation, the MO at the RMS is informed by historical data from nearby wells of which the RMS is intended to be representative. The MOs for the Shallow and Deep Zone existing wells determined in this manner are listed in **(Table 7-2)** and are denoted on hydrographs in **Appendix 7a**.

Measurable objectives are preliminary for new Shallow and Deep Zone RMSs installed in summer 2021. MOs for these new Shallow and Deep Zone wells will be set at the water level measured at the time the well was drilled. However, as additional data is accumulated, the MOs may be adjusted.

Interim milestones are defined in five-year increments at each RMS to track progress toward meeting the sustainability goal. With the ECC Subbasin currently meeting the sustainability goal, the measurable milestones coincide with the measurable objective for this indicator (**Table 7-2**). Every five years the interim milestones will be reevaluated in the GSP review to confirm that management of the Subbasin satisfies the GSP sustainability goal.



Luhdorff & Scalmanini Consulting Engineers

Measurable Objectives and Minimum Thresholds-TODB Production Wells

East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figure 7-4

7.3.2. Reduction in Groundwater Storage

7.3.2.1. Undesirable Results

As described in this GSP, the current and historical groundwater use in the ECC is free from undesirable results for groundwater storage. Additionally, modeling indicates that undesirable results are not anticipated to occur during the planning and implementation horizon. Stable groundwater levels from 1993 to 2019 indicate that historical pumping in the Subbasin has not depleted useable storage[6].

The sustainable yield of the Subbasin is the total volume of groundwater that can be withdrawn on an average annual basis without leading to a long-term reduction in useable groundwater storage or interfering with other sustainability indicators. **Section 5**, **Water Budget** quantifies sustainable yield of the Subbasin at 72,000 AF/year using the groundwater flow model developed for sustainable management. The modeling tool will be used, refined, and updated as needed, to quantify sustainable yield to avoid significant and unreasonable reductions in groundwater storage.

An undesirable result occurs when available groundwater storage is depleted to the degree that current uses and users are unable to meet groundwater demand.

7.3.2.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. The undesirable result for the reduction in groundwater storage are the same as previously described for chronic lowering of groundwater levels, which act as a proxy for the groundwater storage sustainability indicator. In addition, significant and unreasonable changes in groundwater storage from implementing sustainable management policies, projects, or actions would occur if they caused any of the following:

- Reduction in groundwater storage that restricts the quantity of supply to satisfy existing beneficial use or harms an existing category of groundwater user.
- Any long-term reduction in available drawdown for pump operating margins that adversely affects available capacity or supply.
- Degraded water quality as a result of changed groundwater flow conditions.
- Interference with other sustainability indicators.

[6] Useable storage is that volume of groundwater that may be extracted within the constraints of a balanced water budget.

7.3.2.3. Potential Causes of Undesirable Results

The ECC Subbasin has experienced no long-term reduction in groundwater storage due to pumpage or other imbalance in the water budget. Although unlikely, hypothetical conditions that may lead to a reduction in groundwater storage include the following:

- Prolonged drought. An extensive drought greater than planned for may cause increased pumping of groundwater and a reduction of groundwater storage to a significant and unreasonable level.
- Regulatory changes in streamflow requirements imposed by the SWRCB that reduce long standing surface-water rights and supplies.
- Expansion of pumping and reduced surface water use.

The above hypothetical causes are considered unlikely under projected land and water use estimates even when the effects of climate change and sea level rise are considered (see **Section 5**).

7.3.2.4. Potential Effects of Undesirable Results

The reduction of groundwater storage in the Shallow Zone (e.g., lowering of shallow zone groundwater levels) could potentially impact domestic well owners whose wells may go dry, decrease shallow water available to GDEs, and induce baywater intrusion causing degraded groundwater quality. These changes could impact property values, quality of life, and environment in the ECC Subbasin. Changes in groundwater storage in the Deep Zone, which provides the main source of water supply in the Subbasin, could impact groundwater supply reliability, and increase costs for users and consumers.

7.3.2.5. Minimum Thresholds

SGMA Regulations (§354.36(b)(1)) allow GSAs to use groundwater elevation as a proxy for any sustainability indicator provided there is sufficient correlation between groundwater levels and the other metric (Sustainable Management Criteria BMP, 2017). This GSP uses chronic lowering of groundwater levels as a proxy for reduction in groundwater storage. As cited previously, useable storage, or sustainable yield, is estimated at 72,000 AFY. The ECC GSP groundwater flow model was used to determine the maximum sustainable yield and set groundwater elevation minimum thresholds (MT). As a proxy, the MTs for groundwater levels are protective of groundwater storage and beneficial uses and users in the Subbasin.

7.3.2.6. Measurable Objectives and Interim Milestones

The measurable objectives and interim milestones for the reduction in groundwater storage sustainability indicator are the same as for the chronic lowering of groundwater levels.

7.3.3. Seawater Intrusion

There is no evidence of seawater intrusion in the ECC Subbasin at present or in the past. However, potential mechanisms for saline baywater intrusion may be triggered as a result of sea-level rise, unsustainable levels of pumping, or changes in Bay-Delta water quality and flow requirements by the state Water Board. In recognition of these potential mechanisms, the seawater intrusion sustainability indicator is incorporated into the ECC Subbasin GSP.

7.3.3.1. Undesirable Results

Significant and unreasonable changes related to seawater intrusion as a result of implementing sustainable management policies, projects or actions could occur if they induce any of the following:

- Changes in baseline water quality that cause significant and unreasonable impacts on groundwater supply for beneficial users in the Subbasin.
- Changes in baseline water quality at any location which indicate new pathways or mechanisms of degradation of any freshwater source that adversely impacts existing beneficial uses and users.
- Changes in baseline water quality that adversely interfere with other sustainability indicators.

A data gap for monitoring the interface between baywater and shallow groundwater was identified in **Section 6** and will be filled by the installation of monitoring wells at multiple sites in the second half of 2021.

7.3.3.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. Undesirable results for seawater intrusion would occur if inland migration of saline baywater adversely reduces groundwater availability through degraded water quality. The potential degradation of water quality will be monitored by groundwater chloride concentrations as previously discussed in **Section 3.3.4**. The criterion for potential undesirable results for this indicator is as follows:

> *An undesirable result may be present if a bayside monitoring well has a chloride concentration above 250 mg/L over three consecutive years and is causally related to groundwater sustainable management in the Subbasin.*

An increasing trend in chloride concentration may indicate that saline baywater is advancing inland and represents an undesirable result for the seawater intrusion Indicator. None of the wells listed in **Table 7-4** have chloride concentrations that exceed 250 mg/L.

A chloride isocontour shall be developed as more data is collected.

7.3.3.3. Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for seawater intrusion include the following:

- Sea level rise and saline baywater migrating into the Shallow Zone and vertically to the Deep Zone where the majority of pumping occurs.
- In combination with the above, changes in water quality and flow requirements by the state Water Board under the Bay-Delta Plan[7].

Periodic evaluations using the ECC Subbasin groundwater flow model will also be used to assess the potential causes and onset of undesirable results for this indicator (see model description in **Section 5**).

[7] https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/ Accessed June 29, 2021

7.3.3.4. Potential Effects of Undesirable Results

Baywater intrusion into the ECC Subbasin could cause the groundwater supply to become more saline and impact the use of groundwater for domestic, municipal, and agricultural purposes. Historically, there have been no limitations on the primary groundwater supply source (the Deep Aquifer Zone) due to elevated chloride concentration. The state's upper maximum contaminant level chloride concentration is 500 mg/L[8]. The potential effects of undesirable results for seawater intrusion are:

- Reduced available supply requiring users to replace wells or seek alternative sources of supply.
- Cause economic hardships on domestic wells users, many of which reside in DACs, to install water treatment or seek alternative sources.
- Added costs to systems serving municipalities to install treatment systems or seek alternate sources.
- Reduced groundwater quantity and quality for agricultural supply.
- Adverse effects to groundwater dependent ecosystems due to changes in freshwater quantity (e.g., outflow) and/or quality.
- Adverse effects on property values for landowners that rely on groundwater for domestic and agricultural supply.

7.3.3.5. Minimum Thresholds

Section §354.28(c)(3) of the Code of Regulations states:

> *"The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results."*

GSP regulations require that the minimum threshold for seawater intrusion be determined from a chloride isocontour line. In order to construct the isocontour, chloride concentrations at multiple monitoring locations are required. At present, Shallow Zone well chloride concentration data along the San Joaquin River is sparse and a chloride isocontour cannot be constructed. With the installation and sampling of new monitoring wells in 2021, a chloride isocontour will be developed as a basis for long-term monitoring for the seawater intrusion indicator. Consistent with other indicators in the ECC Subbasin, the initial isocontour is expected to be used as a minimum threshold until a more definitive value is determined. The expanded dataset from filling the Shallow Zone data gaps will be presented in the initial annual report in April 2022.

Based on the Subbasin HCM (see **Section 3**), the Shallow Zone would be impacted first if baywater salinity increases. Nevertheless, the Deep Zone RMSs will also be monitored for chloride and the interim seawater intrusion minimum threshold chloride concentration for any Shallow Zone or Deep Zone well is set at 250 mg/L which is the recommended level Secondary Maximum Contaminant Level (SMCL). This is based on the observation that the majority of wells in the Subbasin have chloride concentrations near this level and any significant increase may be indicative of a degradation mechanism such as seawater intrusion. As

[8] California secondary maximum contaminant level-upper limit for aesthetics (taste and color).

data from the new monitoring wells are collected, this interim approach will be modified and ultimately be replaced through isocontour maps for both aquifer zones.

7.3.3.6. Information and Criteria Relied Upon to Establish the Minimum Threshold

GSP Regulations (CCR 2016) require the following information when setting the seawater intrusion minimum threshold at a chloride isocontour:

- Section §354.28(c)(3)(A): Maps and cross-sections of the chloride concentration isocontour that define the minimum threshold and measurable objective for each principal aquifer.
- Section §354.28(c)(3)(B): A description of how seawater intrusion minimum threshold considers the effects of current and projected sea levels.

Due to the data gap in Shallow Zone wells and chloride concentration data, a chloride concentration map for Shallow Zone and Deep Zone wells developed in **Section 3, Figure 3-16d** in lieu of a chloride concentration isocontou**r**. A chloride isocontour will be developed through the addition of the new monitoring wells to fill data gaps as discussed in **Section 6** and will be included with the submittal of the first annual report in April 2022. The groundwater flow model will be used to evaluate the potential impact of sea level rise on this indicator by assessing flow gradients along the margins of the Subbasin and the Bay-Delta water bodies. In addition, a groundwater transport model project is proposed in **Section 8** to further evaluate water quality degradation mechanisms in the ECC Subbasin.

7.3.3.7. The Relationship of Minimum Thresholds for Other Sustainability Indicators

The minimum thresholds for seawater intrusion are established to avoid undesirable results for the remaining sustainability indicators, as described below.

- **Chronic lowering of groundwater levels, Reduction in Groundwater Storage, Subsidence, Depletion of interconnected surface waters.** The minimum threshold for seawater intrusion is not associated with mechanisms or processes that would impact the minimum thresholds for these sustainability indicators.
- **Degraded Water Quality**. The minimum threshold for seawater intrusion is the same as for degraded water quality (250 mg/L chloride concentration) and will not cause an exceedance of groundwater quality minimum thresholds.

7.3.3.8. How the MT was Selected to Avoid Causing Undesirable Results in Adjacent Basins

Adoption of the seawater intrusion minimum threshold is expected to be protective of adjacent subbasins by monitoring mechanisms that may also arise in those regions. The hydrogeologic setting for the Shallow Zone in the ECC Subbasin is sufficiently separate from aquifers in the Solano, Eastern San Joaquin, and Tracy Subbasins such that if intrusion arises due to ECC sustainable management activities, it would not be expected to propagate to those areas.

The Pittsburg Plain Subbasin borders the City of Antioch and is separated by either a groundwater divide or barrier to cross flow. New monitoring wells being installed in Antioch will provide more data on the relationship between the two subbasins.

The groundwater flow model will be used to assess subsurface movement in and out of the ECC Subbasin and to assess future changes and potential adverse conditions at the shared boundaries with those subbasins.

7.3.3.9. How the MT may Affect the Interests of Beneficial Uses and Users of Groundwater

The minimum threshold for seawater intrusion is not expected to affect beneficial uses, users, or land uses in the Subbasin as it preserves existing water quality and seeks to protect future degradation.

7.3.3.10. How the MT Relates to the Federal, State, or Local Standards

There are no federal, state, or local standards for seawater intrusion that are applicable to the ECC Subbasin. However, the GSP accounts for the fact that there are state and federal standards for chloride concentration which is monitored as an indicator for seawater intrusion mechanisms.

7.3.3.11. How Each MT Will be Quantitatively Measured

Chloride concentrations are quantitatively measured in groundwater samples collected from the ECC GSP seawater intrusion monitoring network. **Figure 3-16d** presents the average chloride concentration for post-2008 measurements in Shallow and Deep Zone wells. It shows that most concentrations are below 250 mg/L. The symbols are color coded by aquifer to denote the aquifer zone. Noting that seawater has a total dissolved mineral content of 35,000 mg/L and a chloride concentration on the order of 19,000 mg/L, the groundwater monitoring data for the ECC Subbasin indicate that there is no inland saline intrusion of sea water into groundwater at any location).

The minimum threshold for the Subbasin is set at a chloride concentration of 250 mg/L because average native chloride concentrations in groundwater are typically less than this value (see **Figure 3-16a**). Any trend of increasing chloride concentration in the RMSs, or migration of a chloride isocontour inland (when the Shallow Zone data gap is filled), will be interpreted as a possible indication that saline baywater is moving inland. An assessment would then be made to determine 1) if bay water salinity has the potential at any location to elevate groundwater chloride concentrations, 2) whether a gradient for inland migration exists, and 3) whether any local groundwater management activity induced conditions to change. While any future intrusion process is expected to be slow (e.g., on the order of years), chloride concentration monitoring using 250 mg/L as a trigger for examining possible links to sustainable management in the Subbasin would be protective of groundwater resources.

7.3.3.12. Measurable Objectives and Interim Milestones

Measurable objectives for seawater intrusion are the desired conditions for the ECC Subbasin and are based on maintaining the current native chloride concentration in the Subbasin. The measurable objectives for each RMS are the average chloride concentrations from 2013 to 2017. **Table 7-4** presents the measurable objectives for each RMS. If an RMS does not have groundwater quality data during this period, the cells are left blank and will be populated when data is collected.

If chloride concentrations trend upward above the measurable objective, but below the minimum threshold, verification measures regarding links to groundwater management as described in the preceding section will be triggered.

Since the chloride concentration in the Subbasin is currently stable and above minimum thresholds for all RMSs, the interim milestones are set at the same values as the measurable objectives shown in **Table 7-4**. No changes in quality are expected as a result of implementing projects and management actions described in **Section 8**.

7.3.4. Degraded Water Quality

7.3.4.1. Undesirable Results

Significant and unreasonable changes in groundwater quality as a result of implementing sustainable management policies, projects, or other actions could occur if they cause any of the following:

- Increases in concentrations of key groundwater quality constituents above drinking water maximum contaminant limits (MCLs) that reduce groundwater availability for domestic, agricultural, municipal, or environmental beneficial uses.
- Changes in water quality that cause economic burdens placed on users to treat or replace sources of groundwater supply including but not limited to increased treatment costs to mitigate elevated mineral content such as hardness.
- Adverse impacts to agricultural crop production, yield, and/or quality.
- Migration of contaminants to domestic or agricultural sources of supply, including but not limited to unregulated discharges of hazardous substances, and from oil and gas wells.
- Movement or increases in currently unregulated chemical constituents that adversely impact beneficial uses and users (e.g., DACs and environmental users) of groundwater.

Overall, groundwater quality is satisfactory for the various beneficial uses in the ECC Subbasin. Some parts of the Subbasin experience naturally elevated TDS and chloride that are near or exceed the recommended SMCL indicating a higher baseline for these constituents. Elevated nitrate concentrations occur in shallow wells near Brentwood with concentrations exceeding the MCL attributable to past agricultural practices. Arsenic is generally less than the MCL and boron concentrations are naturally elevated in most wells. Water hardness varies and in some cases adds financial burdens on users needing to use water softeners. For municipalities, TDS and hardness may lead to customer dissatisfaction and limit the ability to blend groundwater with treated surface water under conjunctive use[9]. In order to meeting customer water hardness expectations municipalities may be required to install expensive water treatment systems.

7.3.4.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. Any RMS that exceeds any state drinking water standard during GSP implementation because of groundwater management activities, would constitute an undesirable result for the degradation of groundwater quality.

[9] Conjunctive use is the coordinated and planned management of both surface and groundwater resources in order to maximize the efficient use of both resources.
https://water.ca.gov/Water-Basics/Glossary Accessed August 2021.

7.3.4.3. Potential Causes of Undesirable Results

Overall, groundwater quality is satisfactory for the various beneficial uses in the ECC Subbasin. However, potential causes of degraded groundwater quality may include the following:

- **Changes in groundwater gradients**- Changes to the location or rates of pumping could result in mobilization and vertical migration of certain constituents from the Shallow Zone to the Deep Zone including saline water and anthropogenic sources of contamination or natural constituents of concern.
- **Changes in groundwater pumping patterns-** Changes in location and rates of pumping may alter and increase contributions from zones containing higher dissolved minerals including hardness.
- **Groundwater recharge projects**–Use of recharge basins could cause localized groundwater mounding resulting in altered flow directions and potential movement of water quality constituents towards wells in concentrations that exceed water quality standards. Also, recharge of poor-quality water that exceeds the MCL or SMCL.

7.3.4.4. Potential Effects of Undesirable Results

The potential effects of undesirable results for degradation of water quality are the same as described above for seawater intrusion.

7.3.4.5. Minimum Thresholds

SGMA regulations guide the setting of the minimum threshold for degraded water quality as follows:

- The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined to be of concern for the basin.

The minimum thresholds for degraded groundwater quality in the ECC Subbasin were selected to avoid undesirable results induced as a result of implementing sustainable management policies, projects or actions. The minimum threshold at a given RMS in the ECC Subbasin is:

- The three-year running average exceedance of an MCL for a key monitoring constituent.

7.3.4.6. Information Used and Methodology

The information used to establish the degraded groundwater quality minimum threshold includes:

- Historical groundwater quality from basin-wide monitoring wells in the ECC Subbasin.
- Depths and locations of existing wells.
- Federal and state drinking water quality standards.
- Information from interested parties of significant and unreasonable conditions.

Federal and state drinking water quality standards will be used to define degraded groundwater quality minimum thresholds.

7.3.4.7. Degraded Groundwater Quality Minimum Thresholds

Minimum thresholds were set to represent conditions considered just above conditions that could cause undesirable results in the ECC Subbasin as discussed in (**Section 3). Table 7-3** lists the constituents of concern, the reason for concern, and the drinking water standard/minimum threshold.

Table 7-3. Constituents of Concern for Groundwater Quality Minimum Threshold

Constituent of Concern	Reason for Concern	Minimum Threshold
Total dissolved solids	Naturally Elevated; may be associated with higher hardness	1,000 mg/L[1]
Chloride	Baywater Intrusion/Naturally Elevated	500 mg/L[1]
Nitrate as nitrogen	Agriculture and Septic Systems	10 mg/L[2]
Arsenic	Naturally Elevated	10 ug/L[2]
Boron	Naturally Elevated	5,000 ug/L[3]
Mercury	Mercury Mine Upstream	2 ug/L[2]

1. California Secondary Maximum Contaminant Level (SMCL)
2. California Primary Maximum Contaminant Level (SMCL)
3. US EPA Health Advisory for non-cancer health effect.

The TDS minimum threshold of 1,000 mg/L is generally protective for domestic and agricultural uses. TDS is secondary standard established for aesthetic purposes such as taste, odor, and color and not based on public health concerns. Note: public water system threshold of 500 mg/L for TDS.

Groundwater contains numerous naturally occurring minerals that vary throughout the ECC Subbasin. While groundwater quality is generally favorable with respect to primary drinking water quality constituents, some areas have elevated total dissolved minerals, hardness, and some secondary constituents which may affect domestic and agricultural uses. The GSP is intended to avoid degradation of water quality as a result of implementing sustainable management policies, projects or actions. For example, projects that affect pumping patterns resulting in movement and mixing of groundwater sources that adversely affect certain users. The GSP does not mitigate groundwater quality in the Subbasin that is naturally occurring during the historical baseline."

7.3.4.8. The Relationship of Minimum Thresholds between Like and Different Sustainability Indicators

All sustainability indicators are intrinsically related and SGMA requires an assessment that a particular MT does not result in an undesirable result arising in another sustainability indicator. There is a minor influence on other sustainability indicators due to the potential degradation of groundwater quality. However, minimum thresholds were set to avoid undesirable results for other sustainability indicators as described below:

- **Chronic lowering of groundwater levels and groundwater storage**. Recharge projects implemented to mitigate lower water levels and storage must use sources that do not exceed any of the groundwater quality minimum thresholds.
- **Other sustainability indicators (seawater intrusion, subsidence, and depletion of interconnected surface water).** The groundwater quality minimum threshold is not associated with mechanisms or processes that would impact other minimum thresholds.

7.3.4.9. How the MT was Selected to Avoid Causing Undesirable Results in Adjacent Basins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring basins is the following:

Tracy Subbasin (medium priority), Eastern San Joaquin Subbasin (critically-over drafted), Solano Subbasin (medium priority). Minimum thresholds are set to protect groundwater quality. Any interaction, such as outflow to another basin, would not induce undesirable results in those areas. The interpreted groundwater flow direction in the ECC Subbasin is generally to the Delta and outflow to the ocean further reducing the likelihood of causing impacts to the surrounding basins.

Pittsburgh Plain Basin (low priority). There is no interpreted direct hydraulic connection with the Pittsburg Plain Basin. The City of Antioch borders the Pittsburg Plain Basin and does not pump groundwater, primarily due to poor native water quality. The ECC Subbasin degraded groundwater quality minimum threshold is protective of groundwater quality and would otherwise not induce undesirable results in that basin.

7.3.4.10. How the MT May Affect the Interests of Beneficial Uses and Users of Groundwater

Degraded groundwater quality minimum thresholds are not expected to have negative effects on beneficial uses, users, or land uses in the Subbasin as described:

- **Rural residential land uses and users**. The groundwater quality minimum thresholds protect domestic users of groundwater including individual well owners, small water systems, and DACs by applying drinking water standards.
- **Agricultural land uses and users**. The groundwater quality minimum thresholds protect agricultural users by applying drinking water standards which exceed generally acceptable irrigation quality.
- **Urban land uses and users**. The groundwater quality minimum thresholds protect municipal supplies by applying the same drinking water standards required under state permits.
- **Ecological land uses and users**. The groundwater quality minimum thresholds protect groundwater dependent ecosystems by employing standards that maintain current or existing conditions and preventing future degradation.

7.3.4.11. How the MT Relates to the Federal, State, or Local Standards

The MTs for water quality degradation are based on federal, state, and local regulations for groundwater source protection and drinking water quality standards.

7.3.4.12. How Each MT Will be Quantitatively Measured

The minimum threshold for degraded groundwater quality will be directly and quantitatively measured in accordance with the monitoring plan and protocols outlined in **Section 6** and will meet the requirements of the technical and reporting standards under SGMA regulations. The current representative monitoring network includes five Shallow Zone wells and six Deep Zone wells that are either designated monitoring wells or public supply wells.

7.3.4.13. Measurable Objectives and Interim Milestones

Measurable objectives for degraded groundwater quality are the desired conditions for the Subbasin and are based on maintaining the current water quality in the Subbasin. The measurable objectives for each RMS are the average concentrations (2013 to 2017) for each constituent of concern for each RMS (**Figure 6-5**). **Table 7-4** presents the measurable objectives for each RMS. If a RMS does not have groundwater quality data during this period, the cells are left blank, and it will be calculated after five years of data collection.

Since the groundwater quality in the Subbasin is currently sustainable and above minimum thresholds for all RMSs (**Figure 6-5**), the interim milestones are set at the same values as the measurable objectives shown in **Table 7-4**. No changes in quality are expected from projects and management actions implemented to achieve sustainability.

Table 7-4. Minimum Thresholds, Measurable Objectives, and Interim Milestones for Degradation of Groundwater Quality

Zone	Well Name	As (ug/L)	B (ug/L)	Cl (mg/L)	Hg (ug/L)	NO_3 as N (mg/L)	TDS (mg/L)
Minimum Threshold		**10**	**5,000**	**250**	**2**	**10**	**1,000**
Shallow Zone	BG-1	2.7	230	210	0.01	27	890
	Antioch MW-15						
	DWD MW-15						
	TODB MW 15						
	Old River MW-30						
Deep Zone	Antioch MW-90						
	City of Brentwood Well 13	2.0	1,800	92	1.00	2.5	540
	City of Brentwood Well 14	3.2	1,150	180	1.00	4.1	970
	Glen Park Well	2.3	1,300[1]	100	1.00	1.2	690
	Bethel-Willow Rd						
	Town of Discovery Bay Well 4A	2.5	2,200	100	0.51	0.25	600

Notes: Blue shading indicates New Monitoring Well; Measurable objectives and interim milestones will be set at the concentrations from the initial results.

Interim Milestones are the same as Measurable Objectives (e.g., the average concentrations [2013 to 2017]).

[1]Average Concertation between 2006-2007

7.3.5. Land Subsidence

7.3.5.1. Undesirable Results

Land subsidence associated with groundwater pumping is a result of dewatering, or "mining" groundwater, from fine-grained geologic materials such as clay. The inelastic nature of this mechanism results in permanent deformation of the land surface and compaction of geologic formations. The potential undesirable results for this type of land subsidence are:

- Impacts to infrastructure such as damage to roads and structures, reduced capacity of water conveyances, and increased vulnerability to flooding.

There is no historic evidence of land subsidence related to groundwater pumping in the ECC Subbasin, in part or wholly due to the lack of formations which are susceptible to subsidence mechanisms[10]. This sustainability indicator will be assessed using existing independent monitoring at a UNAVCO Plate Boundary Observatory (PBO) station (see **Sections 3 and 6**). In addition, groundwater level and interferometric synthetic aperture radar (InSAR) measurements will be used to support analysis of the PBO data as discussed below.

7.3.5.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. For this sustainability indicator, undesirable results occur when inelastic land subsidence due to groundwater extraction results in significant and unreasonable impacts to roads and structures, water conveyances, and flood control facilities.

7.3.5.3. Potential Causes of Undesirable Results

A potential cause of undesirable results for the land subsidence sustainability indicator is the following:

- **Increased pumping in susceptible areas** – Compressible clays of sufficient volume which are susceptible to dewatering and compaction due to groundwater pumping have not been identified under the present hydrogeologic conceptualization of the Subbasin. Expansion of pumping into new areas where geologic formations susceptible to compaction mechanisms are present, may result in subsidence that has not been observed historically in the Subbasin.

7.3.5.4. Potential Effects of Undesirable Results

The undesirable result for land subsidence includes impacts to infrastructure. The potential effects of undesirable results for this indicator would be the following:

- Damage to water conveyance facilities and flood control facilities.
- Reduced capacity of surface water delivery systems that in turn leads to increased groundwater demand.
- Adverse effects to property values.
- Economic burdens to mitigate damage.

7.3.5.5. Minimum Thresholds

Land subsidence induced by groundwater pumping has not been observed in the ECC Subbasin including through recent state-wide drought periods (2007-2009 and 2012-2016). Despite the lack of historical land subsidence, minimum thresholds and measurable objectives are established to guide sustainable management response should land subsidence occur.

[10] While land subsidence associated with groundwater pumping has not occurred historically, another type of subsidence due to exposure of peat soils in reclaimed lands in the Delta has occurred to a significant degree.

Section 354.28(c)(5) of the SGMA regulations state that "The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results."

A minimum threshold is based on data from the UNAVCO P256 Plate Boundary Observatory station described in (**Section 3)** and presented in (**Figure 3-22)**. Two other sources of information, groundwater elevations and InSAR measurements, will be used for verification of associations with groundwater pumping and management in the Subbasin.

A minimum threshold of 1 inch land surface elevation outside the historical elastic range over a three-year period as exhibited by monitoring data at the UNAVCO site P256. Deviations from this minimum threshold over three or more consecutive years may indicate the onset of an inelastic component of subsidence. The historic elastic range is approximately 0.8 inches observed between 2005 to 2016 (see **Figure 3-22**). Exceedance of this minimum threshold would not necessarily result in undesirable results; however, since land subsidence associated with groundwater pumping may occur over many years even after pumping stresses are reduced, it is desired to identify mechanisms and implement sustainability measures to ensure that significant and unreasonable impacts do not arise over time.

7.3.5.6. Information and Criteria Relied Upon to Establish the Minimum Threshold

Information used to establish minimum threshold for land subsidence includes:

1. Historical subsidence measurements from P256 UNAVCO station.
2. Current and historical groundwater elevation in wells.
3. Modeling scenario results of future groundwater level conditions
4. InSAR measurement surveys.

The minimum threshold for subsidence is set to detect the onset of conditions that could potentially lead to undesirable results in the ECC Subbasin as follows.

In addition to the PBO station monitoring data, groundwater elevation data and InSAR measurements[11] will be reviewed to determine whether any inelastic component of land subsidence, should it occur, is related to groundwater pumping. This includes review of minimum thresholds for chronic groundwater decline. If the MT for land subsidence is exceeded for three consecutive years and an associated with groundwater pumping is verified, new adaptive management measurements will be developed and detailed in the subsequent plan update report.

[11] InSAR surveys have only been recently conducted in the ECC Subbasin area. **Figure 3-22** shows survey results for the period June 2015 to June 2019

7.3.5.7. The Relationship of Minimum Thresholds between Like and Different Sustainability Indicators

All sustainability indicators are intrinsically related and SGMA requires an assessment that a particular MT does not result in an undesirable result arising in another sustainability indicator. In the ECC Subbasin, the conservative nature of the land subsidence minimum threshold would have little or no impact to the other minimum thresholds.

- **Chronic lowering of groundwater levels**. The land subsidence minimum threshold will not result in significant and unreasonable lowering of groundwater elevations. However, declining groundwater elevations may have causal association with land subsidence.
- **Reduction in Groundwater Storage**. The land subsidence minimum threshold will not result in significant and unreasonable change in useable groundwater storage.
- **Seawater Intrusion**. The land subsidence minimum threshold will not cause an increase in baywater intrusion in the Subbasin.
- **Degraded Water Quality**. The land subsidence minimum threshold will not result in significant and unreasonable changes in groundwater quality.
- **Depletion of interconnected surface waters**. The land subsidence minimum threshold will not result in significant and unreasonable changes in groundwater elevations and will not impact depletion of interconnected surface waters.

7.3.5.8. How the MT was Selected to Avoid Causing Undesirable Results in Adjacent Basins

There are four adjacent basins to the ECC Subbasin:

- Pittsburg Plain Basin
- Solano Subbasin
- Eastern San Joaquin Subbasin
- Tracy Subbasin

The land subsidence minimum threshold induced by groundwater pumping was set to prevent significant and unreasonable land subsidence that damages infrastructure in the ECC Subbasin. No impacts to the adjacent basins are expected because 1) subsidence due to groundwater withdrawal has not occurred historically in the ECC Subbasin and 2) groundwater demand is projected to be stable or decrease in the future. In addition, the MT for land subsidence is sufficiently conservative to avoid adverse impacts from propagating outside the Subbasin.

7.3.5.9. How the MT May Affect the Interests of Beneficial Uses and Users of Groundwater

The subsidence minimum thresholds are set to prevent inelastic subsidence that could impact infrastructure. Currently there is no inelastic subsidence occurring in the ECC Subbasin that impacts any beneficial user and the MT is sufficiently conservative to avoid impacts by subsidence and permit adaptive mitigation measures to be implemented if it occurs.

7.3.5.10. How the MT Relates to the Federal, State, or Local Standards

There are no federal, state, or local standards for land subsidence.

7.3.5.11. How Each MT Will be Quantitatively Measured

Minimum thresholds are based on UNAVCO data for site P256 and measurements of groundwater levels as described in **Section 6**.

7.3.5.12. Measurable Objectives and Interim Milestones

The measurable objectives and interim milestones are based on the elastic range of historically observed land deformation at the UNAVCO P256 station. The measurable objective and interim milestones for P256 is set at the average seasonal elastic movement (0.6 inch vertical) as shown in (**Figure 3-22**). Deviations from this measurable objective over three or more years may indicate the onset of an inelastic component of subsidence as discussed above.

7.3.6. Depletions of Interconnected Surface Waters

As described in **Section 3.3.8,** the majority of the ECC Subbasin may have interconnected surface water and groundwater through the Shallow Zone. In the Subbasin setting, the major surface water conveyances are the San Joaquin River and Old River. These conveyances are influenced by two major water supply projects, the California State Water Project and the federal Central Valley Project. Through the Bay-Delta Plan, the state Water Board sets regulations for water quality and flow to protect both environmental and water supply concerns in the region. Thus, shallow groundwater and surface water interconnections are not controlled locally or by the ECC Subbasin GSAs.

The hydraulic connections between groundwater and surface water have not been definitively characterized. New shallow monitoring wells are being installed as part of this GSP at locations on the San Joaquin River and Old River, and immediately upstream of the San Joaquin and Sacramento confluence in Antioch. This expanded Shallow Zone monitoring network, plus two existing shallow wells on western creeks, will be used to characterize the nature of surface water-groundwater connections and to assess the surface water depletion sustainability indicator in relation to local groundwater management as instituted in the ECC Subbasin GSP. Groundwater level monitoring adjacent to streams will be used with existing stream gages to show the spatial and temporal relationships between groundwater and surface water heads.

The groundwater flow model described in **Section 5** will be used as a comparative tool to provide initial estimates of the limits of groundwater pumping in the Subbasin which could cause undesirable results for stream depletion. This provides an interim basis for setting minimum thresholds and measurable objectives which can then be refined using data from the expanded Shallow Zone and surface water monitoring networks.

7.3.6.1. Undesirable Results

There is no evidence of past or present significant and unreasonable depletions of surface water as a result of groundwater use in the ECC Subbasin. Major rivers and streams that have a hydraulic connection to the groundwater system are the San Joaquin River and Old River. Managed conveyances (i.e., conveyances for irrigation water, drainage, and flood control) are generally not considered in the analysis of depletions. Creeks, including Marsh Creek, are considered important aspects of the environmental setting and the Shallow Zone monitoring network is designed to assess the presence of depletion mechanisms for these features (see **Section 6**).

7.3.6.2. Criteria to Define Undesirable Results

SGMA requires each GSP to consider the consequences of undesirable results even if they have not occurred historically or are projected to occur in the future. Significant and unreasonable depletions of interconnected surface waters in the Subbasin are defined as:

- Depletions that result in reductions in flow or stage of major rivers and streams that are hydrologically connected to groundwater in the Subbasin and which cause significant and unreasonable impacts on beneficial uses and users of surface water and the environment.

The relationship between shallow groundwater levels and potential impacts on species and habit will be evaluated as data are collected from the expanded Shallow Zone monitoring network discussed in **Section 6**.

7.3.6.3. Potential Causes of Undesirable Results

Potential causes of depletion of interconnected surface water include the following:

- New large-scale pumping or diversions from shallow wells.
- New localized pumping from Deep Zone wells in locations that are vertically connected to the Shallow Zone and surface water.
- Interception or reduction of natural patterns of groundwater discharge to surface water.

7.3.6.4. Potential Effects of Undesirable Results

Depletions of interconnected surface water could result in:

- Reduction in flows that negatively impact aquatic species and groundwater dependent ecosystems.
- Reduced flows within rivers and streams that adversely impact diversions for agricultural or urban users.
- Increased costs to mitigate impacts.

7.3.6.5. Minimum Thresholds

Section 354.28(c)(6) of the SGMA regulations states:

> *"The minimum threshold or depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results."*

The rate and volume of flow in and out of surface water have been initially quantified through water budget modeling scenarios in **Section 5**. For the Base Period 1997 to 2018, the average annual groundwater inflow attributed to all surface water features was 18,560 AFY and ranged from 10,135 to 31,887 AFY. High values occurred during dry years and the low values during wet years.

For sustainable yield scenarios, groundwater pumping at higher than historical levels were simulated to assess potential impacts to the interconnected surface water indicator. The historical average annual pumping in the ECC Subbasin during the Base Period was approximately 46,455 AFY. Annual pumping ranged between a high of approximately 58,250 and a low of 32,500 AF in dry and wet years, respectively. In the sustainable yield scenarios, surface water deliveries were reduced by 40, 45, 50, and 75 percent. This resulted in greater groundwater pumping to meet various demands. Relative to the Base Period average, these four scenarios resulted in 30, 42, 55, and 135 percent more groundwater pumping. With regard to sustainability indicators, the contribution to the water budget from surface water features (i.e., depletion) in the 75-percent surface water reduction scenario was nearly 10,000 AFY more than the Base Period average (approximately 26,850 versus 17,770 AFY). Net subsurface flow between adjoining groundwater basins also changed significantly for the highest surface water reduction scenario. Instead of average outflow of -8,500 AFY in the Base Period, this scenario resulted in about 8,300 AFY inflow.

From the modeling, it was seen that up to 50 percent reductions in surface water deliveries, there were no significant changes in water budget components that might induce undesirable results. At the more conservative 75-percent reduction scenario, undesirable results may be triggered for the interconnected surface water sustainability indicator. While no conclusion was drawn as to whether this scenario actually would lead to significant and unreasonable results, the results indicate that changes in basin management that result in sustained pumping in all water years at more than twice the historical average (i.e., 135 percent) would be required to induce a major changes in surface water depletion.

Based on the groundwater flow model results, a conservative interim minimum threshold for depletion of interconnected surface water is set at a value corresponding to 45 percent reduction in surface water deliveries. In this scenario, sustained basin-wide pumping would be 42 percent greater than the historic Base Period average, or 66,000 AFY. While this leads to a moderate increase in average contribution from surface water bodies in the subbasin water budget (about 18,100 AFY versus 17,800 AFY), it serves as conservative threshold at which closer examination of undesirable results could be undertaken if more groundwater use is projected in the future.

Greater precision and accuracy for the minimum threshold for this sustainability indicator may be achieved by using Shallow Zone groundwater levels as a proxy. This proxy would be complemented by the stream stage monitoring network described in **Section 6**. GSP regulations allow GSAs to use groundwater levels as a proxy metric for any sustainability indicator if the GSP demonstrates there is significant correlation between groundwater levels and the depletions of interconnected surface water. The relationship between the ECC Subbasin GSP groundwater flow model results and measured groundwater level data will serve as a basis for determining the effectiveness of a groundwater level proxy. Since no apparent surface water depletions are evident in the Subbasin, future projects and management actions shall be evaluated through comparative modeling scenarios and with monitoring data to assess potential mechanisms for the onset of undesirable rates of surface water depletion.

7.3.6.6. Information and Criteria Relied Upon to Establish the Minimum Threshold

Water budget modeling scenarios presented in **Section 5** are used to inform potential hydraulic mechanisms that could indicate significant and unreasonable results for this indicator. As data are developed, groundwater level minimum thresholds may be used as a proxy with data from the expanded Shallow Zone groundwater monitoring network and informed by the ECC groundwater flow model.

7.3.6.7. How the MT May Affect the Interests of Beneficial Uses and Users of Groundwater

The interconnected surface water minimum thresholds are set to avoid effects on beneficial users and land uses in the Subbasin:

- Domestic and agricultural well owners: Currently there are no reported shallow groundwater level declines in the Subbasin and none are expected by employing a minimum threshold for this indicator.
- Urban land uses and users: No changes are expected since no changes to shallow groundwater are expected.
- Environmental land uses and users. The minimum threshold is set to protect GDEs near streams where there is a connection to shallow groundwater.

7.3.6.8. The Relationship of Minimum Thresholds for Other Sustainability Indicators

The minimum thresholds for the depletions of interconnected surface waters are established to avoid undesirable results for other sustainability indicators, as described below.

- **Chronic Lowering of Groundwater Levels and Reduction in Groundwater Storage.** Modeling scenarios indicate that the minimum threshold for interconnected surface water depletions would not trigger chronic declines in water levels or storage.
- **Land Subsidence.** Since the minimum threshold for interconnected surface water depletions would not trigger chronic declines in water levels, land subsidence would not be induced.
- **Seawater Intrusion and Degraded Water Quality.** The minimum threshold for the depletions of interconnected surface waters may be linked to these indicators as they may be affected by induced movement of surface water into the groundwater system at higher pumping volumes. However, the MT is sufficiently conservative that if pumping increased to the threshold, significant impacts are not expected to occur. Rather, the MT is set as a trigger to further assess the presence of mechanisms that might lead to undesirable results.

7.3.6.9. How the MT was Selected to Avoid Causing Undesirable Results in Adjacent Basins

Adjacent basins are linked through their proximity and possible similar connections to the Bay-Delta ecosystem. The minimum threshold for the interconnected surface water sustainability indicator is conservatively based on comparative model scenarios that consider the entire Subbasin water budget including flows to and from other basins. The modeling results indicate that for a scenario of 135 percent increased pumping compared to the Base Period, significant changes in inter-basin flow to balance the ECC water budget could occur. It was concluded that setting an interim MT at 42 percent more pumping relative to the Base Period average, the potential impacts would be less than significant and allow the GSAs to conduct further modeling and monitoring to determine how and where impacts might occur if the pumping rates were projected to continue rising beyond that level. Using the ECC groundwater flow model to continually update the water budget will enable the ECC GSAs to identify needs for management changes to avoid adverse impacts to adjoining basins.

7.3.6.10. How the MT Relates to the Federal, State, or Local Standards

There are no federal, state, or local standards for depletion of interconnected surface water. However, depletion of interconnected surface water has the potential to conflict with the state Water Board Bay-Delta Plan and, as such, the GSAs will consider any future updates to the plan and how such updates may affect sustainable groundwater management in the ECC Subbasin, particularly with respect to the Shallow Zone.

7.3.6.11. How Each MT Will be Quantitatively Measured

Groundwater flow modeling suggests a link to increased pumping and stream depletion over baseline levels. The flow model relies on quantitative groundwater level data as measured in the basin-wide and representative monitoring networks. The use of the model to assess this sustainability indicator may be complemented or replaced by proxy groundwater level measurements.

7.3.6.12. Measurable Objectives

The measurable objectives and interim milestones for depletions of interconnected surface water sustainability indicator are set at the average annual groundwater pumping during the Base Period 1997 to 2018, or 46,455 AFY. In dry years, pumping increased to 58,250 AFY in the Base Period, still well below the 42-percent pumping increase used to define the MT.

7.4. References

California Department of Water Resources (DWR). November 2017. Draft Guidance Document for the Sustainable Management of Groundwater: Sustainable Management of Groundwater, Best Management Practice.

California Department of Water Resources (DWR). Well Completion Report Map Application. 2019. https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. Accessed May 2019.

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8. PROJECTS AND MANAGEMENT ACTIONS (§ 354.44)

As established in **Section 7**, groundwater conditions in the ECC Subbasin exhibit stability and sustainability. The technical analysis of groundwater conditions shows through historic and current use of the Subbasin no signs of chronic lowering of groundwater levels, reduction of groundwater storage, land subsidence, sea water intrusion, degraded water quality or depletion of interconnected surface water. The Subbasin Sustainability Goal broadly includes maintaining safe and reliable access to groundwater, assessing and managing groundwater in the future under climate change, protecting the sustainable yield, and continuing to avoid undesirable results of groundwater extraction as defined by Subbasin stakeholders.

Projects and management actions (PMAs) were developed to achieve the ECC Subbasin sustainability goal by 2042 and avoid undesirable results over the GSP planning and implementation horizon. Given the current and projected stability and sustainability of groundwater in the ECC Subbasin, PMAs are developed with the goal of maintaining sustainable groundwater conditions. PMAs include a suite of targeted PMAs that the GSAs may develop and implement, if needed under future conditions. The GSP also includes some PMAs that are expected to be implemented (or are already being implemented) by individual GSAs in the Subbasin to maintain sustainability.

ECC Subbasin GSAs have identified a range of PMAs. Projects generally refer to structural programs, including, for example, direct and in-lieu recharge utilization of recycled water, and other capital improvement projects. In contrast, management actions are typically non-structural programs or policies that do not require a substantial capital outlay and are intended to incentivize reductions in groundwater pumping when needed.

ECC Subbasin PMAs are described in accordance with 23 California Code of Regulations (CCR) §354.44. Because the ECC Subbasin is currently and projected to be sustainable over the implementation and planning horizon (i.e., no onset of undesirable results), PMAs are not expected to be essential for sustainability. However, future conditions are uncertain and PMAs are viewed as enhancing management capabilities and will be implemented on an as-needed basis. It is anticipated that PMAs would be targeted at specific regions that may emerge in the future as potential areas of concern.

Projects included in the GSP include infrastructure to provide in-lieu recharge, improve water quality, and increase use of recycled wastewater. Projects are either ongoing, under construction, or in the planning stage and are expected to help maintain sustainable conditions in the Subbasin and mitigate potential future problems. The estimated groundwater recharge benefit and capital cost of each project is shown. Project cost information is limited for many projects because a detailed feasibility assessment has not been completed. Other projects have cost estimates that were developed several years ago and may not reflect current conditions. To the extent possible, project costs are adjusted and reported on a consistent basis. GSAs and other agencies in the Subbasin will further develop projects during the GSP implementation period and refine estimated costs.

Management actions are options available to the GSAs if groundwater conditions begin to trend below Measurable Objectives (MO) or approach Minimum Thresholds (MT). Some GSAs may implement management actions proactively as a local policy. However, this appears unlikely based on current and projected groundwater modeling for the Subbasin (**Section 7**). Management actions in the GSP include oversight of well construction features, metering, and demand management. Management actions have more concise descriptions because they generally do not require outside approval or infrastructure and are part of authorities granted to GSAs under SGMA legislation. Benefits and costs will mostly depend on necessity and the extent of the area or areas which would require the action.

In accordance with CCR §354.44(b)(9), GSAs will identify sources of funding to cover project development, capital, and operating costs, including but not limited to, groundwater extraction fees, increasing water rates, grants, low interest loans, and other assessments. The exact funding mechanism will vary by project and the legal authority of each GSA (or project proponent). A general description of how each GSA expects to cover costs is presented after the description of each project.

Individual GSAs or other water agencies in the Subbasin will manage the permitting and other specific implementation oversight for its own projects. The ECC GSAs have an obligation to ensure groundwater sustainability in the Subbasin, however, they are not the primary regulator of land use, water quality, or environmental project compliance. The individual GSAs will be responsible for implementing projects and management actions in accordance with applicable statutes and regulations, and in coordination with other local, state, and federal authorities that may have permitting and regulatory authority over PMAs.

GSAs will notify the public and other agencies of the planned or ongoing implementation of PMAs through the communication channels identified for each project (23 CCR §354.44(b)(1)(B)). Noticing will occur as projects are being considered for implementation, and as future projects are implemented. Noticing will inform the public and other agencies that the GSA is considering or has implemented the PMA and will provide a description of the actions that will be taken.

PMAs are categorized and presented in this chapter according to the current status of implementation and development. This is consistent with the adaptive approach to PMA implementation and with development of PMAs based on the best available data and science (per 23 CCR §354.44(c)). This chapter also acknowledges ongoing investments made by GSAs and other agencies in the Subbasin (including prior to the passage of SGMA), such as projects that were identified and moved forward under regional water management planning efforts.

The PMA categories described in this chapter include:

- Completed Projects and Management Actions are PMAs that the GSA or other project proponents have implemented that will support sustainable groundwater management in the Subbasin. In accordance with 23 CCR §354.44(a) these are PMAs that would allow GSAs to achieve the sustainability goal for the ECC Subbasin and avoid minimum thresholds defined in this GSP under future, changing conditions.
- Under Construction Projects and Management Actions are PMAs that are being implemented and will support sustainable groundwater management in the Subbasin. In accordance with 23 CCR

§354.44(a) these are PMAs that would allow GSAs to achieve the sustainability goal for the Subbasin and avoid minimum thresholds defined in this GSP under future, changing conditions.

- Planned Projects and Management Actions are PMAs that are expected to be implemented and support sustainable groundwater management in the Subbasin. These may have been studied by the project proponent, or in earlier regional water planning documents, but most project design, costs, and planning work has yet to be completed.
- Conceptual Projects and Management Actions are PMAs that are being discussed as potential options to be implanted only as needed in any areas of the Subbasin facing deleterious groundwater conditions. This is not expected in the Subbasin as a whole, but these PMAs may be considered in specific areas facing unforeseen unsustainable conditions due to, for example, prolonged drought or supply disruption.

Table 8-1 summarizes the PMAs, type, and expected benefits to measurable objectives in the Subbasin. Most proposed PMAs are expected to benefit groundwater levels and groundwater storage, whether through direct or in-lieu groundwater recharge, management of water supplies, or demand reduction. Projects that increase the overall water supply are also expected to reduce depletions of interconnected surface water. Some management actions would potentially benefit all measurable objectives if those were ultimately triggered for implementation.

Table 8-1. Summary of ECC Projects & Management Action

Project/ Management Action Name	Project/ Management Action Category	Measurable Objectives Expected to Directly Benefit					
		GW Levels	GW Storage	SW Depletion	Land Subsidence	Seawater Intrusion	Water Quality
Northeast Antioch Annexation Water and Sewer Facility Installation	Completed	X	X				X
Non-Potable Storage Facility and Pump Station	Completed	X	X	X			
Dry-Year Water Transfer ECCID/CCWD	Completed	X	X	X			
Citywide Non-Potable Water Distribution System	Under Construction	X	X	X			
City of Antioch Brackish Water Desalination Project	Under Construction	X	X	X			X

Project/ Management Action Name	Project/ Management Action Category	Measurable Objectives Expected to Directly Benefit					
		GW Levels	GW Storage	SW Depletion	Land Subsidence	Seawater Intrusion	Water Quality
Treatment and Reuse of Alternative Water Supplies	Planned	X	X	X			X
Transport Model Development	Planned						X
Well Spacing Control	Conceptual	X	X		X		
Oversight of Well Construction Features	Conceptual						X
Well Metering, Monitoring, and Reporting	Conceptual	X	X	X	X		
Demand Management Program	Conceptual	X	X	X	X	X	X
Water Conservation Programs	Varied	X	X	X	X	X	X

This rest of this chapter is structured as follows. **Section 8.1** provides a summary of projects. The three subsequent subsections describe the projects in each of the three categories. **Section 8.2** describes management actions.

8.1 Projects

Seven (7) projects are included in the GSP. These projects provide a benefit to water supply or water quality, and are currently completed, under construction, or planned for implementation over the next 20 years (GSP implementation period). As described above and in **Section 7**, groundwater conditions are projected to be sustainable over the GSP implementation period, even in the absence of any projects. The GSAs will continue to monitor groundwater conditions, and report on them in annual GSP reports and 5-year GSP updates. Some projects may be triggered if undesirable results are projected to occur and subsequent GSP updates would provide an implementation schedule and additional project details.

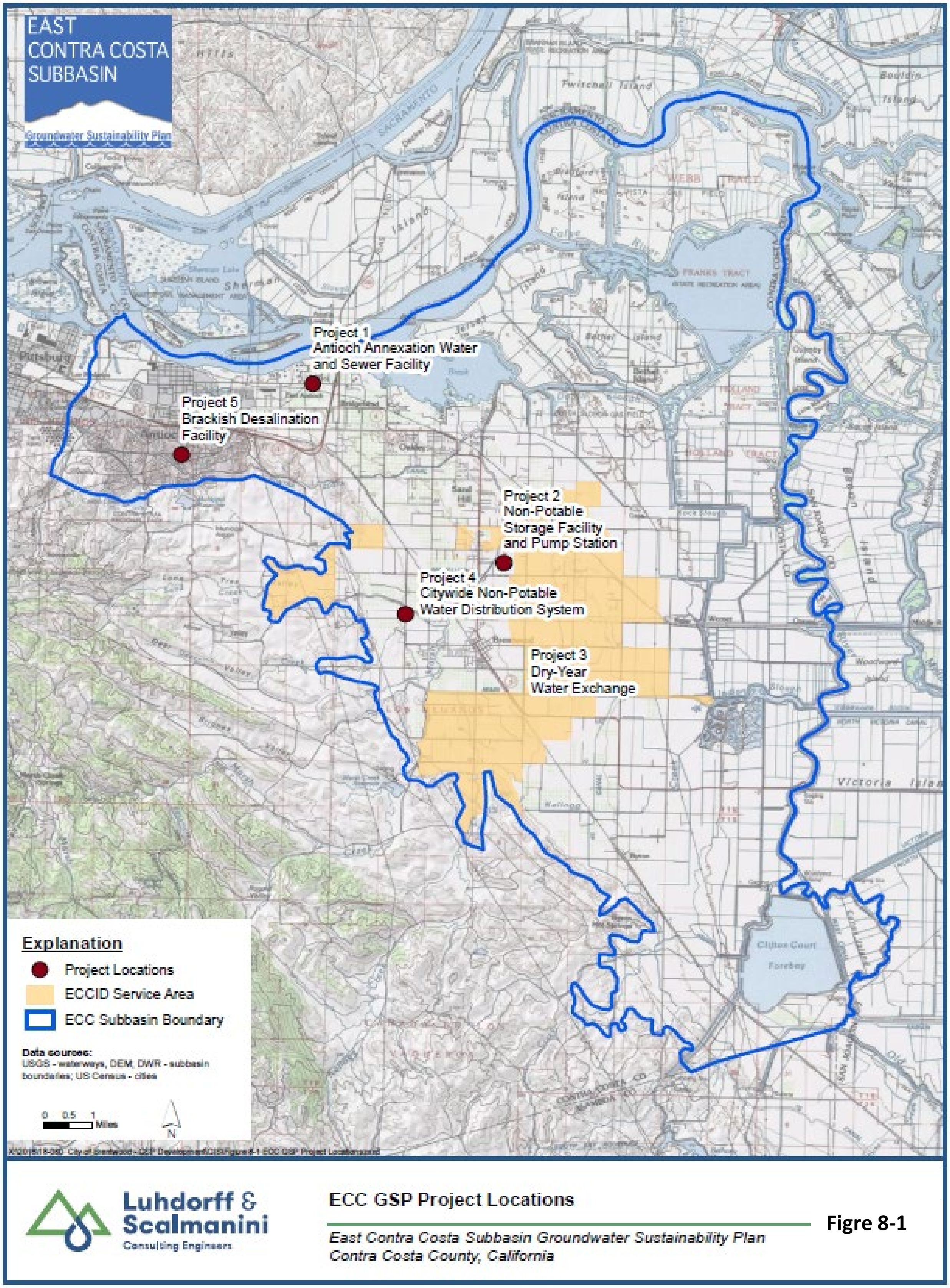
The ECC GSP Working Group used the Integrated Regional Water Management (IRWM) Plan (ECWMA 2019) to generate a preliminary list of projects that have been previously developed and evaluated by local entities in the ECC Subbasin. The GSAs then selected projects from this list that are expected support sustainable groundwater management and help maintain sustainable conditions in the Subbasin. Some projects described in this section are extensions of those detailed in the most recent IRWM Plan. Interested parties were informed and could provide feedback on the projects at a public workshop held on June 23, 2021; additional comments will be received during public review of this GSP.

8.1.1 Project Implementation

Projects will be administered by the project proponent (e.g., GSA). The project proponent has sole discretion to designate and implement a project in a timeframe in accordance with its funding, capability, and prioritization. No projects identified to date are considered essential for achieving the Subbasin sustainability goal because the ECC Subbasin is currently and projected to be sustainable over the implementation and planning horizon.

8.1.2 List of Projects

Seven possible projects to increase water supply availability and reliability in the ECC Subbasin were identified and are included in the GSP. These projects help contribute to the current and continued sustainability of the Subbasin. Projects include water recycling and water quality and are detailed in the project summaries below and in **Figure 8-1** and **Table 8-1**. **Figure 8-1** illustrates projects that are completed or under construction. **Table 8-2** lists projects which are completed, under construction, or planned.


EAST
CONTRA COSTA
SUBBASIN
Groundwater Sustainability Plan
Project 1
Antioch Annexation Water
and Sewer Facility
Project 5
Brackish Desalination
Facility
Project 2
Non-Potable
Storage Facility
and Pump Station
Project 4
Citywide Non-Potable
Water Distribution System
Project 3
Dry-Year
Water Exchange
Explanation
Project Locations
ECCID Service Area
ECC Subbasin Boundary
Data sources:
USGS - waterways, DEM; DWR - subbasin boundaries; US Census - cities
0 0.5 1
Miles
N
Luhdorff & Scalmanini
Consulting Engineers
ECC GSP Project Locations
East Contra Costa Subbasin Groundwater Sustainability Plan
Contra Costa County, California

Figre 8-1

Table 8-2. Summary of ECC GSP Projects

Name	Type	Proponent	MO to Benefit	Status	Completion Year[1]	Capital Cost ($)	Expected Yield[2]
Northeast Antioch Annexation Water and Sewer Facility Installation	In-Lieu Recharge / Water Quality	City of Antioch	Groundwater Levels, Groundwater Storage, Water Quality	Completed	2020	4,400,000	8 AFY (.0007 MGD)
Non-Potable Storage Facility and Pump Station	In-Lieu Recharge / Recycled Water	City of Brentwood	Groundwater Levels, Groundwater Storage, Interconnected Surface Water	Completed	2020	12,804,500	1,661 AFY (1.5 MGD)
Dry-Year Water Transfer ECCID/CCWD	In-Lieu Recharge	East Contra Costs ID	Groundwater Levels, Groundwater Storage, Interconnected Surface Water	Completed	2000	N/A	4,000 AFY (3.5 MGD)
Citywide Non-Potable Water Distribution System	In-Lieu Recharge / Recycled Water	City of Brentwood	Groundwater Levels, Groundwater Storage, Interconnected Surface Water	Under construction	2021	9,054,036	1,661 AFY (1.5 MGD)
City of Antioch Brackish Water Desalination Project	In-Lieu Recharge	City of Antioch	Groundwater Levels, Groundwater Storage, Interconnected Surface Water	Under construction	2023	110,000,000	6,720 AFY (6 MGD)
Treatment and Reuse of Alternative Water Supplies	In-Lieu Recharge / Recycled Water	Diablo Water District	Groundwater Levels, Groundwater Storage, Interconnected Surface Water	Planned	TBD	20,000,000 to 100,000,000	2,800 AFY (2.5 MGD)
Transport Model Development[3]	Water Quality	Diablo Water District	Water Quality	Planned	TBD	250,000 to 500,000	N/A

1. SGMA's required planning implementation horizon is 50 years.
2. Represents total offset to water supply; direct benefits to groundwater will vary.
3. The Transport Model Development project is in progress.

8.1.3 Completed Projects

Projects in this category are completed and operating. They have either been completed recently and will have benefits not accounted for in the water budget described in **Section 5**, or they are ongoing with the capacity to expand. These projects provide in-lieu groundwater recharge benefits. The estimated cumulative benefit of these projects is 5,669 AFY.

8.1.3.1 Project 1: Northeast Antioch Annexation Water and Sewer Facility Installation

Project Summary	
Submitting GSA	City of Antioch
Project Type	In-Lieu Recharge / Water Quality
Estimated Groundwater Offset and/or Recharge	8 AFY, Water Quality Benefits

This project involved construction of new water and sewer facilities where there were none. Residents in this area had been relying on aging individual wells and septic tanks without access to municipal treated water or sewer services. This project provides facilities to a lower-income community, thus more equitably providing water access and protecting groundwater from potential septic tank and leach field contamination.

Measurable Objective Expected to Benefit:

This project, through reducing well use, helps avoid potential lowering of groundwater levels and reduction in groundwater storage. It also avoids potential water quality degradation from existing septic tanks and leach fields.

Project Status and Timetable for Initiation and Completion:

This project was completed in May of 2020.

Required Permitting and Regulatory Process:

All work was performed in City right-of-way or in areas that easements have been acquired. Permitting was required through BNSF Railroad for installation of a pipeline across its right-of-way.

Expected Benefits and Evaluation:

Groundwater recharge is an important part of the GSP and will be critical to maintaining long-term Subbasin sustainability. This project is anticipated to reduce 8 AFY in groundwater pumping by providing residents and businesses access to the City of Antioch water supply. Furthermore, the project is expected to benefit water quality through reduction of potential contamination. Benefits to groundwater levels and water quality will be evaluated through monitoring, as described in **Section 6**.

How Project Will Be Accomplished/Evaluation of Water Source:

New pipelines provide City water to residents that were not in the system. The source of water will be the City of Antioch, which is expected to provide a reliable water supply for the annexed area.

Legal Authority:

GSAs, in this case the City of Antioch GSA, have the authority to plan and implement projects. The City of Antioch is a local agency established to serve water for agricultural and municipal demands.

Estimated Costs and Plans to Meet Costs:

The capital cost for this project is $4,400,000. Costs for this project have been met through City of Antioch and County funds.

Annual operating costs of the project are $21,500. Operating costs from the project are paid for by ratepayers.

Circumstances for Implementation:

A construction agreement for this work was approved by the Antioch City Council on December 11, 2018. The Notice of Completion was approved by the Antioch City Council on June 9, 2020. No further process is needed to determine the conditions which would require this project because it is already constructed.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held the City of Antioch GSA and others.

8.1.3.2 Project 2: Non-Potable Storage Facility and Pump Station

Project Summary	
Submitting GSA	City of Brentwood
Project Type	In-Lieu Recharge / Recycled Water
Estimated Groundwater Offset and/or Recharge	Up to 1,661 AFY

The Wastewater Treatment Plant (WWTP) discharges about 2 million gallons of recycled water per day into Marsh Creek. Utilization and blending of this valuable resource are major strategic components for compliance with the requirements of the National Pollution Discharge Elimination System (NPDES) Permit. This reduces the reliance and associated treatment costs on potable water and complies with both State and City mandates on increasing recycled water usage.

The City of Brentwood is implementing steps to utilize more recycled water citywide; however, the peak daily recycled water supply (morning and evenings) does not align with the peak recycled water demand (night). The City of Brentwood needs an adequate storage facility to maximize utilization of this valuable resource. This project offsets the use of 1,661 AFY of potable water sourced in part from the Subbasin, reduces discharge to Marsh Creek, and reduces surface water diversions used for irrigation.

Measurable Objective Expected to Benefit:

This project, through increasing the city water supply, helps avoid potential lowering of groundwater levels, reduction in groundwater storage, and depletion of interconnected surface water.

Project Status and Timetable for Initiation and Completion:

This project was completed in 2020.

Required Permitting and Regulatory Process:

Requirements from the Central Valley Regional Water Quality Control Board, as part of the WWTP NPDES Permit, include that the City of Brentwood must expand recycled water usage and decrease discharge of treated water into Marsh Creek. Storage facility construction was completed following all required permitting and regulatory requirements.

Expected Benefits and Evaluation:

Recycled water is an important part of the City's water resources. Recycled water allows the City of Brentwood to conserve potable water, thereby ensuring a reliable water supply for current and future demand. This project is expected to offset 1,661 AFY in water demand.

The amount of in-lieu recharge depends on the availability of other sources, but some offset of groundwater pumping is expected. The Non-Potable Storage Facility project will improve access to recycled water supplies. Alternate water supplies will be an important component of the priorities and requirements to facilitate sustainable groundwater management and will be critical to establishing long-term groundwater sustainability. Benefits will be evaluated through volumetric measurement of recycled water added back into the system.

How Project Will Be Accomplished/Evaluation of Water Source:

The City's Wastewater Treatment Plant's tertiary treatment and disinfection provides recycled water for landscaping. The City of Brentwood is a producer and distributor of Title 22 tertiary recycled water for unrestricted reuse. Upon completion of the pipeline installation, recycled water will be pumped throughout the City of Brentwood for irrigation uses in lieu of potable water. Since the source of water is recycled wastewater, this is expected to be reliable even during drought periods.

Legal Authority:

GSAs, in this case the City of Brentwood GSA, have the authority to plan and implement projects. Unrestricted, non-potable recycled water is defined as wastewater that has been treated to tertiary standards (via filtration and disinfection) that meet Title 22 of the California Code of Regulations (California Department of Public Health, 2018). The production and distribution of recycled water is covered in the City's Master Reclamation Permit. Recycled water treated to this level can be used for all outdoor irrigation demands in a community, including parks, schools, street medians, residential front and backyard landscaping, public open space, as well as industrial uses such as cooling water.

Estimated Costs and Plans to Meet Costs:

The capital cost for this project was $12,804,500. The project was funded by a State Water Resources Control Board Revolving Fund "SRF" loan, so project approvals were obtained from the Regional Water Quality Control Board (RWQCB) and other affected local agencies. The SRF funding consisted of 35% from State and Federal grants and 65% from a loan that will be repaid using Wastewater Development Impact Fees and Wastewater Enterprise Funds.

Annual operating costs associated with this specific project are minor because this is an improvement on existing WWTP operations, which are already paid for by ratepayers.

Circumstances for Implementation:

This project was completed in 2020. The City of Brentwood has developed preliminary planning documents to identify uses for recycled wastewater at both existing and future sites. The recycled wastewater will be used for the irrigation of parks and other landscape amenities. The City of Brentwood already has constructed a portion of the recycled water distribution system and will continue to expand the system as the City of Brentwood grows. Recycled water demands are estimated to be 2,111 AF (688 MGY) at buildout. No further process is needed to determine the conditions which would require this project because it is already complete.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held by the City of Brentwood GSA and others.

8.1.3.3 Project 3: Dry-year Water Transfer ECCID/CCWD

Project Summary	
Submitting GSA	East Contra Costa Irrigation District
Project Type	Dry-Year Water Exchange
Estimated Groundwater Offset and/or Recharge	Up to 4,000 AFY

Under this project, CCWD diverts surface water of the same quantity ECCID has pumped from groundwater sources to meet local municipal and industrial demands within the ECC Subbasin. In wet years ECCID does not pump groundwater beyond what is required for use by ECCID direct use customers. This project is ongoing and implemented on an as needed basis and could be expanded if necessary to meet water supply needs while avoiding undesirable results. This exchange benefits local domestic supply as the aquifer recovers quickly through natural recharge and aids in meeting the measurable objective of maintaining average groundwater storage through all water year types. Although surface water meets about 85 percent of the ECC Subbasin water supply, groundwater can play a key role in prolonged droughts and benefit and preserve the agricultural resources of the region. ECCID will pump additional groundwater in dry years when surface waters are in a shortage as a result of drought.

<u>Measurable Objective Expected to Benefit:</u>

This project can help to avoid lowering groundwater levels and reduction in groundwater storage through replenishment of groundwater pumped during dry water years using surface water in wet water years. It also can help avoid depletion of interconnected surface water through taking stress of surface water supplies during dry years.

<u>Project Status and Timetable for Initiation and Completion:</u>

This project was first implemented in 2000 and is ongoing. The project will be implemented in dry years under an existing agreement.

<u>Required Permitting and Regulatory Process:</u>

The dry year transfer has been permitted and approved under the following agreements:

- Contract Among the Department of Water Resources of the State of California, East Contra Costa Irrigation District, and Contra Costa Water District, 1991 (amended 2000).
- Water Sales Agreement Between the East Contra Costa Irrigation District and the Contra Costa Water District, 2000.
- DWR approved the dry year exchange in a letter dated May 22, 2003.

<u>Expected Benefits and Evaluation:</u>

This project helps ensure groundwater is made available and distributed fairly to as many users as possible in the Subbasin when needed. Although surface water meets about 85 percent of the ECC Subbasin water supply, groundwater can play a key role in prolonged droughts and benefit and preserve the agricultural resources of the region. Benefits will be evaluated through volumetric measurement of delivered water.

<u>How Project Will Be Accomplished/Evaluation of Water Source:</u>

ECCID will pump additional groundwater in dry years when surface waters are in a shortage as a result of drought. Currently a long-term agreement is in place to initiate the transfer in dry years. Implementation includes a monitoring plan that was approved by DWR. The source of water will be the ECCID which is expected to be reliable. At this time there are no exchanges scheduled. However, additional wells may be considered to improve the efficiency of the groundwater transfer as well as to allow transfers outside of the irrigation season.

Legal Authority:

The dry year groundwater exchange is included in the Water Sales Agreement between ECCID and CCWD, dated February 22, 2000.

Estimated Costs and Plans to Meet Costs:

The initial implementation costs for this project have already been met by ECCID. Ongoing and future costs of the project are expected to be minimal and would be paid for by rate payers as needed.

Circumstances for Implementation:

For purposes of this transfer, a shortage situation must be determined when the U.S. Bureau of Reclamation notifies the CCWD that the allocation of Central Valley Water Project (CVP) water to CCWD will be less than CCWD's requested schedule of water supply service, submitted pursuant to CCWD's CVP contract. DWR will be informed when the transfer begins and ends. Total volumes of water will be reported monthly and annually to DWR per the existing agreements and approved monitoring plan. No further process is needed to determine the conditions which would require this project because it has already been implemented.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held by the ECCID GSA and others.

8.1.4 Projects Under Construction

Projects in this category are currently under construction and will be operating by 2042. Both projects provide in-lieu groundwater recharge benefits. The projected cumulative supply of these projects is 8,381 AFY.

8.1.4.1 Project 4: Citywide Non-Potable Water Distribution System

Project Summary	
Submitting GSA	City of Brentwood
Project Type	In-Lieu Recharge / Recycled Water
Estimated Groundwater Offset and/or Recharge	Up to 1,661 AFY

This project consists of the expansion of the reclaimed (non-potable) water distribution system throughout the City to provide reclaimed water for irrigation of golf courses, parks, parkways, medians, and other applicable uses. There are parks and public landscaping that are currently irrigated using potable water. By converting to non-potable water usage, the City can save on potable water supply. This project will deliver an additional 1,661 AFY produced by its treatment plant and offset the use of potable water sourced in part from the Subbasin.

Measurable Objective Expected to Benefit:

This project, through increasing the city water supply, helps avoid potential lowering of groundwater levels, reduction in groundwater storage, and depletion of interconnected surface water.

Project Status and Timetable for Initiation and Completion:

This project is currently under construction. This project began February 16, 2021 and is on schedule to be completed by November 2021.

Required Permitting and Regulatory Process:

This project requires the installation of non-potable water main lines throughout various portions of Brentwood. The project is being funded by a State Water Resources Control Board Revolving Fund "SRF" loan, so project approvals were obtained from the Regional Water Quality Control Board (RWQCB) and other affected local agencies.

Expected Benefits and Evaluation:

Recycled water is an important part of the City's water resources. Recycled water allows the City to conserve potable water, thereby ensuring a reliable water supply for current and future demand. The Non-Potable Water Distribution System project will expand the non-potable water distribution system and improve access to recycled water supplies. This project will create an additional 1,661 AFY in total water supply and offset groundwater pumping and dependence on surface water. Developing alternative water supplies is an important component of the requirements to achieve sustainable groundwater management and will be critical to maintaining long-term groundwater sustainability. Benefits will be evaluated through volumetric measurement of recycled water added back into the system.

How Project Will Be Accomplished/Evaluation of Water Source:

The City's Wastewater Treatment Plant's tertiary treatment and disinfection provides recycled water for landscaping. The City is a producer and distributor of Title 22 tertiary recycled water for unrestricted reuse. Upon completion of the pipeline installation, recycled water will be pumped throughout the City of Brentwood for irrigation uses in lieu of potable water. Since the source of water is recycled wastewater, this is expected to be reliable even during drought periods.

Legal Authority:

GSAs, in this case the City of Brentwood GSA, have the authority to plan and implement projects. Unrestricted, non-potable recycled water is defined as wastewater that has been treated to tertiary standards (via filtration and disinfection) that meet Title 22 of the California Code of Regulations (California Department of Public Health, 2018). The production and distribution of recycled water is covered in the City's Master Reclamation Permit. Recycled water treated to this level can be used for all outdoor irrigation demands in a community, including parks, school grounds, street medians, residential landscaping, public open space, as well as industrial uses such as cooling water.

Estimated Costs and Plans to Meet Costs:

The estimated capital cost for this project is $9,054,036. The State approved an agreement with the City for utilization of the SRF to fund the City's Recycled Water Project, which included the Citywide Non-Potable Water Distribution System project. The loan agreement also provides for a portion to be funded with grants from both Proposition 1 and Proposition 13. The final loan amount will be dependent upon final project costs, with the loan portion of the agreement to be repaid from Wastewater Enterprise and Wastewater Development Impact Fee funds over 30 years.

Annual operating costs associated with this expansion project are minor because this is an improvement on existing City of Brentwood non-potable water system infrastructure, with operations already paid for by ratepayers.

Circumstances for Implementation:

The Brentwood City Council approved this project in August 2020. This project began on February 16, 2021. The City of Brentwood has developed preliminary planning documents to identify uses for recycled wastewater at both existing and future sites. The recycled wastewater will be used for the irrigation of parks and landscape amenities. The City of Brentwood already has constructed a portion of the recycled water distribution system and will continue to expand the system as the City grows. Recycled water demands are estimated to be 2,111 AF (688 MGY) at buildout. There is no process for determining the conditions which would require this project because it is already underway.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held the City of Brentwood GSA and others.

8.1.4.2 Project 5: City of Antioch Brackish Water Desalination Project

Project Summary	
Submitting GSA	City of Antioch
Project Type	In-Lieu Recharge
Estimated Groundwater Offset and/or Recharge	Up to 6,720 AFY

This project improves water supply reliability by providing the production of up to 6 MGD of drinkable water utilizing high salinity water from the San Joaquin River that was previously untreatable via conventional treatment methods.

Measurable Objective Expected to Benefit:

This project, through increasing water supply, helps avoid potential lowering of groundwater levels, reduction in groundwater storage, and depletion of interconnected surface water.

Project Status and Timetable for Initiation and Completion:

Construction for this project began following a construction agreement for this work approved by the Antioch City Council on December 15, 2020. The project is currently under construction and expected to be completed in 2023.

Required Permitting and Regulatory Process:

This project includes the construction of a new intake from the San Joaquin River, modification to an existing water treatment plant, installation of approximately 4.5 miles of pipeline, and the introduction of brine in the discharge stream at the location of the wastewater treatment facility. The work will require permits from National Marine Fisheries Services (NMFS), California Department of Fish and Wildlife (DFW), Regional Water Quality Control Board (RWQCB), U.S. Army Corps of Engineers (USACE), State Department of Transportation (Caltrans), and Union Pacific Railroad (UPRR). All permits for this project have been obtained.

Expected Benefits and Evaluation:

Water supply reliability is a critical component of the GSP and will be important in maintaining the sustainability of the Subbasin. This project will introduce up to 6 MGD of new drinking water into the region, equivalent to providing water for 27,000 people per day[1]. This water will be produced from high salinity source water from the San Joaquin River that is currently unusable, utilizing conventional treatment methods. The benefits will be evaluated based on volumetric measurement of the amount of treated water put into the system.

How Project Will Be Accomplished/Evaluation of Water Source:

The City of Antioch will continue to use its pre-1914 water rights to pump water from the San Joaquin River. The river pump station is currently permitted to pump up to 16 MGD from the river. As a pre-1914 right, this supply will be highly reliable.

[1] In 2016 the Legislative Analyst's Office estimates that the average residential water use was 85 gallons per person per day. The average number of people per household is 2.5 (average number of people per household in the United States from 1960 to 2019).

Legal Authority:

GSAs, in this case the City of Antioch GSA, have the authority to plan and implement projects. The City of Antioch will continue to use its pre-1914 water rights to pump water from the San Joaquin River. Construction of the new facilities will occur on existing City right-of-way or with new easements which have been acquired.

Estimated Costs and Plans to Meet Costs:

The estimated capital costs for this project total $110,000,000. **Table 8-3** summarizes the funding sources for the project.

Estimated annual operating costs of the project are between $2,100,000 and $4,000,000, depending on annual rainfall. Operating costs from the project will be paid for by ratepayers.

Table 8-3. City of Antioch Brackish Water Desalination Project Funding Sources

Source	Amount ($)
California Department of Water Resources Desalination Grant	10,000,000
State Water Resources Control Board Drinking Water Revolving Loan Fund Award	56,000,000
California Department of Water Resources Settlement Agreement Funds	27,000,000
City of Antioch Water Enterprise Funds	17,000,000

Circumstances for Implementation:

A construction agreement for this work was approved by the Antioch City Council on December 15, 2020. The project is already underway and does not require any new conditions or approvals.

Notice to Public and Other Agencies

Public noticing and public meetings for this project have complied with all noticing requirements followed by the City of Antioch GSA and other participating agencies.

8.1.5 Planned Projects

Projects in this category are planned and are expected to be completed and operating by 2042. One project provides in-lieu groundwater recharge benefits, and the other provides water quality benefits. The projected cumulative supply of these projects is 2,800 AFY.

8.1.5.1 Project 6: Treatment and Reuse of Alternative Water Supplies

Project Summary	
Submitting GSA	Diablo Water District
Project Type	In-Lieu Recharge / Recycled Water
Estimated Groundwater Offset and/or Recharge	Up to 2,800 AFY

This project will offset current and future groundwater pumping. Through the introduction of recycled water for future park and public landscaping areas, future groundwater pumping in these areas is reduced. Additionally, through aquifer storage and recovery via indirect potable reuse, a drought-resilient water supply will be created to help limit groundwater drawdown during periods of drought.

Measurable Objective Expected to Benefit:

This project, by increasing water supply, will help to avoid potential lowering of groundwater levels, reduction in groundwater storage, and depletion of interconnected surface water.

Project Status and Timetable for Initiation and Completion:

The feasibility study phase is complete, and the project will move into the planning phase in late 2021. The timeline for initiation and completion is still under development, pending the final plan. It is anticipated to take between 5 and 10 years from the beginning of project construction to completion.

Required Permitting and Regulatory Process:

This project will require a CEQA review and permit from the SWRCB. Additional requirements may include County Well Permits, and City/County encroachment permits.

Expected Benefits and Evaluation:

This project will create up to 2,800 AFY reduction in future estimated aquifer extraction through availability of recycled water. This likely will increase as flows to the sanitary district increase due to regional growth. The yield will be evaluated through volumetric monitoring of recycled water delivered for parks and landscape use. Developing alternative water supplies is an important component of maintaining long-term groundwater sustainability.

How Project Will Be Accomplished/Evaluation of Water Source:

Currently, the GSA is in initial discussions with the sanitary district regarding funding, organization structure, responsibilities, etc. Each agency has created an ad hoc committee to assess ideas and bring to their full Boards for evaluation. Since the source of water would be recycled wastewater, this is expected to be reliable even during drought periods.

Legal Authority:

GSAs, in this case the Diablo Water District GSA, have the authority to plan and implement projects. Unrestricted, non-potable recycled water is defined as wastewater that has been treated to tertiary standards (via filtration and disinfection) that meet Title 22 of the California Code of Regulations (California Department of Public Health, 2018). This project may also involve the creation of a Joint Powers Agreement between DWD and Ironhouse Sanitary District (ISD).

Estimated Costs and Plans to Meet Costs:

The estimated capital costs for this project are expected to fall between $20 and $100 Million. A more precise estimate and the proposed method to cover this cost will be determined during the planning phase of the project, which will begin in late 2021.

Circumstances for Implementation:

This is a future action approved by both the sanitary board and the Diablo Water District Board. The project will be implemented following completion of the East Cypress Corridor. The decision to move forward will depend on confirmation of water supply availability from the project and desire to move forward from the stakeholders. Water supply availability and stakeholder desire will be determined during the planning phase. Unsustainable changes in aquifer conditions, while not expected, would accelerate the implementation of this project. Aquifer conditions will be monitored as described in **Section 6**.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held by the Diablo Water District GSA and others.

8.1.5.2 Project 7: Transport Model Development

Project Summary	
Submitting GSA	Diablo Water District
Project Type	Water Quality
Estimated Groundwater Offset and/or Recharge	N/A, Water Quality Benefits

This project will address the water quality measurable objective by expanding the existing surface water/groundwater flow model to include a solute transport component. The development of a solute transport component will complement the existing ECCSim modeling work completed for the GSP by allowing the simulation of the transport of chemicals within the East Contra Costa Subbasin. This will improve the understanding of the movement of water and constituents under various flow regimes including climate change, sea level rise, and changes in groundwater use. The current ECCSim platform does not directly support inclusion of a transport component, so this project would involve converting the IWFM model platform inputs to a MODFLOW platform, with various improvements necessary to facilitate solute transport. Particle tracking would be incorporated into the new MODFLOW model for the ECC Subbasin after sufficient refinement of lateral and vertical discretization, calibration, development of climate change and sea level rise scenarios, and various additional future groundwater pumping regimes. The new flow and transport model would allow ECC to determine how chemicals could potentially be mobilized as a result of additional groundwater development, in order to avoid degradation of groundwater quality. This project would require converting the current ECCSim model to the MODFLOW platform and would include a detailed report, including maps, figures, charts, and tables describing the development of the model. This also would include developing the solute transport component and documenting the results of the modeling effort.

Measurable Objective Expected to Benefit:

This project will help to avoid degraded water quality concerns.

Project Status:

This project is currently in the planning phase. The timeline for implementation is still under development. It is anticipated to take about a year to complete.

Required Permitting and Regulatory Process:

No permits will be required for this project.

Expected Benefits and Evaluation:

The new model will increase the understanding about movement of poor-quality water within the Subbasin under various hydrologic conditions including climate change and sea level rise. This also will enhance the water quality monitoring described in **Section 6**.

How Project Will Be Accomplished/Evaluation of Water Source:

The project is currently in initial discussions with GSAs regarding funding, organizational structure, and responsibilities.

Legal Authority:

GSAs have the authority to plan and implement projects.

Estimated Costs and Plans to Meet Costs:

The estimated costs for this project are $250,000 to $500,000. The plans to cover these costs are currently under development.

Circumstances for Implementation:

This project would be implemented by the ECC Working Group. Implementation would begin when agreement about funding and potential grant money is secured. Water supply availability, political desire, and aquifer conditions are all motivating the desire to develop a transport model.

Notice to Public and Other Agencies

Public noticing for this project is being done in accordance with noticing requirements and in public meetings held the Diablo Water District GSA and others.

8.2 Management Actions

Management actions are activities that GSAs may implement locally to achieve or maintain groundwater sustainability. These management actions are all "planned" and therefore are currently in the conceptual phase. GSAs will consider these management actions to address possible future threats to groundwater sustainability on an as-needed basis in potential areas of concern. They generally do not require outside approval or infrastructure and are part of the authorities granted to GSAs under SGMA legislation.

As established in **Section 7***,* groundwater conditions in the ECC Subbasin exhibit stability and sustainability. Basin-wide management actions are not currently proposed for GSP implementation, but future actions may be instituted by GSAs to address local concerns if they arise during the implementation and planning horizon. Some GSAs may implement management actions proactively as a local policy. If undesirable results occur or are projected to occur during the GSP implementation period, subsequent GSP updates will identify additional management actions and provide an implementation schedule as needed.

8.2.1 Potential Management Actions

The GSAs may elect to implement one or more potential management actions for maintaining sustainability in the Subbasin (or portion thereof). **Table 8-4** lists the potential management actions included in this GSP. Generally, these management actions are not applicable to de minimis well users[2]. De minimis well users are discussed further in **Section 8.2.1.1**. Management actions include well spacing control, oversight of well construction, reporting, and a potential demand management program. These potential management actions fall within the powers and authorities of GSAs under SGMA.

[2] "De minimis extractor" means a person who extracts, for domestic purposes, two acre-feet or less per year. Section 10721, Water Code

Table 8-4. Summary of Potential Management Actions

Name	Type	MO to Benefit	Status
Well Spacing Control	Demand Management	Groundwater Levels, Groundwater Storage, Land Subsidence	Concept
Oversight of Well Construction Features	Water Quality	Water Quality	Concept
Well Metering, Monitoring, and Reporting	Improved Data / Demand Management	Groundwater Levels, Groundwater Storage, Interconnected Surface Water, Land Subsidence	Concept
Demand Management Program	Demand Management	All	Concept
State Programs for Domestic Well Users	Well Data	Groundwater Levels, Groundwater Quality	Concept

Not listed under **Table 8-4** are potential advocacy and engagement with other lead agencies that oversee activities that can have an impact on groundwater sustainability. Of particular concern expressed by the public and some GSAs is the risk posed by hazardous substances and oil and gas drilling. The presence of contamination and oil and gas activity in the ECC Subbasin are cited in **Section 3.3.6**. Although GSAs do not have authorities under SGMA to regulate such activities, they may seek to advise applicable agencies of potential risks to sustainability posed by projects and permitting actions. The basis for such engagement may include the subbasin hydrogeologic conceptualization which can provide a more current and robust risk assessment with respect to threats to groundwater.

The next two subsections discuss non-applicability to de minimis users, and coordination with Contra Costa County which would be needed with these actions. The subsections following those summarize the potential management actions.

8.2.1.1 Non-Applicability to De Minimis Users

Management actions related to wells are generally not applicable to de minimis users. Primary exceptions may be made when certain well standards are needed to ensure source protection for the de minimis user and other users. A GSA may therefore impose standards for seal and intake depths where such standards are needed to avoid water quality degradation and are consistent with the sustainability goal and the sustainable management criteria detailed in **Section 7**.

Where applicable, GSAs may seek to develop options to quantify groundwater pumping by de minimis users, including self-certification. This measure is strictly to provide better accuracy for projecting impacts and sustainability and is not intended to infringe on privacy or place any financial or other burden on this category of user. Information will be included in the GSP Data Management System described in **Section 6**.

8.2.1.2 Coordination with Contra Costa County

Implementation of any management action pertaining to new wells, excluding de minimis users, shall be coordinated with Contra Costa County. A management action that pertains to existing wells, such as a requirement to install a meter, would not involve County coordination but would be undertaken by a GSA in accordance with authorities and powers granted under SGMA.

With regard to new wells, the County Environmental Health Division is the permitting authority for well siting (plot plan) and construction inspection. The latter includes a final surface inspection of the completed well. Coordination between the County permitting division and GSAs is recognized as a requirement for implementing future GSP management actions related to wells. If needed to ensure sustainability, existing well owners may be required to conform to well management actions such as metering or pumping limitations. These existing well owners may be identified through county records as part of the well inventory data gap discussed in **Section 6**.

Since each GSA may implement a variety of requirements for new wells as a function of individual sustainable management responsibilities, the permitting process cannot anticipate every possible requirement that may be imposed by the GSAs. Nor is it expected that the County will inspect and regulate conformance to any GSA requirement for all permit applications. Rather, this GSP envisions that an administrative process be developed under which the County would notify well applicants of their responsibility to contact the appropriate GSA for local requirements involving siting, construction, and use of new wells. It would be the GSA’s responsibility to provide information on local requirements and a point of contact to ensure that well owners have a clear understanding of the purpose and execution of a requirement. The GSA, at its discretion, may perform inspections as it deems necessary to certify compliance with a particular requirement.

Presently, the County permit process includes discretionary requirements only for additional water analyses and pump testing. The coordination with GSA requirements would require, as applicable, that a permit application identify any local GSA requirements and provide the certification at completion that such requirements were met. Measures such as ongoing reporting of pumped volumes would be the responsibility of the well owner. Any follow-up inspections or enforcement of a measure would be the responsibility of the GSA.

This GSP recognizes that its management actions must be consistent with and subject to County authorities and responsibilities as the well permitting agency in the Plan area. It is expected that the process will be developed over two to three years commencing with implementation of the GSP in January 2022.

8.2.1.3 Management Action 1: Well Spacing Control

As determined by a GSA, well spacing control may be imposed to prevent a new well from causing a significant reduction in the production of any existing well in the vicinity. Sufficient well spacing, defined as the distance between the proposed new well and existing wells, would be required to mitigate the impacts of pumping interference (water level drawdown) induced by operation of the prospective new well to a less-than-significant degree. Determination of a significant impact shall be made by the GSA on a case-by-case basis considering, but not limited to, the number of wells potentially affected, the estimated effect on existing well production and cost, and the types and uses of the affected wells (e.g., domestic, agricultural, and industrial). The GSAs will seek to prioritize protection of disadvantaged communities, rural domestic wells, agricultural uses, and environmental resources consistent with the Sustainable Management Criteria set forth in this GSP (see **Section 7**).

Measurable Objective Expected to Benefit

This management action would help to avoid lowering of groundwater levels, reduction in groundwater storage, and land subsidence by preventing significant drawdown.

Management Action Status:

This management action is currently conceptual and may be employed as needed by one or more GSAs.

Required Permitting and Regulatory Process:

No additional permitting would be required. Contra Costa County will notify new well permit applicants to identify and comply with the requirements of the applicable local GSA.

Expected Benefits and Evaluation:

The expected benefit is a reduction in groundwater level drawdown. Quantification of interference impacts may be made through direct measurements (well testing), calculations using applicable well hydraulic methods employed in groundwater science, or groundwater flow modeling. These methods shall use aquifer parameters consistent with the basin Hydrogeologic Conceptual Model described in **Section 3** and incorporate flow rate and pumping duration as proposed by the well applicant.

How Management Action Will Be Accomplished:

If a determination that interference would result in a significant deleterious impact on the capacity of an existing well or wells, the well permit applicant may propose an alternate location that reduces the impact to a less than significant degree. The impact assessment and degree of significance may depend on numerous factors and shall be determined on a case-by-case basis by the GSA.

Legal Authority:

GSAs have the authority to plan and implement management actions. Each GSA in the Subbasin has the authority to implement and enforce this management action if needed based on aquifer conditions.

Estimated Costs and Plans to Meet Costs:

Since this management action is in the conceptual phase, specific costs are not yet determined. The costs would be associated with the number of new well permit applications in the Subbasin if the action is implemented.

Circumstances for Implementation:

Groundwater conditions are projected to remain at sustainable levels into the future under GSP implementation as described in **Section 7**. This management action may be implemented and would be monitored and quantified with respect to groundwater levels, as needed, if sustainable groundwater levels cannot be maintained in any areas of the Subbasin during GSP implementation. This will be determined by the methods described in **Section 6**.

Notice to Public and Other Agencies

Public noticing for this management action would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement this management action. Additionally, Contra Costa County will notify new well permit applicants to identify and comply with the requirements of their GSA.

8.2.1.4 Management Action 2: Oversight of Well Construction Features

A GSA may impose requirements for well construction to ensure that a new well does not induce adverse impacts to water quality and availability. Such requirements may include specifying depths for well seals and intake screens to avoid commingling of zones with differing water quality where such commingling may lead to degradation of the water supply. A GSA may also institute construction standards that exceed local and state requirements where it has been determined that such standards are needed to protect water quality for conditions in the GSA plan area.

Measurable Objective Expected to Benefit

This management action would help to avoid degraded water quality concerns through more locally targeted well construction requirements.

Management Action Status:

This management action is currently conceptual and may be employed as needed by one or more GSAs.

Required Permitting and Regulatory Process:

No additional permitting would be required. Contra Costa County will notify new well permit applicants to identify and comply with the requirements of the applicable local GSA.

Expected Benefits and Evaluation:

The expected benefit is the protection of water quality. Water quality will be monitored using the methods described in **Section 6**.

How Management Action Will Be Accomplished:

The GSA or GSAs which elect to implement this management action would work with the County well permitting office to ensure new well permit holders are aware of construction requirements. The GSAs will also establish and/or develop with the County a process for inspecting well construction activities and ensuring requirements are met.

Legal Authority:

GSAs have the authority to plan and implement management actions. Each GSA in the Subbasin has the authority to implement and enforce this management action if needed based on aquifer conditions.

Estimated Costs and Plans to Meet Costs:

Since this management action is in the conceptual phase, specific costs are not yet determined. The costs would be associated with the number of new well permits sought in the Subbasin if the action is implemented.

Circumstances for Implementation:

Groundwater conditions are projected to remain at sustainable levels into the future under GSP implementation, as described in **Section 7**. This management action may be implemented and would be monitored and quantified with respect to water quality, as needed, if sustainable conditions are not maintained in any areas of the Subbasin during initial GSP implementation. This will be determined by the methods described in **Section 6**.

Notice to Public and Other Agencies

Public noticing for this management action would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement this management action, if needed. Additionally, Contra Costa County will notify existing and new well permit applicants to identify and comply with the requirements of their GSA.

8.2.1.5 Management Action 3: Well Metering, Monitoring, and Reporting

A fundamental requirement for sustainable groundwater management is quantification of a water budget and continual updating of predictive tools, such as groundwater flow models, used to assess water supply availability under future water demands, land-use changes, climate change, and sea level rise. To meet this need, a GSA may impose metering, monitoring, and reporting requirements for new and existing wells.

Measurable Objective Expected to Benefit

By providing better data on water budgets, this management action would help to avoid the potential lowering of groundwater levels, reduction in groundwater storage, depletion of interconnected surface water, and land subsidence.

Management Action Status:

This management action is currently conceptual and may be employed as needed by one or more GSAs.

Required Permitting and Regulatory Process:

No additional permitting would be required. Contra Costa County will notify new well permit applicants to identify and comply with the requirements of the applicable local GSA. Implementation of this management action for existing wells (i.e., after a well is constructed under a County permit) shall be done by the GSA in accordance with its authorities and powers under SGMA.

Expected Benefits and Evaluation:

The expected benefit is more accurate estimation of groundwater extraction in the Subbasin. This will enhance the planned monitoring programs described in **Section 6**.

How Management Action Will Be Accomplished:

The GSA or GSAs which elect to enforce this management action would work with the County well permitting office to ensure new and existing well permit holders are aware of monitoring and reporting requirements. The GSAs would also establish a process for inspecting and ensuring that monitoring and reporting requirements are met, and/or work with the County to establish a process.

Legal Authority:

GSAs have the authority to plan and implement management actions. Each GSA in the Subbasin has the authority to implement and enforce this management action if needed based on aquifer conditions.

Estimated Costs and Plans to Meet Costs:

Since this management action is in the conceptual phase, specific costs are not yet determined. The costs would be associated with the number of wells located in the area or areas requiring this management action.

Circumstances for Implementation:

Groundwater conditions are projected to remain at sustainable levels into the future under GSP implementation, as described in **Section 7**. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable conditions are not maintained in any areas of the Subbasin during initial GSP implementation. This will be determined by the methods described in **Section 6**. Some GSAs may implement metering and reporting of existing and new wells proactively as a local policy.

Notice to Public and Other Agencies

Public noticing for this management action would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement this management action, if needed. Additionally, Contra Costa County will notify new well permit applicants to identify and comply with the requirements of their GSA.

8.2.1.6 Management Action 4: Demand Management Program

The planned PMAs described in this Section will be pursued by the ECC Subbasin GSAs to maintain sustainable groundwater conditions. The GSAs have also included a potential demand management program to avoid undesirable results as a “backstop” to other PMAs. Events that may trigger this management action include, but are not limited to severe, prolonged drought conditions resulting in groundwater levels approaching MT or MO in specific parts of the Subbasin; other PMAs are not achieving the expected level of benefits; or new information about projected future conditions show that sustainability objectives will not be met.

Demand management broadly refers to any water management activity that reduces the consumptive use of water. To be effective for purposes of sustainable groundwater management, demand management must result in a reduction in net groundwater pumping (pumping net of recharge). Activities that, for example, reduce canal seepage or reduce deep percolation from irrigation will not be effective.

They may decrease quantity of water diverted or applied but they also reduce recharge to usable groundwater, so do not improve the net pumping from the aquifer.

For purposes here, a demand management action is one that incentivizes, enables, or possibly requires water users to reduce their consumptive use, but does not dictate exactly how users have to do it. Agricultural users can respond to demand management by changing to lower water-using crops, water-stressing crops (providing less water than the crop would normally consume for full yield), reducing evaporation losses, and reducing irrigated acreage. Urban users can respond to demand management through lower water-using landscapes, reducing evaporative losses, or reducing landscape requiring irrigation.

The ECC member water agencies have a range of options for implementing demand management, if required. These would only be included as part of GSP implementation as needed in any areas where sustainable groundwater conditions are not maintained. Through reducing overall water demand, this action would potentially provide a benefit to all measurable objectives.

General types of demand management programs include:

- **Allocation**. An allocation may be directly coupled with pumping limits. Under an allocation, the different sources of groundwater are quantified and allocated to individual parcels, wells, or entities (such as, for example, farming operations). By defining the quantities of groundwater available to individuals, this can incentivize reductions in use and development of new recharge opportunities. An allocation is a rigid method for implementing demand management. It effectively limits water use on a well, parcel, or operation basis. This could require idling land or switching crop or landscape on lands that have insufficient allocation to meet irrigation demand, which imposes costs on water users (e.g., growers). There are ways to increase the flexibility of allocations to reduce the costs of demand management. For example, the allocation could be defined as an average over a period of time rather than a fixed amount every year, or users could be allowed to carry over unused allocation into the next year.

- **Allocation + Water Market**. An allocation that is less than historical water use can be coupled with a water market. A groundwater market is another way to increase the flexibility of an allocation to reduce costs of demand management. A market is an institution that allows willing buyers and sellers to exchange groundwater allocation (“credits”). More broadly, a market creates a means to exchange allocation with another groundwater user, whether for a single season or using a multi-year trade. Willing sellers trade a part of their allocation to willing buyers in exchange for a payment that the seller expects will exceed the return he/she would have earned from using the water for irrigation. This additional flexibility reduces the cost to the GSA’s users of achieving demand reduction under an allocation. Development of a water market institution is a complex process that encompasses more than defining the groundwater allocation. This investigation would be initiated by the GSAs in the future, if needed.

- **Land Repurposing**. Land repurposing programs are more targeted than an allocation or market program but maintain flexibility for participants by its voluntary nature. Such a program would provide a financial incentive to willing participants for their currently irrigated lands to be repurposed into other, non-irrigated uses. Programs can focus on short-term drought conditions, or they can provide multi-year reductions in demand if that is needed under some conditions. For longer-term programs, lands can be repurposed to achieve other multi-benefit objectives - for example, to create habitat corridors or to support local endangered species.

- **Other financial incentives**. Demand management can also be achieved through a range of other financial incentives. This could include positive financial incentives to reduce consumptive groundwater use. It could also include groundwater extraction fees that disincentivize groundwater use.

Measurable Objective Expected to Benefit

Depending on how the demand management program is structured, it has the potential to benefit all measurable objectives in the ECC Subbasin.

Management Action Status:

This management action is currently conceptual and would only be employed as needed by one or more GSAs.

Required Permitting and Regulatory Process:

No additional permitting would be required.

Expected Benefits and Evaluation:

The expected benefit is preventing lowering of groundwater levels and reduction in groundwater storage, where and when this may be needed. Water quality and other benefits may also be present depending on the specific program deployed. These will be monitored as described in **Section 6**.

How Management Action Will Be Accomplished:

The GSA or GSAs that elect to implement a demand management program would first initiate a study for the program design. This would include assessing program goals, incentives, and potential program structure. It would also involve substantial stakeholder outreach and engagement. Program design would include an assessment of the economic impacts of alternative demand management strategies to identify ways to minimize costs to individuals, businesses, and the regional economy in affected areas.

Legal Authority:

GSAs have the authority to plan and implement management actions. Each GSA in the Subbasin has the authority to implement and enforce this management action if needed based on aquifer conditions.

Estimated Costs and Plans to Meet Costs:

Since this management action is in the conceptual phase, specific costs are not yet determined. Costs would be assessed as part of the demand management program design.

Circumstances for Implementation:

Groundwater conditions are projected to remain at sustainable levels into the future under GSP implementation, as described in **Section 7**. This management action would be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if and only if sustainable conditions are not maintained in any areas of the Subbasin during GSP implementation. This will be determined by the methods described in **Section 6**.

Notice to Public and Other Agencies

Public noticing for this management action would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement this management action, if needed. Additionally, and as appropriate depending on the structure of the program, Contra Costa County will notify new well permit applicants to identify and comply with the requirements of their GSA.

8.2.1.7 Management Action 5: State Programs for Domestic Well Users

A GSA may engage existing and developing state programs to monitor and strengthen resiliency of domestic well users including DACs and vulnerable populations that use groundwater. They are located at the following links:

- https://mydrywell.water.ca.gov/report/shortage_resources
- https://mydrywell.water.ca.gov/report/
- https://water.ca.gov/Programs/Groundwater-Management/Drinking-Water-Principles

Measurable Objective Expected to Benefit

This management action would help to identify significant and unreasonable impacts from lowering of groundwater levels, reduction in groundwater storage, and degradation of groundwater quality.

Management Action Status:

This management action is currently conceptual and will be employed by one or more GSAs to enhance outreach and information exchange with key groundwater users in the basin.

Required Permitting and Regulatory Process:

No additional permitting would be required.

Expected Benefits and Evaluation:

The expected benefit is reporting of groundwater level drawdown and degradation of groundwater quality. These programs may be expanded in the future and would be incorporated into Annual Reports.

How Management Action Will Be Accomplished:

GSAs will notify their constituency that these programs are available.

Legal Authority:

GSAs have the authority to plan and implement management actions. Each GSA in the Subbasin has the authority to provide the information in this management action if needed desired.

Estimated Costs and Plans to Meet Costs:

No costs are expected at this time.

Circumstances for Implementation:

If constituents are concerned about sustainability and protection of drinking water, GSAs would seek to facilitate participation in these state programs

Notice to Public and Other Agencies

Public noticing for this management action would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement this management action.

8.2.2 Other Water Conservation Actions

The ECC member water agencies have a full range of existing water conservation policies and programs promoting efficient water use. Like the other management actions listed, these would be included as part of GSP implementation as needed in any areas where sustainable groundwater conditions are not maintained. The various conservation efforts proposed by different GSAs and other agencies could provide benefits to all measurable objectives, as needed. Some of these actions are ongoing or have been implemented previously, while others are in the conceptual or planning phase. Additional permitting should not be required for any of these actions, and the County will notify new well permit applicants to identify and comply with the requirements of their GSA. Benefits to groundwater levels would be monitored using the methods described in **Section 6.** Specific costs have not been established for actions in the conceptual phase. For those that are planned or already implemented, costs beyond what the agencies already incur should be minimal.

Groundwater conditions are projected to remain at sustainable levels into the future under GSP implementation, as described in **Section 7**. However, if sustainable levels are not maintained in any areas of the Subbasin during initial GSP implementation, management actions may be implemented and their effects would be monitored and quantified with respect to groundwater conditions, as needed. This will be determined by the methods described in **Section 6**. Public noticing for these actions would be done in accordance with noticing requirements and in public meetings held by the GSA or GSAs which elect to implement the actions as part of the GSP, if needed. Additionally, Contra Costa County will notify new well permit applicants to identify and comply with the requirements of their GSA.

Table 8-5 summarizes key water conservation efforts listed by GSA in corresponding Urban Water Management Plans and Agricultural Water Management Plans. Plans include those listed for the City of Antioch, City of Brentwood, Diablo Water District, Town of Discovery Bay Community Services District, BBID, and CCWD. While CCWD is not a GSA, the District has several water conservation plans.

Table 8-5. Summary of Water Conservation Programs Listed in Urban Water Management Plans and Agricultural Water Management Plans

Programs	City of Antioch[1]	City of Brent-wood[1]	Diablo Water District[2]	Discovery Bay[3]	BBID[4]	CCWD[5]
Water Waste Prevention Ordinances	X	X	X	X	X	X
Metering	X	X	X	X	X	X
Conservation Pricing	X	X	X	X	X	X
Public Education and Outreach	X	X	X	X	X	X
Programs to Assess Management Distribution System Real Loss	X	X	X	X	X	X
Water Conservation Program and Coordination Staffing Support	X	X	X	X	X	X
Increasing Water Order Flexibility					X	
Providing for Availability of Water Management Services					X	X
Rebates for Lawn Replacements						X

1. Brown and Caldwell (2021)
2. CDM Smith (2021)
3. LSCE (2021)
4. CH2M (2017)
5. CCWD (2021)

8.3 References

Brown and Caldwell. 2021. Final 2020 Urban Water Management Plan. Prepared for City of Antioch. May 2021.

Brown and Caldwell. 2021. Draft 2020 Urban Water Management Plan. Prepared for City of Brentwood. May 2021.

Contra Costa Water District. 2021. Draft 2020 Urban Water Management Plan. April 2021.

CDM Smith (CDM). 2021. Draft 2020 Diablo Water District Urban Water Management Plan. May 2020.

CH2M.2017.Byron Bethany Irrigation District Agricultural Water Management Plan. Prepared for Byron Bethany Irrigation District. October 2017.

East County Water Management Association. 2019. East Contra Costa County Integrated Regional Water Management Plan, Update 2019. March 2019

Legislative Analyst's Office (LAO). 2017. Residential Water Use TRENDS AND Implications for Conservation Policy. https://lao.ca.gov/Publications/Report/3611#top.Accessed June 2021.

Luhdorff and Scalmanini, Consulting Engineers. 2021. Draft 2020 Urban Water Management Plan Town of Discovery Bay Community Services District. March 2021.

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9 PLAN IMPLEMENTATION

This section outlines the schedule and costs to implement the Groundwater Sustainability Plan (GSP) over the first five years and discusses implementation effects in accordance with GSP regulations, CCR §354.6(e) and §354.8(f)(3), in addition to the annual and 5-year evaluation reporting in accordance with GSP regulations CCR §356.2 and §356.4. The implementation plan is based on the hydrogeologic conceptual model of the East Contra Costa Subbasin (Subbasin) (**Section 3**), current and projected water demands (**Section 4**), and the projected water budget (**Section 5**). Estimated costs are developed to meet GSP regulations and to implement PMAs under **Section 8**. Costs include annual and 5-year reports as required under GSP regulations (CCR §356.2 and §356.4).

To achieve the Subbasin sustainability goal by 2042 and avoid undesirable results through 2072 as required by SGMA and the GSP regulations, a range of Projects and Management Actions (PMAs) will be developed and implemented by the GSAs. **Section 8** describes each PMA, gross benefit, project capital and operating costs, and how it will be implemented. This section describes:

- Costs for GSAs to administer GSP activities (not including the project-specific costs described in **Section 8**), as required by CCR § 354.6(e).
- Financing approaches.
- Timeline for implementing all GSA PMAs between 2022 and 2042.
- Monitoring and reporting, including the contents of annual reports and 5-year periodic evaluations that the GSAs must provide to DWR (CCR §356.2 and §356.4).

9.1 Estimate of GSP Implementation Costs

The seven GSAs and Contra Costa Water District (CCWD) are exploring whether amendments to the existing MOU, new MOU or other cooperative agreement will be used to administer and implement the ECC GSP.It is anticipated that an annual operating budget will be established that is considered for approval by each GSA. The initial development of the GSP was funded by the GSAs and CCWD with help from grant funding under Proposition 1. No fees have been charged to landowners and water users in the Subbasin. It is anticipated that funding and financing sources—including potential fees—will be developed to cover the costs of GSP implementation, development of PMAs, annual reports, and 5-year periodic evaluations of the GSP. Groundwater management fees, as authorized through SGMA, may be adopted by GSAs based on their needs and applicable to their jurisdictions only.

Implementation of the GSP includes project and management actions discussed in **Section 8** and the following:

- **GSA Administration:** Public Outreach, Legal Services, and other tasks.
- **GSP Implementation:** Implementation Agreement, Grant Writing, Internal Coordination and Meetings.
- **GSP Updates:** Addressing Comments from DWR on the GSP, Annual Reports, Periodic (5-year) Evaluations, GSP Studies.
- **Monitoring and Data Management:** Monitoring of Wells, Metering and Monitoring Water Use, DMS.
- **Contingency**

The following subsections describe these cost components in greater detail and the estimated costs for these activities are summarized in Section 9.2. In this section, costs are not included for project development or implementation. It is anticipated that each GSA will generate revenue to cover its PMA costs using its available legal authorities.

9.1.1 GSA Administration

Administration may be performed through outside services, agency staff, or a combination. Administrative costs generally include record keeping, bookkeeping, continued outreach to stakeholders, legal services, government relations, and general management. GSA administration also includes project and contract management for external services for GSP implementation and technical studies for PMAs. It is anticipated that some administrative tasks will have a lead GSA.

9.1.1.1 Public Outreach

Each GSA will conduct public outreach and engagement to provide timely information to stakeholders regarding GSP progress and Subbasin conditions. A GSP Working Group will meet regularly to inform participating agencies and the public regarding implementation activities and reporting. Any changes in administration and management will be conducted through a public process in which stakeholders will be engaged for input into the decision-making process.

The GSP Working Group will routinely meet at a regular frequency to be determined through the implementation agreement to implement the GSP. The Working Group will provide information to the public about GSP implementation and the status of groundwater sustainability in the Subbasin. The GSP website[1] will be maintained as a communication tool for posting updated groundwater level time series graphs, reports, meeting information, technical updates and data analyses. Other outreach starting in 2022 includes an electronic newsletter, board notifications, and inter- and intra-Subbasin coordination.

Most GSAs have included public outreach costs under general GSA Administration, however, others include public outreach as part of GSP Implementation costs. Therefore, GSP implementation costs vary across GSAs for public outreach activities (**Section 9.1.2**).

9.1.1.2 Legal Services

The ECC Working Group currently receives in-kind legal services from Contra Costa County on an as-needed basis. If legal services are needed on issues requiring specific expertise in groundwater, SGMA compliance, or other specialized matters, the ECC Working group may engage outside counsel. Costs for such services are not currently anticipated and are not included in the current budget estimates. Any legal costs would be authorized separately by the GSP Working Group on an as-needed basis. GSA legal services costs included in the GSP are for general legal review and retainers.

[1] https://www.eccc-irwm.org/about-sgma

9.1.2 GSP Implementation

The GSAs will be responsible for GSP implementation. The GSAs implementing the ECC Subbasin GSP anticipate this will involve substantial coordination across GSAs for technical tasks. For example, many planned PMAs require coordination between one or more GSAs. The overall Subbasin sustainability depends on continued coordination, planning, and evaluation of groundwater conditions.

The lead GSA, or GSAs, for each implementation task will keep the other GSAs informed through periodic updates to stakeholders, the public, the GSP Working Group, and any other ad-hoc committees.

9.1.2.1 Implementation Agreement

The GSAs and CCWD will enter into a joint implementation agreement after the GSP is approved by DWR. Cost sharing to fund GSP implementation, as described in this section, will be part of the joint agreement.

9.1.2.2 Grant Writing

DWR and other agencies may release solicitation packages for grants to assist medium priority subbasins in funding PMA development and GSP implementation. The GSP Working Group will review future grant solicitations from DWR and other state and federal agencies and be responsible for grant writing and submission. The Working Group may engage outside services to assist in grant writing. It is anticipated that the GSAs may also engage outside services to implement grant activities (e.g., development of planned PMAs).

9.1.2.3 Internal Coordination and Meetings

The GSP Working Group will meet at a regular frequency to be determined through the Implementation agreement to implement the GSP. GSAs will regularly hold board meetings, committee meetings, and other public meetings throughout the year to discuss updates and ongoing initiatives.

9.1.3 GSP Updates

In addition to finalizing the GSP, GSP regulations require submittal of annual reports and 5-year GSP assessment reports to DWR. The elements of these reports shall comply with DWR technical guidance and requirements and be made available to the public.

9.1.3.1 Response to DWR Comments on the ECC GSP

As applicable, responses or revisions to the GSP based on DWR review comments will be made and authorized through the GSP Working Group.

9.1.3.2 Annual Reports

Annual reports will be submitted to DWR starting on April 1, 2022. The contents of the report are detailed in **Section 9.5** below. Annual reports will be available to ECC Subbasin stakeholders on the ECC GSP website. The reports may be prepared by a technical consultant, agency staff designated by the GSP Working Group, or a combination of the two. The estimated cost of the annual report is presented in **Table 9-1** based on typical rates for technical consulting services. GSAs expect that annual reports will also require inter- and intra-GSA coordination as well as stakeholder outreach.

Table 9-1. ECC GSP Estimated Joint Implementation Costs

Cost Category	2022	2023	2024	2025	2026
Community Outreach & Education	$10,000 to $25,000	$10,000 to $25,000	$10,000 to $25,000	$10,000 to $25,000	$10,000 to $25,000
Monitoring and Data Management	$45,000	$45,000	$45,000	$45,000	$45,000
GSP Updates[1]	$33,000 to $50,000	$33,000 to $50,000	$48,000 to $65,000	$48,000 to $65,000	$140,000 to $500,000
Grant Writing	$25,000	$25,000	$25,000	$25,000	$25,000
Contingency	$11,300 to $14,500	$11,300 to $14,500	$12,800 to $16,000	$12,800 to $16,000	$22,000 to $59,500
Total	$124,300 to $159,500	$124,300 to $159,500	$140,800 to $176,000	$140,800 to $176,000	$242,000 to $654,500

1. Annual reports and 5-Year Update.

9.1.3.3 Periodic (5-year) Assessments

Periodic (5-year) GSP assessment reports will be submitted to DWR starting in 2027. The GSAs will evaluate the GSP at least every five years to assess whether GSP implementation is achieving the sustainability goal for the Subbasin. The contents for this report are detailed in **Section 9.5** below. The estimated cost of the 5-year evaluations is presented in **Table 9-1** based on typical rates for technical consulting services. In contrast to the annual report, this report requires additional evaluation of sustainability conditions, objectives, monitoring, and documentation of new information that is available since the last update to the GSP. It may also include substantial updates to the GSP, if monitoring of groundwater conditions show that the GSP is not achieving the sustainability goal. GSAs expect that periodic evaluations will also require significant inter- and intra-GSA coordination and stakeholder outreach.

9.1.3.4 GSP Studies

GSP implementation will require various planning, technical, and economic/financial studies. These are additional costs that are not covered by the cost of specific PMAs (see **Section 8**). For example, this may include planning studies for proposed PMAs and studies to assess and allocate PMA and GSP implementation costs. GSAs will also need to continue to monitor PMAs to assess their benefit, update implementation, and coordinate with stakeholders and other GSAs. This may include modifying PMAs to ensure the Subbasin meets its sustainability objectives. These reports and analyses may be prepared by a technical consultant, agency staff designated by the GSP Working Group, or a combination of the two.

9.1.3.4.1 Planning Studies

GSAs may develop planning studies to integrate the GSP with other regional water management efforts, monitor Subbasin conditions, and update the GSP to ensure that the Subbasin continues to meet all sustainability objectives. GSAs will continue to evaluate Subbasin conditions and may adjust short- and long-term Subbasin planning efforts accordingly. Other planning studies may include evaluating projects and developing other programs to support sustainable management.

9.1.3.4.2 Technical Evaluations

Annual and 5-year reports will require additional technical analysis. GSAs will continue to monitor data pertaining to sustainability indicators in the Subbasin to document progress toward sustainability objectives. Additional monitoring wells may be installed in an adaptive process, and GSAs will evaluate and report groundwater conditions, water use, and change in groundwater storage as required by DWR. GSAs will continue to evaluate data gaps and implement programs to improve data quality and applicability.

9.1.3.4.3 Economic/Financial Analyses

GSAs may develop economic and fiscal studies to support implementation of PMAs and the overall GSP. This may include feasibility assessments for proposed projects, or to support development of grant applications. Other financial analyses may include rate studies and supporting technical analysis required to implement fees or assessments to cover costs. GSAs would engage legal and technical experts to help develop the required studies.

9.1.4 Monitoring and Data Management

Monitoring of the six sustainability indicators as described in **Sections 6** and **7** shall be performed as part of the GSP implementation. **Section 6** identifies the monitoring networks for the ECC GSP and **Section 7** describes the management criteria for SGMA sustainability indicators. The ECC GSP monitoring networks incorporate existing monitoring conducted by the GSAs and other agencies. The GSAs will continue their individual monitoring programs as outlined in **Section 6** to satisfy the requirements under the GSP. The ECC GSP does not fund these individual monitoring efforts and these costs are not included in the overall cost to implement the GSP.

9.1.4.1 Monitoring of Wells

Monitoring and well maintenance costs reported in Section 9.2 include four new well installations that are required to fill data gaps discussed in Section 6. Additionally, appendix 9a gives a detailed table of monitoring costs of the new wells.

9.1.4.2 Metering and Monitoring Water Use

Some GSAs may introduce a program to meter and monitor groundwater pumping. Costs reported by the GSAs would be associated with direct costs to the individual GSA. The capital and operating costs associated with the flow meters and monitoring equipment will be determined at the time of adoption by the GSA. Costs may be borne by the well owner or another entity other than the GSA or could be funded under future grant opportunities from state or federal sources.

9.1.4.3 Data Management System

Data from the various monitoring sources is included in the DMS discussed in **Section 6**. The DMS will be updated with monitoring network data and will be used to prepare reports made publicly available on the ECC GSP website. The DMS will be used for analysis and will be presented in various forms to enhance interpretation and to demonstrate basin conditions with respect to sustainability indicators. As required by DWR, certain data will be uploaded to the SGMA portal twice per year.

9.1.4.4 Well Inventory Program

As discussed in **Section 6**, a well inventory program shall be created to be completed by the first 5-year GSP evaluation and report. The well inventory will be developed as a tool to better understand how GSP implementation is affecting groundwater sustainability in the Subbasin.

The process of creating a well inventory will be coordinated with the Contra Costa County which is the permitting agency for new wells in the ECC Subbasin. A procedure for sharing information on all new wells constructed under the County's permitting authority with the ECC Subbasin Data Management System shall be developed. The well inventory system will track various parameters including:

- Well location (physical address) and GIS coordinates
- Date installed
- Permit number (County)
- Well Drillers Report number (DWR)
- Depth of well
- Well diameter
- Depths of perforations
- Use (domestic, industrial, commercial, agricultural, other)

A method to incorporate wells constructed prior to implementation of the new data exchange system will be evaluated with the objective that the DMS substantially accounts for active wells in the Subbasin to serve the sustainable management goals as detailed in **Section 7.**

9.1.5 Contingency

An additional GSA contingency cost is included for planning purposes. This may include actions needed to respond to critically dry years or if Subbasin conditions start trending towards minimum threshold levels in any area. The GSA budgets include a 10-percent annual contingency to account for unanticipated expenses (see **Table 9-1**). This is in addition to other contingency costs identified and reported by some GSAs.

9.2 GSA Implementation Costs

This section summarizes GSP implementation activities and estimated budgets for the first five years of GSP implementation. This does not include PMAs that are discussed in **Section 8**. The estimated 5-year budget for total GSA implementation costs is between $2.4 and $3.0 million. The estimated annual cost is between $450,000 and $480,000 for most years and could be in excess of $1 million during years when 5-year evaluations and reports are prepared. There also are expected to be additional costs in 2024 and 2025 to address DWR review comments. GSA implementation costs will be paid for through contributions from the member GSAs and CCWD under a cost-sharing arrangement to be developed following GSP adoption. Annual costs for individual GSAs will vary and generally be higher in years when 5-year evaluations and reports are prepared.

There are two components of GSA Implementation costs in the ECC Subbasin: joint implementation costs, which will be shared by the member GSAs, and individual costs for each of the GSAs. Joint implementation costs are summarized in **Table 9-1**. Details are available in **Appendix 9a**. These costs generally are for services provided to complete necessary tasks associated with implementation, including outreach, monitoring, data management, reporting and grant writing. Cost sharing between the GSAs will be determined prior to execution of the joint implementation agreement. There are some uncertainties regarding the joint costs, particularly for the costs to prepare the 5-year evaluation and reports. Therefore, ranges are reported for many of the joint cost categories and totals in **Table 9-1**.

Table 9-2 summarizes the estimated total of individual GSA implementation costs across all GSAs (and CCWD) by year. This is followed by subsections summarizing costs by agency. All costs are preliminary estimates based on the information available as of GSP development. GSAs will evaluate funding needs, opportunities, and update budget projections periodically.

Table 9-2. ECC GSP Estimated Total of Individual GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$118,550	$111,772	$112,003	$112,245	$122,829
GSP Implementation	$71,539	$71,836	$72,145	$72,467	$88,450
GSP Updates	$19,516	$19,598	$19,683	$19,771	$43,363
Monitoring and Implementation	$62,015	$62,015	$62,015	$62,015	$62,015
Contingency	$48,362	$47,722	$47,785	$47,850	$57,866
Total	**$319,982**	**$312,943**	**$313,631**	**$314,348**	**$374,523**

Other costs borne by each of the GSAs are presented in the following subsections. These costs reflect local needs and engagement that are unique to each agency's area and may change based on future assessment of conditions in the subbasin.

9.2.1 Byron-Bethany Irrigation District GSA

The Byron-Bethany Irrigation District GSA (BBID) estimates that annual implementation costs will be approximately $47,860 per year over the next five years (**Table 9-3**). GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. GSP Updates includes GSP document review. Monitoring and Implementation covers well monitoring, metering water use, and DMS costs. Contingency includes GSP management and legal services. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include project-specific costs, described in **Section 8**, nor costs to build and operate additional PMAs that may be required if the GSA determines that its sustainability objectives are not being met.

BBID will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how BBID and other GSAs may recover GSP implementation costs.

Table 9-3. BBID GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$22,000	$22,000	$22,000	$22,000	$22,000
GSP Implementation	$11,920	$11,920	$11,920	$11,920	$11,920
GSP Updates	$1,000	$1,000	$1,000	$1,000	$1,000
Monitoring and Implementation	$2,950	$2,950	$2,950	$2,950	$2,950
Contingency	$9,987	$9,987	$9,987	$9,987	$9,987
Total	**$47,857**	**$47,857**	**$47,857**	**$47,857**	**$47,857**

9.2.2 City of Antioch GSA

The City of Antioch GSA estimates that annual implementation costs will be approximately $17,600 per year over the next five years (**Table 9-4**). GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. Monitoring and Implementation covers well monitoring, metering water use, and DMS costs. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include PMA-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

The City of Antioch GSA will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how City of Antioch GSA and other GSAs may recover GSP implementation costs.

Table 9-4. City of Antioch GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$4,500	$4,500	$4,500	$4,500	$4,500
GSP Implementation	$8,000	$8,000	$8,000	$8,000	$8,000
Monitoring and Implementation	$3,500	$3,500	$3,500	$3,500	$3,500
Contingency	$1,600	$1,600	$1,600	$1,600	$1,600
Total	**$17,600**	**$17,600**	**$17,600**	**$17,600**	**$17,600**

9.2.3 City of Brentwood GSA

The City of Brentwood GSA estimates that annual implementation costs will be approximately $13,500 per year over the next five years (**Table 9-5**). GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach. Monitoring and Implementation covers well monitoring. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include project-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

The City of Brentwood GSA will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how the City of Brentwood GSA and other GSAs may recover GSP implementation costs.

Table 9-5. City of Brentwood GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$6,130	$6,130	$6,130	$6,130	$6,130
GSP Implementation	$3,065	$3,065	$3,065	$3,065	$3,065
Monitoring and Implementation	$3,065	$3,065	$3,065	$3,065	$3,065
Contingency	$1,226	$1,226	$1,226	$1,226	$1,226
Total	**$13,486**	**$13,486**	**$13,486**	**$13,486**	**$13,486**

9.2.4 Contra Costa Water District

CCWD, although not a GSA, will be active in GSP implementation and will therefore incur associated costs. CCWD estimates that annual implementation costs will be approximately $7,000 per year over the next five years (**Table 9-6**). GSA Administration includes public outreach. GSP Implementation includes internal coordination, committee meetings, and board meetings. GSP Updates include GSP document review. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include project-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the CCWD determines that its sustainability objectives are not being met.

CCWD will recover GSP implementation costs through grants and local revenues that are yet to be determined. CCWD is currently evaluating options. **Section 9.3** provides a general description of how CCWD and the GSAs may recover GSP implementation costs.

Table 9-6. CCWD Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$1,257	$1,295	$1,333	$1,373	$1,415
GSP Implementation	$3,769	$3,882	$3,998	$4,118	$4,242
GSP Updates	$966	$995	$1,025	$1,055	$1,087
Contingency	$599	$617	$636	$655	$674
Total	**$6,591**	**$6,789**	**$6,992**	**$7,201**	**$7,418**

9.2.5 County of Contra Costa GSA

The County of Contra Costa GSA estimates that annual implementation costs will be approximately $33,000 per year over the next five years (**Table 9-7**). Annual costs are projected to be higher when a 5-year evaluation and report is prepared. GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include PMA-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

The County of Contra Costa GSA will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how the County of Contra Costa GSA and other GSAs may recover GSP implementation costs.

Table 9-7. County of Contra Costa GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$13,988	$6,988	$6,988	$6,988	$15,317
GSP Implementation	$18,610	$18,610	$18,610	$18,610	$25,256
Contingency	$3,260	$2,560	$2,560	$2,560	$4,057
Total	**$35,858**	**$28,158**	**$28,158**	**$28,158**	**$44,630**

9.2.6 Diablo Water District GSA

DWD estimates that annual implementation costs will be approximately $140,400 per year over the next five years (**Table 9-8**) and $164,650 in 2026 when the 5-year evaluation and report will be prepared. GSA Administration includes public outreach, legal services, and staff time. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. GSP Updates include GSP document review, which will be higher in years when a 5-year assessment is prepared. Monitoring and Implementation covers well monitoring, metering water use, and DMS costs. Contingency includes GSP management and legal services, plus a 10-percent annual contingency to account for unanticipated expenses. These costs do not include project-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

DWD will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options under its current legal authorities. **Section 9.3** provides a general description of how DWD and other GSAs may recover GSP implementation costs.

Table 9-8. DWD GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$60,000	$60,000	$60,000	$60,000	$60,000
GSP Implementation	$10,500	$10,500	$10,500	$10,500	$10,500
GSP Updates	$7,500	$7,500	$7,500	$7,500	$25,000
Monitoring and Implementation	$36,000	$36,000	$36,000	$36,000	$36,000
Contingency	$26,400	$26,400	$26,400	$26,400	$33,150
Total	**$140,400**	**$140,400**	**$140,400**	**$140,400**	**$164,650**

9.2.7 Discovery Bay Community Services District GSA

The Discovery Bay Community Services District GSA estimates that annual implementation costs will be approximately $10,000 per year over the next five years (**Table 9-9**). GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. GSP Updates includes GSP document review. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs do not include project-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

Discovery Bay Community Services District GSA will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how Discovery Bay Community Services District GSA and other GSAs may recover GSP implementation costs.

Table 9-9. Discovery Bay Community Services District GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$3,675	$3,859	$4,052	$4,254	$4,467
GSP Implementation	$3,675	$3,859	$4,052	$4,254	$4,467
GSP Updates	$1,050	$1,103	$1,158	$1,216	$1,276
Contingency	$840	$882	$926	$972	$1,021
Total	**$9,240**	**$9,703**	**$10,188**	**$10,696**	**$11,231**

9.2.8 East Contra Costa Irrigation District GSA

The East Contra Costa Irrigation District GSA (ECCID) estimates that annual implementation costs will be approximately $49,000 per year over the next five years (**Table 9-10**), and $67,650 in FY 2026 when the 5-year evaluation and report will be prepared. GSA Administration includes public outreach and legal services. GSP Implementation includes public outreach, internal coordination, committee meetings, and board meetings. GSP Updates includes GSP document review. The budget also includes a 10-percent annual contingency to account for unanticipated expenses. These costs are all expected to be higher in 2026 when the 5-year evaluation and report will be prepared. Monitoring and Implementation covers well monitoring, metering water use, and DMS costs. These costs do not include PMA-specific costs, described in **Section 8**, nor costs to build and operate additional projects or management actions that may be required if the GSA determines that its sustainability objectives are not being met.

ECC ID will recover GSP implementation costs through grants and local revenues that are yet to be determined. The GSA is currently evaluating options. **Section 9.3** provides a general description of how the ECC ID and other GSAs may recover GSP implementation costs.

Table 9-10. ECCID GSA Implementation Costs

Cost Category	2022	2023	2024	2025	2026
GSA Administration	$7,000	$7,000	$7,000	$7,000	$9,000
GSP Implementation	$12,000	$12,000	$12,000	$12,000	$21,000
GSP Updates	$9,000	$9,000	$9,000	$9,000	$15,000
Monitoring and Implementation	$16,500	$16,500	$16,500	$16,500	$16,500
Contingency	$4,450	$4,450	$4,450	$4,450	$6,150
Total	**$48,950**	**$48,950**	**$48,950**	**$48,950**	**$67,650**

9.3 GSP Funding and Financing

Administering the GSP and monitoring and reporting progress is projected to cost approximately $360,000 per year on average across all Subbasin GSAs and CCWD. Costs are projected to be higher during years in which a 5-year periodic evaluation and report is prepared, and slightly lower during other years when an annual report is prepared. This does not include the capital and annual operating cost of PMAs (see **Section 8**).

Covering the costs of PMAs and general GSP implementation requires evaluating both financing and funding sources. Financing relates to identifying sources of capital (typically bonds and bank loans) to pay for project capital expenses. Funding relates to sources of money required to cover capital repayment (pay back the debt financed projects) as well as project O&M, GSA administration, and other annual expenses.

The agencies in the ECC Subbasin have the powers and authority to impose fees and assessments and may pursue other financing sources for capital projects and funding sources for repayment of debt, operations, and other ongoing expenses. The GSAs also have explicit fee authorities under SGMA legislation (Water Code §10730 and §10730.2). **Table 9-11** summarizes potential financing and funding sources that may be used by GSAs for GSP implementation. Individual GSAs will create their own funding and financing plans to address their portion for the cost share, considering the options available to them.

Table 9-11. Potential Funding and Financing Sources for GSP Implementation

Capital Financing	Considerations
State (DWR) Grants (Prop. 68 and future bonds)	Solicitations are typically targeted to general types of projects and specific benefits that are in the State's interest
US Bureau of Reclamation WaterSmart Grants	Project-specific funding that can support planning studies (e.g., water market strategy grants)
Other targeted potential grant programs (e.g., AB 252)	Potential for multi-benefit projects
Local bond issuance	Local borrowing based on agency authority
Private borrowing	Current low interest rate environment may make these options attractive
State or Federal low interest loans	This could include future bond funded loan programs
Funding Sources	**Considerations**
Fee – General	General options for legal authority pre- and post-GSP development: Prop. 26, Prop. 218, Water Code §10730, Water Code §10730.2
Regulatory Fee	Typically, pre-GSP fee that is related to regulatory cost. Prop. 26 and Water Code §10730
Service Fee	Related to cost of service. Prop 218 and Water Code §10730.2. Subject to majority protest vote
Special Tax	Subject to 2/3 majority approval vote
Special Benefit	Special benefit assessment subject to majority protest vote

The ECC Subbasin has been successful in pursuing past grant funding (e.g., Sustainable Groundwater Planning Grant programs). The GSAs will pursue grant opportunities to fund this GSP implementation and local infrastructure projects. The initial funding for GSP implementation will be provided by the seven GSAs and CCWD through a joint agreement.

GSA annual budgets will be reviewed, revised if needed, and approved by the GSAs based on interpreted basin conditions, past actual expenditures, and the immediate future needs. The budget will be adjusted over time as the GSP implementation costs are better understood through sustainable management activities and guidance from DWR on the submitted GSP and subsequent reporting.

9.4 Schedule for Implementation

The GSP implementation schedule allows time for GSAs to develop and implement PMAs and meet all sustainability objectives by 2042. While some sustainability projects began immediately after SGMA became law and are already contributing to Subbasin goals, the GSAs will begin implementing all other planned GSP activities by 2022. Many PMAs will be implemented adaptively on an as-needed basis as explained in **Section 8**.

A general implementation schedule showing the major tasks and estimated timeline during the 20 years of GSP implementation is provided in **Figure 9-1**. This includes key implementation tasks, projects that are either completed or currently under construction, and required reporting. Projects in the planning phase and management actions detailed in **Section 8** are not included because these are going to be implemented on as needed basis, and likely would not occur if the Subbasin continues to exhibit stable and sustainable conditions.

Figure 9-1. General Schedule of 20-year ECC GSP Plan Implementation

<table>
<tr><th>Task Name</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030</th><th>2031</th><th>2032</th><th>2033</th><th>2034</th><th>2035</th><th>2036</th><th>2037</th><th>2038</th><th>2039</th><th>2040</th><th>2041</th><th>2042</th></tr>
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<tr><td>GSP Submittal to DWR</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Joint Implementation Agreement</td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td colspan="22">Projects (Completed or Under Construction)</td></tr>
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<tr><td>Non-Potable Storage and Pump Station</td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td></tr>
<tr><td>Dry-Year Water Transfer</td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td></tr>
<tr><td>Brentwood Non-Potable Distribution</td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td></tr>
<tr><td>Antioch Brackish Water Desalination</td><td></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td><td bgcolor="#B4C6E7"></td></tr>
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<tr><td bgcolor="#B4C6E7"></td><td>Indicates ongoing event.</td></tr>
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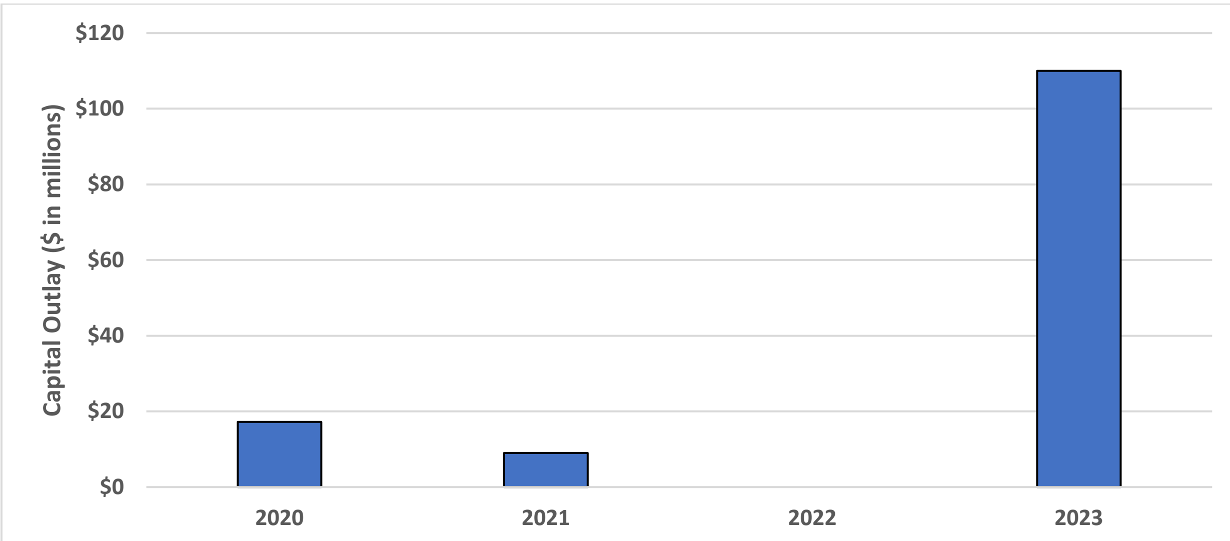
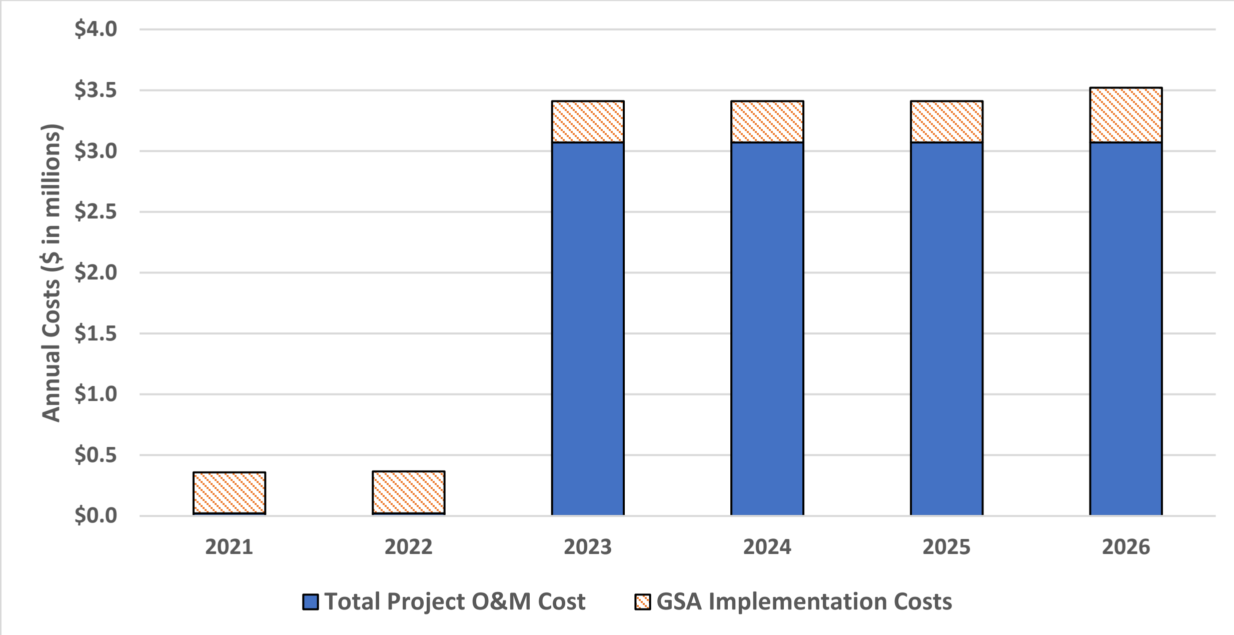
The capital cost of each project and management action is summarized and discussed in more detail in **Section 8**. **Figure 9-2** illustrates the capital outlay required to implement all of the PMAs specified in the GSP that are completed or are under construction. The figure indicates the year that the projects would be completed and begin operation, not when all the capital cost would be incurred. The total capital cost of all these projects equals approximately $136 million. These capital costs do not include the cost of management actions which would be implemented on an as-needed basis.

Figure 9-2. ECC Subbasin Estimated Capital Outlay for Projects



As projects are implemented, GSAs will incur annual operation and maintenance (O&M) costs. **Figure 9-2** illustrates the estimated annual O&M costs (in current dollars) for all GSP projects described in **Section 8** and the GSA annual costs described in **Section 9.2**. Average annual operating costs for projects increase from $21,500 per year in 2022 to over $3 million per year in 2023 when the City of Antioch Brackish Water Desalination Project is expected to go online. Project costs will be refined by GSAs as the GSP is implemented. GSA costs total about $0.3 million per year from 2021 to 2025 and over $0.4 million in 2026 when a 5-year evaluation and report is prepared.

Figure 9-3. ECC Subbasin Estimated Annual Costs for Project O&M and GSA Implementation



9.5 Initial and Subsequent Annual Reporting

Pursuant to CCR §356.2, an annual report shall be submitted to DWR each year by April 1 following adoption of a GSP. The first ECC Subbasin GSP Annual Report is due April 1, 2022 and will cover the period October 1, 2019 through September 30, 2021 and will be annually thereafter. DWR has provided forms and instructions for submitting the materials electronically through the DWR online reporting system[2]. The GSP Annual Report contains both a narrative description and data in DWR provided templates.

The following subsections provide an overview of the basic contents for the Annual Report.

9.5.1 General Information (§356.2(a))

General information includes an executive summary discussing any significant findings or recommendations from the reporting period. Additionally, it will include a map showing the Subbasin and GSA boundaries.

[2] https://sgma.water.ca.gov/portal/#gsp

9.5.2 Subbasin Conditions (§356.2(b))

The subbasin conditions section of the annual report will provide an update on groundwater and surface water conditions in the Subbasin. This will include:

- Groundwater Elevation:
  - Groundwater elevation contour maps by aquifer zone to depict the seasonal high (winter/spring) and seasonal low (late summer/fall).
  - Groundwater elevation hydrographs which illustrate water-year type and incorporate historical data.
- Groundwater Extraction:
  - A table summarizing groundwater extractions by GSAs, estimates of groundwater use by sector (urban, agricultural, industrial, managed wetlands, managed recharge, and native vegetation), measurement method (direct or estimated), and accuracy of the measurements.
  - A map of the general location and quantities of groundwater extractions.
- Surface Water Supply:
- Surface water volume supplied by water source type (e.g., Central Valley Project, State Water Project, Colorado River Project, local supplies, local imported supplies, recycled water, desalination, and others).
- Total Water Use:
- Total water use by source and water use sector.
- Changes in Groundwater Storage:
  - Map of the change in groundwater storage for each principal aquifer in the Subbasin.
  - A graph of historical to the present period showing water-year type, groundwater use, annual change in groundwater storage, and the cumulative change in groundwater storage for the Subbasin.

9.5.3 Plan Implementation Progress (§356.2(c))

The annual report will include a statement of the progress of the GSP implementation with milestones, significant updates or changes, implementation schedule, and implementation tasks and costs which will be reviewed, discussed, and updated as necessary.

9.5.4 GSP Annual Report Module

All parts of the ECC GSP Annual Report are uploaded through the SGMA Portal consisting of the following parts:

- Part A. Groundwater Extractions excel file: volume extracted by water use sector (e.g., urban, industrial, agricultural, managed wetlands, managed recharge, native vegetation, and other).
- Part B. Groundwater Extraction Methods excel file: volume extracted by methods (e.g., meters, electrical records, land use, groundwater model, or other).
- Part C. Surface Water Supply excel file: water supply volume by water source type (e.g., Central Valley Project, State Water Project, Colorado River Project, local supplies, local imported supplies, recycled water, desalination, and other).

- Part D. Total Water Use excel file: total water use volume by water use sector and by water source type.
- Part E. Change in Storage.
- Part F. Monitoring Network Module: information updated as needed.
- Part G. GSP Annual Report PDF and GSP Annual Report Elements Guide Template: upload the GSP Annual Report pdf and populate the Elements Guide template.
- Part H. GSP Annual Report Submittal.

9.6 Periodic (5-Year) Evaluation and Reporting

The GSP will be evaluated every five years in accordance with CCR §356.4, with interim evaluations made in response to significant hydrologic changes or exceedances of minimum thresholds as discussed above. The periodic evaluation will be provided to DWR and shall include elements of the annual reports, GSP implementation progress, and progress toward meeting the sustainability goal of the Subbasin. The periodic evaluations will be available to interested parties and the public through the DWR website.

The following subsections summarize what will be included in the periodic evaluation and report.

9.6.1 Sustainability Evaluation (§356.4(a) - §356.4(d))

An evaluation and description of current groundwater conditions will be included for each applicable sustainability indicator relative to the measurable objectives, interim milestones, minimum thresholds, and undesirable results. A summary of interim milestones and measurable objectives will be included, along with an evaluation of groundwater elevations in relation to minimum thresholds. If any minimum thresholds are found to be exceeded, the GSAs will investigate probable causes and implement actions to correct conditions, as warranted. However, exceedance of a minimum threshold does not automatically trigger corrective action, as the exceedance may be due to factors beyond the control of the GSA. As established in **Section 7**, groundwater conditions in the ECC Subbasin exhibit stability and sustainability, so this scenario is unlikely.

Projects described in **Section 8** will be evaluated to determine their implementation status, success, and progress toward reaching the GSP sustainability goal. If projects or management actions are not performing as expected, and in the unexpected case that sustainable conditions are not maintained in the Subbasin, the update will describe steps the GSAs will take to implement additional projects or demand management. Any changes to the implementation schedule of PMAs will be described in the periodic evaluation.

Elements of the GSP will be evaluated for any potential reconsiderations or revisions, which will be proposed in the periodic evaluation. The sustainability indicators will be evaluated for undesirable results, and minimum thresholds and measurable objectives will be reconsidered with revisions proposed, if necessary. Evaluation will include the progress of the GSP toward meeting the sustainability goal and interim milestones. If conditions become worse than projected because any projects or management actions are not implemented according to the specified timeline, the deviation from the original plan will be documented and to the extent possible, corrective actions will be taken to speed implementation if necessary.

Each periodic evaluation will include an assessment of the basin setting in relation to any significant or unanticipated changes or new information that may have developed during the evaluation period. Also, land uses and economic conditions will change in ways that cannot be anticipated at this time. As such, it may be necessary to revise the GSP to account for these changes. The elements of the GSP including the basin setting, management areas, undesirable results, minimum thresholds, and measurable objectives will be reconsidered by the GSAs during the periodic evaluations. Any proposed revisions will be documented in the periodic evaluation.

9.6.2 Monitoring Network Description (§356.4(e))

A description of the established ECC Subbasin Monitoring Network will be provided in the periodic evaluation and will include a description of potential data gaps, areas within the basin that are represented by data that does not meet the Data and Reporting Standards set by SGMA, and an assessment of the monitoring network functionality. If necessary, the evaluation will include actions necessary to improve the monitoring network, identification of data gaps, a program to acquire additional data sources (and the timing of such), and a plan to install new data collection facilities.

9.6.3 New Information (§356.4(f))

GSAs will continuously monitor Subbasin conditions, and the DMS will allow GSAs to identify additional data gaps and implement procedures to secure additional data. Land use and economic incentives for farming and other water uses in the Subbasin will continue to change as the GSP is implemented. GSAs expect that new information about groundwater conditions, PMAs, and sustainability objectives will continue to be available. Any significant, new information that has been developed since GSP adoption, amendment or the last periodic evaluation will be discussed, and will indicate whether new information warrants changes to any aspect of the GSP, including the basin setting, measurable objectives, minimum thresholds, or undesirable results.

9.6.4 GSA Actions ((§356.4(g) - §356.4(h))

The evaluation will include a description of any relevant actions taken by the GSAs since the last periodic or 5-year assessment including any regulations or ordinances related to the GSP, development of new PMAs, substantial changes in land use, and other actions impacting the implementation of the GSP. Within their allowed authorities, GSAs are evaluating new regulations or ordinances that could be implemented to help maintain sustainable conditions in the Subbasin. The 5-year periodic evaluation will include a summary of state laws and regulations, or local ordinances related to the GSP that have been implemented since the previous periodic evaluation and address how these may require updates to the GSP.

Enforcement or legal actions taken by the GSAs in relation to the GSP will be summarized along with how such actions support sustainability in the Subbasin. The effect on any aspect of the GSP, including the basin setting, measurable objectives, minimum thresholds, or undesirable results will be described.

9.6.5 Plan Amendments, Coordination, and Other Information (§356.4(i) - §356.4(k))

The evaluation will include a description of any completed or proposed Amendments to the GSP. This will also include a summary of amendments that are being considered or developed at that time. Any changes to the basin setting, measurable objectives, minimum thresholds, or undesirable results will be described.

Any changes to the GSA coordination agreement, or other Subbasin coordination agreements will be documented and summarized. If necessary, a description of the coordination of GSAs within the Subbasin, coordination between hydrologically connected subbasins, and land use agencies will be presented.

The Periodic Evaluation will include any other appropriate and relevant information pursuant to SGMA, GSP Implementation, and DWR review. The first 5-year GSP update and evaluation of sustainable management are due in 2027.

SECTION 10 CONTENTS

LIST OF TABLES

APPENDICES

10. NOTICE AND COMMUNICATION (§ 354.10)

The ECC Subbasin is governed by seven Groundwater Sustainability Agencies (GSAs) with the active participation of the Contra Costa Water District (**Figure 1-2**). As public agencies, each offers public engagement as part of their decision-making processes. A Memorandum of Understanding guided the development of this East Contra Costa (ECC) Groundwater Sustainability Plan (GSP). As part of this effort an agency Working Group and a Communications Committee were formed to advise the GSP development. The ECC GSP Working Group will continue to meet, at minimum, quarterly during GSP implementation.

10.1 Description of Beneficial Uses and Users of Groundwater in the Basin

The Water Code Section 10723.2 requires the GSAs to consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing the GSP. These interests include, but are not limited to, the following:

1. Holders of overlying groundwater rights, including:
    a. Agricultural users, including farmers, ranchers, and dairy professionals.
    b. Domestic well owners.
2. Municipal well operators.
3. Public water systems.
4. Local land use planning agencies.
5. Environmental users of groundwater.
6. Surface water users where there is a hydrologic connection between surface and groundwater bodies.
7. The federal government, including, but not limited to, the military and managers of federal lands.
8. California Native American tribes.
9. Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.
    a. Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of the ECC Subbasin.

10.1.1 Interest Groups

The ECC Working Group considered each type of interested parties named by SGMA to determine if they were represented in the Subbasin and to include them in the outreach for the GSP.

<u>Agricultural Users</u>: In 2015, agriculture was the primary land use covering 41 percent of the Subbasin. The agricultural sector is primarily served by surface water provided by BBID and ECCID and individual water rights to divert surface water on the delta islands. Both BBID and ECCID are members of the ECC GSP Working Group. Their service areas make up 37 percent of the agricultural land use.

<u>Domestic Well Users</u>: Private residential well owners are estimated to pump approximately 600 afy (**Table 4-2**) from the Subbasin. Private well owner water use is primarily for residential, landscape, and some small-scale farming and livestock. To be considered a de minimis user, one well can pump up to two afy. Private well owner interests are represented by the GSAs that include de minimis users in their area.

Small Water Systems: About 22 small water systems as described in **Section 2.1.1.3** use approximately 500 af (**Table 4-2**) of groundwater pumped every year from the Subbasin. The small public water systems in the Subbasin are represented by Contra Costa County and by the individual GSAs where the systems are located.

Large Public and Municipal Well Operators: As discussed in more detail in **Section 2.1.1.3**, there are four public water systems (PWS) in the Subbasin: The City of Brentwood (a municipal well operator), Diablo Water District, and the Town of Discovery Bay. The City of Antioch is the fourth municipal PWS, but it does not supply groundwater to customers. Most of the water supplied by the City of Brentwood and Diablo Water District is surface water. The Town of Discovery Bay supply is entirely groundwater. The ECC Working Group includes representatives from the City of Antioch and all three of the systems that use groundwater.

Local Land Use Agencies: Four entities in the ECC Subbasin have land use authority: Contra Costa County, the City of Antioch, the City of Brentwood, and the City of Oakley (water provided by DWD). All four entities (DWD for Oakley) are GSAs and participate in the ECC Subbasin Working Group.

Environmental Users: The Subbasin has a generous supply of surface water due to the Bay-Delta setting and includes creeks and streams that are connected to shallow groundwater. The creeks, streams, and shallow groundwater discharge to the Bay-Delta. Environmental users of groundwater include species and habitat reliant on instream flows, wetlands and GDEs. GDEs are mapped in **Figures 3-26a and 3-26b** in **Section 3.3.9**. All vegetative species in the ECC Subbasin are listed in **Table 3-4**. Critical habitat for species in the ECC Subbasin is shown on **Figure 3-27**. Groups interested in environmental restoration of habitats and species within the Subbasin (e.g., Friends of Marsh Creek and DWR that manages Dutch Slough tidal marsh restoration) were called and/or emailed requesting input on the draft sections of this GSP.

Surface Water Users with a Connection to Groundwater: The Subbasin includes several streams that are connected to groundwater in some of their reaches. Marsh Creek is connected to groundwater in part of its watershed, but surface water and groundwater use are limited to individual private users along the creek. Many properties along the creek are served by the City of Brentwood Public Works.

Federal Government: Federal lands in the Subbasin include two small parcels in the City of Antioch (**Figure 2-3**) and are represented by the City of Antioch GSA.

California Native American tribes: There are no tribal lands within the Subbasin (see **Section 2.1.1.4**). However, the GSAs formally contacted the Native American Heritage Commission[1] to verify any potential interests. Additional targeted outreach was made to tribes or tribal representatives with a potential interest due to historic use of subbasin lands for gathering and other traditional practices.

Disadvantaged Communities: The disadvantaged areas (DAs) are described in **Section 2.3.2**. The total DAs population in the Subbasin is approximately 35,600 (**Table 2-5**). All DAs are served by small water systems, municipal water, or individual domestic wells (**Figures 2-13a and 2-13b**). SGMA has limited authority with regards to water quality improvements related to drinking water beneficial uses. Despite these limitations, GSAs represent the interests of the DAs (e.g., the City of Antioch, DWD, Contra Costa County,

[1] Native American Heritage Commission, 1550 Harbor Blvd., Ste. 100, West Sacramento, CA 95691, (916) 373-3710.

and the City of Brentwood). The interests of the DAs are reflected in the sustainability goal and sustainable management criteria described in **Section 7**.

Entities Monitoring and Reporting Groundwater Elevations: The ECC GSP Working Group members are the main entities that monitor groundwater elevations and conduct testing of groundwater quality in the Subbasin (see **Section 2.2.1**). Groundwater contamination sites report groundwater levels and water quality testing results through requirements set forth by other regulatory agencies and can be accessed via GeoTracker.

10.1.2 ECC GSP Advisory Groups

The ECC GSP Working Group was established in 2015 after SGMA legislation was passed. The members are GSA representatives plus a representative from CCWD that meet monthly to coordinate GSP development. **Figure 1-2** provides the management structure.

In September 2018, the ECC GSP Working Group applied for and received facilitation support services (FSS) from DWR. These services are provided by STANTEC through January of 2022. FSS provides assistance from professional facilitators to encourage active involvement of diverse social, cultural, and economic interests and consider all beneficial uses and users of groundwater when developing and implementing GSPs. An ECC GSP Communication Committee was created to target public input required by GSP regulations.

10.2 List of Public Meetings Where the GSP was Discussed

During the development of this GSP, public meetings were held and noticed on the ECC GSP website. Notifications were sent via email to the interested parties and via newspaper ads. **Table 10-1** lists the public meetings where the GSP was discussed from June 2019 to August 2021.

Opportunities for written comment were separately publicized and noticed, see below.

10.2.1 Informational Public Meetings on ECC GSP

Appendix 10a provides the complete list of outreach and communication for the ECC Subbasin and **Table 10-1** provides a summary list of public information meetings and outreach on development of the the draft ECC Subbasin GSP.

Table 10-1. List of Public Information Meetings and Outreach on the Draft ECC Subbasin GSP

Format	Date	Detail	Participation	Purpose
Public Meetings	July 9, 2020 June 23, 2021 September 14, 2021	Online/Virtual Online/Virtual (recorded) Online/Virtual	33 47 ??	1. Review SGMA and Sections 1&2 2. Review Secs 3-9 3. Review entire GSP
Postcard Mailings	September 2018 August 2021	Postcard to public water systems and local agencies	120 of 153	1. Basin Boundary Modification Support & SGMA 2. GSP public comment period
Surveys on ECC GSP Website	Dec. 7, 2018 May 2020 to Oct0ber 2021	On-line survey for individual GSP Sections and entire GSP	Outreach Assessment =21 Chapter comments =28	Learn about GSPs Provided for public comment
Email Listserv	300 emails were mailed to interested parties prior to each public meeting	Notifications to interested parties list	900 emails	Notification of Sections available for review and comment and for public meeting announcements.
Public Board Meetings	January 2015 to August 2021	36 GSA public Board meetings		ECC GSP updates
ECC GSP Working Group Meetings	June 2017 to August 2021	Total of 45 monthly meetings	Varied	Plan GSP Development
ECC GSP Communications Committee Meetings	2019 to 2021	Total of 15 separate meetings	varied	Plan public outreach
Website	August 2019 to present	https://www.eccc-irwm.org/about-sgma	2019:205 views 2020: 506 views 2021: 620 views (to 8/3/21)	Update on GSP Development
Monthly Newsletter	September 2020 to January 2022	1 page pdf posted on ECC GSP Website and distributed to GSAs	To GSAs and posted on Website	Update on GSP Development
Public Meeting Notice	Prior to each public workshop	Newspaper advertising	Circulation to approximately 210,000 homes	Public Notice

10.2.2 Outreach Presentations to Community Groups

Municipal Advisory Councils (MAC) in the unincorporated County within the ECC groundwater basin are the Bethel Island Municipal Improvement District, the Byron Municipal Advisory Council, and the Knightsen Town Advisory Council. Each MAC meets regularly to advise the County of Board of Supervisors on discretionary land use projects, among other things. The County GSA emailed the draft GSP to individual members of each MAC above and presented the draft GSP on the following dates:

- Knightsen Town Advisory Council-September 14, 2021
- Byron Municipal Advisory Council-September 28, 2021
- Bethel Island Municipal Improvement District-October 12, 2021

10.3 Comments on the GSP and a Summary of Responses

Appendix 10b provides the comments on the GSP and a summary of responses.

10.4 Decision-Making Process

On May 9, 2017, the ECC GSAs and CCWD entered into a Memorandum of Understanding (MOU) for the development of a single GSP for the ECC Subbasin and agreed to collaborate to ensure sustainable groundwater management for the subbasin, manage the groundwater subbasin as efficiently as practicable balancing the financial resources of the agencies with the principles of effective and safe groundwater management, while retaining groundwater management authority within their respective jurisdictions. Minor amendments were approved in the MOU on November 16, 2017, and April 13, 2020. By agreement of the GSAs and CCWD, the ECC GSP becomes effective when all parties adopt the GSP for the entire Subbasin. Under SGMA, each GSA Board is responsible to approve the GSP; the entire GSP will be submitted to DWR on or before January 31, 2022.

The ECC Working Group directed the consultant Luhdorff & Scalmanini Consulting Engineers (LSCE) to fulfill the requirements of SGMA. LSCE provided the Working Group with draft GSP Sections, budgets, and other work products as required to complete the GSP. As described in detail below, public involvement of all beneficial users was sought from the start, and their input and feedback are included in the decision-making process for the GSP.

10.5 Opportunities for Public Engagement and How Public Input and Response was Used

The ECC stakeholders and the public were notified and encouraged to participate in the development of the GSP as outlined in the *ECC Subbasin Communications Plan* (**Appendix 10c**). The DWR FSS Program provided assistance to complete this task. Actions to engage the public are identified below, and **Table 10-1** provides a summary of public engagement opportunities.

ECC GSP Website: The ECC GSP website at https://www.eccc-irwm.org/about-sgma has been active since August 2019 and is continually maintained with current and updated documents that comprise the parts of the GSP. Contact information is presented for stakeholders to communicate with the ECC GSAs and the public can be added to the ECC GSP mailing list to receive updates on upcoming events. Meeting information with agendas and summary notes are posted regularly along with technical reports and educational materials. During GSP implementation the website will continue to be active and provide quarterly updates.

East County Times and the Brentwood Press:

ECC GSP Monthly Newsletter: Provides monthly updates on the progress of the GSP, posted to the ECC GSP website.

GSA Board Meetings: ECC GSAs Board meetings where the ECC GSP was discussed presented information to the respective GSA Boards and the public.

Public Workshops: Informational meetings to provide the public with SGMA information and the GSP process (**Table 10-1**).

Public Outreach on Draft ECC Sections: Draft sections of the GSP were posted for public comment as they became available (see **Table 10-2** below) along with two public meetings with Q&A sessions (July 2020 and June 2021). The surveys for each section were "live" and available for public comment through August 2021.

Table 10-2. Public Comment Period for each GSP Section

GSP Section	Public Comment Period
1. Introduction to East Contra Costa GSP	April to July 2020
2. Plan Area	
3. Basin Setting	10/30/2020 to 1/15/2021
4. Historical, Current, and Projected Water Supply	11/2020 to 1/15/2021
5. Water Budget	Aug 9 to Aug 23 2021
6. Monitoring Network, Data Management System and Reporting	4/8/2021 to 5/3/2021
7. Sustainable Management Criteria (SMC)	7/16 to 8/16/2021
8. Projects and Management Actions (PMA)	
9. Plan Implementation	
10. Notice and Communications	

Public Outreach on the Entire Draft ECC Subbasin GSP: The complete draft ECC Subbasin GSP was available for the month of September 2021 for public comment, this included one public meeting with Q&A in September 2021.

Postcard Mailers: Two postcard mailers to about 94 interested parties (public water systems and local agencies) to engage this group (2018) about the basin boundary modification and SGMA.

Surveys: Each Draft Section of the ECC Subbasin GSP when posted to the ECC GSP website included a survey for interested parties to express their needs and concerns. 29 people responded.

Existing Outreach: GSAs use existing outreach networks to provide regular updates about the GSP development. This includes information through bill inserts, newsletters, and presentations to their boards.

10.6 Encouraging Active Involvement

As discussed in **Sections 10.2** and **10.5**, the outreach and education process are important to develop a comprehensive GSP, and the ECC Working Group has prioritized involvement by interested parties in the GSP effort. The following strategies were developed to encourage stakeholder engagement:

- Conduct a comprehensive outreach and education process that facilitates development of a GSP that meets SGMA requirements.
- Keep the stakeholders informed by providing timely and accurate information.
- Provide opportunities for interested parties to provide input during the planning process.
- Provide opportunities for input during every step of the GSP process.
- Update the outreach process throughout the GSP process as needed.
- Multiple opportunities were provided for stakeholders to review and comment on each of the sections as they were being developed (**Table 10-2**).

10.7 Informing the Public on GSP Implementation Progress

The draft GSP was posted to the ECC GSP website on September 1, 2021 and was available for a 30-day public review and comment period. A public meeting was held on September 14, 2021 to provide an overview of the GSP content and an opportunity for stakeholder feedback and comments about the GSP. These comments will be taken into consideration and incorporated into a final version of the GSP that will be adopted by each of the seven GSA Board of Directors before submitting to DWR by the deadline of January 31, 2022. Stakeholders will be given an additional 60-day comment period through DWR's SGMA portal at https://sgma.water.ca.gov/portal/gsp/status following the submittal. Comments will be posted to DWR's website prior to the evaluation and approval by DWR.

The ECC GSP Working Group will continue to meet to guide the GSP implementation process through ongoing monitoring and sustainable groundwater management. The adopted Communication and Engagement Plan will guide future outreach during the GSP implementation process.

10.8 Interbasin Coordination

A list of interbasin coordination meetings with neighboring subbasins is below:

- Tracy Subbasin-February 12, 2020, and September 30, 2020
- Solano Subbasin (LSCE technical consultant for both ECC and Solano Subbasins)
- Eastern San Joaquin Subbasin

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APPENDIX 1a

Definitions and Key Terms (CWC 10721 and 23 CCR 351)

TERMS AND DEFINITIONS

"Working Group" refers to representatives of seven GSAs in the East Contra Costa Subbasin (City of Antioch, City of Brentwood, Byron-Bethany Irrigation District, Contra Costa County, Diablo Water District, Discovery Bay Community Services District, and East Contra Costa Irrigation District) plus a representative from Contra Costa Water District (an equal partner and financial contributor) that meet monthly to coordinate GSP development.

Cited from: Section 10733.2, Water Code

"Agency" refers to a groundwater sustainability agency as defined in the Act.

"Agricultural water management plan" refers to a plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq.

"Alternative" refers to an alternative to a Plan described in Water Code Section 10733.6.

"Annual report" refers to the report required by Water Code Section 10728.

"Baseline" or "baseline conditions" refer to historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin.

"Basin" means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq.

"Basin setting" refers to the information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and the water budget, pursuant to Subarticle 2 of Article 5.

"Best available science" refers to the use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice.

"Best management practice" refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.

"Board" refers to the State Water Resources Control Board.

"CASGEM" refers to the California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended.

"Data gap" refers to a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed.

"Groundwater dependent ecosystem" refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

"Groundwater flow" refers to the volume and direction of groundwater movement into, out of, or throughout a basin.

"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.

"Interested parties" refers to persons and entities on the list of interested persons established by the Agency pursuant to Water Code Section 10723.4.

"Interim milestone" refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

"Management area" refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

"Measurable objectives" refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

"Minimum threshold" refers to a numeric value for each sustainability indicator used to define undesirable results.

"NAD83" refers to the North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

"NAVD88" refers to the North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified.

"Plain language" means language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing.

"Plan" refers to a groundwater sustainability plan as defined in the Act.

"Plan implementation" refers to an Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities.

"Plan manager" is an employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for submitting the Plan and serving as the point of contact between the Agency and the Department.

"Principal aquifers" refer to aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

"Reference point" refers to a permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site.

"Representative monitoring" refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin.

"Seasonal high" refers to the highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand.

"Seasonal low" refers to the lowest annual static groundwater elevation that is typically measured in the Summer or Fall, and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand.

"Seawater intrusion" refers to the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source.

"Statutory deadline" refers to the date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4.

"Sustainability indicator" refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x).

"Uncertainty" refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.

"Urban water management plan" refers to a plan adopted pursuant to the Urban Water Management Planning Act as described in Part 2.6 of Division 6 of the Water Code, commencing with Section 10610 et seq.

"Water source type" represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies.

"Water use sector" refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation.

"Water year" refers to the period from October 1 through the following September 30, inclusive, as defined in the Act.

"Water year type" refers to the classification provided by the Department to assess the amount of annual precipitation in a basin.

Cited from: PART 2.74. Sustainable Groundwater Management [10720 - 10737.8] - CHAPTER 2. Definitions [10721- 10721.]

"Adjudication action" means an action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin.

“Basin” means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722).

“Bulletin 118” means the department’s report entitled “California’s Groundwater: Bulletin 118” updated in 2003, as it may be subsequently updated or revised in accordance with Section 12924.

“Coordination agreement” means a legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part.

“De minimis extractor” means a person who extracts, for domestic purposes, two acre-feet or less per year.

“Governing body” means the legislative body of a groundwater sustainability agency.

“Groundwater” means water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels unless included pursuant to Section 10722.5.

“Groundwater extraction facility” means a device or method for extracting groundwater from within a basin.

“Groundwater recharge” or “recharge” means the augmentation of groundwater, by natural or artificial means.

“Groundwater sustainability agency” means one or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, “groundwater sustainability agency” also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action.

“Groundwater sustainability plan” or “plan” means a plan of a groundwater sustainability agency proposed or adopted pursuant to this part.

“Groundwater sustainability program” means a coordinated and ongoing activity undertaken to benefit a basin, pursuant to a groundwater sustainability plan.

“In-lieu use” means the use of surface water by persons that could otherwise extract groundwater in order to leave groundwater in the basin.

“Local agency” means a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin.

“Operator” means a person operating a groundwater extraction facility. The owner of a groundwater extraction facility shall be conclusively presumed to be the operator unless a satisfactory showing is made to the governing Home Bill Information California Law Publications Other Resources My Subscriptions My Favorites body of the groundwater sustainability agency that the groundwater extraction facility actually is operated by some other person.

“Owner” means a person owning a groundwater extraction facility or an interest in a groundwater extraction facility other than a lien to secure the payment of a debt or other obligation.

"Personal information" has the same meaning as defined in Section 1798.3 of the Civil Code.

"Planning and implementation horizon" means a 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield.

"Public water system" has the same meaning as defined in Section 116275 of the Health and Safety Code.

"Recharge area" means the area that supplies water to an aquifer in a groundwater basin.

"Sustainability goal" means the existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield.

"Sustainable groundwater management" means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

"Sustainable yield" means the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.

"Undesirable result" means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
(2) Significant and unreasonable reduction of groundwater storage.
(3) Significant and unreasonable seawater intrusion.
(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.
(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

"Water budget" means an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored.

"Watermaster" means a watermaster appointed by a court or pursuant to other law.

"Water year" means the period from October 1 through the following September 30, inclusive.

"Wellhead protection area" means the surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

APPENDIX 1b

Amended and Restated Memorandum of Understanding, Development of a Groundwater Sustainability Plan for the East Contra Costa Subbasin

AMENDED AND RESTATED
MEMORANDUM OF UNDERSTANDING

Development of a Groundwater Sustainability Plan

for the East Contra Costa Subbasin, (DWR Basin 5-22.19, San Joaquin Valley)

This Amended and Restated Memorandum of Understanding for the Development of a Groundwater Sustainability Plan for the East Contra Costa Subbasin, (DWR Basin 5-22.19, San Joaquin Valley) ("**MOU**") is entered into and effective this 13th day of April, 2020 ("**Effective Date**") by and among the City of Antioch ("**Antioch**"), City of Brentwood ("**Brentwood**"), Byron-Bethany Irrigation District ("**BBID**"), Contra Costa Water District ("**CCWD**"), Contra Costa County ("**County**"), Diablo Water District ("**DWD**"), East Contra Costa Irrigation District ("**ECCID**"), and Discovery Bay Community Services District ("**Discovery Bay**"). Each of the foregoing parties to this MOU is sometimes referred to herein as a "**Party**" and are collectively sometimes referred to as the "**Parties**."

Recitals

A. In September 2014, the California Legislature enacted the Sustainable Groundwater Management Act of 2014 ("**SGMA**"), which established a statewide framework for the sustainable management of groundwater resources. That framework focuses on granting new authorities and responsibility to local agencies while holding those agencies accountable. The framework also provides for state intervention where a local agency fails to develop a groundwater sustainability plan in a timely manner.

B. The East Contra Costa Subbasin ("**Basin**") is referred to as DWR Basin 5-22.19, San Joaquin Valley, and is shown on the map attached hereto as Exhibit A and incorporated herein by reference as if set forth in full. The Basin is located in eastern Contra Costa County. The Parties collectively overlie all of the Basin.

C. Under SGMA, one or more local agencies may form a groundwater sustainability agency ("**GSA**"), by memorandum of agreement, joint exercise of powers agreement, or other agreement. (Wat. Code, §§ 10723(a), 10723.6.) The Parties desire for each Party to be the GSA within all or a portion of that Party's boundary. The Parties further desire to develop a governance structure for the Basin to be considered during development of the groundwater sustainability plan (a "**GSP**") for the Basin (the "**Basin GSP**"). The Parties further desire to resolve areas of jurisdictional overlap so that no two Parties serve as GSAs over the same area. The purpose of this MOU is to coordinate the Parties' activities related to each Party becoming a GSA, development of the Basin GSP, and each Party's future consideration of whether to adopt the Basin GSP.

D. The Parties wish to collaborate in an effort to ensure sustainable groundwater management for the Basin, manage the groundwater basin as efficiently as practicable balancing the financial resources of the agencies with the principles of effective and safe groundwater management, while retaining groundwater management authority within their respective jurisdictions. The Parties desire to share responsibility for Basin management under SGMA. The Parties recognize that the key to success in this effort will be the coordination of activities under SGMA, and the collaborative development of the Basin GSP, which each Party may consider adopting and implementing within its GSA management area.

E. The Basin has been designated by the California Department of Water Resources ("**DWR**") as a medium-priority groundwater basin, which, under the terms of SGMA, means that the Parties must submit a Basin GSP to DWR by January 31, 2022.

F. This MOU amends and restates the original Memorandum of Understanding, dated May 9, 2017, and as amended on November 16, 2017. This MOU also recognizes changes that reflect DWR's determination that, for purposes of SGMA, the Basin is separate and distinct from other portions of the Tracy Subbasin located in San Joaquin and Alameda Counties. The Basin is located entirely within Contra Costa County. The Parties wish to memorialize and restate their commitments by means of this MOU.

Understandings

1. *Term.* The term of this MOU begins on the Effective Date, which shall occur upon execution of this MOU by all eight of the parties, and this MOU shall remain in full force and effect until the earliest of the following events: (i) January 31, 2022, (ii) the date upon which the Parties submit a Basin GSP to DWR, or (iii) the date upon which the Parties then party to the MOU execute a document jointly terminating the provisions of this MOU. An individual Party's obligations under this MOU terminate when the Party withdraws from the MOU in accordance with Section 4.

2. *Development of the GSP*

a. *Parties to Become GSAs.* Each Party, except Contra Costa Water District, agrees to take the necessary actions to become the GSA for all or a portion of that area of the East CC Basin that it overlies, as shown on Exhibit A, attached hereto, no later than April 1, 2017, or shortly thereafter. The Parties shall jointly submit the Parties' individual elections to become GSAs and this MOU to DWR prior to April 1, 2017, or shortly thereafter. The Parties further agree to develop a governance structure for the Basin to be considered during development of the Basin GSP

b. *Single GSP*. The Parties will collaborate to develop a single Basin GSP that, at a minimum, satisfies the GSP requirements in the SGMA and the regulations promulgated under the SGMA. The Basin GSP must include an analysis of implementation costs and revenue sources, and must include an analysis of governance structure options. The Basin GSP shall be drafted in a manner that preserves, and does not purport to supersede, the land use authority of each city or county, or the statutory authority of each special district, that is a party to this MOU. The Basin GSP must include provisions for consultation between a GSA and any public agency that the GSA overlaps before the GSA takes any action that may relate to that public agency's exercise of its statutory authority. Unless the Parties later agree otherwise, it is intended that the Basin GSP will be implemented by each Party within its respective GSA management area, and that the Parties will coordinate their implementation of the Basin GSP.

c. *Overlap Areas.* Solely for the purpose of complying with the SGMA requirement that GSA management areas not overlap, the Parties agree that there are no overlapping GSA management areas, as shown on Exhibit A. This MOU does not purport to limit any Party's legal authority to utilize and deliver groundwater or surface water throughout its jurisdictional boundary (as may be amended from time-to-time), which may include area outside of a Party's management area shown on Exhibit A.

d. *Cooperation of Efforts*. The Parties will designate staff who will endeavor to meet monthly or more frequently if necessary to develop the terms of the Basin GSP in an expeditious manner.

e. *Contracting with Consultant & Cost Share Among the Parties.*

(1) Contracting with Consultant.

A. Contract for the Preparation of the GSP. Brentwood, acting on behalf of the other Parties, shall promptly enter into an agreement with Luhdorff and Scalmanini ("**Consultant**") for the preparation of the Basin GSP.

B. Annual Budgets and Scopes of Work. Not later than each February 15, Brentwood shall obtain a proposed budget and scope from Consultant for services during the upcoming fiscal year. Brentwood shall promptly provide the proposed budget and scope to the other Parties and shall give the other Parties until each March 15 to review the proposed budget and scope, and provide written comments to Brentwood. Such comments shall include each Party's determination as to whether it is willing to pay its share of the cost of such work, as identified in Paragraph 2(e)(2). If, after each March 15, no Party has indicated in writing that it is unwilling to pay its share of the cost of such work, the Consultant's budget and scope for the upcoming fiscal year shall be deemed approved and Brentwood shall take such actions as may be necessary to cause Consultant to perform the services included in that budget and scope of work. In the event that one or more Parties object to the proposed budget and scope of work, the Parties shall promptly meet and confer to determine an appropriate course of action.

C. Payments by Parties to Brentwood. Brentwood shall, upon receipt of Consultant's monthly invoices, pay Consultant for services rendered during the previous month. Brentwood will promptly provide invoices to the other Parties identifying their shares of the cost of the previous month's work and such other Parties shall pay said invoices within 45 days of receipt.

(2) *Cost-Share for Basin GSP*. The costs associated with developing the Basin GSP ("**GSP Costs**"), including but not limited to, any local cost-shares required by state or federal grants, will be shared equally among the Parties.

A. <u>In-Kind Services Provided by County</u>. The County, at its sole discretion, may satisfy its share of GSP Costs by providing in-kind services, which may include but may not be limited to mapping, graphics, and database management services. The County will provide written notice to the other Parties by the March 15 immediately preceding the fiscal year stating either that the County will pay its share of GSP Costs in the fiscal year, or that the County will provide in-kind services in lieu of paying its share of GSP Costs in the fiscal year. In the case of payments to Consultant or other vendors where the County wishes to substitute in-kind services for direct payments, Brentwood shall allocate such invoices equally among the Parties other than the County. Notwithstanding anything to the contrary contained herein, no Party shall be obligated to pay the County for the value of any in-kind services provided by the County, and the value of any in-kind services provided by the County shall only act as a credit towards the County's share of GSP Costs, as more particularly described in 2(e)(2)(B).

B. <u>Annual Accounting</u>. Brentwood shall prepare an annual accounting by October 1 that shows all GSP Costs for the previous fiscal year and that identifies in-kind services provided by the County and the County's calculation of the value of those in-kind services. By July 30th following the end of a fiscal year, the County will provide

Brentwood an accounting of the County's in-kind services during the prior fiscal year, and any carry-over value of in-kind services provided during any fiscal years preceding the prior fiscal year. The value of the County's in-kind services will be calculated based on (1) the then-current fully-burdened hourly rates for County staff time, benefits, and overhead, and (2) the County's actual costs for any materials or supplies required to provide the in-kind services.

i. Upon written notice to the other Parties no later than 15 days after receiving Brentwood's annual accounting, any Party other than the County may dispute the County's calculation of the value of the in-kind services that the County provided during the fiscal year for which the accounting is prepared, but no Party may challenge the value of in-kind services that were carried over from any fiscal year preceding the fiscal year for which the accounting is prepared. In the event that one or more Parties provide notice of a dispute under this subparagraph, the Parties shall promptly meet and confer in an effort to resolve the dispute to the satisfaction of all Parties. The County's obligation to make any payments to other Parties under Paragraph 2(e)(2)(B)(ii) shall be tolled until the County receives, from each disputing Party, written notice that the dispute has been resolved to the disputing Party's satisfaction.

ii. Except as expressly provided in Paragraph 2(e)(2)(B)(i), in the event that Brentwood's annual accounting shows that the value of the in-kind services provided by the County during the fiscal year for which the accounting is prepared, plus any carry-over value for in-kind services provided in any preceding fiscal years, is less than the individual contributions of the other Parties during the fiscal year for which the annual accounting is prepared, the County shall provide, by the November 30 following receipt of the annual accounting, payments to each of the other Parties sufficient to equalize the values of the

Parties' contributions during the fiscal year for which the accounting is prepared. In the event that Brentwood's annual accounting shows that the value of the in-kind services provided by the County during the fiscal year for which the accounting is prepared, plus any carry-over value for in-kind services provided in any preceding fiscal years, is greater than the individual contributions of the other Parties, Brentwood shall credit the County with the difference and carry over that excess contribution to be credited towards the value of the County's in-kind services provided in the subsequent fiscal year.

f. *Approval of the GSP*. The Parties agree that the Basin GSP will become effective for each Party when all of the Parties adopt the Basin GSP.

3. *Savings Provisions.* This MOU shall not operate to validate or invalidate, modify or affect any Party's water rights or any Party's obligations under any agreement, contract or memorandum of understanding/agreement entered into prior to the effective date of this MOU. Nothing in this MOU shall operate to convey any new right to groundwater to any Party. Each Party to this MOU reserves any and all claims and causes of action respecting its water rights and/or any agreement, contract or memorandum of understanding/agreement; any and all defenses against any water rights claims or claims under any agreement, contract or memorandum of understanding/agreement.

4. *Withdrawal*. Any Party shall have the ability to withdraw from this MOU by providing sixty (60) days written notice of its intention to withdraw. Said notice shall be given to each of the other Parties.

a. A Party shall not be fiscally liable for expenditures following its withdrawal from this MOU, provided that the Party provides written notice at least sixty (60) days prior to the effective date of the withdrawal. A withdrawal shall not terminate, or relieve the withdrawing Party from, any express contractual obligation to another Party to this MOU or to any third party incurred or encumbered prior to the withdrawal.

b. In the event of a Party's withdrawal, this MOU shall continue in full force and effect among the remaining Parties. Further, a Party's withdrawal from this MOU does not, without further action by that Party, have any effect on the withdrawing Party's decision to be a GSA. A withdrawing Party shall coordinate the development of its groundwater sustainability plan with the other Parties to this MOU.

5. *CEQA*. Nothing in this MOU commits any Party to undertake any future discretionary actions referenced in this MOU, including but not limited to electing to become a GSA and adopting the Basin GSP. Each Party, as a lead agency under the California Environmental Quality Act ("**CEQA**"), shall be responsible for complying with all obligations under CEQA that may apply to the Party's future discretionary actions pursuant to this MOU, including electing to become a GSA and adopting the Basin GSP.

6. *Books and Records.* Each Party shall have access to and the right to examine any of the other Party's pertinent books, documents, papers or other records (including, without limitation, records contained on electronic media) relating to the performance of that Party's obligations pursuant to this Agreement, *providing that* nothing in this paragraph shall be construed to operate as a waiver of any applicable privilege and *provided further* that nothing in this paragraph shall be construed to give either Party rights to inspect the other Party's records in excess of the rights contained in the California Public Records Act.

7. *General Provisions*

a. *Authority*. Each signatory of this MOU represents that s/he is authorized to execute this MOU on behalf of the Party for which s/he signs. Each Party represents that it has legal authority to enter into this MOU and to perform all obligations under this MOU.

b. *Amendment*. This MOU may be amended or modified only by a written instrument executed by each of the Parties to this MOU.

c. *Jurisdiction and Venue*. This MOU shall be governed by and construed in accordance with the laws of the State of California, except for its conflicts of law rules. Any suit, action, or proceeding brought under the scope of this MOU shall be brought and maintained to the extent allowed by law in the County of Contra Costa, California.

d. *Headings*. The paragraph headings used in this MOU are intended for convenience only and shall not be used in interpreting this MOU or in determining any of the rights or obligations of the Parties to this MOU.

e. *Construction and Interpretation*. This MOU has been arrived at through negotiations and each Party has had a full and fair opportunity to revise the terms of this MOU. As a result, the normal rule of construction that any ambiguities are to be resolved against the drafting Party shall not apply in the construction or interpretation of this MOU.

f. *Entire Agreement*. This MOU constitutes the entire agreement of the Parties with respect to the subject matter of this MOU and supersedes any prior oral or written