Note: Agricultural pumping is reported on a water-year basis whereas urban pumping is reported on a calendar-year basis. Rural domestic pumping is estimated on a calendar year basis.

### 6.6.2 Riparian Evapotranspiration

Due to the seasonal release of water from the Nacimiento and San Antonio reservoirs, the Salinas River has been transformed from an ephemeral to a perennial river that supports extensive strands of non-native riparian vegetation. The non-native riparian vegetation represents a significant loss of water from the basin through evapotranspiration (ET). In particular, *Arundo donax* is an invasive reed that has spread throughout California and other states. The ET rate of *Arundo donax* is highly variable but is estimated to be up to 20 AF/yr./acre (E. Zefferman, County of Monterey Resource Conservation District, personal communication, 2019). The California Department of Fish and Wildlife Biogeographic Information and Observation System GIS database indicates that there are approximately 800 acres of *Arundo donax* in the 180/400-Foot Aquifer Subbasin. For the historical and current water budgets, ET by *Arundo donax* was assumed to be 16 AF/yr./acre. The riparian ET occurs at the interface between the surface water and groundwater budgets and could be incorporated into either budget. For the historical and current water budgets, the riparian ET is included in the groundwater budget. Table 6-14 presents the constant riparian ET rate used in the historical and current water budgets.

Table 6-14. Riparian Evapotranspiration in Historical and Current Water Budgets

| | Average Acre-Feet/Year for the Historical Water Budget | Average Acre-Feet/year for the Current Water Budget | Notes |
|---|---|---|---|
| Riparian Evapotranspiration | 12,000 | 12,000 | Estimated acreage and ET rate |

### 6.6.3 Subsurface Outflows to Adjacent Subbasins

Based on groundwater flow directions at the Subbasin boundaries, subsurface outflow from the Subbasin occurs at the Eastside and Langley Subbasin boundaries. The combined outflow to these two subbasins has been estimated at approximately 8,000 AF/yr. (Montgomery Watson, 1997). In addition, at the northern boundary groundwater flows toward the Pajaro Valley Basin. The rate of subsurface flow from the Subbasin to the Pajaro Basin is estimated at 1,500 AF/yr. based on modeling analysis reported by USGS (Hanson, et al., 2014b). The estimated values are assumed constant for the historical and current budgets. The boundary flows can be reassessed when the calibrated historical SVIHM is available. Table 6-15 summarizes the subsurface inflow components from the historical and current water budgets.

Table 6-15. Subsurface Outflow to Adjacent Subbasins/Basin in Historical and Current Water Budgets

| | Average for the Historical Water Budget (AF/yr.) | Average for the Current Water Budget (AF/yr.) | Notes |
|---|---|---|---|
| **Eastside/Langley Subbasins** | 8,000 | 8,000 | Brown and Caldwell (2015) |
| **Pajaro Valley Basin** | 1,500 | 1,500 | Hanson et al., (2014b) |
| **Total Subsurface Outflow** | 9,500 | 9,500 | |

## 6.7 Change in Storage Data

### 6.7.1 Groundwater Elevation Fluctuations

The change in groundwater storage estimated from observed change in groundwater elevations is described in Section 5.2. The change in the volume of groundwater in storage is based on fall water levels collected by MCWRA, which are the best available data. Conversion of the measured groundwater elevation changes to estimated groundwater storage changes requires an estimate of the storage coefficient and area of the Subbasin. The storage coefficient is dependent on the material properties of the aquifer and the degree to which the aquifer is confined by an overlaying aquitard. Brown and Caldwell estimated the storage coefficient in the 180/400-Foot Aquifer Subbasin to be 0.04 (Brown and Caldwell, 2015).

As noted in Section 5.2.2, the long-term change in storage since 1944 is an average annual loss of approximately 1,200 AF/yr.  The average change in storage due to groundwater elevation fluctuations during the historical period, based on fall water measurements, is a loss of approximately 650 AF/yr. The average change in storage due to groundwater elevation fluctuations during the current period is a loss of approximately 1,000 AF/yr.

### 6.7.2 Seawater Intrusion

As reported in Section 5.2, seawater intrusion has occurred and is occurring in response to groundwater pumping in the 180/400-Foot Aquifer Subbasin. The 10,500 AF/yr. estimated rate of seawater intrusion into the 180/400-Foot Aquifer Subbasin presented in Section 5.2 is used as a constant value for both the Historical and Current Water Budget (Table 6-16). This estimate may be improved based on access to the calibrated SVIHM.

Table 6-16. Seawater Intrusion in Historical and Current Water Budgets

| | Average for the Historical Water Budget (AF/yr.) | Average for the Current Water Budget (AF/yr.) | Notes |
|---|---|---|---|
| **Seawater Intrusion** | -10,500 | -10,500 | Estimated from previous studies (Section 5.2) |

## 6.8 Historical and Current Water Budgets

The historical water budget is based on 20 years of historical data covering 1995 to 2014. The 20-year period of 1995 to 2014 was selected as the period for the historical water budget because:

- Relatively complete pumping rates from most wells in the Subbasin were available from MCWRA,
- A relatively complete climatic cycle occurred, and
- The current water supply management system was in place for a significant amount of time.

The current water budget is based on the average of conditions between 2015 and 2017, the most recent years for which complete data are available. Because the current water budget represents a relatively short time period, it cannot be directly compared to the historical water budget. The historical water budget is designed to reflect average historical conditions. The current water budget reflects a snapshot in time that is susceptible to short-term climatic conditions.

### 6.8.1 Surface Water Budget

The surface water inflow and outflow components described in Sections 6.3 and 6.4 are combined to generate annual surface water budgets for the historical and current water budget periods.

Table 6-17 summarizes the average, minimum, and maximum annual values for each component of the historical surface water budget. Table 6-18 summarizes the average, minimum, and maximum annual values for each component of the current surface water budget. The minimum and maximum of total inflows and outflows are not equal to the sum of the sectors because the timing of sector extremes is not coincident.

Table 6-17. Summary of Historical Surface Water Budget

| Inflow | | | Average (AF/yr.) | Minimum (AF/yr.) | Maximum (AF/yr.) |
|---|---|---|---|---|---|
| | Surface Water Inflows | | | | |
| | | Salinas River from Forebay Subbasin | 312,100 | 5,000 | 1,155,600 |
| | | Tributaries from Eastside Subbasin | 2,300 | 0 | 11,800 |
| | Precipitation Runoff | | 1,100 | 0 | 9,400 |
| | Irrigation Return Flow | | 10,000 | 5,000 | 16,400 |
| TOTAL INFLOW | | | 325,500 | 10,000 | 1,186,800 |
| | | | | | |
| **Outflow** | | | **Average (AF/yr.)** | **Minimum (AF/yr.)** | **Maximum (AF/yr.)** |
| | Surface Water Outflows | | | | |
| | | Salinas River Diversions | 8,000 | 6,500 | 9,200 |
| | | Salinas River Outflow to Monterey Bay | 240,800 | 0 | 1,251,400 |
| | | Other Outflows to Monterey Bay | 10,000 | 5,000 | 16,400 |
| | Net Percolation of Streamflow to Groundwater System | | 76,800 | 5,000 | 90,000 |
| TOTAL OUTFLOW | | | 335,600 | 18,900 | 1,359,400 |

Table 6-18. Summary of Current Surface Water Budget

| Inflow | | | Average (AF/yr.) | Minimum (AF/yr.) | Maximum (AF/yr.) |
|---|---|---|---|---|---|
| | Surface Water Inflows | | | | |
| | | Salinas River from Forebay Subbasin | 163,700 | 3,300 | 477,900 |
| | | Tributaries from Eastside Subbasin | 900 | 0 | 2,600 |
| | Precipitation Runoff | | 1,700 | 200 | 3,200 |
| | Irrigation Return Flow | | 18,000 | 8,700 | 30,800 |
| TOTAL INFLOW | | | 184,300 | 13,700 | 511,400 |
| | | | | | |
| **Outflow** | | | **Average (AF/yr.)** | **Minimum (AF/yr.)** | **Maximum (AF/yr.)** |
| | Surface Water Outflows | | | | |
| | | Salinas River Diversions | 7,900 | 7,600 | 8,300 |
| | | Salinas River Outflow to Monterey Bay | 103,400 | 0 | 310,300 |
| | | Other Outflows to Monterey Bay | 18,000 | 8,700 | 30,800 |
| | Net Percolation of Streamflow to Groundwater System | | 34,400 | 3,300 | 90,000 |
| TOTAL OUTFLOW | | | 163,700 | 20,300 | 438,900 |

The surface water budget components are highly variable. Figure 6-4 illustrates the annual inflow and outflow components for the historical budget period. The diagram uses stacked bar height to illustrate the magnitude of budget components for each year, with inflows shown on the positive y-axis and outflows on the negative y-axis. The inflow and outflow components for each year are tabulated in Appendix 6A.

Figure 6-4 shows that streamflow percolation remains relatively stable over the historical period, with a drastic decrease during the 2014 dry year, when the reservoirs did not release as much water into the Salinas River as in previous years. The Salinas River flows are highly managed and depend on the Nacimiento and San Antonio Reservoir operations. Thus, they are generally kept constant through reservoir management. The other components of the surface water budget are dependent on the varying climate and correlate to the water year types.

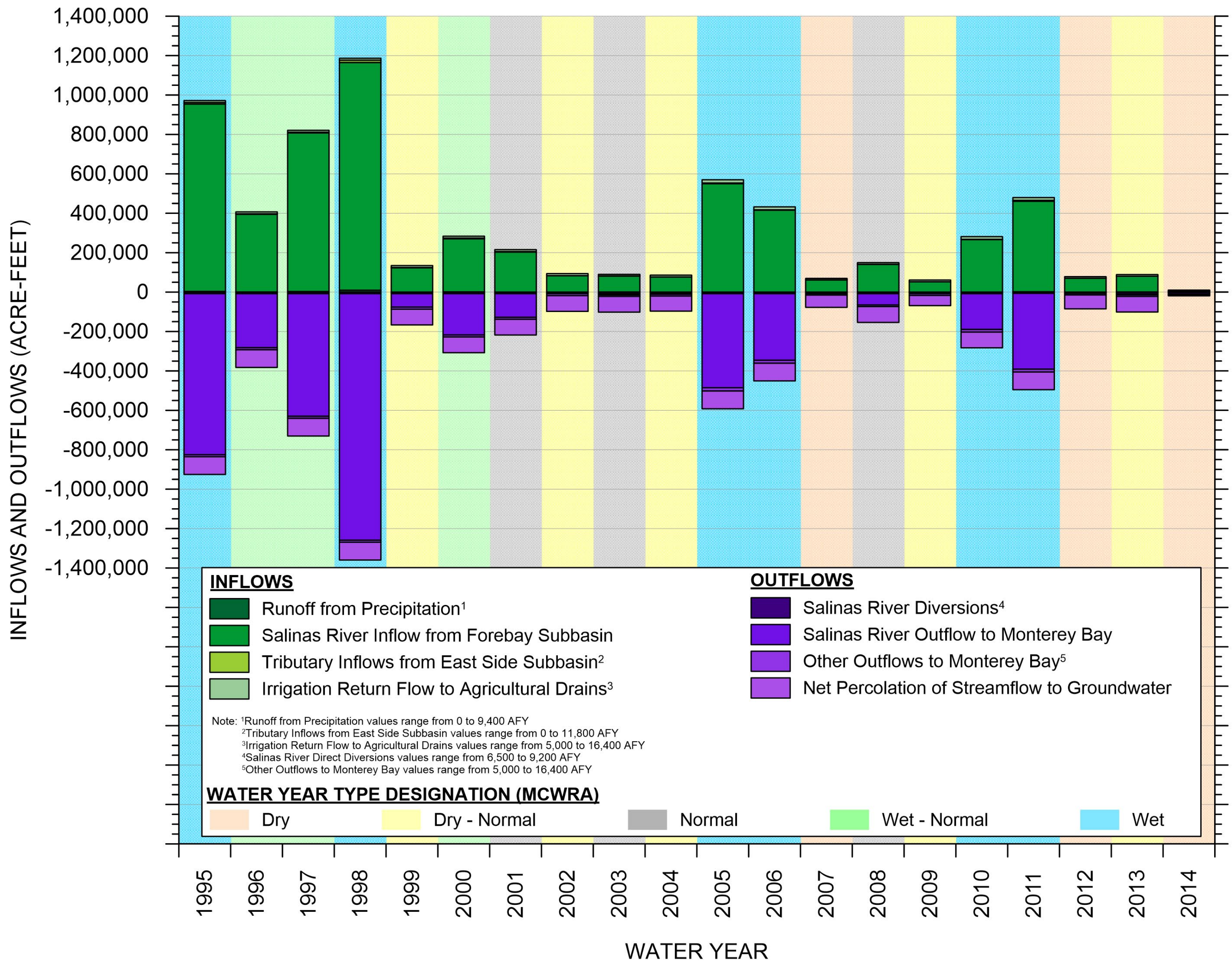


Figure 6-4. Historical Surface Water Budget

### 6.8.2 Groundwater Budget

The groundwater inflow and outflow components described in Sections 6.5 and 6.6 are combined to generate annual groundwater budgets for the historical and current budget periods. The groundwater system encompasses all groundwater that exists in the shallow sediments as well as the principal aquifers, as described in Chapter 4 of this GSP.

Table 6-19 summarizes the average, minimum, and maximum annual values for each component of the historical groundwater budget. Table 6-20 summarizes the average, minimum, and maximum annual values for each component of the current groundwater budget. The minimum and maximum of total inflows and outflows are not equal to the sum of the sectors because the timing of sector extremes is not coincident.

Table 6-19. Summary of Historical Groundwater Budget

| Inflow | Average (AF/yr.) | Minimum (AF/yr.) | Maximum (AF/yr.) |
|---|---|---|---|
| Net Percolation of Streamflow to Groundwater System | 76,800 | 5,000 | 90,000 |
| Deep Percolation of Precipitation and Excess Irrigation | 19,900 | 9,700 | 69,400 |
| Subsurface Inflows from Adjacent Subbasins | 20,000 | 20,000 | 20,000 |
| **TOTAL INFLOW** | 116,700 | 43,300 | 179,400 |
| | | | |
| **Outflow** | **Average (AF/yr.)** | **Minimum (AF/yr.)** | **Maximum (AF/yr.)** |
| Pumping - Total Subbasin | 108,100 | 92,900 | 130,800 |
| Agricultural | 89,000 | 76,200 | 110,800 |
| Urban | 18,900 | 14,000 | 27,500 |
| Rural Domestic | 200 | 200 | 200 |
| Riparian Evapotranspiration | 12,000 | 12,000 | 12,000 |
| Subsurface Outflows to Adjacent Subbasins/Basin | 9,500 | 9,500 | 9,500 |
| **TOTAL OUTFLOW** | 129,600 | 114,400 | 152,300 |
| | | | |
| **Difference Between Inflows and Outflows** | **Average (AF/yr.)** | | |
| Difference Between Inflows and Outflows | -12,900 | | |

Table 6-20. Summary of Current Groundwater Budget

| Inflow | | Average (AF/yr.) | Minimum (AF/yr.) | Maximum (AF/yr.) |
|---|---|---|---|---|
| | Net Percolation of Streamflow to Groundwater System | 34,400 | 3,300 | 90,000 |
| | Deep Percolation of Precipitation and Excess Irrigation | 10,400 | -6,400 | 18,900 |
| | Subsurface Inflows from Adjacent Subbasins | 20,000 | 20,000 | 20,000 |
| TOTAL INFLOW | | 64,800 | 42,200 | 103,600 |
| | | | | |
| **Outflow** | | **Average (AF/yr.)** | **Minimum (AF/yr.)** | **Maximum (AF/yr.)** |
| | Pumping - Total Subbasin | 109,100 | 108,200 | 111,100 |
| | Agricultural | 91,900 | 89,000 | 97,700 |
| | Urban | 17,000 | 12,900 | 19,000 |
| | Rural Domestic | 200 | 200 | 200 |
| | Riparian Evapotranspiration | 12,000 | 12,000 | 12,000 |
| | Subsurface Outflows to Adjacent Subbasins/Basin | 9,500 | 9,500 | 9,500 |
| TOTAL OUTFLOW | | 130,600 | 129,700 | 132,400 |
| | | | | |
| **Difference Between Inflows and Outflows** | | **Average (AF/y.)** | | |
| | Difference Between Inflows and Outflows | -65,800 | | |

[1]Deep percolation is equal to the amount of deep percolation from precipitation plus applied irrigation water minus crop consumption and flow in the Blanco Drain and Rec Ditch. In 2017, flows were extremely high, which results in a negative value for this year. The total recharge from both irrigation and precipitation is correct.

The annual groundwater system budget components are variable, although not as variable as the surface water budget components. Figure 6-5 illustrates the annual inflow and outflow components for the historical budget period. The diagram uses stacked bar height to illustrate the magnitude of budget components for each year, with inflows shown on the positive y-axis and outflows on the negative y-axis. The inflow and outflow components for each year are tabulated in Appendix 6A.

Figure 6-5 shows that groundwater pumping in the Subbasin is not directly correlated to the amount of inflow to the principal aquifers. For example, during the 2014 dry year, when the inflows decreased drastically due to very little streamflow percolation from the Salinas River, total groundwater system pumping remained similar to the previous year, where streamflow percolation was more in line with average years.

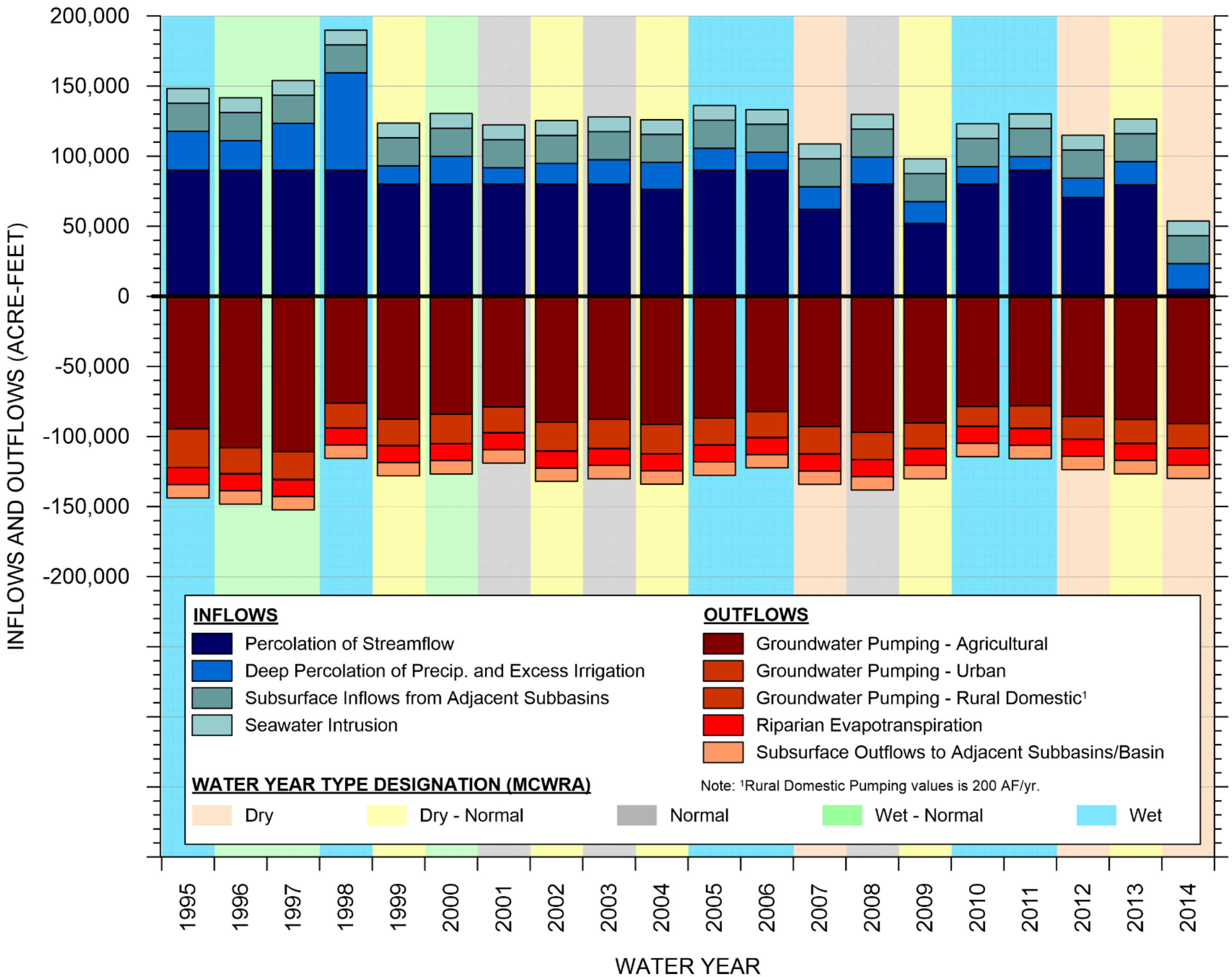


Figure 6-5. Historical Groundwater Budget

### 6.8.3 Subbasin Water Supply Reliability

A review of water supply sources in the 180/400-Foot Aquifer Subbasin shows that surface water supplies, as measured by the San Antonio and Nacimiento Reservoir releases to the Salinas River, allow for a reliable, yet small supply in wet and normal years. The reservoir releases also supply a stable supply of surface water in the first year of a drought by taking advantage of carry-over storage (Figure 6-6). However, the current operations do not allow for reliability in multi-year drought periods as shown in the 2002-2004 and 2007-2009 droughts. More recently, during the 4-year drought from 2012 to 2015, no water was released from the reservoirs in the last 2 years of the drought. Although no water was released, agricultural groundwater pumping did not substantially increase in those years.

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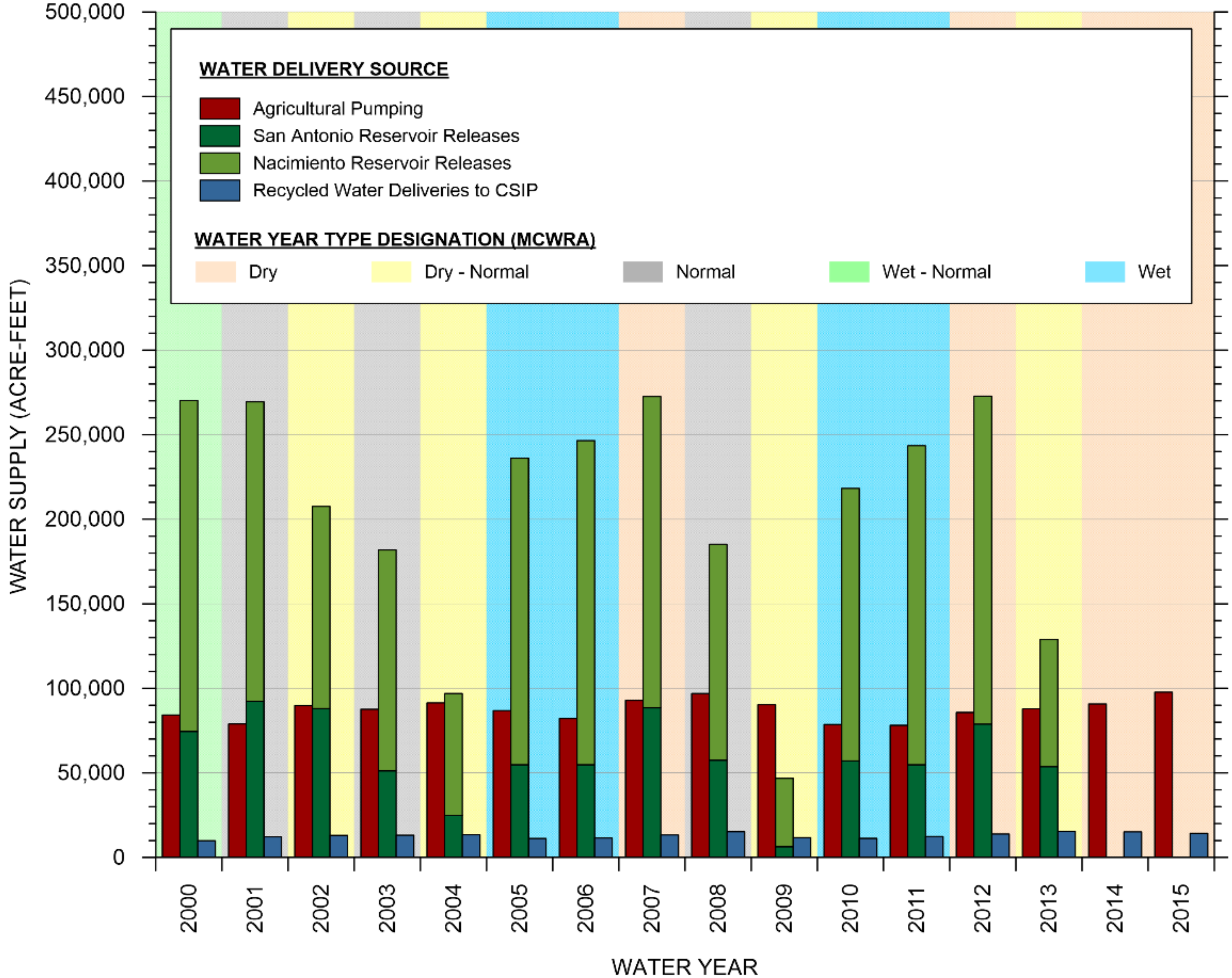



Figure 6-6. Water Supply Reliability

### 6.8.4 Subbasin Water Budget Summary

Figure 6-7 provides a diagram illustrating the interrelationship of the surface water and groundwater budget components. Average rates for these components over the historical water budget period are included in the diagram.

### 6.8.5 Sustainable Yield

The historical and current sustainable yield of the Subbasin is an estimate of the quantity of groundwater that can be pumped on a long-term average annual basis without causing a net decrease in storage. The sustainable yield can be estimated based on the average annual values of the following components of the historical water budget:

- Total pumping
- Change in groundwater system storage, including seawater intrusion

The sustainable yield is computed as:

Sustainable yield = pumping - change in storage

Table 6-21 summarizes the estimated historical sustainable yield for the 180/400-Foot Aquifer Subbasin. Negative values in Table 6-21 represent a loss of groundwater storage. The quantification of overdraft is the sum of the change in storage and seawater intrusion. Based on the water budget components, the historical sustainable yield of the Subbasin is 97,200 AF/yr., which represents a 10% reduction in total pumping relative to the average annual historical pumping rate. The current sustainable yield of the Subbasin is 98,000 AF/yr. The values in Table 6-21 are estimates only. The sustainable yield value will be modified and updated as more data are collected and more analyses are conducted.

Table 6-21. Estimated Historical and Current Sustainable Yield for the 180/400-Foot Aquifer Subbasin

| | Average for the Historical Water Budget (AF/yr.) | Average for the Current Water Budget (AF/yr.) |
|---|---|---|
| **Total Subbasin Pumping** | 108,100 | 109,100 |
| **Change in Storage (Groundwater Elevations)** | -400 | -600 |
| **Seawater Intrusion** | -10,500 | -10,500 |
| **Estimated Historical Sustainable Yield** | 97,200 | 98,000 |

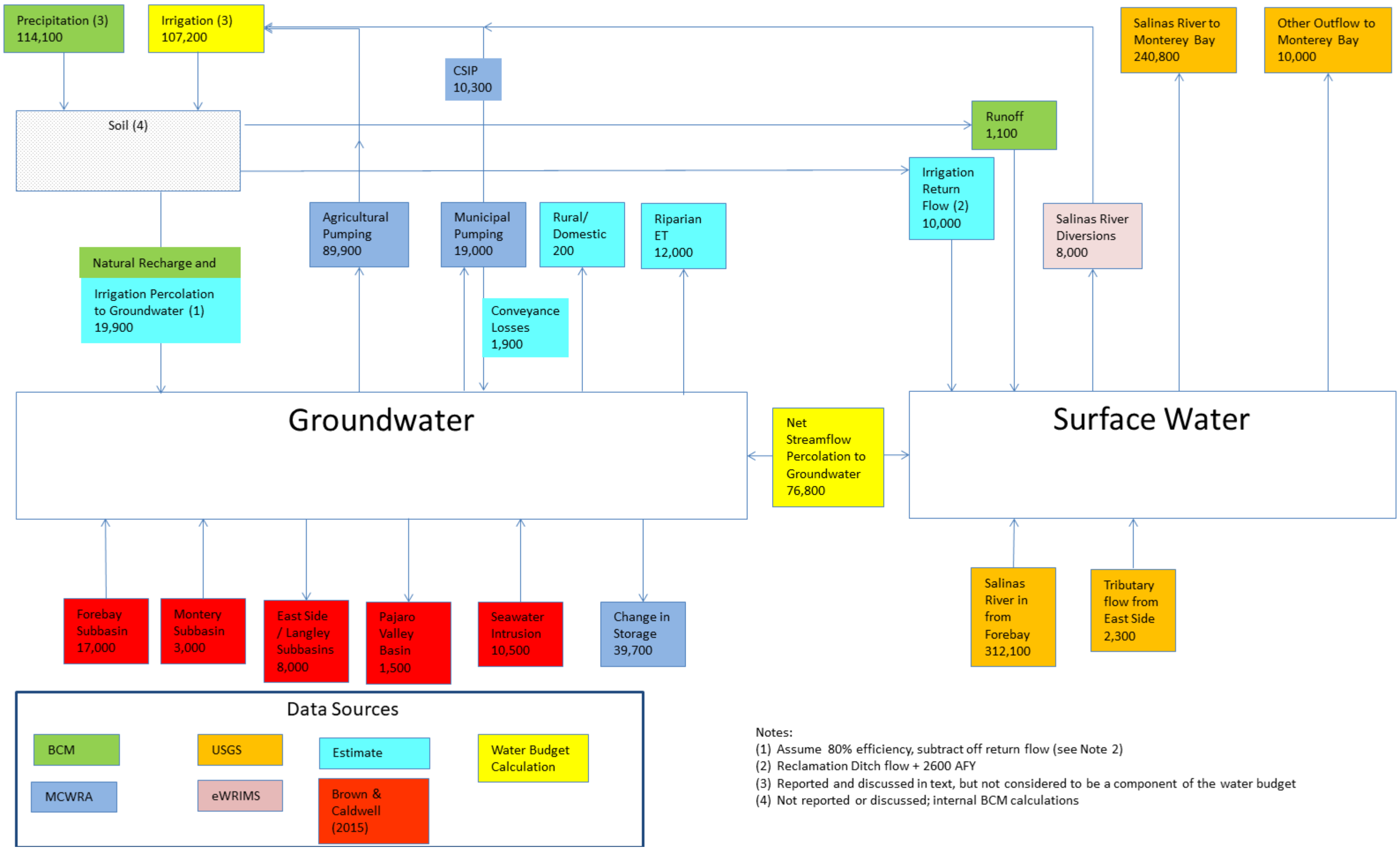



Figure 6-7. Annual Average Historical Total Water Budget

## 6.9 Uncertainties in Historical and Current Water Budget Calculations

As described in Section 6.1, the level of accuracy and certainty is highly variable between water budget components. The water budget uncertainty will be reduced over time as the GSP monitoring programs are implemented and the resulting data are used to check and improve the budgets.

Although the uncertainty of each component has not been quantified, the net uncertainty in the groundwater budget can be assessed based on a comparison between calculated and estimated change in storage. This difference provides a quantitative estimate of how well the water budget matches observed conditions. Although this measure doesn't quantify uncertainty in the components of the budgets, it allows an assessment of whether the net sum of the components is reasonable.

Since there are no significant surface water storage reservoirs within the Subbasin, the uncertainty in the surface water budget is the difference between inflows and outflows. Table 6-22 shows that the historical surface water budget has an uncertainty of -10,100 AF/yr., which is 3% of the historical outflow. By contrast, the current surface water budget has an uncertainty of 20,600 AF/yr., which is 13% of the outflow.

Table 6-23 compares the difference between estimated groundwater inflows and outflow to the calculated change in groundwater storage for the historical and current time periods. The difference between groundwater inflows and outflows for the historical groundwater budget is 12,900 AF/yr. This 12,900 AF/yr. is an estimate of the annual storage loss if all inflows and outflows are perfectly known. The MCWRA calculations of storage loss only account for storage losses due to change in groundwater elevations. To compare the budget estimate of storage loss to the MCWRA estimate, storage loss is reduced by the 10,500 AF of annual storage loss attributed to for seawater intrusion. The annual storage change for the historical period based on the difference between inflows and outflows is therefore a loss of 2,400 AF/yr. The calculated change in storage from groundwater elevations is a storage loss of 400 AF/yr. The difference between these two estimates of storage loss is 2,000 AF/yr., which is equivalent to 2% of the average water budget (average of inflows and outflows).

In the current groundwater budget, Table 6-23 indicates that the difference between inflows and outflows is a storage loss of 65,800 AF/yr. Accounting for a reduction of 10,500 AF due to seawater intrusion, the annual storage change for the current period is -55,300 AF/yr. The calculated change in storage from groundwater elevations is a storage loss of 600 AF/yr. for the current groundwater budget. The difference between these two estimates of storage loss is 54,700 AF/yr., which is equivalent to 42% of the average water budget.

As noted in Section 6.4.1, double-counting of water used for irrigation in the SWRCB diversion data and the MCWRA groundwater pumping results in an over-estimate of the amount of water used for irrigation for the historical and current groundwater budgets. This accounts for some of the error on the water budget. This error will be removed when the SVIHM becomes available.

Table 6-22. Estimated Historical and Current Surface Water Budget Uncertainties

| | Historical Budget | Current Budget |
|---|---|---|
| Budget Average Annual Inflow (AF/yr.) | 325,500 | 184,300 |
| Budget Average Annual Outflow (AF/yr.) | 335,600 | 163,700 |
| Difference Between Inflow and Outflow (AF/yr.) | -10,100 | 20,600 |
| Difference Between Budget and Estimated (% of Outflow) | 3% | 13% |

Table 6-23. Estimated Historical and Current Groundwater Budget Uncertainties

| | Historical Budget | Current Budget |
|---|---|---|
| Budget Average Annual Inflow (AF/yr.) | 116,700 | 64,800 |
| Budget Average Annual Outflow (AF/yr.) | 129,600 | 130,600 |
| Difference Between Inflow and Outflow (AF/yr.) | -12,900 | -65,800 |
| Seawater Intrusion (AF/yr.) | -10,500 | -10,500 |
| Average Annual Change in Storage Based on Inflows and Outflows (AF/yr.) | -2,400 | -55,300 |
| Estimated Average Annual Change in Storage (AF/yr.) Based on MCWRA Water Level Measurements | -400 | -600 |
| Difference Between Budget and Estimated (AF/yr.) | -2,000 | -54,700 |
| Difference Between Budget and Estimated (% of Avg Water Budget) | -2% | -42% |

Note: although seawater intrusion is identified as an inflow to quantify the overall basin water budget, it is not considered part of the sustainable yield.

The historical groundwater budget uncertainty of 2% is relatively small. The current ground budget uncertainty of 42% is significant. These estimates will be changed and refined when the SVIHM is made available.

## 6.10 Projected Water Budget

The projected water budget is extracted from the SVIHM, incorporating projected hydrologic conditions and climate change. Two projected water budgets are presented, one incorporating estimated 2030 climate change projections and one incorporating estimated 2070 climate change projections. The projected water budget represents 47 years of future conditions including projected climate change and sea level rise. The future water budget simulations do not simulate a 47-year projected future, but rather simulate 47 likely hydrologic events that may occur in 2030, and 47 likely hydrologic events that may occur in 2070.

The climate change projections are based on the available climate change data provided by DWR (2018). Projected water budgets will be useful for showing that sustainability will be achieved in the 20-year implementation period and maintained over the 50-year planning and implementation horizon.

## 6.10.1 Assumptions Used in Projected Water Budget Development

### 6.10.1.1 General SVIHM Characteristics

The SVIHM is a numerical groundwater-surface water model that was constructed using the code MODFLOW-OWHM (Hanson, et al., 2014a). This code is a version of the USGS groundwater flow code MODFLOW that includes a focus on the agricultural supply and demand system, through the Farm Process. The model grid consists of 976 rows, 272 columns, and 9 layers, covering the Salinas Valley Groundwater Basin from the Monterey-San Luis Obispo County Line in the south to the Pajaro Valley Basin in the north, including the offshore extent of the major water supply aquifers. The model includes operations of the San Antonio and Nacimiento reservoirs that supply the Salinas Valley Groundwater Basin.

### 6.10.1.2 SVIHM Assumptions and Modifications to Simulate Future Conditions

The assumptions incorporated into the SVIHM for the projected water budget simulations include the following:

- **Land Use**: The land use is assumed to be static, aside from a semi-annual change to represent crop seasonality. The annual pattern is repeated every year in the model. Land use in the model reflects the 2014 land use, which is the most recent crop and land use data in the available model. This assumption is consistent with the GSP Regulations that state “Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand”.
- **Urban Growth**: No urban growth is included in this simulation to remain consistent with the USGS assumptions. If urban growth is infill, this assumption may result in an underestimate of net pumping increases and an underestimate of the Subbasin’s future overdraft. If urban growth replaces agricultural irrigation, the impact may be minimal.
- **Reservoir Operations**: The reservoir operations reflect the current approach to reservoir management taken by MCWRA. Therefore, the projected surface water supply reflects the current and most recent water supply information.
- **Stream Diversions**: The SVIHM explicitly simulates only two stream diversions in the Salinas Valley Groundwater Basin: Clark Colony and the SRDF. The Clark Colony

diversion is located along Arroyo Seco, and diverts water to an adjacent agricultural area. The SRDF came online in 2010, and diverts water from the Salinas River to the CSIP area. Clark Colony diversions are repeated from the historical record to match the water year. SRDF diversions are made throughout the duration of the Operational SVIHM whenever reservoir storage and streamflow conditions allow.

- **Recycled Water Deliveries**: Recycled water has been delivered to the CSIP area since 1998 as irrigation supply. The SVIHM includes recycled water deliveries throughout the duration of the model.

#### 6.10.1.2.1 Future Projected Climate Assumptions

Several modifications were made to the SVIHM in accordance with recommendations made by DWR in their *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development* (DWR, 2018). Three types of datasets were modified to account for 2030 and 2070 projected climate change: climate data, streamflow, and sea level.

***Climate Data***

DWR has provided gridded change factors for 2030 and 2070 climate conditions. These change factors are derived from the statewide gridded datasets for the Variable Infiltration Capacity (VIC) hydrologic model and are provided as monthly gridded values that can be multiplied by historical data between 1915 and 2011 to produce a dataset of climate inputs for each climate change scenario. Because the change factors are only available through December 2011 and the SVIHM uses a climate time series through December 2014, monthly change factors were estimated for January 2012 to December 2014. Historical data were analyzed from the Salinas Airport precipitation gauge record to identify years from 1968 to 2011 that were most similar to conditions in 2012, 2013 and 2014. As a result, projected climate data from 1981, 2002, and 2004 were applied as the climate inputs for 2012, 2013, and 2014, respectively.

The modified gridded monthly climate data for the entire model period were applied as inputs to the model, which reads precipitation and $ET_0$ data on a monthly basis.

***Streamflow***

DWR has provided monthly change factors for unimpaired streamflow throughout California. For the Salinas Valley Groundwater Basin and other areas outside of the Central Valley, these change factors are provided as a single time series for each major watershed. Streamflows along the margins of the Subbasin were modified by the monthly change factors. As with the climate data, an assumption was made to extend the streamflow change factor time series through December 2014. The similarity in rainfall years at the Salinas Airport rainfall gauge could reasonably be expected to produce similar amounts of streamflow; therefore, the same years of 1981, 2002, and 2004 were repeated to represent the 2012, 2013, and 2014 streamflows, respectively.

***Sea Level Rise***

DWR guidance recommends using a constant rate of sea level rise for each of the climate change scenarios (DWR, 2018). For the 2030 climate change scenario, a sea level rise value of 15 centimeters (5.9 inches) was used. For the 2070 climate change scenario, a sea level rise value of 45 centimeters (17.7 inches) was used.

### 6.10.2 Projected Water Budget Overview

Although the physical processes simulated by the SVIHM are similar to the processes discussed in the historical and current water budget discussion, the SVIHM output provides slightly different water budget components than those in the historical and current water budgets. The SVIHM includes various calculations that can produce three types of water budgets:

- Land surface water budget
- Groundwater system budget
- Surface water budget

The land surface water budget is not required by the SGMA Regulations, but it does provide important information that informs how water is managed in the Salinas Valley Groundwater Basin. Therefore, information from the land surface budget is included in this GSP. The land surface water budget was used to differentiate water budget components related to crop water use and groundwater system recharge.

The surface water budget cannot readily be extracted from the SVIHM output, and further work is necessary to develop it once the SVIHM is available. The surface water budget will be provided after the model post-processing analysis is completed as part of GSP implementation.

### 6.10.3 Land Surface Water Budget

The land surface water budget quantifies flows into and out of the land surface and root zone of agricultural areas. The components of the land surface water budget are as follows:

- Water budget inflow components into the crop/land surface:
    - Precipitation.
    - Recycled water deliveries.
    - Surface water deliveries.
    - Agricultural application of pumped groundwater.
    - Evaporation from groundwater. This is effectively a pass-through value with the evaporation entering the soil column from below and leaving the top of the soil column.

- Transpiration from groundwater. This is effectively a pass-through value with the transpiration entering the crop roots from below and leaving the crops into the atmosphere.

- Water budget outflow components out of the crop/land surface:
  - Evaporation of irrigation water.
  - Evaporation from precipitation.
  - Evaporation from groundwater. This is effectively a pass-through value with the evaporation entering the soil column from below and leaving the top of the soil column.
  - Transpiration of irrigation water.
  - Transpiration from precipitation.
  - Transpiration from groundwater. This is effectively a pass-through value with the transpiration entering the crop roots from below and leaving the crops into the atmosphere.
  - Overland runoff onto surrounding non-agricultural areas.
  - Deep percolation.
  - Surface water returns: Unused surface water deliveries that are returned to the stream system.

Land surface water budget inflow and outflow data for the 47-year future simulation period with 2030 climate change assumptions and the 2070 climate change assumptions are detailed in Table 6-24 and Table 6-25, respectively.

Table 6-24. Average Land Surface Water Budget Inflows

| Projected Climate Change Timeframe | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Precipitation | 135,700 | 141,200 |
| Recycled Water Deliveries | 4,400 | 4,400 |
| Surface Water Deliveries | 8,300 | 8,500 |
| Agricultural Pumping | 94,800 | 99,500 |
| Evaporation from Groundwater | 6,500 | 6,800 |
| Transpiration from Groundwater | 29,600 | 30,800 |
| Total Inflows | 279,300 | 291,200 |

Table 6-25. Average Land Surface Water Budget Outflows

| Projected Climate Change Timeframe | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Evaporation from Irrigation | 14,100 | 14,800 |
| Evaporation from Precipitation | 38,700 | 38,600 |
| Evaporation from Groundwater | 6,500 | 6,800 |
| Transpiration from Irrigation | 64,300 | 67,200 |
| Transpiration from Precipitation | 32,500 | 32,300 |
| Transpiration from Groundwater | 29,600 | 30,800 |
| Overland Runoff | 25,200 | 27,500 |
| Deep Percolation | 77,000 | 82,300 |
| Surface Water Returns | 500 | 400 |
| Total Outflows | 288,400 | 300,700 |

### 6.10.4 Groundwater Budget

The inflow components of the projected groundwater budget include:

- Stream leakage
- Deep percolation of precipitation and irrigation
- Inflow from the Monterey Subbasin
- Inflow from the Eastside Subbasin
- Inflow from the Langley Subbasin
- Inflow from the Forebay Subbasin
- Inflow from the Pajaro Valley

The simulated average water budget inflow components for each of the 47 years in the future simulation with 2030 and 2070 climate change projections are quantified in Table 6-26.

Table 6-26. Average Groundwater Inflow Components for Projected Climate Change Conditions

| Projected Climate Change Timeframe | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Stream leakage | 71,500 | 71,700 |
| Deep Percolation | 76,300 | 81,800 |
| Interflow in Wells | 20,400 | 20,900 |
| Inflow from Monterey Subbasin | 10,900 | 11,500 |
| Inflow from Eastside Subbasin | 9,800 | 10,400 |
| Inflow from Forebay Subbasin | 5,300 | 5,300 |
| Inflow from Langley Subbasin | 1,800 | 1,800 |
| Mountain front recharge | 2,600 | 2,700 |
| Underflow from Pajaro Valley Basin | 100 | 100 |
| Total Inflows | 198,700 | 206,200 |

The outflow components of the projected groundwater budget include:

- Total groundwater extraction including municipal, agricultural, and rural domestic pumping.
- Flow to agricultural drains.
- Stream gains from groundwater.
- Outflow to the Monterey Subbasin.
- Outflow to the Eastside Subbasin.
- Outflow to the Langley Subbasin.
- Outflow to the Forebay Subbasin.
- Outflow to the Pajaro Valley Basin.
- Outflow to Ocean.

The simulated water budget inflow components for each of the 47 years in the future simulation with 2030 and 2070 climate change projections are quantified in Table 6-27.

Table 6-27. Average Groundwater Outflow Components for Projected Climate Change Conditions

| Projected Climate Change Timeframe | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Pumping | 135,800 | 141,600 |
| Drain Flows | 7,100 | 8,000 |
| Flow to Streams | 1,800 | 1,900 |
| Groundwater ET | 35,100 | 36,700 |
| Outflow to Ocean | 800 | 700 |
| Outflow to Monterey Subbasin | 5,400 | 5,300 |
| Outflow to Eastside Subbasin | 17,000 | 16,600 |
| Outflow to Forebay Subbasin | 300 | 300 |
| Outflow to Langley Subbasin | 100 | 100 |
| Outflow to Upland Areas | 900 | 900 |
| Outflow to Pajaro | 1,000 | 1,000 |
| Total Outflows | 205,300 | 213,100 |

As with the historical and current groundwater budgets, groundwater storage change consists of both groundwater elevation changes and seawater intrusion. The total change in groundwater storage is shown in Table 6-28.

Table 6-28. Change in Groundwater Storage for Projected Groundwater Budgets

| Component | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Groundwater Elevation Change | -4,600 | -4,700 |
| Seawater Intrusion | -3,500 | -3,900 |
| Total | -8,100 | -8,600 |

#### 6.10.4.1 Groundwater Budget Summary

The total groundwater inflows and outflows, along with the model error, are shown in Table 6-29. The total in and total out flows are derived from Table 6-26 and Table 6-27. The total error and percent error are calculated as

$$Error = (Inflows + Outlfows) - Change\ in\ Storage$$

$$\%Error = \frac{Error}{\left(\frac{Inflows - Outflows}{2}\right)} x100$$

Unlike the historical and current water budgets, these water budgets have acceptably small budget uncertainty errors as a percentage of the total water budget.

Table 6-29. Total Groundwater Inflows and Outflows for Projected Groundwater Budgets

| Projected Climate Change Timeframe | 2030 (AF/yr.) | 2070 (AF/yr.) |
|---|---|---|
| Total In | 198,700 | 206,200 |
| Total Out | -205,300 | -213,100 |
| Total Change in Storage | -8,100 | -8,600 |
| Error | 1,500 | 1,700 |
| % Error | 0.74% | 0.81% |

Combining the land surface and groundwater budgets, groundwater pumping by water use sector can be summarized, as shown in Table 6-30.

Table 6-30. Projected Annual Groundwater Pumping by Water Use Sector

| Water Use Sector | 2030 Average | 2070 Average |
|---|---|---|
| Agricultural | 94,800 | 99,500 |
| Urban (total pumping minus agricultural) | 20,500 | 21,100 |
| Rural-Domestic (not simulated in model, considered minimal) | 0 | 0 |
| Total Pumping | 135,800 | 141,600 |

### 6.10.5 Projected Sustainable Yield

The projected sustainable yield is the amount of long-term pumping that can be sustained over the planning horizon once all undesirable results have been addressed. It is not the amount of pumping needed to stop undesirable results. For example, the sustainable yield calculated in this chapter assumes zero seawater intrusion, but it does not account for temporary pumping reductions that may be necessary to achieve the higher groundwater elevations that help mitigate seawater intrusion. The SVBGSA recognizes that, dependent on the success of various proposed projects and management actions, there may be a number of years when pumping might be held at a lower level to achieve necessary rises in groundwater elevation. The actual amount of allowable pumping from the Subbasin will be adjusted in the future based on the success of projects and management actions.

The projected sustainable yield for 2030 and 2070 can be calculated in a similar way to the historical sustainable yield calculated in Table 6-21. The projected sustainable yield can be estimated by summing all of the average groundwater extractions and subtracting the average seawater intrusion and the average change in storage. The projected sustainable yields are quantified in Table 6-31. The net pumping shown on this table is the total pumping in Table 6-27 less the well interflow shown in Table 6-26. Well interflow is water that flows through an inactive well from one aquifer to another. The model calculates this flow as extraction from one aquifer and injection to another aquifer, thus adding to the total extraction and total injection in the model. The extraction portion of this well interflow must be subtracted from total model extraction to calculate the correct amount of water that is pumped out of the Subbasin. This table estimates that pumping reductions of between 7.0% and 7.1% will be needed to reduce Subbasin pumping to the sustainable yield. The quantification of overdraft is the sum of seawater intrusion and change in storage.

Table 6-31 includes the estimate of historical sustainable yield for comparison purposes. However, because of the significant differences in the estimated components between the historical and projected water budgets, the projected sustainable yield should not be directly compared to the historical sustainable yield. For example, the total pumping used to calculate the historical sustainable yield is 108,100 AF/yr., while the pumping used to estimate the projected sustainable yields varies between 115,300 and 120,600 AF/yr. Additionally, the values in Table 6-31 are estimates only. The sustainable yield value will be modified and updated as more data are collected and more analyses are performed.

It is important to recall that simply reducing pumping to within the sustainable yield is not proof of sustainability, which must be demonstrated by achieving the SMC that are outlined in Chapter 8. While the sustainable yield estimates in Table 6-31 assume zero seawater intrusion, they do not account for temporary pumping reductions that may be necessary to help mitigate seawater intrusion.

Table 6-31. Projected Sustainable Yields

| | 2030 Projected Sustainable Yield | 2070 Projected Sustainable Yield | Historical Sustainable Yield |
|---|---|---|---|
| Net Pumping | 115,300 | 120,600 | 108,100 |
| Seawater Intrusion | -3,500 | -3,900 | -10,500 |
| Change in Storage | -4,600 | -4,700 | -400 |
| Projected Sustainable Yield | 107,200 | 112,000 | 97,200 |
| % Pumping Reduction | 7.0% | 7.1% | 10.0% |

### 6.10.6 Projected Surface Water Budget

A surface water budget was not available at the time of this writing because it could not be easily extracted from the SVIHM during the short time the SVIHM was available to the SVBGSA. A surface water budget will be included as soon as available.

## 6.11 Uncertainties in Projected Water Budget Simulations

As shown in Table 6-29, the calculated error in the projected water budget is acceptably small. This is in contrast to the current water budget, which had significantly larger errors due to uncertain data and less rigorous analytical methods. However, even with the small calculated error, there is inherent uncertainty involved in projecting water budgets with projected climate change based on the available scenarios and methods. The scenarios that were used to develop the projected water budgets with the SVIHM provide what might be considered the most likely future conditions; there is an approximately equal likelihood that actual future conditions will be more stressful or less stressful than those described by the recommended scenarios (DWR, 2018).

Further, as stated in DWR (2018):

> *Although it is not possible to predict future hydrology and water use with certainty, the models, data, and tools provided (by DWR) are considered current best available science and, when used appropriately should provide GSAs with a reasonable point of reference for future planning.*
>
> *All models have limitations in their interpretation of the physical system and the types of data inputs used and outputs generated, as well as the interpretation of outputs. The climate models used to generate the climate and hydrologic data for use in water budget development were recommended by the DWR Climate Change Technical Advisory Group (CCTAG) for their applicability to California water resources planning (DWR, 2018).*

Finally, there is also inherent uncertainty in groundwater flow modeling itself, since mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute data. As stated by DWR (2018):

> *Models are inherently inexact because the mathematical depiction of the physical system is imperfect, and the understanding of interrelated physical processes incomplete. However, mathematical (or numerical) models are powerful tools that, when used carefully, can provide useful insight into the processes of the physical system.*

# 7 MONITORING NETWORKS

This chapter describes the monitoring networks that will be used to monitor the sustainable management criteria (SMCs) for the 180/400-Foot Aquifer Subbasin. The SMCs are described in Chapter 8 and are established based on the monitoring networks described herein. This description of the monitoring network has been prepared in accordance with the GSP Regulations §354.32 to include monitoring objectives, monitoring protocols, and data reporting requirements.

## 7.1 Introduction

### 7.1.1 Monitoring Objectives

SGMA requires monitoring networks be developed to promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.
- Demonstrate progress toward achieving measurable objectives.
- Monitor impacts to the beneficial uses or users of groundwater.
- Quantify annual changes in water budget components.

The measurable objectives and minimum thresholds monitored by the networks are described in Chapter 8.

### 7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the six sustainability indicators that are relevant to the GSP area:

- Chronic lowering of groundwater levels
- Reduction in groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

In accordance with GSP Regulations, the monitoring networks presented in this chapter are primarily based on existing monitoring sites. The monitoring networks are limited to data points and locations that are publicly available and not confidential.

The SVBGSA determined the density of monitoring sites and frequency of measurements required in order to demonstrate short-term, seasonal, and long-term trends. These trends are also based on the amount of current and projected groundwater use, aquifer characteristics and other physical characteristics that affect groundwater flow, impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production (including adjacent subbasins that could affect the ability of the subbasin to meet the sustainability goal), and the adequacy of long-term existing monitoring results.

For some sustainability indicators, it is necessary to expand the existing monitoring systems. Data gaps are identified for each monitoring system; filling these data gaps and developing more extensive and complete monitoring systems will improve the SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. Chapter 10 provides a plan and schedule for data gap resolution. The SVBGSA will review the monitoring network in each 5-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin.

### 7.1.3 Management Areas

The regulations require that if management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the Subbasin setting and sustainable management criteria specific to that area. At this time, management areas have not been defined for the 180/400-Foot Aquifer Subbasin.

## 7.2 Groundwater Elevation Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by monitoring groundwater elevations in designated monitoring wells. The regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

### 7.2.1 Relevance of CASGEM Program

In November 2009, the State amended the Water Code to mandate statewide groundwater elevation monitoring through collaboration between local agencies and the Department of Water Resources (DWR). In response, DWR created the California Statewide Groundwater Elevation Monitoring (CASGEM) program wherein local agencies upload available water elevation data and DWR maintains the database in a format that is readily and widely available to the public.

The goal of the CASGEM program is to collect and store groundwater elevation data such that current and future groundwater management programs can draw upon the data to assess seasonal and long-term trends in local groundwater conditions.

The CASGEM program was therefore specifically intended to serve the purpose that is now required of the groundwater elevation monitoring network under SGMA. A CASGEM network has already been established by MCWRA for the 180/400-Foot Aquifer Subbasin (MCWRA, 2015b) This GSP will base its network for monitoring chronic lowering of groundwater elevations on the existing CASGEM network. After incorporating the CASGEM network into the GSP groundwater elevation monitoring network, no future CASGEM reporting will be necessary. All groundwater elevation data will continue to be collected by MCWRA for consistency with previous CASGEM efforts and will be reported to DWR through the monitoring module of the SGMA GSP upload tool.

### 7.2.2 Current CASGEM Network

The current CASGEM monitoring network consists of 23 wells with publicly available data within the 180/400-Foot Aquifer Subbasin. The CASGEM monitoring network was created to ensure adequate understanding of aquifer response. As a voluntary program, MCWRA based the CASGEM network on wells that were owned and monitored by MCWRA prior to initiation of the CASGEM program.

Table 7-1 summarizes the distribution of CASGEM wells by aquifer designation.

Table 7-1. CASGEM Well Network – Summary of Wells by Aquifer

| Aquifer Designation | Number of Wells in Network |
|---|---|
| 180-Foot Aquifer | 12 |
| 400-Foot Aquifer | 10 |
| Deep | 1 |

The wells in the water level monitoring network are listed in Table 7-2 and shown by aquifer depth on Figure 7-1, Figure 7-2, and Figure 7-3. The distribution of wells in the existing network and the need for additional wells is discussed below in Section 7.2.4. Appendix 7A presents well construction information and historical hydrographs for each CASGEM well.

Table 7-2. Existing 180/400-Foot Aquifer CASGEM Well Network

| State Well Number | CASGEM Well Number | Local Well Designation | Well Use | Total Well Depth | Latitude (NAD 83) | Longitude (NAD 83) | Period of Record (years) |
|---|---|---|---|---|---|---|---|
| **180-Foot Aquifer** | | | | | | | |
| **14S02E03F004M** | 367454N1217393W001 | ESPA22636 | Observation | 205 | 36.74539 | -121.739313 | 14.7 |
| **13S02E21Q001M** | 367816N1217514W001 | SELA22633 | Observation | 157 | 36.781644 | -121.751387 | 12.7 |
| **14S02E27A001M** | 366933N1217294W001 | MCFD22632 | Observation | 293 | 36.693296 | -121.729435 | 13.0 |
| **14S03E30G008M** | 366869N1216785W001 | MKTC22650 | Observation | 293 | 36.68688 | -121.678517 | 14.7 |
| **14S02E26H001M** | 366889N1217079W001 | AMST22651 | Observation | 339 | 36.688875 | -121.707934 | 13.0 |
| **16S04E08H004M** | 365550N1215466W001 | CHEA21208 | Observation | 140 | 36.555022 | -121.546557 | 13.0 |
| **17S05E06C002M** | 364883N1214684W001 | GZWA21202 | Observation | 115 | 36.488323 | -121.468395 | 12.7 |
| **14S03E18C001M** | 367207N1216806W001 | BORA15009 | Observation | 225 | 36.720721 | -121.680556 | 13.0 |
| **14S02E12B002M** | 367343N1216958W001 | RODA14455 | Observation | 265 | 36.734316 | -121.69585 | 13.0 |
| **15S03E16M001M** | 366250N1216532W001 | 1359 | Irrigation | Confidential | 36.624978 | -121.653213 | 3.4 |
| **16S04E15D001M** | 365444N1215220W001 | BRME10389 | Unknown | 384 | 36.544406 | -121.522009 | 4.4 |
| **15S03E17M001M** | 366265N1216692W001 | 1480 | Irrigation | 271 | 36.62654 | -121.669184 | 3.4 |
| **400-Foot Aquifer** | | | | | | | |
| **14S02E12Q001M** | 367221N1216965W001 | 1707 | Residential | 619 | 36.722108 | -121.696473 | 3.4 |
| **14S02E08M002M** | 367275N1217803W001 | 239 | Irrigation | 500 | 36.727523 | -121.78025 | 3.4 |
| **14S02E12B003M** | 367343N1216959W001 | RODB14456 | Observation | 390 | 36.734282 | -121.695864 | 15.0 |
| **17S05E06C001M** | 364883N1214684W002 | GZWB21201 | Observation | 300 | 36.488323 | -121.468404 | 13.0 |
| **14S02E03F003M** | 367455N1217395W001 | ESPB22635 | Observation | 455 | 36.74548 | -121.739492 | 14.7 |
| **13S02E32A002M** | 367653N1217636W001 | 10161 | Irrigation | 600 | 36.765339 | -121.763589 | 3.4 |
| **14S03E18C002M** | 367207N1216805W001 | BORB15010 | Observation | 395 | 36.720735 | -121.680531 | 14.7 |
| **15S03E16F002M** | 366292N1216474W001 | 1862 | Irrigation | 592 | 36.629202 | -121.647449 | 3.4 |
| **13S02E21N001M** | 367847N1217618W001 | 2432 | Irrigation | 550 | 36.784731 | -121.761804 | 3.4 |
| **16S04E08H003M** | 365550N1215465W001 | CHEB21205 | Observation | 295 | 36.555032 | -121.546545 | 10.7 |
| **Deep Aquifers** | | | | | | | |
| **13S02E19Q003M** | 367808N1217847W001 | 75 | Irrigation | 1562 | 36.780798 | -121.784687 | 3.4 |

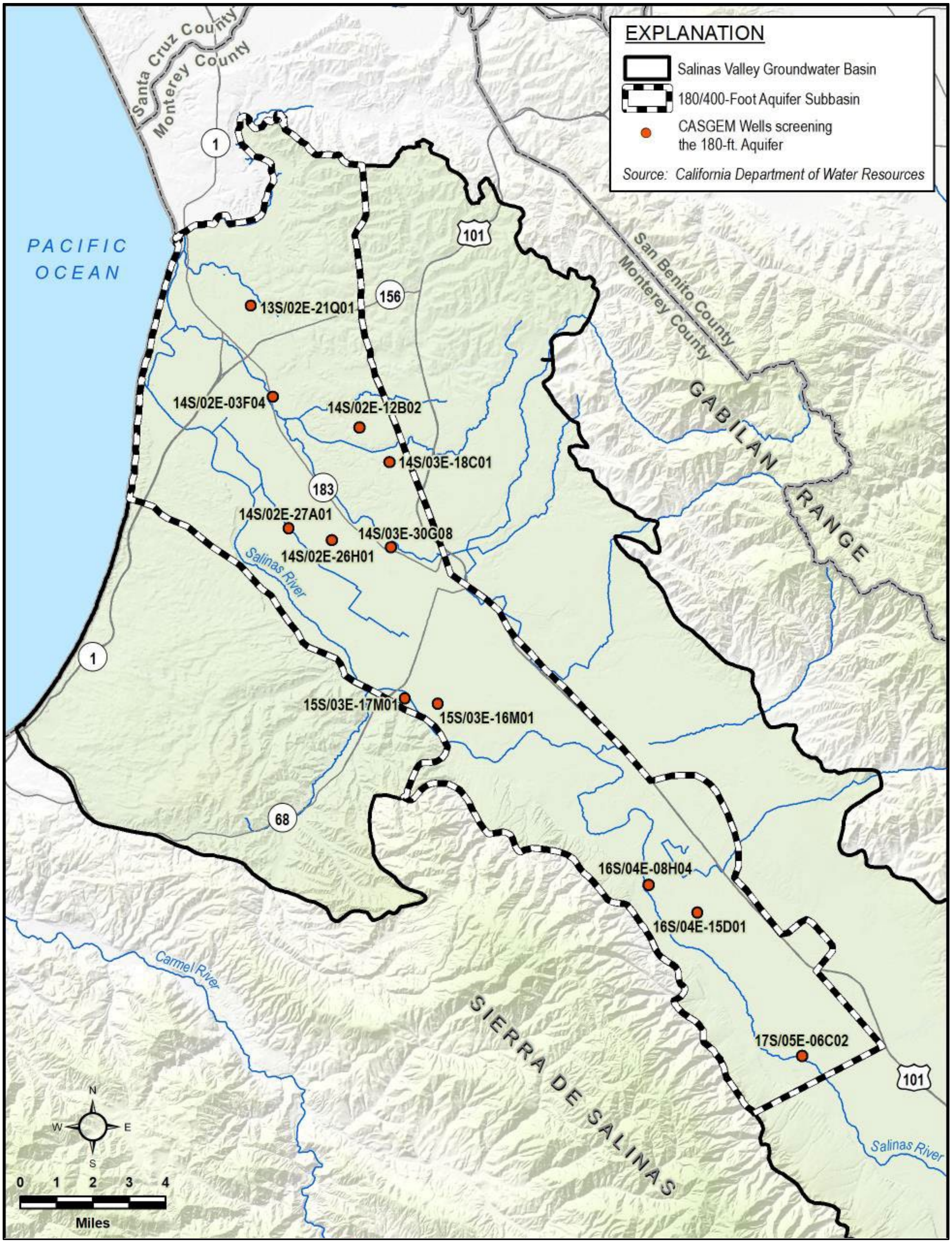



Figure 7-1. Current 180-Foot Aquifer CASGEM Monitoring Network for Water Levels

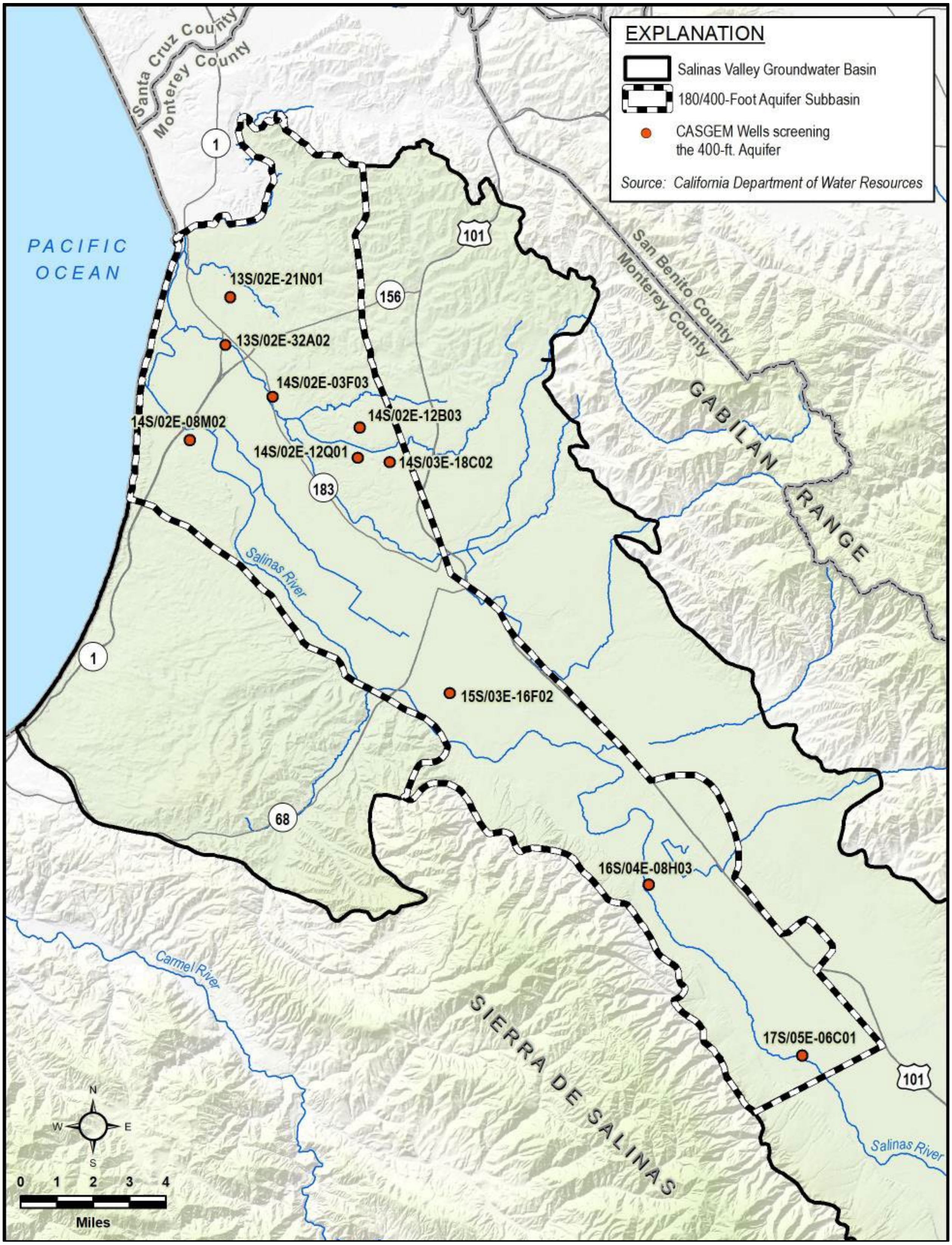


Figure 7-2. Current 400-Foot Aquifer CASGEM Monitoring Network for Water Levels

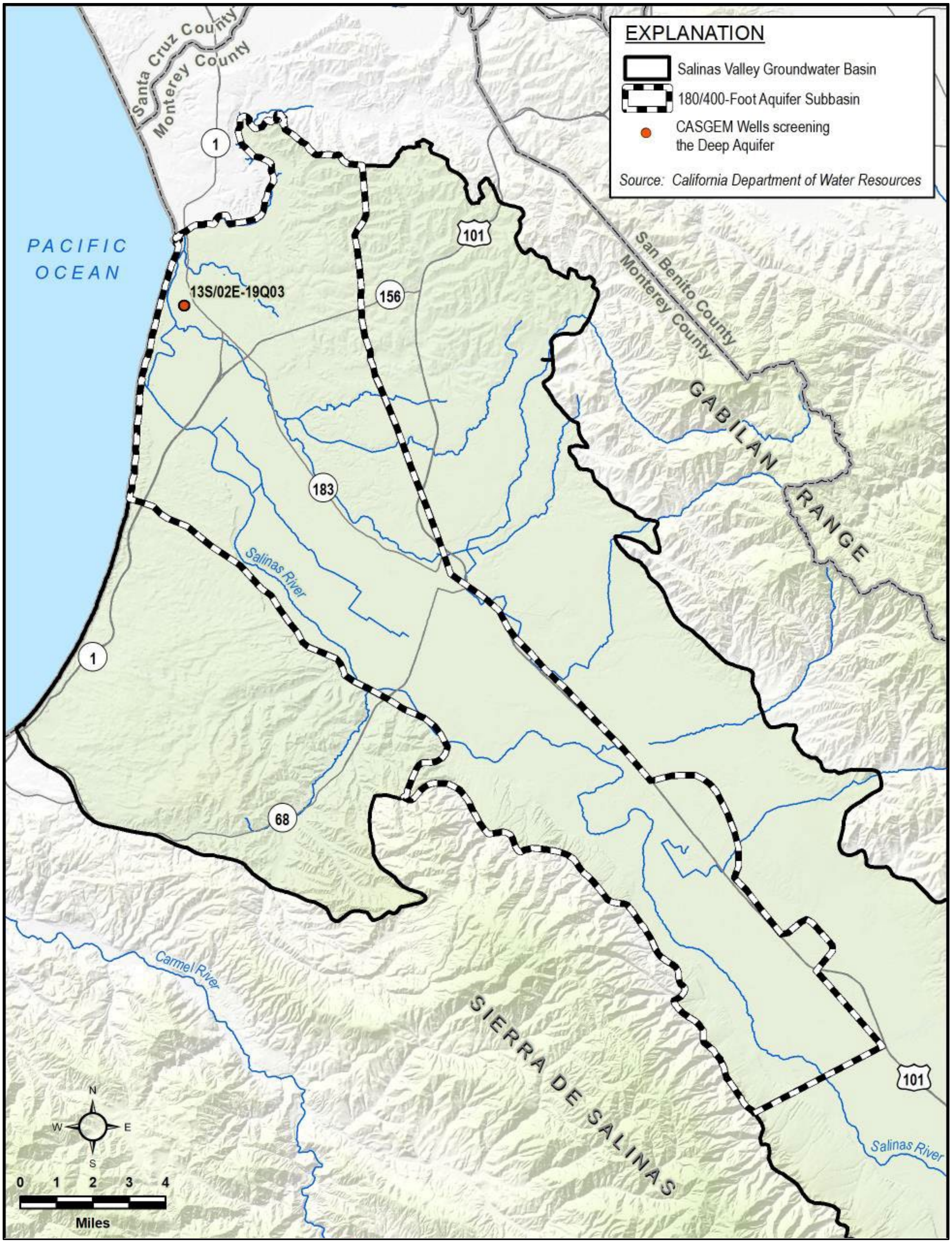



Figure 7-3. Current Deep Aquifers CASGEM Monitoring Network for Water Levels

### 7.2.3 Groundwater Elevation Monitoring Protocols

Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of the monitoring procedures (MCWRA, 2015b). The CASGEM groundwater elevation monitoring protocols established by MCWRA are adopted by this GSP for groundwater elevation monitoring. The monitoring protocols are included in Appendix 7B. Groundwater elevation measurements will be collected at least two times per year to represent seasonal low and seasonal high groundwater conditions, as described in Appendix 7B. Groundwater elevation data are currently collected both by hand and using automated pressure transducers. The monitoring protocols established by MCWRA cover multiple monitoring methods for collection of data by hand and by automated pressure transducers. These protocols are consistent with data and reporting standards described in SGMA Regulation §352.4.

### 7.2.4 Groundwater Elevation Monitoring Network Data Gaps

Based on the SGMA regulations and the BMPs published by DWR on monitoring networks (DWR, 2016b), a visual analysis of the existing monitoring network was performed using professional judgment to evaluate whether there are data gaps in the groundwater elevation monitoring network.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins and Anderson, 2016) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgement should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The 180/400-Foot Aquifer Subbasin encompasses 132 square miles. If the BMP guidance recommendations are applied to the three aquifers in the Subbasin, the well network should include between 1 and 13 wells in each of the 180-Foot, 400-Foot, and Deep Aquifers. The current network includes 12 wells in the 180-Foot aquifer, 10 wells in the 400-Foot aquifer, and 1 well in the Deep Aquifers. The CASGEM wells in the 180-Foot, 400-Foot, and Deep Aquifers therefore fall within the range of the BMP guidance. However, visual inspection of the geographic distribution of the well network indicates that additional wells are necessary to adequately characterize the Subbasin. A higher density of monitoring wells may also be recommended in areas of potential subsidence, groundwater withdrawal, and seawater intrusion.

Figure 7-4 through Figure 7-6 show the locations of existing groundwater elevation monitoring wells and the generalized locations of proposed monitoring wells for the 180-Foot, 400-Foot, and Deep Aquifers. The generalized locations for new wells were based on addressing the criteria listed in the monitoring BMP including:

- Monitoring every principal aquifer

- Providing adequate data to produce seasonal potentiometric maps
- Providing adequate data to map groundwater depressions and recharge areas
- Providing adequate data to estimate change in groundwater storage
- Demonstrating conditions at Subbasin boundaries

The data gap areas shown for each aquifer on Figure 7-4, Figure 7-5, and Figure 7-6 will be addressed in the future by either identifying an existing well in each area that meets the criteria for a valid monitoring well, or drilling a new well in each area, as further described in Chapter 10. Some of the data gaps in the Deep Aquifers will likely be filled in response to Monterey County Urgency Ordinance 5302. This ordinance, adopted in 2018, limits the number of wells that can be drilled into the Deep Aquifers and requires that all new wells in the Deep Aquifers meter groundwater extractions, monitor groundwater elevations and quality, and submit all data to MCWRA and SVBGSA.

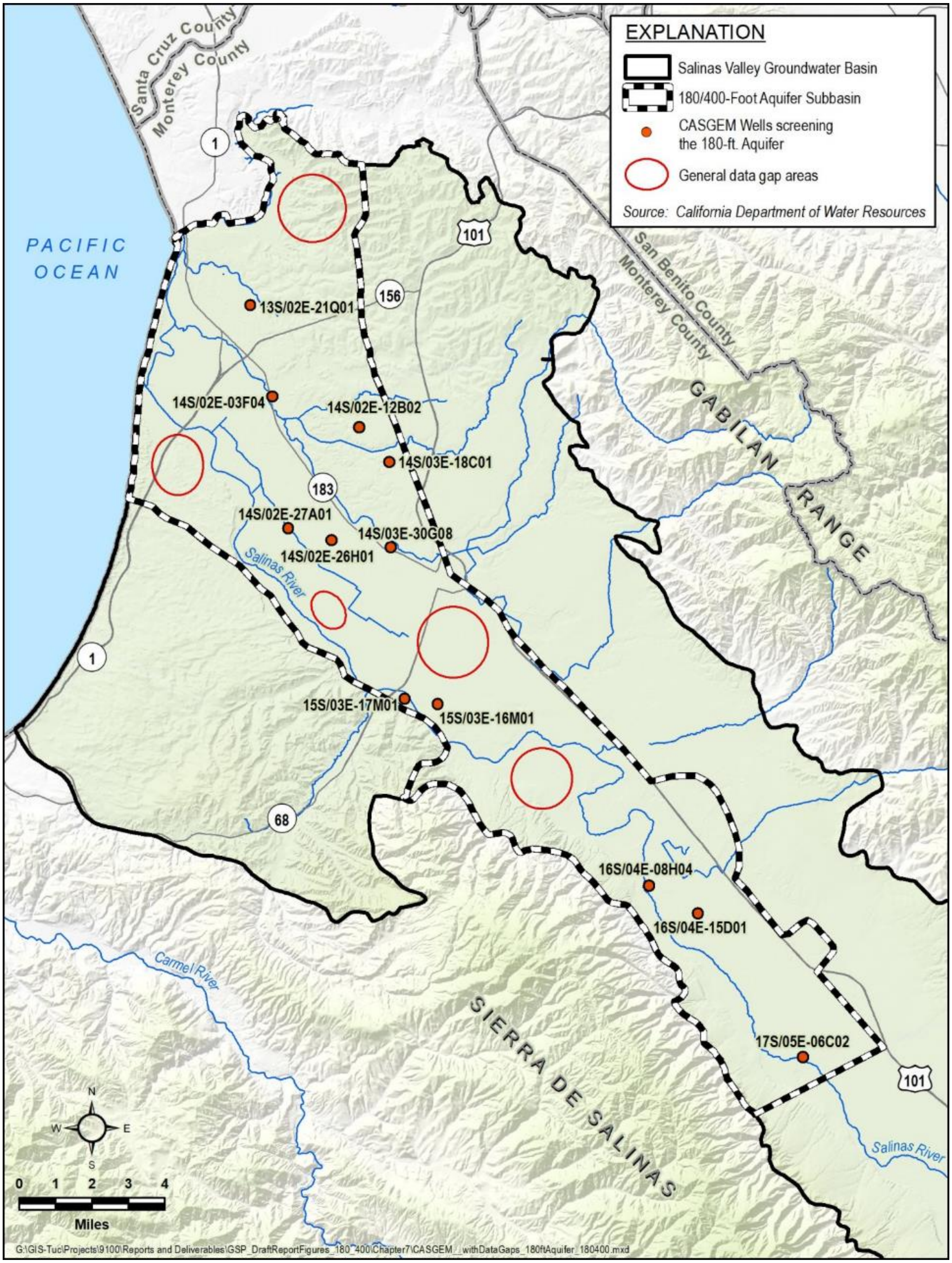


Figure 7-4. Proposed Locations for Additional Groundwater Elevation Monitoring Wells in the 180 Foot Aquifer

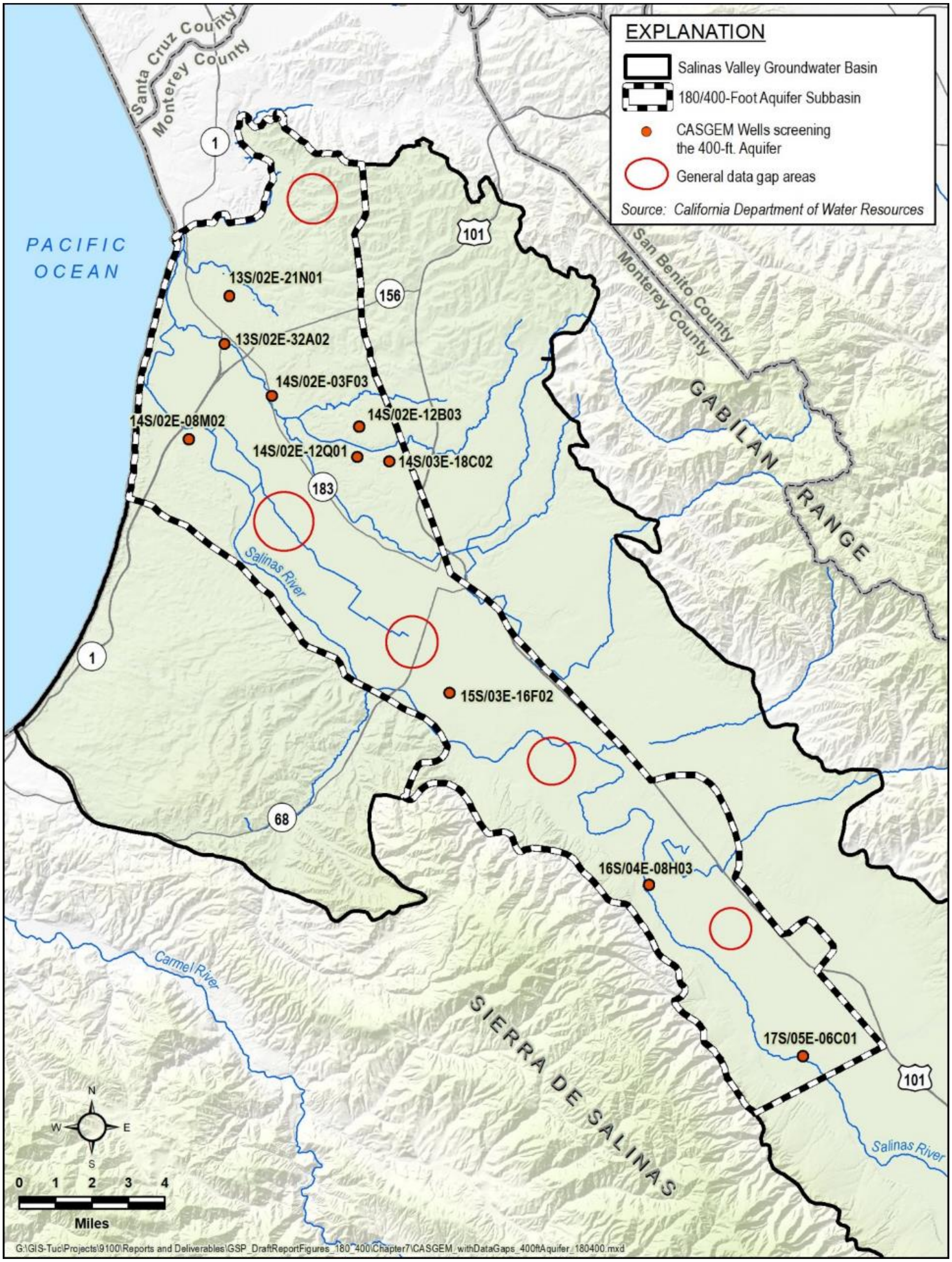


Figure 7-5. Proposed Locations for Additional Groundwater Elevation Monitoring Wells in the 400 Foot Aquifer

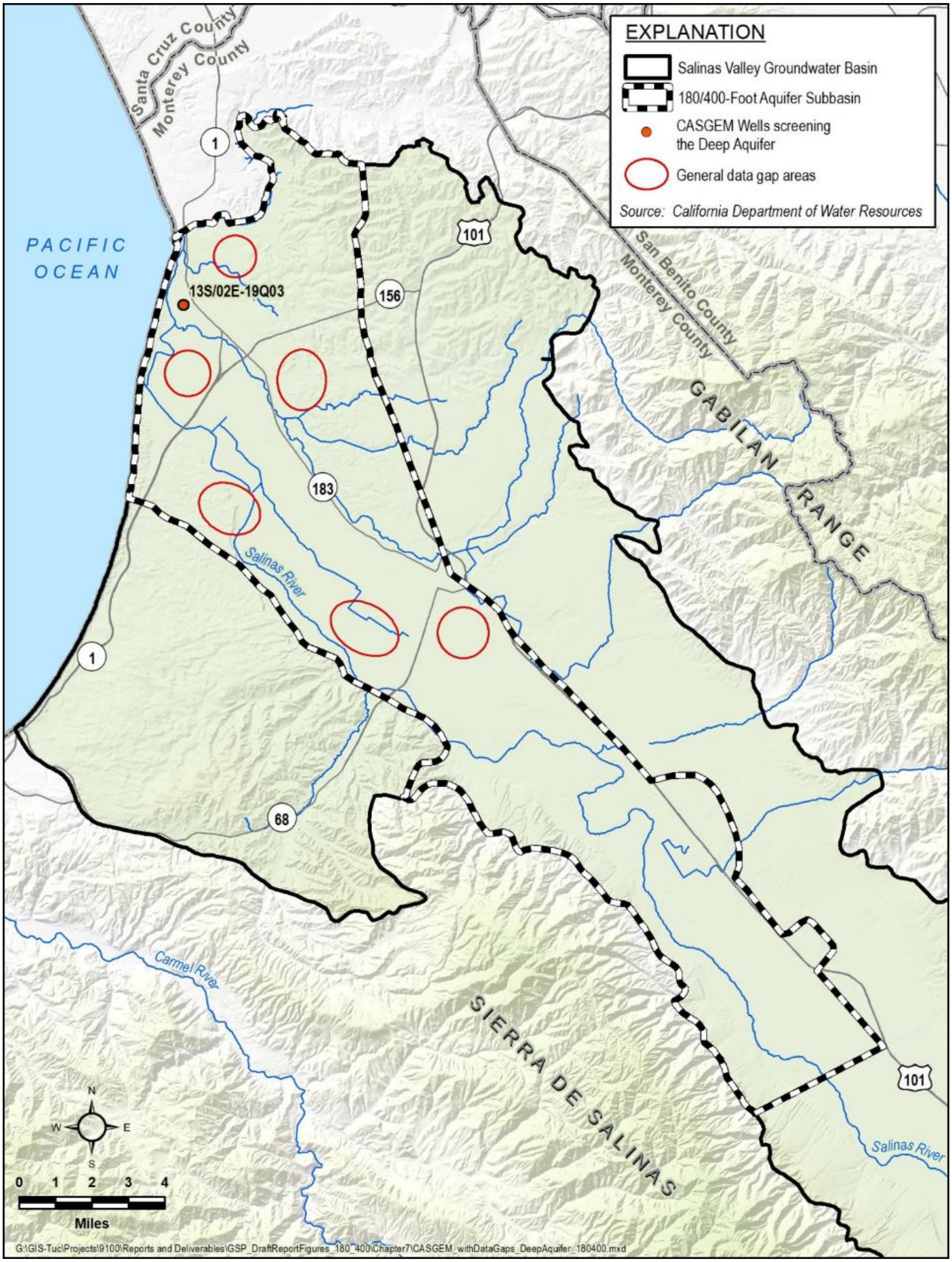



Figure 7-6. Proposed Locations for Additional Groundwater Elevation Monitoring Wells in the Deep Aquifers

## 7.3 Groundwater Storage Monitoring Network

In accordance with the change in groundwater storage minimum thresholds, the sustainability indicator for reduction of groundwater in storage is an amount of annual groundwater pumping. The total amount of groundwater withdrawn from the basin will be measured in a number of ways:

- Municipal groundwater users and small water systems, defined as systems with at least 15 connections or serving at least 25 people, are required to measure their groundwater usage and report it to the State of California. These data are available on the State's Drinking Water Information Clearinghouse website. These data will be used to quantify municipal and small system pumping.
- Agricultural pumping will be collected in one of two ways:
  - Most agricultural pumpers comply with the existing Monterey County Water Resources Agency Ordinance 3717 that requires groundwater users to report total pumping rates annually to the MCWRA. Groundwater wells with a discharge pipe less than 3 inches in diameter are exempt from this requirement. These lower production wells will be accounted for separately. SVBGSA will work with MCWRA to obtain the Ordinance 3717 data through a coordinated reporting program such that wells owners can provide a single annual reporting to fulfill the requirements of both the GSP and the existing County ordinance 3717.
  - For agricultural users that do not report their pumping annually, pumping will be estimated using Monterey County crop data and crop duty estimates, times a multiplier. The crop duty and multipliers are a data gap as described in Section 7.3.1.
- Domestic pumping, including water systems small enough to not require reporting to the State, will be estimated by multiplying the estimated number of domestic users by a water use factor. The initial water use factor will be 0.39 AF/yr./dwelling unit. The 0.39 AF/yr./dwelling unit is consistent with the value used in the historical and current water budgets in Chapter 6. This factor may be revised in the future if SVBGSA obtains information to justify a change.

The density of monitoring sites and frequency of measurements required from these sources will enable the agency to demonstrate short-term, seasonal, and long-term trends.

### 7.3.1 Groundwater Storage Monitoring Protocols

Groundwater storage monitoring will be accomplished through the use of existing monitoring programs performed by other agencies. For municipal groundwater users and small water systems, SVBGSA will download data directly from the State's Drinking Water Information Clearinghouse website. No other protocols are required.

For agricultural groundwater users, SVBGSA will work with MCWRA to develop a protocol for sharing data that is currently reported under County Ordinance 3717. SVBGSA will consider the value of developing protocols for flowmeter calibration. These protocols are consistent with data and reporting standards described in SGMA Regulation §352.4.

### 7.3.2 Groundwater Storage Monitoring Data Gaps

Accurate assessment of the amount of pumping requires an accurate count of the number of municipal, agricultural, and domestic wells in the GSP area. During implementation, the SVBGSA will finalize a database of existing and active groundwater wells in the 180/400-Foot Aquifer Subbasin. This database will draw from the existing MCWRA database, DWR's OWSCR database, and the Monterey County Health Department database of small water systems. As part of the assessment, the SVBGSA will verify well completion information and location, and whether the well is active, abandoned, or destroyed.

A potential data gap is the accuracy and reliability of reported groundwater pumping. SVBGSA will work with MCWRA to evaluate methods currently in place to assure data reliability. Based on the results of that evaluation, the protocols for monitoring may be revised and a protocol for well meter calibration may be developed. In addition, crop data and crop duty multipliers for estimating unreported pumping must be developed in areas where agricultural groundwater pumping is not reported. These crop duty multipliers will be used to estimate groundwater pumping, based on crop type and acreage.

## 7.4 Seawater Intrusion Monitoring Network

The sustainability indicator for Seawater Intrusion is evaluated using the location of a chloride isocontour, based on chloride concentration measured at an existing network of monitoring wells. MCWRA currently develops biennial maps of the 500 mg/L chloride isocontour (Figures 5-7a and 5-7b). However, those maps are based in part on confidential information obtained from private wells. The seawater intrusion monitoring network will include only wells where the data can be made publicly available.

Tables 7-3 and 7-4 list the wells currently used by MCWRA to monitor seawater intrusion. Figure 7-7 and Figure 7-8 show the locations of these wells in the 180-Foot and 400-Foot Aquifers. There is currently no seawater intrusion mapping in the Deep Aquifers. This is a data gap that is addressed below.

Table 7-3. MCWRA Seawater Intrusion Network with Publicly Available Data

| Aquifer Designation | Number of Wells in Network |
|---|---|
| **180-Foot Aquifer** | 17 |
| **400-Foot Aquifer** | 31 |
| **Deep** | 0 |

Table 7-4. 180/400-Foot Aquifer Seawater Intrusion Well Network

| State Well Number | Total Well Depth | Latitude (NAD 83) | Longitude (NAD 83) |
|---|---|---|---|
| **180-Foot Aquifer** | | | |
| **13S/02E-21Q01** | 205 | 36.79763 | -121.7288605 |
| **14S/01E-24L02** | 157.4 | 36.7816493 | -121.7514003 |
| **14S/01E-24L03** | 205 | 36.7453955 | -121.7393269 |
| **14S/01E-24L04** | 250 | 36.737132 | -121.7098186 |
| **14S/01E-24L05** | 100 | 36.7371266 | -121.7097372 |
| **14S/02E-03F03** | 265 | 36.7343205 | -121.6958626 |
| **14S/02E-11A02** | 280 | 36.7156293 | -121.6980266 |
| **14S/02E-11A03** | 339.3 | 36.6888803 | -121.7079471 |
| **14S/02E-11A04** | 292.7 | 36.6933013 | -121.729448 |
| **14S/02E-12B02** | 225 | 36.7207266 | -121.6805693 |
| **14S/02E-12B03** | 260 | 36.7183481 | -121.6865932 |
| **14S/02E-13F02** | 293 | 36.6868846 | -121.6785298 |
| **14S/02E-13F03** | 130 | 36.5551669 | -121.5474146 |
| **14S/02E-26H01** | 140 | 36.5550273 | -121.5465705 |
| **14S/02E-27A01** | 115 | 36.4891675 | -121.4676728 |
| **14S/03E-18C01** | Unknown | 36.4883286 | -121.4684084 |
| **14S/03E-18C02** | 205 | 36.79763 | -121.7288605 |
| **400-Foot Aquifer** | | | |
| **13S/02E-15R02** | 585 | 36.7976336 | -121.7288114 |
| **14S/02E-01C01** | 591 | 36.7505714 | -121.6975633 |
| **14S/02E-02A02** | 810 | 36.7513598 | -121.70755 |
| **14S/02E-02C03** | 835 | 36.7499731 | -121.7192889 |
| **14S/02E-03F03** | 455 | 36.7454852 | -121.7395058 |
| **14S/02E-03H01** | 800 | 36.7465666 | -121.7288185 |
| **14S/02E-03R02** | 638 | 36.7400975 | -121.7277911 |
| **14S/02E-04G02** | 620 | 36.746502 | -121.7493753 |
| **14S/02E-09D04** | 610 | 36.7364032 | -121.7600966 |
| **14S/02E-09K02** | 610 | 36.7287081 | -121.7515143 |
| **14S/02E-10E02** | 717 | 36.7305044 | -121.7426612 |
| **14S/02E-10H01** | 640 | 36.7314208 | -121.7309841 |
| **14S/02E-11A04** | 490 | 36.7371694 | -121.7098984 |
| **14S/02E-11B01** | 822 | 36.7360994 | -121.7142361 |

| State Well Number | Total Well Depth | Latitude (NAD 83) | Longitude (NAD 83) |
|---|---|---|---|
| **14S/02E-11M03** | 660 | 36.7275465 | -121.7207546 |
| **14S/02E-12B03** | 390 | 36.7342872 | -121.6958768 |
| **14S/02E-13F02** | 480 | 36.7156078 | -121.6980344 |
| **14S/02E-14A01** | 532 | 36.7193809 | -121.7105053 |
| **14S/02E-14L03** | 612 | 36.7142507 | -121.7197337 |
| **14S/02E-15A01** | 623 | 36.7211569 | -121.7296572 |
| **14S/02E-15C02** | 550 | 36.7216387 | -121.7378289 |
| **14S/02E-16G01** | 610 | 36.7179115 | -121.7493994 |
| **14S/02E-22B01** | 670 | 36.7076668 | -121.7318719 |
| **14S/02E-22L01** | 680 | 36.7013362 | -121.7359514 |
| **14S/03E-18C02** | 395 | 36.7207409 | -121.6805442 |
| **14S/03E-18E04** | 495 | 36.7183349 | -121.6865671 |
| **16S/04E-08H02** | 295 | 36.5551431 | -121.547419 |
| **16S/04E-08H03** | 295 | 36.5550375 | -121.5465589 |
| **16S/05E-31P01** | 300 | 36.4891598 | -121.4676964 |
| **17S/05E-06C01** | Unknown | 36.4883278 | -121.4684169 |
| **13S/02E-15R02** | 585 | 36.7976336 | -121.7288114 |

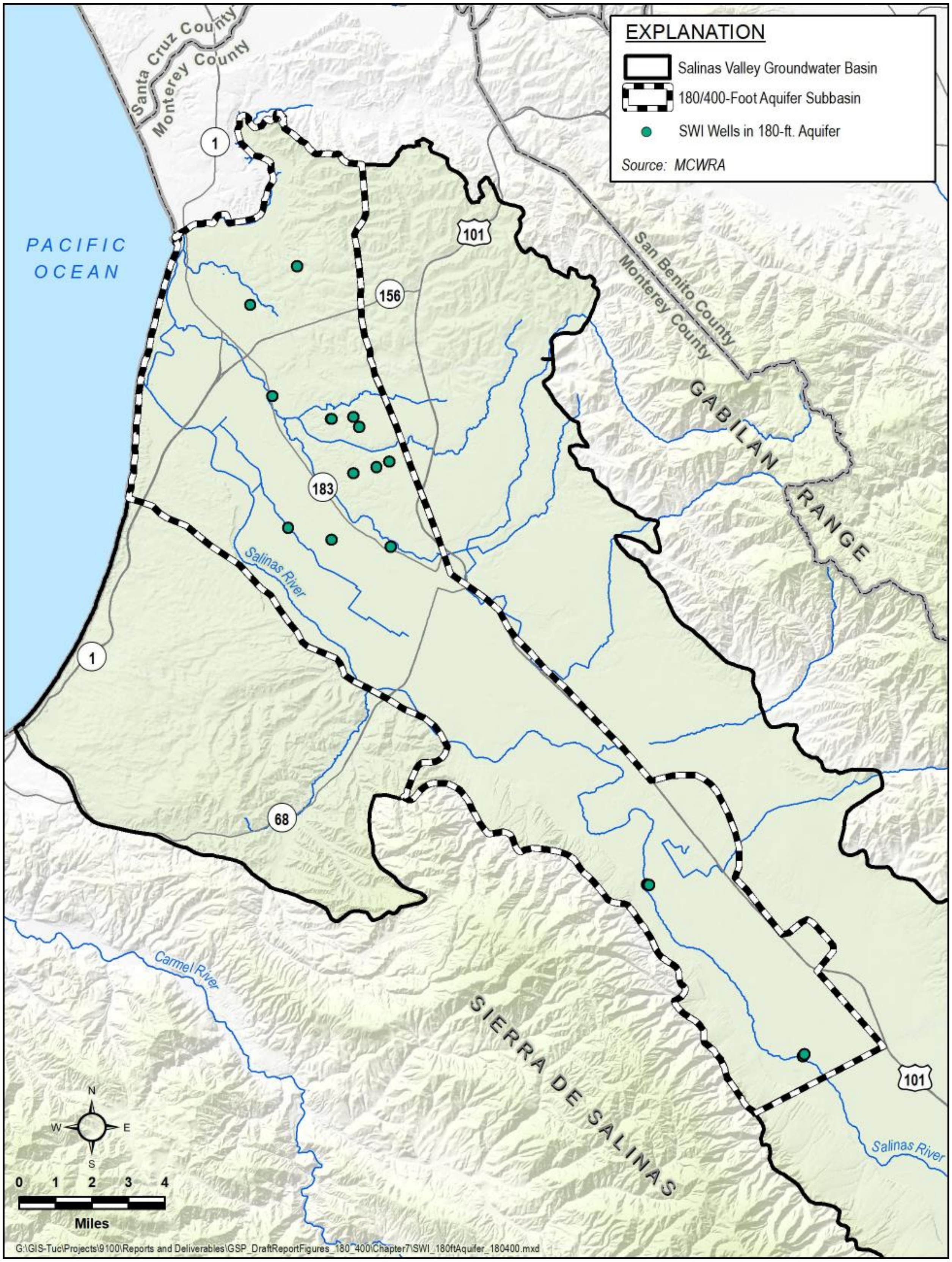



Figure 7-7. 180-Foot Aquifer Monitoring Network for Seawater Intrusion

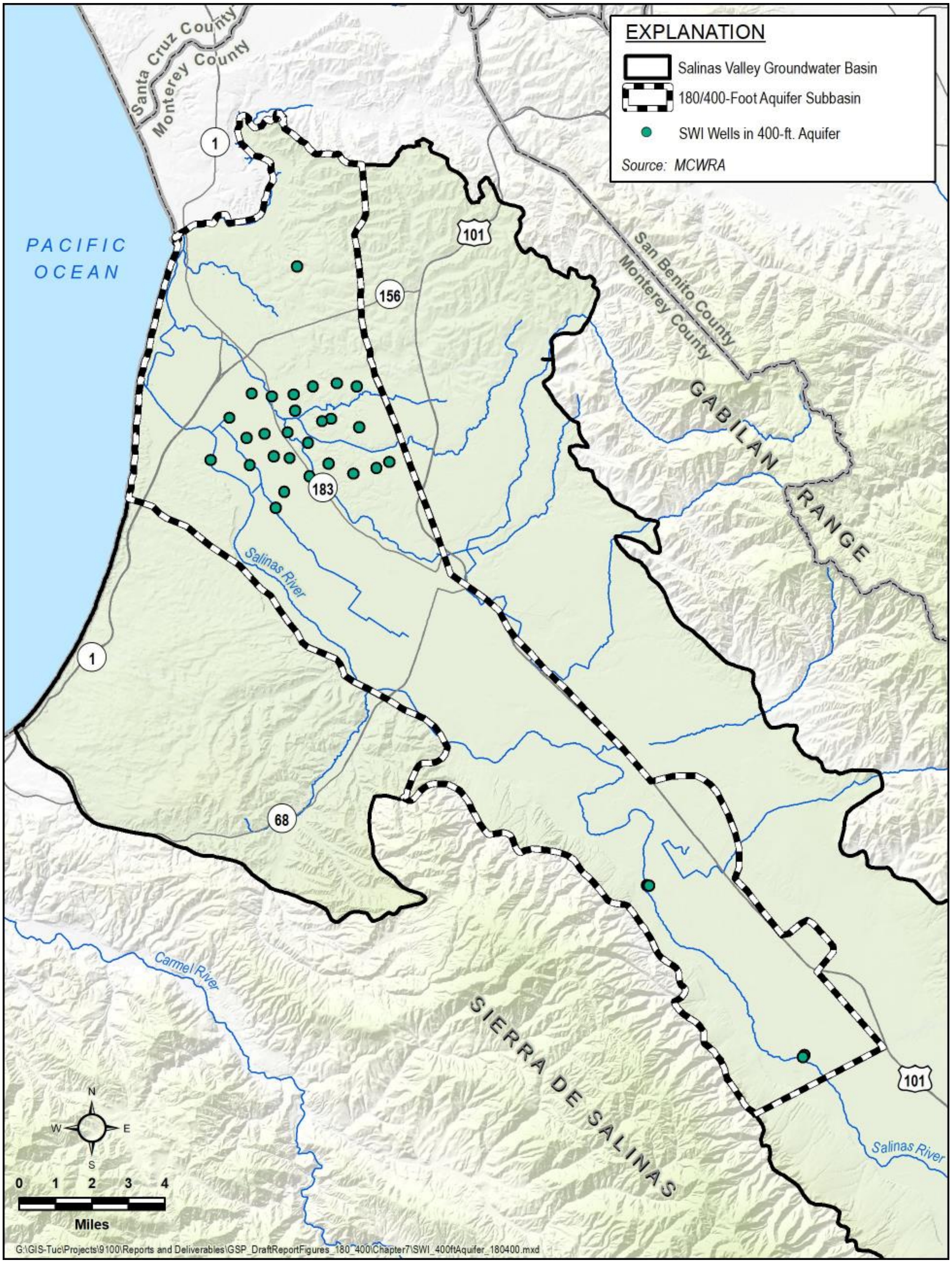


Figure 7-8. 400-Foot Aquifer Monitoring Network for Seawater Intrusion

### 7.4.1 Seawater Intrusion Monitoring Protocols

Seawater intrusion monitoring has been on-going activity since the MCWRA formed in 1947. The protocols established by MCWRA for collecting groundwater quality data from monitoring wells and analyzing those data for seawater intrusion are adopted by this GSP. The groundwater quality data monitoring protocols are available in the Monterey County Quality Assurance Project Plan (QAPP) and included in Appendix 7C. MCWRA also established chloride data contouring protocols to establish the isocontour map, provided in Appendix 7D. These protocols are consistent with data and reporting standards described in SGMA Regulation §352.4.

### 7.4.2 Seawater Intrusion Monitoring Data Gaps

The network of wells with publicly available data for monitoring chloride concentrations includes an adequate number and distribution of wells in the 180-Foot and the 400-Foot Aquifers (Figure 7-7 and Figure 7-8). However, the distribution of wells in the Deep Aquifers is inadequate and considered a data gap. As described in Section 7.2, additional wells will be identified in the Deep Aquifers for water level monitoring. The data gap for seawater intrusion monitoring in the Deep Aquifers will be addressed by using the same set of new monitoring wells identified in the water level monitoring network.

Some of the data gaps in the Deep Aquifers will likely be filled in response to Monterey County Urgency Ordinance 5302. This ordinance, adopted in 2018, limits the number of wells that can be drilled into the Deep Aquifers and requires that all new wells in the Deep Aquifers meter groundwater extractions, monitor groundwater elevations and quality, and submit all data to MCWRA and SVBGSA.

## 7.5 Water Quality Monitoring Network

The sustainability indicator for Degraded Water Quality is evaluated by monitoring groundwater quality at a network of existing water supply wells. The regulations require sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators to address known water quality issues.

As described in Chapter 8, separate minimum thresholds are set for agricultural constituents of concern and public supply well constituents of concern. Therefore, although there is a single groundwater quality monitoring network, different wells in the network will be reviewed for different constituents. Constituents of concern for drinking water will be assessed at public water supply wells and on-farm domestic wells. Constituents of concern for crop health will be assessed at agricultural supply wells.

The municipal public water system supply wells included in the monitoring network were identified by reviewing data from the State Water Resources Control Board (SWRCB) Division of Drinking Water. This is the same as the Public Water Systems category in the Safe Drinking

Water Plan for California. It includes municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. Wells were selected that had at least one of the constituents of concern reported from 2015 or more recently, and totaled 51 wells (Burton and Wright, 2018). These wells are listed in Appendix 7E and shown on Figure 7-9.

Small public water systems wells, regulated by Monterey County Department of Public Health, will eventually add another136 wells to the monitoring network. These include both state small water systems that serve 5-14 connections and local water systems that serve 2-4 service connections. The limitation of this dataset is that the well location coordinates and construction information are currently missing; this is a data gap. SVBGSA work with the County to fill this data gap. When location and well construction data become available, these wells will be added to the monitoring network and included in Appendix 7E and Figure 7-9.

The domestic wells and agricultural supply wells included in the monitoring network will be a subset of those that have been sampled through the ILRP by the CCGC. The CCGC has conducted groundwater monitoring under the ILRP since 2013, sampling more than 1,200 domestic and irrigation supply wells on Coalition member ranches within the agricultural region (CCGC, 2017).

In 2017, Ag. Order 3.0 was issued and provides a "temporary 3-year order, in anticipation of a comprehensive order anticipated for adoption in 2020". Under the anticipated 2020 Ag. Order 4.0, a long-term groundwater quality monitoring program will be put in place. The SVBGSA will use the data developed under this monitoring program to determine if domestic on-farm supply wells have constituents of concern above drinking water limits. In addition, the data will be reviewed to assess if agricultural supply wells are impacted by constituents that are detrimental to crops and could impair the agricultural beneficial use. The SVBGSA will identify a select number of domestic and irrigation ILRP wells as representative sites after Ag Order 4.0 is issued; not all wells sampled under Ag Oder 4.0 will be included in the GSP's agricultural water quality monitoring network. Figure 7-10 shows the locations of all wells in the current ILRP groundwater quality monitoring network that were sampled under the temporary orders. The SVBGSA assumes that Ag Order 4.0 will have a similar representative geographic distribution of wells within the Subbasin. However, this network cannot be finalized until Ag Order 4.0 is issued, sometime in 2020.

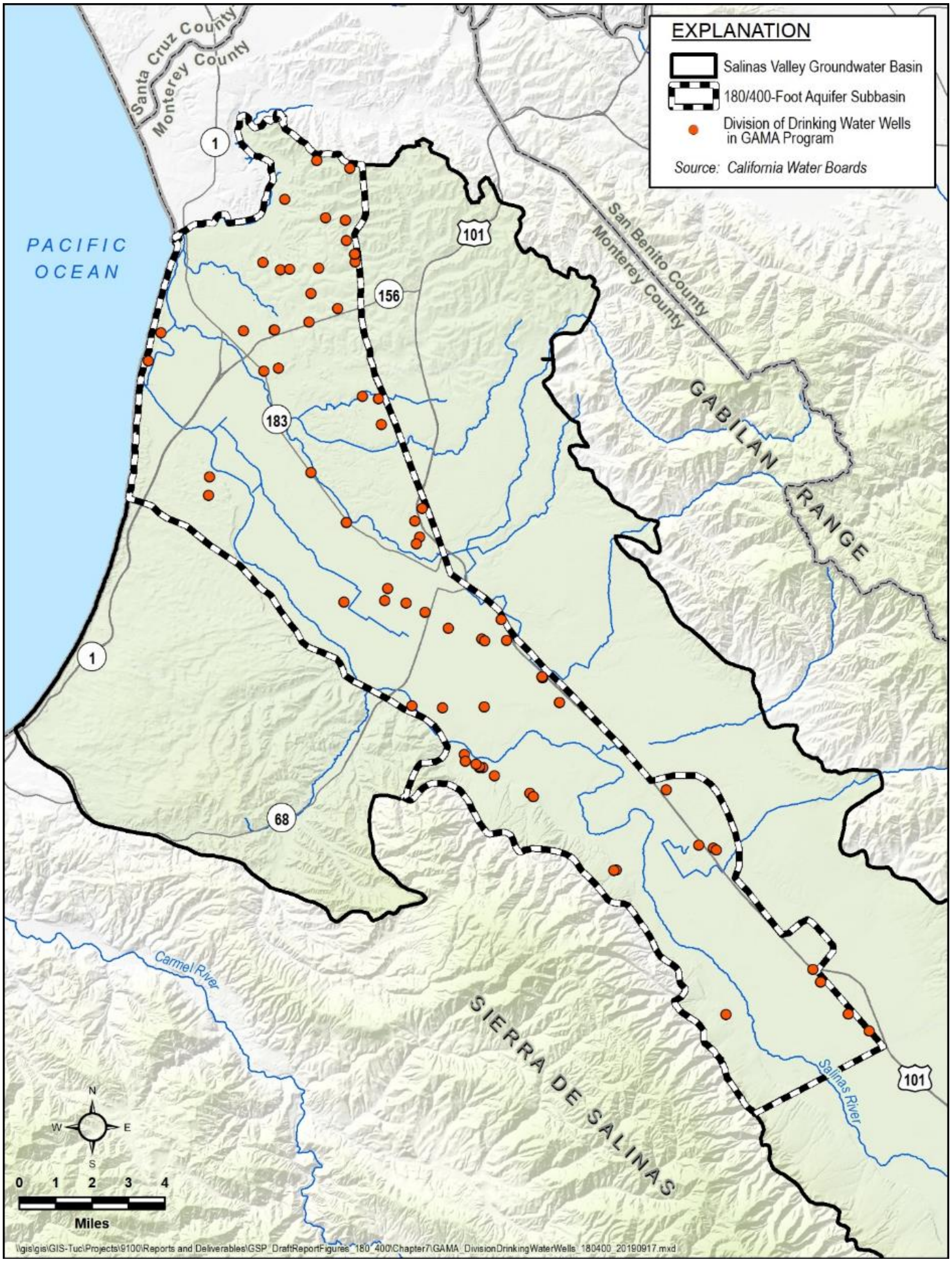



Figure 7-9. Locations of Wells in the Groundwater Quality Monitoring Network for Public Water Supply Wells

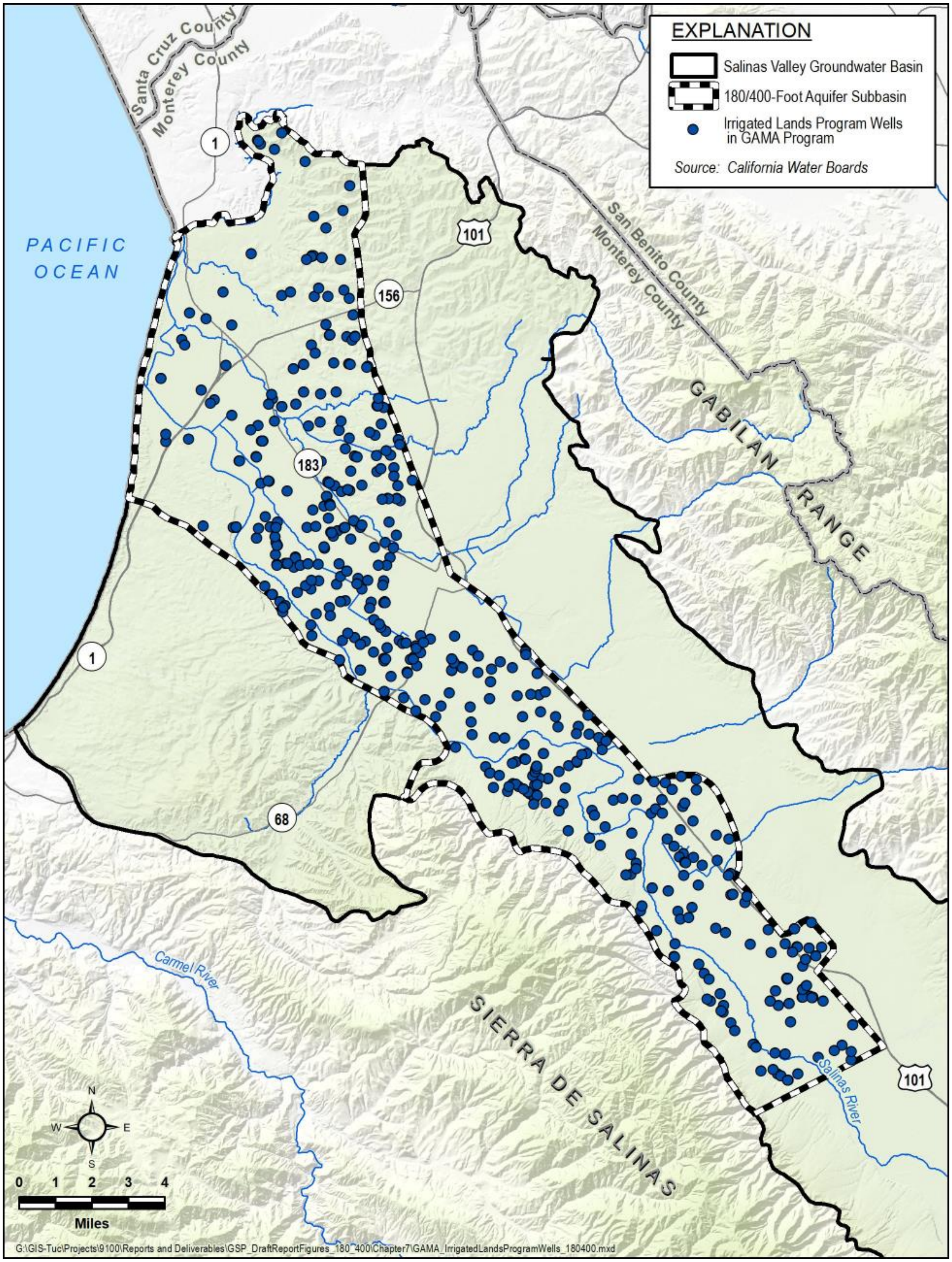



Figure 7-10. Locations of ILRP Wells Monitored under Ag Order 3.0

### 7.5.1 Groundwater Quality Monitoring Protocols

Water quality samples are currently being collected according to SWRCB and ILRP requirements. Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB, Division of Drinking Water, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

ILRP data are currently collected under Central Coast RWQCB Ag Order 3.0. ILRP samples are collected under the Tier 1, Tier 2, or Tier 3 monitoring and reporting programs. Copies of these monitoring and reporting programs are included in Appendix 7F, and incorporated herein as monitoring protocols. These protocols will continue to be followed during GSP implementation for the groundwater quality monitoring. These protocols are consistent with data and reporting standards described in SGMA Regulation §352.4.

### 7.5.2 Groundwater Quality Monitoring Data Gaps

There is adequate spatial coverage to assess impacts to beneficial uses and users. The primary data gap is that well construction information for many wells in the monitoring network is not known. The missing well construction data will be collected during plan implementation, as described in Chapter 10.

## 7.6 Land Subsidence Monitoring Network

As described in Section 5.4, DWR has, and will be, collecting land subsidence data using InSAR satellite data, and will make these data available to GSAs. This subsidence dataset represents the best available science for the 180/400-Foot Aquifer Subbasin and will therefore be used as the subsidence monitoring network.

### 7.6.1 Land Subsidence Monitoring Protocols

Land Subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be correlated to groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in SGMA Regulation §352.4.

### 7.6.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

## 7.7 Interconnected Surface Water Monitoring Network

As described in Section 5.6 and Chapter 4 of this GSP, there is little direct connection between surface water and the 180-Foot, 400-Foot, or Deep Aquifers in the Subbasin. However, the Salinas River is potentially in connection with groundwater in the shallow water-bearing sediments that do not constitute a principal aquifer. The shallow sediments are not used for any significant extraction and have very little monitoring data. This analysis of locations of interconnected surface water is based on best available data; however, the level of interconnection is unclear. As mentioned in Chapter 4, the Salinas Valley Aquitard is not completely continuous, and there are locations where the 180-Foot Aquifer may be in hydraulic connection with overlying sediments. However, groundwater in the 180- and 400-Foot Aquifers is generally not considered to be hydraulically connected to the Salinas River or its tributaries. This aspect of the 180/400-Foot Aquifer Subbasin has been well documented in multiple independent studies (DWR, 1946; DWR, 2018; Durbin, et al., 1978; Kennedy-Jenks, 2004). Additional data are needed to reduce uncertainty and refine the map of interconnected surface waters.

The primary tool for assessing depletions of interconnected surface waters due to pumping will be the SVIHM. The SVIHM will supply surface water discharge, surface water head, baseflow contributions, location of ephemeral or intermittent flowing streams. It will also provide temporal changes in conditions due to variations in stream discharge and regional groundwater extraction, as well as other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

Chapter 8 describes the use of the SVIHM model to develop minimum thresholds for the depletion of interconnected surface water. This approach is in accordance with the Monitoring Networks BMP which states [emphasis added]:

> *Monitoring of the interconnected surface water depletions requires the use of tools,* ***commonly modeling approaches****, to estimate the depletions associated with groundwater extraction. Models require assumptions be made to constrain the numerical model solutions. These assumptions should be based on empirical observations determining the extent of the connection of surface water and groundwater systems, the timing of those connections, the flow dynamics of both the surface water and groundwater systems, and hydrogeologic properties of the geologic framework connecting these systems.* [emphasis added]

### 7.7.1 Interconnected Surface Water Monitoring Protocols

Monitoring protocols for interconnected surface water will be developed when the SVIHM is available and when shallow wells are installed. The protocols will be consistent MCWRA's current groundwater elevation monitoring protocols, and with data and reporting standards described in SGMA Regulation §352.4.

### 7.7.2 Interconnected Surface Water Data Gaps

There is very little monitoring data in the shallow sediments, and the level of interconnection to the 180/400-Foot Aquifer is unclear, as described in section 5.6. To address this data gap and develop the needed empirical data regarding the extent and timing of hydrologic connection, the SVBGSA will install two shallow wells along the Salinas River in the 180/400-Foot Aquifer Subbasin, as discussed in Chapter 10. Data from these wells will be used in conjunction with the SVIHM to address the data gap in interconnected surface water.

## 7.8 Representative Monitoring Sites

Representative monitoring sites (RMS) are defined in the regulations as a subset of monitoring sites that are representative of conditions in the Subbasin. All of the monitoring sites shown in figures and tables in this Chapter are considered RMS (except where noted).

## 7.9 Data Management System and Data Reporting

The SVBGSA has developed a Data Management System (DMS) that is used to store, review, and upload data collected as part of the GSP development and implementation. The DMS adheres to the following SGMA regulations:

- Article 3, Section §352.6: Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the Plan and monitoring of the Subbasin.
- Article 5, Section §354.40: Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.

The SVBGSA DMS consists of two SQL databases. The HydroSQL database stores information about each well and water level and extraction time-series data. Fields in the HydroSQL database include:

- Subbasin
- Cadastral coordinates
- Planar coordinates
- Well owner

- Well name
- Well status
- Well depth
- Screened interval top and bottom
- Well type
- Water level elevation
- Annual pumping volume

Streamflow gauge data from the USGS is stored in the HydroSQL similarly to the well water level information.

Water quality data are stored in the EnviroData SQL database, which is linked to the HydroSQL for data management purposes. EnviroData SQL contains fields such as:

- Station
- Parameter
- Sample Date
- Detection (detect or non-detect)
- Value
- Unit

The data used to populate the SVBGSA DMS are listed in Table 7-5. Categories marked with an X indicate datasets that are publicly accessible or available from MCWRA and other sources that were used in populating the DMS. Additional datasets will be added in the future as appropriate, such as recharge or diversion data.

Table 7-5. Datasets Available for Use in Populating the DMS

| Data Sets | Data Category | | | | | | |
|---|---|---|---|---|---|---|---|
| | Well and Site Information | Well Construction | Aquifer Properties and Lithology (Data to be Added when Available) | Water Level | Pumping (Data to be Added when Available) | Streamflow | Water Quality |
| DWR (CASGEM) | X | X | | X | | | |
| MCWRA | X | X | | X | X | | X |
| GeoTracker GAMA | X | | | | | | X |
| USGS Gage Stations | | | | | | X | |

Data were compiled and reviewed to comply with quality objectives. The review included the following checks:

- Identifying outliers that may have been introduced during the original data entry process by others.
- Removing or flagging questionable data being uploaded in the DMS. This applies to historical water level data and water quality data.

The data were loaded into the database and checked for errors and missing data. The error tables identify water level and/ or well construction data as missing. Another quality check was completed with the water level data by plotting each well hydrograph to identify and remove anomalous data points.

In the future, well log information will be entered for selected wells and other information will be added as needed to satisfy the requirements of the SGMA regulations.

The DMS also includes a publicly accessible web-map hosted on the SVBGSA website; accessed at https://svbgsa.org/gsp-web-map-and-data/. This web-map gives interested parties access to technical information used in the development of the GSP and includes public well data, and analysis such as water level contour maps, seawater intrusion, as well as various local administrative boundaries. In addition, the web-map has functionalities to graph time series of water levels and search for specific wells in the database. This web-map will be regularly updated as new information is made available to the SVBGSA.

# 8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management, discusses the process by which the SVBGSA will characterize undesirable results, and establishes minimum thresholds and measurable objectives for each sustainability indicator.

This is the fundamental chapter in the GSP that defines sustainability in the 180/400-Foot Aquifer Subbasin and addresses significant regulatory requirements. The measurable objectives, minimum thresholds, and undesirable results detailed in this chapter define the Subbasin's future conditions and commits the GSA to actions that will meet these criteria. Defining these SMC requires a significant level of analysis and scrutiny, and this chapter includes adequate data to explain how SMC were developed and how they influence all beneficial uses and users.

This chapter is structured to address all of the SGMA regulations regarding SMC. The SGMA regulations are extensive. To retain an organized approach, this chapter follows the same structure for each sustainability indicator. The result is somewhat repetitive, but is complete when addressing the regulations. The SMC are grouped by sustainability indicator. Each section follows a consistent format that contains the information required by Section 354.22 *et. seq* of the regulations and outlined in the SMC BMP (DWR, 2017; CCR, 2016). Each SMC section includes a description of:

- How locally defined significant and unreasonable conditions were developed
- How minimum thresholds were developed, including:
    - The information and methodology used to develop minimum thresholds (§354.28 (b)(1))
    - The relationship between minimum thresholds and the relationship of these minimum thresholds to other sustainability indicators (§354.28 (b)(2))
    - The effect of minimum thresholds on neighboring basins (§354.28 (b)(3))
    - The effect of minimum thresholds on beneficial uses and users (§354.28 (b)(4))
    - Relevant federal, state, or local standards (§354.28 (b)(5))
    - The method for quantitatively measuring minimum thresholds (§354.28 (b)(6))
- How measurable objectives were developed, including:
    - The methodology for setting measurable objectives (§354.30)
    - Interim milestones (§354.30 (a), §354.30 (e), §354.34 (g)(3))
- How undesirable results were developed, including:
    - The criteria for defining undesirable results (§354.26 (b)(2))

- The potential causes of undesirable results (§354.26 (b)(1))
- The effects of these undesirable results on the beneficial users and uses (§354.26 (b)(3))

## 8.1 Definitions

The SGMA legislation and GSP Regulations contain a number of new terms relevant to the SMC. These terms are defined below using the definitions included in the GSP Regulations. Where appropriate, additional explanatory text is added in italics. This explanatory text is not part of the official definitions of these terms.

- **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.

  *Interconnected surface waters are sections of streams, lakes, or wetlands where the groundwater table is at or near the ground surface.*

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of 5 years, set by an Agency as part of a Plan.

  *Interim milestones are targets such as groundwater elevations that will be achieved every five years to demonstrate progress towards sustainability.*

- **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.

  *Measurable objectives are goals that the GSP is designed to achieve.*

- **Minimum threshold** refers to a numeric value for each sustainability indicator used to define undesirable results.

  *Minimum thresholds are indicators of an unreasonable condition. For example, the level of a pump in a well may be a minimum threshold because groundwater levels dropping below the pump level would be an unreasonable condition.*

- **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.

- **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).

  *The six sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; seawater intrusion; and depletion of interconnected surface waters.*

- **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.

- **Undesirable Result**

  *Undesirable Result is not defined in the Regulations. However, the description of undesirable result states that it should be a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the subbasin. An example undesirable result is more than 10% of the measured groundwater elevations being lower than the minimum thresholds. Undesirable results should not be confused with significant and unreasonable conditions. Significant and unreasonable conditions are physical conditions to be avoided; an undesirable result is a quantitative assessment based on minimum thresholds.*

## 8.2 Sustainability Goal

Per Section §354.24 of the GSP Regulations (CCR, 2016), the sustainability goal for the Subbasin has three parts:

- A description of the sustainability goal;
- A discussion of the measures that will be implemented to ensure the Subbasin will be operated within sustainable yield, and;
- An explanation of how the sustainability goal is likely to be achieved.

The goal of this GSP is to manage the groundwater resources of the 180/400-Foot Aquifer Subbasin for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. This GSP will ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

A number of projects and management actions are included in this GSP and detailed in Chapter 9. Not all of these projects and actions will be implemented. However, some combination of these will be implemented to ensure the Subbasin is operated within its sustainable yield and achieves sustainability. These management actions and project types include:

Management Actions:

- Agricultural land and pumping allowance retirement
- Outreach and education for agricultural BMPs
- Nacimiento and San Antonio Reservoirs Reoperation
- Restrict Pumping in CSIP Area
- Support and strengthen MCWRA restrictions on additional wells in the Deep Aquifers
- Convene a seawater intrusion working group

Projects:

- In-lieu recharge through direct surface water delivery for irrigation
- Direct recharge through recharge basins and injection wells
- Indirect recharge through decreased evapotranspiration (e.g., removal of invasive species) or increased percolation (e.g., stormwater capture)
- Hydraulic barrier to control seawater intrusion

For each of these project types, a number of priority projects with specific conceptual designs are described in Chapter 9.

The management actions and projects are designed to achieve sustainability within 20 years by one or more of the following means:

- Educating stakeholders and prompting changes in behavior to improve chances of achieving sustainability.
- Increasing awareness of groundwater pumping impacts to promote voluntary reductions in groundwater use through improved water use practices or fallowing crop land.
- Increasing basin recharge by capturing surface water under approved or modified permits.
- Developing new renewable water supplies for use in the Subbasin to offset groundwater pumping.

- Working with MCWRA to effectively re-operate surface water reservoirs to benefit groundwater sustainability.
- Develop a barrier that halts seawater intrusion on the coast.

## 8.3 General Process for Establishing Sustainable Management Criteria

The SMC presented in this chapter were developed using publicly available information, feedback gathered during public meetings, hydrogeologic analysis, and meetings with SVBGSA staff and Advisory Committee members. The general process included:

- Presentations to the Board of Directors on the SMC requirements and implications.
- Presentations to the Advisory Committee and Subbasin Specific working groups outlining the approach to developing SMC and discussing initial SMC ideas. The Advisory Committee and working groups provided feedback and suggestions for the development of initial SMC.
- Discussions with GSA staff and various Board Members.
- Modifying minimum thresholds and measurable objectives based on input from GSA staff and Board Members.

This general process resulted in the SMC presented in this chapter.

## 8.4 Management Areas

SGMA allows for the establishment of management areas within a basin or subbasin to distinguish different monitoring and management criteria and facilitate implementation of the GSP. Management areas have not been established in the Subbasin.

## 8.5 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the SMC for each of the six sustainability indicators. The rationale and background for developing these criteria are described in detail in the following sections. The SMC are individual criteria that will each be met simultaneously, rather than in an integrated manner. For example, the groundwater elevation and seawater intrusion SMCs are two independent SMC that will be achieve simultaneously.  The groundwater elevation SMC do not hinder the seawater intrusion SMC, but also, they do not ensure the halting of seawater intrusion by themselves.  SMC are developed for all principal aquifers that have sufficient data. Where insufficient data exists, SMC will be developed when data gaps are filled.

Table 8-1. Sustainable Management Criteria Summary

| Sustainability Indicator | Minimum Threshold | Measurement | Measurable Objective | Undesirable Result | Interim Milestones |
|---|---|---|---|---|---|
| **Chronic lowering of groundwater levels** | Water level minimum thresholds set to 1 foot above 2015 groundwater elevations. See Table 8-2 for wells in the 180- and 400- Foot aquifers | Measured through monitoring well network | Water level measurable objectives set to 2003 groundwater elevations | Over the course of any 1 year, no more than 15% of groundwater elevation minimum thresholds shall be exceeded in any single aquifer and no one well shall exceed its minimum threshold for more than two consecutive years. Allows two exceedances in the 180-Foot aquifer and two exceedances in the 400-Foot aquifer. | See Table 8-3 |
| **Reduction in groundwater storage** | Minimum threshold set to the estimated long-term future sustainable yield of 112,000 AF/yr. for the entire 180/400-Foot Aquifer Subbasin | Measured through total groundwater extractions. Municipal users and small systems report groundwater extractions to the state. Agricultural pumping will either be collected by MCWRA, or estimated based on crop data | Measurable objective is Identical to the minimum threshold. Pumping is set to the estimated long-term future sustainable yield of 112,000 AF/yr. for the entire 180/400-Foot Aquifer Subbasin | During average hydrogeologic conditions, and as a long-term average over all hydrogeologic conditions, the total groundwater pumping shall not exceed the minimum threshold. | Set to 112,000 AF/yr. |
| **Seawater intrusion** | Minimum threshold is the 2017 extent of the 500 mg/L chloride isocontour as developed by MCWRA for the 180- and 400- Foot Aquifers.<br>The minimum threshold is the line defined by Highway 1 for the Deep Aquifers. | Seawater intrusion maps developed by MCWRA | Measurable objective is the line defined by Highway 1 for the 180-Foot, 400-Foot, and Deep Aquifers | On average in any 1 year there shall be no mapped seawater intrusion beyond the 2017 extent of the 500 mg/L chloride isocontour. | 5-Year: identical to current conditions<br>10-year: one-third of the way to the measurable objective<br>15-year: two-thirds of the way to the measurable objective |

| Sustainability Indicator | Minimum Threshold | Measurement | Measurable Objective | Undesirable Result | Interim Milestones |
|---|---|---|---|---|---|
| **Degraded groundwater quality** | Minimum threshold is zero additional exceedances of groundwater quality constituents of concern known to exist in the Subbasin above drinking water or agricultural limits. Exceedances are only measured in supply wells that regularly test for the parameters. See Tables 8-2 and 8-3 for the list of constituents. | Groundwater quality data downloaded annually from state and local sources. | Measurable objective is identical to the minimum threshold. Zero additional exceedances of groundwater quality constituents of concern known to exist in the Subbasin above drinking water or agricultural limits. | On average during any 1 year, no groundwater quality minimum threshold shall be exceeded as a direct result of projects or management actions taken as part of GSP implementation. | Identical to current conditions |
| **Subsidence** | To account for InSAR errors, the minimum threshold is no more than 0.1 foot per year of estimated land movement, resulting in zero net long-term subsidence | Measured using DWR provided InSAR data. | Measurable objective is identical to the minimum threshold, resulting in Zero net long-term subsidence. | In any 1 year, there will be zero exceedances of minimum thresholds for subsidence. | Zero long-term subsidence averaged over every 5-year period. |
| **Depletion of interconnected surface water** | Set to the estimated average historical rate of stream depletion, adjusted for climate change. This is currently estimated to be 69,700 AF/yr. for future conditions including climate change. | Estimated using the SVIHM integrated model | Identical to the minimum threshold. Set to the estimated average rate of stream depletion of 69,700 AF/yr. for future conditions including climate change | During average hydrogeologic conditions, and as a long-term average over all hydrogeologic conditions, the depletion of interconnected surface waters shall not exceed the minimum threshold. | Average annual depletion rate set to 69,700 AF/yr. for every 5-year period. |

## 8.6 Chronic Lowering of Groundwater Elevations SMC

### 8.6.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were determined based on public meetings and discussions with GSA staff. Significant and unreasonable groundwater elevations in the Subbasin are those that:

- Are at or below the lowest observed groundwater elevations. Public and stakeholder input identified historically low groundwater elevations as significant and unreasonable.
- Cause significant financial burden to local agricultural interests.
- Interfere with other sustainability indicators.

### 8.6.2 Minimum Thresholds

Section §354.28(c)(1) of the GSP Regulations states that "The minimum threshold for chronic lowering of groundwater elevations shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results" (CCR, 2016).

#### 8.6.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The development of minimum thresholds and measurable objectives follow a similar process and are described concurrently in this section. The information used for establishing the chronic lowering of groundwater elevations measurable objectives and minimum thresholds include:

- Feedback from discussions with local stakeholders on challenges and goals.
- Feedback about significant and unreasonable conditions gathered during public meetings.
- Historical groundwater elevation data from wells monitored by the Monterey County Water Resources Agency (MCWRA).
- Maps of current and historical groundwater elevation data.

The general steps for developing minimum thresholds and measurable objectives were:

- Use MCWRA-generated average groundwater elevation change hydrographs to select representative years that represent minimum thresholds and measurable objectives for the Subbasin.

- Use the MCWRA-generated groundwater elevation contour map from the appropriate years to identify minimum threshold and measurable objective values for each monitoring network well.
- Plot the minimum thresholds and measurable objectives on the respective monitoring well hydrographs.
- Visually inspect each hydrograph to check if the minimum threshold and measurable objective are appropriate according to the actual water levels measured during the representative years selected from the groundwater elevation change hydrographs.
- Manually adjust the minimum thresholds and measurable objectives as needed, to better represent conditions at each well.

Each of these steps is described in more detail below.

The MCWRA provided hydrographs of average cumulative groundwater elevation changes for the Pressure Subarea, which covers the 180/400-Foot Aquifer Subbasin. Based on this period of record, a representative climatic cycle from 1967 to 1998 was used to develop values for minimum thresholds and measurable objectives. This representative period also corresponds to important water management milestones for the Salinas Valley Groundwater Basin; water year 1967 marks the beginning of operations at San Antonio Reservoir, with first water releases in November 1966. The Castroville Seawater Intrusion Project (CSIP) began operating in 1998.

The groundwater elevation change hydrograph with preliminary minimum threshold and measurable objectives lines for the Pressure Subarea are shown on Figure 8-1. The Pressure Subarea represents both the 180/400-foot Aquifer Subbasin and the Monterey Subbasin. The average 2015 and 2016 groundwater elevations in the Pressure Subarea are considered significant and unreasonable. The minimum thresholds were therefore set above the 2015 and 2016 groundwater elevations. When looking at the groundwater elevation changes within the representative climatic cycle (Figure 8-1), the historical lowest elevations occurred in 1991 and 1992, at one foot above the 2015 level. Therefore, the Pressure Area minimum thresholds were set one foot above 2015 groundwater elevations.

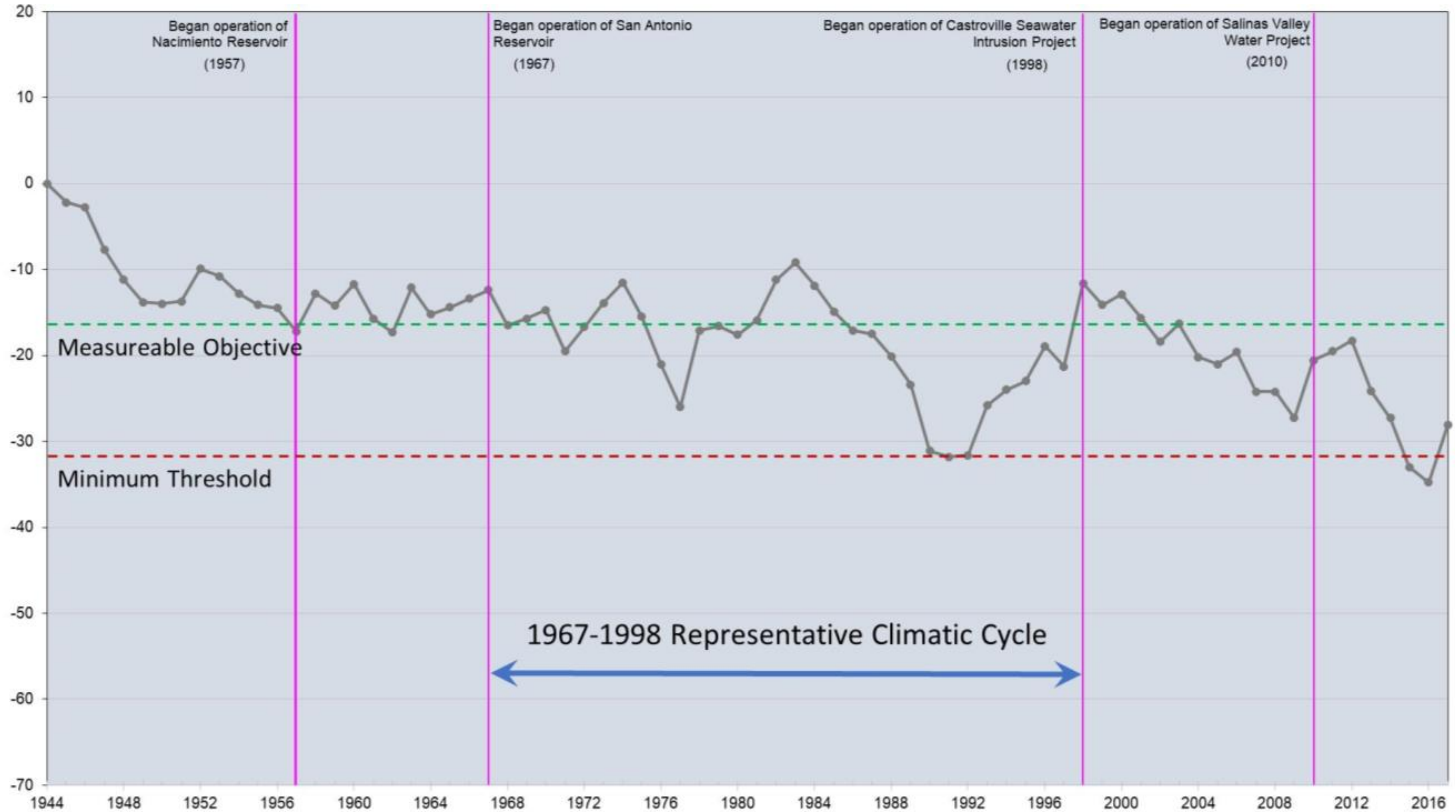



Figure 8-1. Cumulative Groundwater Elevation Change Hydrograph with Selected Measurable Objective and Minimum Threshold for the Pressure Subarea

After the years representing both minimum thresholds and measurable objectives were selected, MCWRA-provided groundwater elevation contour maps for the fall water level measurements of these years were digitized. An additional 1-foot adjustment factor was added to the 2015 map to establish minimum thresholds. Separate maps were created for both the 180-Foot Aquifer and for the 400-Foot Aquifer. No groundwater elevation contour maps currently exist for the Deep Aquifers due to a lack of monitoring data. This is a data gap that will be filled during GSP implementation, and when MCWRA produces a more detailed analysis of the Deep Aquifers.

The minimum threshold contour maps along with the monitoring network wells are shown on Figure 8-2 for the 180-Foot Aquifer and on Figure 8-3 for the 400-Foot Aquifer.

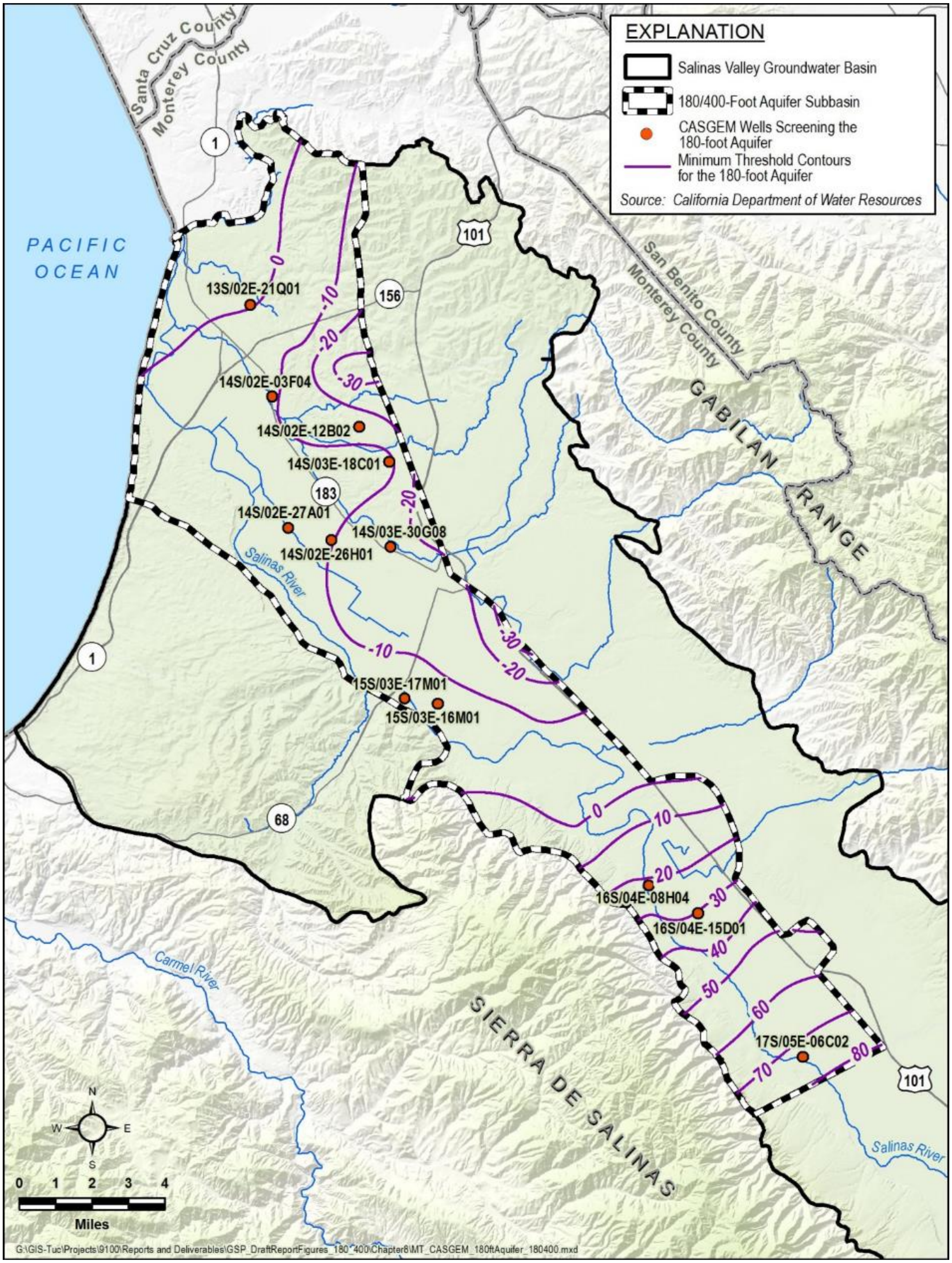



Figure 8-2. Groundwater Elevation Minimum Threshold Contour Map for the 180-Foot Aquifer

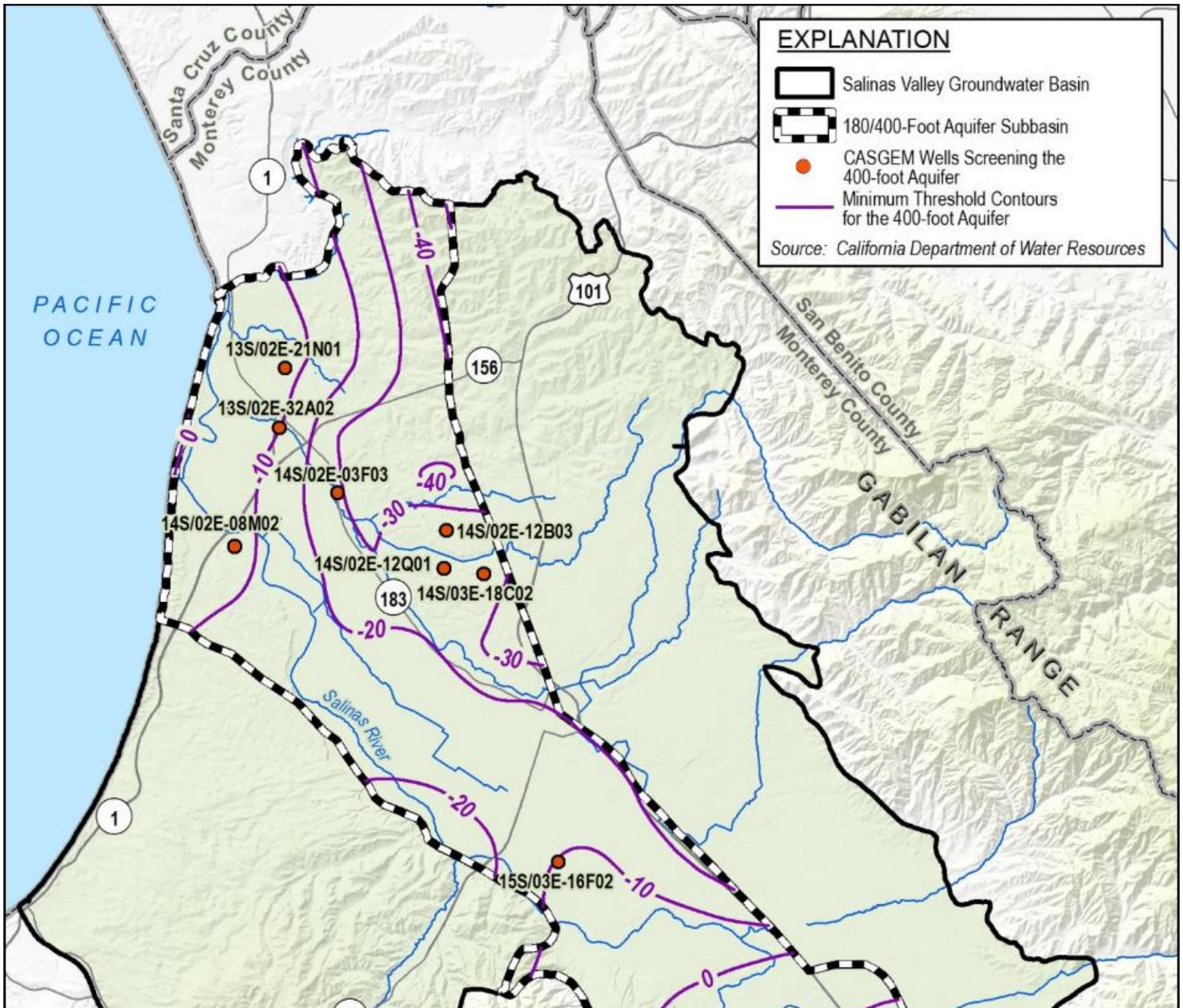


Figure 8-3. Groundwater Elevation Minimum Threshold Contour Map for the 400 Foot Aquifer

The monitoring network well locations were intersected with the contour map to establish the initial minimum threshold for each RMS for chronic lowering of groundwater levels. The initial minimum threshold values were plotted on the respective RMS groundwater elevation hydrographs to visually inspect the applicability of these values for each well. In some cases, the values were not adequate for various reasons including:

- Wells located outside of contour maps
- Deep wells with no contour map available
- Wells located in foothill area where contour maps do not apply
- Interpolated values on the contour maps did not match the individual RMS well values adequately for the month of October and designated year

A detailed review of minimum thresholds and measurable objectives at each RMS well, comparison to the actual measured values at the designated years in October, and professional judgment resulted in a revised set of minimum thresholds and measurable objectives at each RMS well. October was used as the month at which values for minimum thresholds and measurable objectives are established because this is the fall measurement that MCWRA takes every year. Future water levels in October will be compared to these values.

Hydrographs and minimum thresholds for each RMS with well completion information are included in Appendix 8A. These minimum thresholds are selected to avoid the significant and unreasonable conditions outlined above. The minimum threshold values for each well within the groundwater elevation monitoring network are provided in Table 8-2 .

Table 8-2. Chronic Lowering of Groundwater Elevations Minimum Thresholds and Measurable Objectives

| Monitoring Site | Aquifer | Minimum Threshold (ft) | Measurable Objective (ft) |
|---|---|---|---|
| 13S/02E-21Q01 | 180-ft Aquifer | 3 | 8 |
| 14S/02E-03F04 | 180-ft Aquifer | -12 | -7.1 |
| 14S/02E-12B02 | 180-ft Aquifer | -19 | -11.9 |
| 14S/02E-26H01 | 180-ft Aquifer | -25 | -18 |
| 14S/02E-27A01 | 180-ft Aquifer | -18.7 | -10.7 |
| 14S/03E-18C01 | 180-ft Aquifer | 5 | 10 |
| 14S/03E-30G08 | 180-ft Aquifer | -29 | -3.5 |
| 15S/03E-16M01 | 180-ft Aquifer | -16 | -4.1 |
| 15S/03E-17M01 | 180-ft Aquifer | -17.2 | 2.9 |
| 16S/04E-08H04 | 180-ft Aquifer | 30 | 54.8 |
| 16S/04E-15D01 | 180-ft Aquifer | 26 | 55 |
| 17S/05E-06C02 | 180-ft Aquifer | 73.5 | 94.1 |
| 13S/02E-21N01 | 400-ft Aquifer | -15 | -7.6 |
| 13S/02E-32A02 | 400-ft Aquifer | -9.9 | -5 |
| 14S/02E-03F03 | 400-ft Aquifer | -40 | -19.4 |
| 14S/02E-08M02 | 400-ft Aquifer | -12 | -5.9 |
| 14S/02E-12B03 | 400-ft Aquifer | -54 | -43 |
| 14S/02E-12Q01 | 400-ft Aquifer | -26.3 | -13.5 |
| 14S/03E-18C02 | 400-ft Aquifer | -38 | -17.4 |
| 15S/03E-16F02 | 400-ft Aquifer | -20 | 1.2 |
| 16S/04E-08H03 | 400-ft Aquifer | 19 | 48 |
| 17S/05E-06C01 | 400-ft Aquifer | 77 | 89.6 |
| 13S/02E-19Q03 | Deep Aquifers | -10 | 5 |

#### 8.6.2.2 Minimum Thresholds Impact on Domestic Wells

Minimum thresholds for groundwater elevations are compared to the range of domestic well depths in the Subbasin using DWR's Online System for Well Completion Reports (OSWCR) database. This check was done to assure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater elevation do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. The average computed depth of domestic wells in the Subbasin is 316.6 feet for the domestic wells in the OSWCR database.

The comparison showed the following:

- In the 180-Foot Aquifer, 89% of all domestic wells will have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds; and 91% of all domestic wells will have at least 25 feet of water in them when measurable objectives are achieved.

- In the 400-Foot Aquifer, 79% of all domestic wells will have at least 25 feet of water in them provided groundwater elevations remain above minimum thresholds; and 82% of all domestic wells will have at least 25 feet of water in them when measurable objectives are achieved.

#### 8.6.2.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Section 354.28 of the GSP Regulations requires that the description of all minimum thresholds include a discussion about the relationship between the minimum thresholds for each sustainability indicator. In the SMC BMP (DWR, 2017), DWR has clarified this requirement. First, the GSP must describe the relationship between each sustainability indicator's minimum threshold (i.e., describe why or how a water level minimum threshold set at a particular representative monitoring site is similar to or different from water level thresholds in nearby representative monitoring sites). Second, the GSP must describe the relationship between the selected minimum threshold and minimum thresholds for other sustainability indicators (e.g., describe how a water level minimum threshold would not trigger an undesirable result for land subsidence).

The groundwater elevation minimum thresholds are derived from smoothly interpolated groundwater elevations in the Subbasin. Therefore, the minimum thresholds are unique at every well, but when combined represent a reasonable and potentially realistic groundwater elevation map. Because the underlying groundwater elevation map is a reasonably achievable condition, the individual minimum thresholds at RMSs do not conflict with each other.

Groundwater elevation minimum thresholds can influence other sustainability indicators. The groundwater elevation minimum thresholds are selected to avoid undesirable results for other sustainability indicators.

- **Change in groundwater storage**. A significant and unreasonable condition for change in groundwater storage is pumping in excess of the sustainable yield for an extended period of years. Pumping at or less than the sustainable yield will maintain or raise average groundwater elevations in the Subbasin. The groundwater elevation minimum thresholds are set at or above recent groundwater elevations, consistent with the practice of pumping at or less than the sustainable yield. Therefore, the groundwater elevation minimum thresholds will not result in long term significant or unreasonable change in groundwater storage.

- **Seawater intrusion**. A significant and unreasonable condition for seawater intrusion is seawater intrusion in excess of the extent delineated by MCWRA in 2017. Lower groundwater elevations, particularly in the 180- and 400-Foot Aquifers, could cause seawater to advance inland. The groundwater elevation minimum thresholds are set at or above recent groundwater elevations. Therefore, the groundwater elevation minimum thresholds are intended to not exacerbate, and may help control, the rate of seawater intrusion.
- **Degraded water quality**. A significant and unreasonable condition for degraded water quality is exceeding regulatory limits for constituents of concern in production wells due to actions proposed in the GSP. Water quality could be affected through two processes:
    1. Low groundwater elevations in an area could cause deep poor-quality groundwater to flow upward to levels where supply wells pump groundwater. Because the groundwater elevation minimum thresholds are at or above recent groundwater elevations, there is no mechanism for triggering any new upward flow of deep groundwater. Therefore, the groundwater elevation minimum thresholds are set to avoid deep poor-quality water from impacting shallower production wells.
    2. Changes in groundwater elevation due to actions implemented to achieve sustainability could change groundwater gradients, which could cause poor quality groundwater to flow towards production wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold groundwater elevations do not directly lead to a significant and unreasonable degradation of groundwater quality in production wells.
- **Subsidence**. A significant and unreasonable condition for subsidence is any measurable long-term inelastic subsidence that damages existing infrastructure. Subsidence is caused by dewatering and compaction of clay-rich sediments in response to lowering groundwater elevations. The groundwater elevation minimum thresholds are set at or above recent groundwater elevations. Because future groundwater elevations will be higher than current groundwater elevations, they will not induce additional dewatering of clay-rich sediments; and thus, will not induce additional subsidence.
- **Depletion of interconnected surface waters.** A significant and unreasonable condition for the depletion of interconnected surface waters is groundwater pumping-induced depletion of flow in the Salinas River or its major tributaries in excess of current depletion rates. Lowering average groundwater elevations in areas adjacent to interconnected surface water bodies will increase depletion rates. Because the groundwater elevation minimum thresholds are set at or above recent elevations, future groundwater elevations will not induce additional depletion of interconnected surface

waters. Therefore, the groundwater elevation minimum thresholds will not result in a significant or unreasonable depletion of interconnected surface waters, including groundwater-dependent ecosystems.

#### 8.6.2.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The 180/400-Foot Aquifer Subbasin has four neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Langley Subbasin to the north
- The Eastside Subbasin to the northeast
- The Forebay Subbasin to the south
- The Monterey Subbasin to the West

The SVBGSA is either the exclusive GSA, or is one of two coordinating GSAs for the adjacent Langley, Eastside, Forebay, and Monterey Subbasins. Because the SVBGSA covers all of these subbasins, the GSA Board of Directors opted to develop the minimum thresholds and measurable objectives for all of these neighboring subbasins in a single process that is coordinated with the 180/400-Foot Aquifer Subbasin. These neighboring subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of neighboring subbasins' GSPs and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

In addition, the Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the 180/400-Foot Aquifer Subbasin are above historical low groundwater elevations, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Agency to ensure that the basins do not prevent each other from achieving sustainability.

#### 8.6.2.5 Effects on Beneficial Users and Land Uses

The groundwater elevation minimum thresholds may have several effects on beneficial users and land uses in the Subbasin.

**Agricultural land uses and users**. The groundwater elevation minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. This may have the effect of limiting the amount of groundwater pumping in the Subbasin. Limiting the amount of groundwater pumping may limit the amount and type of crops that can be grown in the Subbasin. The groundwater elevation minimum thresholds could therefore limit expansion of the

Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land currently under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not currently under irrigation may become less valuable because it may be too difficult and expensive to irrigate.

**Urban land uses and users**. The groundwater elevation minimum thresholds may reduce the amount of groundwater pumping in the Subbasin. This may limit urban growth, or result in urban areas obtaining alternative sources of water. This may result in higher water costs for municipal water users.

**Domestic land uses and users**. The groundwater elevation minimum thresholds are intended to protect most domestic wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells. However, extremely shallow domestic wells may become dry, requiring owners to drill deeper wells. Additionally, the groundwater elevation minimum thresholds may limit the number of new domestic wells that can be drilled in order to limit future declines in groundwater elevations caused by more domestic pumping.

**Ecological land uses and users**. Groundwater elevation minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This outcome may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations.

#### 8.6.2.6 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater elevations.

#### 8.6.2.7 Method for Quantitative Measurement of Minimum Thresholds

Groundwater elevation minimum thresholds will be directly measured from the monitoring well network. The groundwater elevation monitoring will be conducted in accordance with the monitoring plan outlined in Chapter 7. Furthermore, the groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Regulations.

As noted in Chapter 7, the current groundwater elevation monitoring network in the Subbasin across aquifers includes 23 wells. Data gaps were identified in Chapter 7 and will be resolved during implementation of this GSP.

### 8.6.3 Measurable Objectives

The measurable objectives for chronic lowering of groundwater levels represent target groundwater elevations that are higher than the minimum thresholds. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability. Measurable objectives for the chronic lowering of groundwater levels are summarized in Table 8-2. The measurable objectives are also shown on the hydrographs for each RMS in Appendix 8A.

#### 8.6.3.1 Methodology for Setting Measurable Objectives

The methodology for establishing measurable objectives is described in detail in Section 8.6.2.1 and summarized below.

Figure 8-1 shows that there was only a slow downward trend in average groundwater elevations through 2003. Since 2003, water elevations have consistently decreased at a more rapid rate. To ensure that measurable objectives are achievable, a year from the relatively recent past was selected. Groundwater elevations from 2003 were selected as representative of the measurable objectives for the 180/400-Foot Aquifer Subbasin.

The measurable objective contour maps along with the monitoring network wells are shown on Figure 8-4 for the 180-Foot Aquifer, and on Figure 8-5 for the 400-Foot Aquifer.

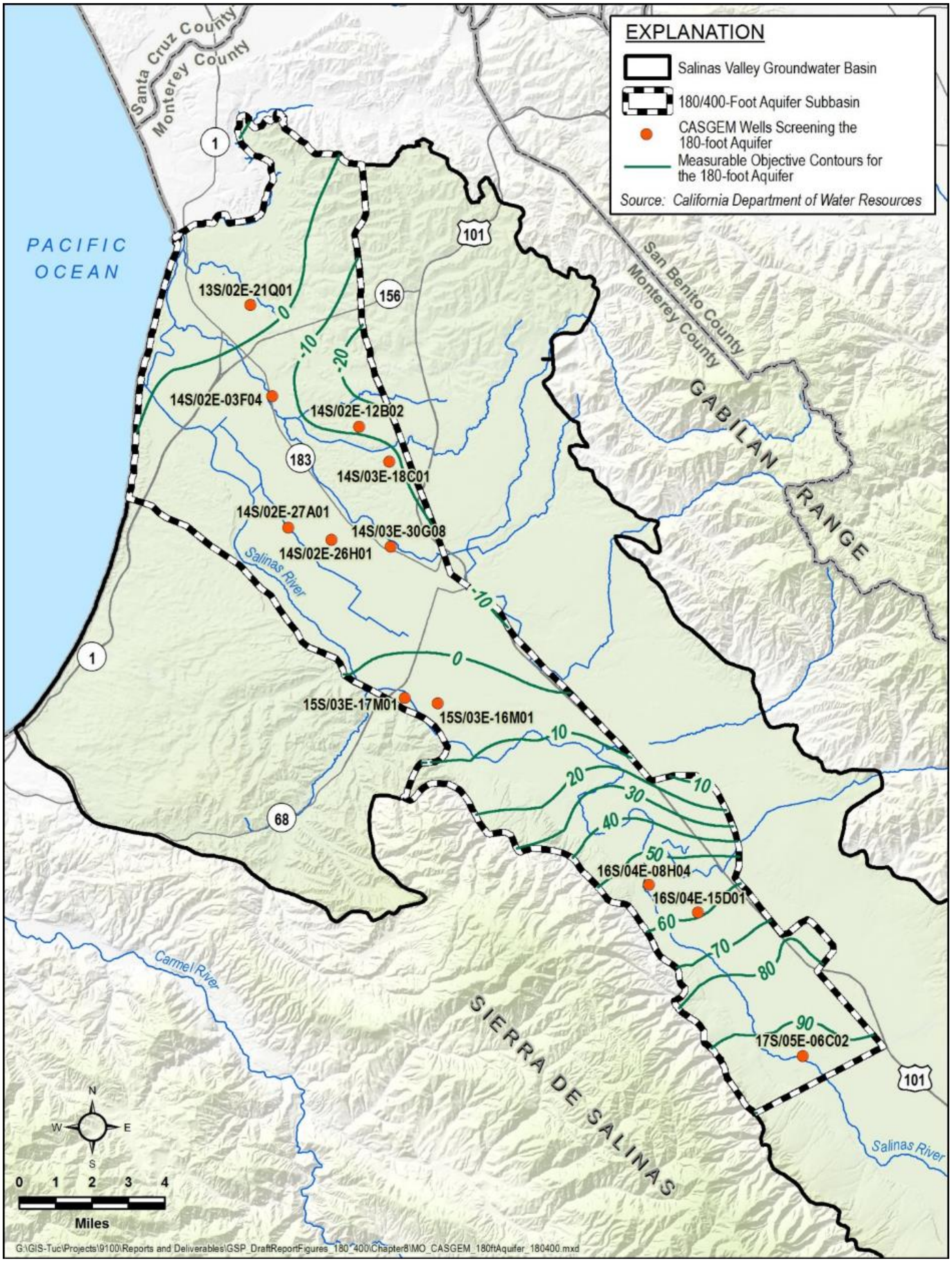


Figure 8-4. Groundwater Elevation Measurable Objective Contour Map for the 180-Foot Aquifer

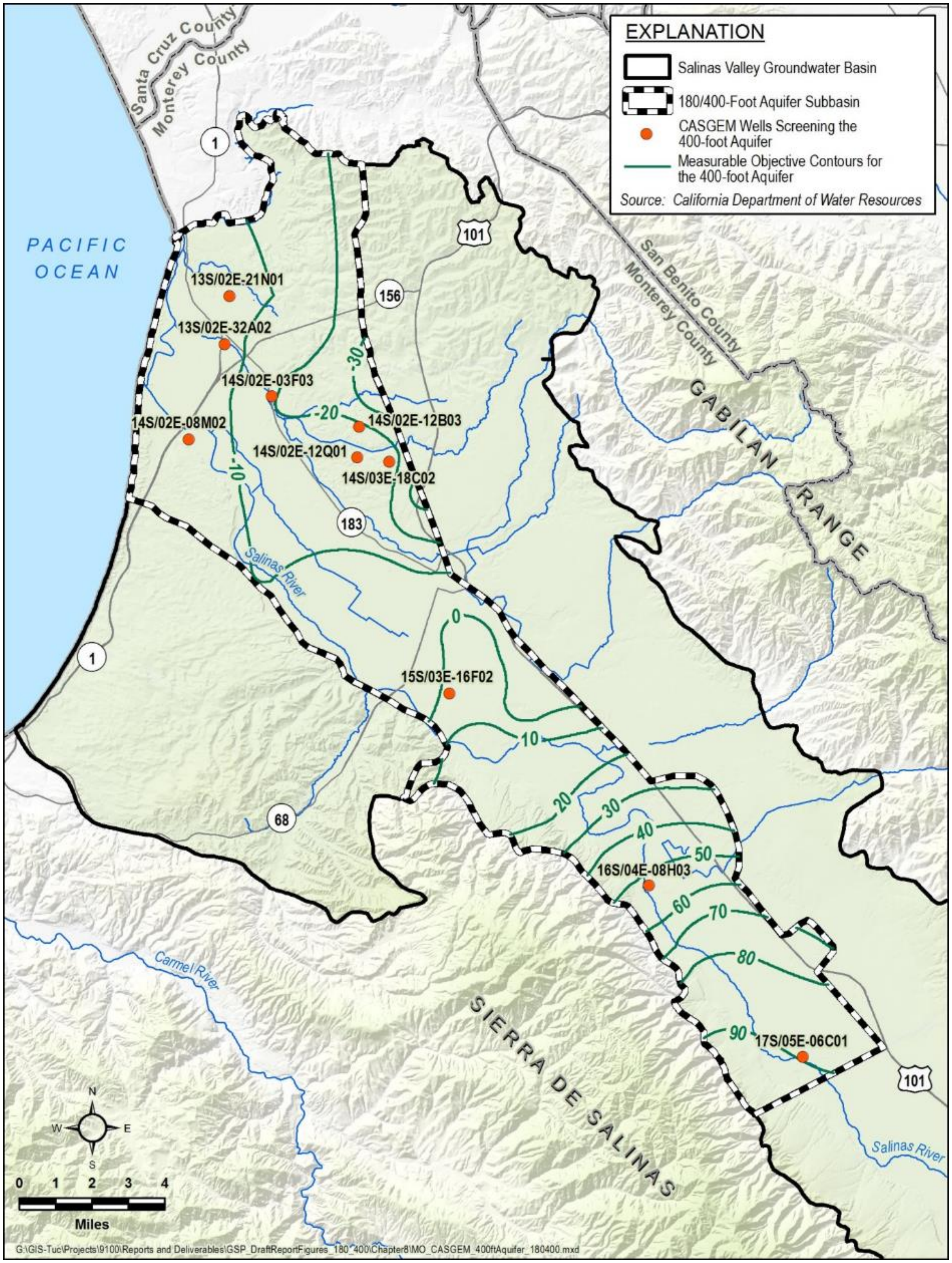



Figure 8-5. Groundwater Elevation Measurable Objective Contour Map for the 400-Foot Aquifer

### 8.6.3.2 Interim Milestones

Interim milestones for groundwater elevations are shown in Table 8-3. These are only initial estimates of interim milestones. Interim milestones for groundwater elevations will be modified once the SVIHM is available for use.

Table 8-3. Groundwater Elevation Interim Milestones

| Monitoring Site | Aquifer | Current Groundwater Elevation ft (assume at 2020) | Interim Milestone at Year 2025 (ft) | Interim Milestone at Year 2030 (ft) | Interim Milestone at Year 2035 (ft) | Measurable Objective (ft) (goal to reach at 2040) |
|---|---|---|---|---|---|---|
| 13S/02E-21Q01 | 180-ft Aquifer | 6.2 | 6.7 | 7.1 | 7.6 | 8 |
| 14S/02E-03F04 | 180-ft Aquifer | -6.2 | -6.4 | -6.7 | -6.9 | -7.1 |
| 14S/02E-12B02 | 180-ft Aquifer | -8.3 | -9.2 | -10.1 | -11.0 | -11.9 |
| 14S/02E-26H01 | 180-ft Aquifer | -11.8 | -13.4 | -14.9 | -16.5 | -18 |
| 14S/02E-27A01 | 180-ft Aquifer | -9.6 | -9.9 | -10.2 | -10.4 | -10.7 |
| 14S/03E-18C01 | 180-ft Aquifer | 11.9 | 11.4 | 11.0 | 10.5 | 10 |
| 14S/03E-30G08 | 180-ft Aquifer | -16.3 | -13.1 | -9.9 | -6.7 | -3.5 |
| 15S/03E-16M01 | 180-ft Aquifer | -12.4 | -10.3 | -8.3 | -6.2 | -4.1 |
| 15S/03E-17M01 | 180-ft Aquifer | -13.2 | -9.2 | -5.2 | -1.1 | 2.9 |
| 16S/04E-08H04 | 180-ft Aquifer | 41 | 44.5 | 47.9 | 51.4 | 54.8 |
| 16S/04E-15D01 | 180-ft Aquifer | 43.06 | 46.0 | 49.0 | 52.0 | 55 |
| 17S/05E-06C02 | 180-ft Aquifer | 78.7 | 82.6 | 86.4 | 90.3 | 94.1 |
| 13S/02E-21N01 | 400-ft Aquifer | -14.4 | -12.7 | -11.0 | -9.3 | -7.6 |
| 13S/02E-32A02 | 400-ft Aquifer | -6.6 | -6.2 | -5.8 | -5.4 | -5 |
| 14S/02E-03F03 | 400-ft Aquifer | -13.72 | -15.1 | -16.6 | -18.0 | -19.4 |
| 14S/02E-08M02 | 400-ft Aquifer | -12 | -10.5 | -9.0 | -7.4 | -5.9 |
| 14S/02E-12B03 | 400-ft Aquifer | -29.6 | -33.0 | -36.3 | -39.7 | -43 |
| 14S/02E-12Q01 | 400-ft Aquifer | -24.7 | -21.9 | -19.1 | -16.3 | -13.5 |
| 14S/03E-18C02 | 400-ft Aquifer | -18.9 | -18.5 | -18.2 | -17.8 | -17.4 |
| 15S/03E-16F02 | 400-ft Aquifer | -16.5 | -12.1 | -7.7 | -3.2 | 1.2 |
| 16S/04E-08H03 | 400-ft Aquifer | 38.5 | 40.9 | 43.3 | 45.6 | 48 |
| 17S/05E-06C01 | 400-ft Aquifer | 54.3 | 63.1 | 72.0 | 80.8 | 89.6 |
| 13S/02E-19Q03 | Deep Aquifers | -10.8 | -6.9 | -2.9 | 1.1 | 5 |

### 8.6.4 Undesirable Results

#### 8.6.4.1 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

The chronic lowering of groundwater levels undesirable result is a quantitative combination of groundwater elevation minimum threshold exceedances. For the Subbasin, the groundwater elevation undesirable result is:

> *Over the course of any one year, no more than 15% of the groundwater elevation minimum thresholds shall be exceeded in any single aquifer. Additionally, the minimum threshold in any one well shall not be exceeded for more than two sequential years.*

Undesirable results provide flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances provides more flexibility but may lead to significant and unreasonable conditions for a number of beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces flexibility due to unanticipated hydrogeologic conditions. The undesirable result was set at 15% to balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty.

The 15% limit on minimum threshold exceedances in the undesirable result allows for four exceedances in the 23 existing monitoring wells: two in the 180-Foot Aquifer and two in the 400-Foot Aquifer. As the monitoring system grows, additional exceedances will be allowed. One additional exceedance will be allowed for approximately every seven new monitoring wells. This was considered a reasonable number of exceedances given the hydrogeologic uncertainty of the Subbasin.

#### 8.6.4.2 Potential Causes of Undesirable Results

An undesirable result for chronic lowering of groundwater levels does not currently exist, since groundwater elevation in 22 out of 23 of the existing monitoring wells (95.7%) in the Subbasin were above the minimum threshold in the most recent Fall groundwater elevation measurements. Conditions that may lead to an undesirable result include the following:

- **Localized pumping clusters**. Even if regional pumping is maintained within the sustainable yield, clusters of high-capacity wells may cause excessive localized drawdowns that lead to undesirable results.
- **Expansion of *de-minimis* pumping**. Individual *de-minimis* pumpers do not have a significant impact on groundwater elevations. However, many *de-minimis* pumpers are often clustered in specific residential areas. Pumping by these *de-minimis* users is not regulated under this GSP. Adding additional domestic *de-minimis* pumpers in these areas may result in excessive localized drawdowns and undesirable results.

- **Extensive, unanticipated drought**. Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future groundwater elevations. Extensive, unanticipated droughts may lead to excessively low groundwater elevations and temporary undesirable results.

#### 8.6.4.3 Effects on Beneficial Users and Land Uses

The primary detrimental effect on beneficial users from allowing multiple exceedances occurs if more than one exceedance occurs in a small geographic area. Allowing 15% exceedances is reasonable as long as the exceedances are spread out across the Subbasin, and as long as any one well does not regularly exceed its minimum threshold. If the exceedances are clustered in a small area, it will indicate that significant and unreasonable effects are being born by a localized group of landowners. To avoid this, the monitoring system is designed to have broad geographic coverage; ensuring that minimum threshold exceedances cannot be clustered in a single area.

## 8.7 Reduction in Groundwater Storage SMC

### 8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were determined based on public meetings, and discussions with GSA staff. Significant and unreasonable changes in groundwater storage in the Subbasin are those that:

- Lead to long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators.

### 8.7.2 Minimum Thresholds

Section §354.28(c)(2) of the GSP Regulations states that "The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the subbasin without causing conditions that may lead to undesirable results" (CCR, 2016).

As noted in the regulatory definition of minimum thresholds quoted above, the reduction in groundwater storage minimum threshold is established for the Subbasin as a whole, not for individual aquifers. Therefore, one minimum threshold is established for the entire Subbasin.

The total volume of groundwater that can be annually withdrawn from the Subbasin without leading to a long-term reduction in groundwater storage or interfering with other sustainability indicators is the calculated sustainable yield of the Subbasin. As discussed in Chapter 6, the future long-term sustainable yield of the Subbasin under reasonable climate change assumptions is 112,000 AF/yr. This sustainable yield represents an approximately 7% reduction in groundwater pumping from the projected pumping volumes.

Public and stakeholder input on the significant and unreasonable conditions for groundwater storage suggested a preference for increasing groundwater storage, but not a preference for restricting average year pumping. Therefore, the minimum threshold is set at the long-term future sustainable yield of 112,000 AF/yr.

While the sustainable yield calculated in chapter 6 assumes zero seawater intrusion, it does not account for temporary pumping reductions that may be necessary to achieve the higher groundwater elevations that help mitigate seawater intrusion. Because the minimum thresholds represent long-term management criteria, any temporary pumping reductions needed to raise groundwater elevations are not explicitly incorporated into the thresholds. However, the SVBGSA recognizes that, dependent on the success of various proposed projects and management actions, there may be a number of years when pumping might be held below the minimum threshold to achieve necessary rises in groundwater elevation. The actual amount of allowable pumping from the Subbasin will be adjusted in the future based on the success of projects designed to halt seawater intrusion.

The minimum threshold applies to pumping of natural recharge only. Natural recharge includes items such as recharge from precipitation and percolation of excess irrigation water. Pumping of intentionally recharged water that is not part of the natural recharge is not considered when compared against the minimum threshold. Intentionally recharged water refers to water recharged through injection wells or percolation ponds, with the sole intent of adding water to the aquifer to increase storage and raise water levels.

#### 8.7.2.1 Information and Methodology Used to Establish Minimum Thresholds

The calculations used to estimate the sustainable yield, and the subsequent minimum threshold for reduction in groundwater storage are detailed in Chapter 6. These calculations acknowledge and account for current land use, future urban growth, and anticipated reasonable climate change.

#### 8.7.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum threshold for reduction in groundwater storage is a single value for the entire Subbasin. Therefore, the concept of potential conflict between minimum thresholds is not applicable.

The reduction in groundwater storage minimum threshold could influence other sustainability indicators. The reduction in groundwater storage minimum threshold is selected to avoid undesirable results for other sustainability indicators, as outlined below.

- **Chronic lowering of groundwater levels**. Pumping at or below the sustainable yield will maintain or raise average groundwater elevations in the Subbasin. Therefore, the minimum threshold for reduction in groundwater storage will not result in a significant or unreasonable lowering of groundwater elevations.

- **Seawater intrusion**. Pumping at or below the sustainable yield will maintain or raise average groundwater elevations in the Subbasin. Therefore, the minimum threshold for reduction in groundwater storage will not result in a significant or unreasonable increase in seawater intrusion. However, pumping at the minimum threshold may not, by itself, stop all seawater intrusion. The seawater intrusion minimum thresholds do not depend on the change in storage minimum threshold: exceedance of both minimum thresholds will be avoided independently.
- **Degraded water quality**. Groundwater quality could be affected through two processes:
    1. Low groundwater elevations could result in poor-quality groundwater being drawn upward into production wells from Deep Aquifers. The reduction in storage minimum threshold is set to prevent any reduction in storage, and therefore prevent lower groundwater elevations. Therefore, the reduction in storage minimum threshold will not draw additional poor-quality water from Deep Aquifers towards production wells.
    2. Changes in groundwater elevations could cause changes in groundwater gradients, which could cause poor quality water to flow towards production wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold for reduction in groundwater storage does not directly lead to a significant and unreasonable degradation of groundwater quality in production wells.
- **Subsidence**. The reduction in storage minimum threshold is established to prevent any reduction in storage, and therefore prevent lowering of groundwater elevations. Because future groundwater elevations will be at or higher than existing groundwater elevations, they will not induce any additional dewatering of clay-rich sediments; and will not induce additional subsidence.
- **Depletion of interconnected surface waters**. The reduction in storage minimum threshold is established to prevent further reduction in storage, and therefore prevent lowering of groundwater elevations. Therefore, the change in storage minimum threshold will not induce additional depletion of interconnected surface waters and will not result in a significant or unreasonable depletion of interconnected surface waters.

#### 8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The 180/400-Foot Aquifer Subbasin has four neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Langley Subbasin to the north

- The Eastside Subbasin to the northeast
- The Forebay Subbasin to the south
- The Monterey Subbasin to the West

The SVBGSA is either the exclusive GSA, or is one of two coordinating GSAs for the adjacent Langley, Eastside, Forebay, and Monterey Subbasins. Because the SVBGSA covers all of these subbasins, the GSA Board of Directors opted to develop the minimum thresholds and measurable objectives for all of these neighboring subbasins in a single process that is coordinated with the 180/400-Foot Aquifer Subbasin. These neighboring subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of neighboring subbasins' GSPs and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

In addition, the Pajaro Valley Basin occurs directly to the north. Because the minimum thresholds in the 180/400-Foot Aquifer Subbasin are set at the long-term future sustainable yield, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

#### 8.7.2.4 Effect on Beneficial Uses and Users

The reduction in groundwater storage minimum threshold of maintaining pumping at the Subbasin's calculated sustainable yield requires a restriction on the amount of groundwater pumping in the Subbasin. Restricting pumping may impact the beneficial uses and users of the Subbasin.

**Agricultural land uses and users**. Restricting the amount of groundwater pumping may limit or reduce agricultural production in the Subbasin by reducing the amount of available water. Agricultural lands that are currently not irrigated may be particularly impacted because the additional groundwater pumping needed to irrigate these lands will increase the Subbasin pumping beyond the sustainable yield, violating the minimum threshold.

**Urban land uses and users**. Restricting the amount of groundwater pumping may increase the cost of water for municipal users in the Subbasin because municipalities may need to find other, more expensive water sources.

**Domestic land uses and users**. Domestic groundwater users may generally benefit from this minimum threshold. Many domestic groundwater users are *de-minimis* users whose pumping may not be restricted by the projects and management actions adopted in this GSP. By restricting the amount of groundwater that is pumped from the Subbasin, the *de-minimis* users are protected from overdraft that could impact their ability to pump groundwater.

**Ecological land uses and users**. Environmental groundwater uses may generally benefit from this minimum threshold. Restricting the amount of groundwater that is pumped from the Subbasin, maintains groundwater supplies at levels similar to present levels which can be used for environmental purposes.

#### 8.7.2.5 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

#### 8.7.2.6 Method for Quantitative Measurement of Minimum Threshold

The total amount of groundwater withdrawn from the Subbasin will be measured in a number of ways:

- Municipal public water systems and small water systems report their measured groundwater usage to the State of California. These data are available on the State's Drinking Water Information Clearinghouse website. These data will be used to quantify municipal and small system pumping on an annual basis.
- Agricultural pumping will be collected in one of two ways:
    1. Agricultural pumpers may report their pumping directly to the SVBGSA
    2. Pumping will be estimated for agricultural pumpers that do not report their pumping. The annual pumping will be estimated using Monterey County crop data and crop duty estimates, times a multiplier. The multiplier is included in these calculations to disincentivize growers from pumping more than the crop duties, yet only being assessed based on the crop duties used by Monterey County.
- Domestic pumping will be estimated by multiplying the estimated number of domestic users by a water use factor. The current water use factor is assumed to be 0.39 AF/yr. dwelling unit.

The impact of groundwater withdrawals on the amount of groundwater in storage will be checked using the updated SVIHM model. At a minimum, the model will be updated every 5 years with new data and the amount of pumping that occurred in the previous 5 years will be checked against the simulated change in groundwater storage. These verifications will indicate whether reducing pumping to the sustainable yield will result in no net reduction in groundwater storage under average hydrologic conditions, or whether the sustainable yield should be reevaluated.

### 8.7.3 Measurable Objectives

The measurable objectives for reduction in groundwater storage is the same as the minimum threshold. The measurable objective is set at the long-term future sustainable yield of 112,000 AF/yr.

#### 8.7.3.1 Method for Setting Measurable Objectives

As discussed in Section 8.7, input from stakeholders suggested that they would prefer more groundwater in storage. However, stakeholders also suggested that they would prefer not to attain this increase in groundwater storage by reducing existing pumping during average years. Instead, they prefer to increase groundwater storage through improving local recharge or by other means.

By regulation, the metric used to assess reductions in groundwater storage is an amount of pumping. Therefore, although increases in groundwater storage are preferred, attaining this measurable objective should not be achieved through future pumping reductions. Therefore, the measurable objective is set at the same level as the minimum threshold of 112,000 AF/yr. of pumping.

#### 8.7.3.2 Interim Milestones

The reduction in storage interim milestone is set to 112,000 AF/yr. for each of the 5-year intervals, consistent with the minimum threshold and the measurable objective.

### 8.7.4 Undesirable Results

#### 8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The reduction in groundwater storage undesirable result is a quantitative combination of reduction in groundwater storage minimum threshold exceedances. However, there is only one reduction in groundwater storage minimum threshold. Therefore, no minimum threshold exceedances are allowed to occur and the reduction in groundwater storage undesirable result is:

> *During average hydrogeologic conditions, and as a long-term average over all hydrogeologic conditions, the total groundwater pumping shall not exceed the minimum threshold, which is equivalent to the long-term sustainable yield of the aquifers in the Subbasin.*

#### 8.7.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the reduction in groundwater storage sustainability indicator include the following:

- **Expansion of agricultural or municipal pumping**. Additional agricultural or municipal pumping may result in exceedance of the long-term sustainable yield, an undesirable result.
- **Expansion of *de-minimis* pumping**. Pumping by *de-minimis* users is not regulated under this GSP. Adding domestic *de-minimis* pumpers in the Subbasin may result in excessive pumping and exceedance of the long-term sustainable yield, an undesirable result.
- **Extensive, unanticipated drought**. Minimum thresholds are established based on reasonable anticipated future climatic conditions. Extensive, unanticipated droughts may lead to excessively low groundwater recharge and unanticipated high pumping rates that could cause an exceedance of the long-term sustainable yield.

#### 8.7.4.3 Effects on Beneficial Users and Land Use

The practical effect of the reduction in groundwater storage undesirable result is no net change in groundwater storage during average hydrologic conditions and over the long-term. Therefore, during average hydrologic conditions and over the long-term, beneficial uses and users will have access to the same amount of water in storage that currently exists, and the undesirable result will not have a negative effect on the beneficial users and uses of groundwater. However, pumping at the long-term sustainable yield during dry years will temporarily reduce the amount of groundwater in storage. If this occurs, there could be short-term impacts from a reduction in groundwater in storage on all beneficial users and uses of groundwater. In particular, groundwater pumpers that rely on water from shallower wells may be temporarily impacted as the amount of groundwater in storage drops and water levels in their wells decline.

## 8.8 Seawater Intrusion SMC

### 8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were determined based on public meetings, and discussions with GSA staff. Significant and unreasonable seawater intrusion in the Subbasin is:

- Seawater intrusion in excess of the seawater intrusion line defined by MCWRA in 2017.

### 8.8.2 Minimum Thresholds

Section §354.28(c)(3) of the Regulations states that "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" (CCR, 2016).

The 2017 extent of the 500 mg/L chloride concentration isocontour as mapped by MCWRA is adopted as the seawater intrusion minimum threshold for both the 180- and 400-Foot Aquifers.

Separate minimum thresholds are defined for the 180-Foot Aquifer and the 400-Foot Aquifer. The line defined by Highway 1 is adopted as the seawater intrusion minimum threshold for the Deep Aquifers.

#### 8.8.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The GSP Regulations (CCR, 2016) require the following supporting 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 defines 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.*

Seawater intrusion minimum thresholds are based on seawater intrusion maps developed by the MCWRA. MCWRA publishes estimates of the extent of seawater intrusion every 2 years. The MCWRA maps define the extent of seawater intrusion as the inferred location of the 500 mg/L chloride concentration. These maps are developed through analysis and contouring of the values measured at privately-owned wells and dedicated monitoring wells near the coast, as shown on Figure 7-7 for the 180-Foot aquifer and on Figure 7-8 for the 400-Foot aquifer. The maps and cross sections of seawater intrusion used to develop the minimum thresholds are included in Chapter 5.

The groundwater model that will be used to assess the effectiveness of projects and management actions on seawater intrusion specifically incorporates assumptions for future sea level rise. Therefore, the minimum thresholds and actions to avoid undesirable results will address sea level rise.

Figure 8-6 presents minimum thresholds for seawater intrusion in the 180-Foot Aquifer and Figure 8-7 presents minimum thresholds for seawater intrusion in the 400-Foot Aquifer, represented by the 500 mg/L chloride concentration isocontour.

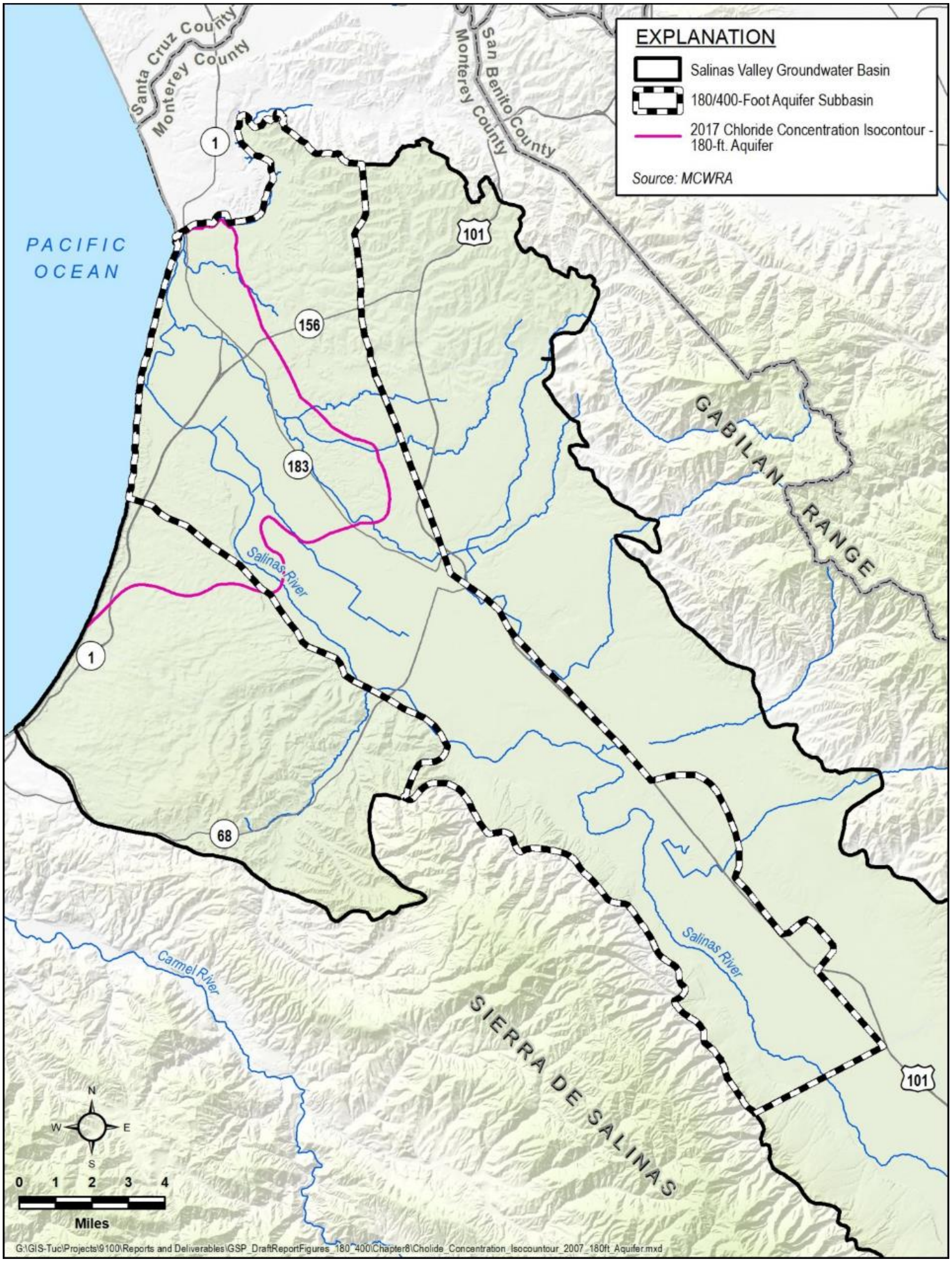



Figure 8-6. Minimum Thresholds for Seawater Intrusion in the 180-Foot Aquifer

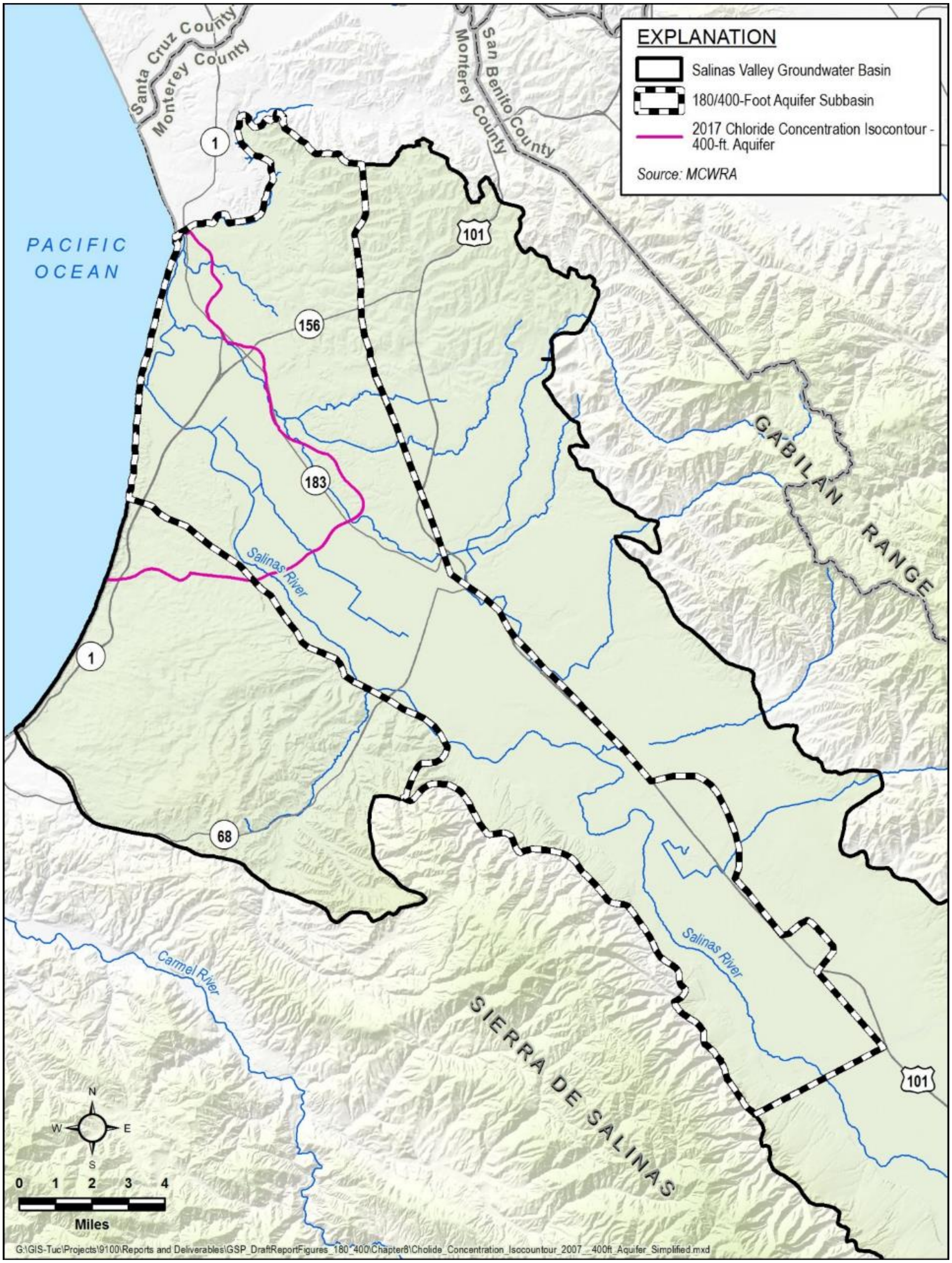



Figure 8-7. Minimum Thresholds for Seawater Intrusion in the 400-Foot Aquifer

#### 8.8.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum threshold for seawater intrusion is a single value for each aquifer. The minimum thresholds are set at mapped extend of 2017 seawater intrusion, meaning that the minimum thresholds are currently and simultaneously met in all three aquifers. Therefore, no conflict exists between minimum thresholds measured in various aquifers within the Subbasin.

The seawater intrusion minimum threshold could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels**. Groundwater elevations will not be affected by the seawater intrusion minimum thresholds.
- **Change in groundwater storage**. Groundwater storage, as measured by pumping, will not be affected by the seawater intrusion minimum thresholds.
- **Degraded water quality**. The seawater intrusion minimum thresholds may have a beneficial impact on groundwater quality by preventing increases in chloride concentrations in supply wells.
- **Inelastic subsidence**. Inelastic subsidence will not be affected by the seawater intrusion minimum thresholds.
- **Depletion of interconnected surface water**. Interconnected surface water will not be affected by the seawater intrusion minimum thresholds.

#### 8.8.2.3 Effect of Minimum Threshold on Neighboring Basins and Subbasin

The 180/400-Foot Aquifer Subbasin has two neighboring subbasins with seawater intrusion concerns:

- The Monterey Subbasin to the west
- The Pajaro Valley Basin to the north

The SVBGSA is one of two coordinating GSAs for the adjacent Monterey Subbasin. The minimum thresholds and measurable objectives for seawater intrusion was developed in a single process that is coordinated the 180/400-Foot Aquifer Subbasin with the Monterey Subbasin. The Monterey Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of the Monterey Subbasin GSP and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the Monterey Subbasin from achieving sustainability.

The Pajaro Valley Basin has submitted an alternative submittal. Because the minimum thresholds in the 180/400-Foot Aquifer Subbasin is no further intrusion, it is likely that the minimum threshold will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

#### 8.8.2.4 Effects on Beneficial Users and Land Uses

**Agricultural land uses and users.** The seawater intrusion minimum thresholds generally provide positive benefits to the Subbasin’s agricultural water users. Preventing additional seawater intrusion ensures that a supply of usable groundwater will exist for beneficial agricultural use.

**Urban land uses and users**. The seawater intrusion minimum thresholds generally provide positive benefits to the Subbasin’s urban water users. Preventing additional seawater intrusion will help ensure an adequate supply of groundwater for municipal supplies.

**Domestic land uses and users**. The seawater intrusion minimum thresholds generally provide positive benefits to the Subbasin’s domestic water users. Preventing additional seawater intrusion will help ensure an adequate supply of groundwater for domestic supplies.

**Ecological land uses and users**. Although the seawater intrusion minimum thresholds do not directly benefit ecological uses, it can be inferred that the seawater intrusion minimum thresholds provide generally positive benefits to the Subbasin’s ecological water uses. Preventing additional seawater intrusion will help prevent unwanted high salinity levels by the coast from impacting ecological groundwater uses.

#### 8.8.2.5 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for seawater intrusion.

#### 8.8.2.6 Method for Quantitative Measurement of Minimum Threshold

Chloride concentrations are measured in groundwater samples collected from the MCWRA’s seawater intrusion monitoring network. These samples are used to develop the inferred location of the 500 mg/L chloride isocontour. The methodology and protocols for collecting samples and developing the 500 mg/L isocontour are detailed in Appendix 7C and Appendix 7D.

## 8.8.3 Measurable Objectives

### 8.8.3.1 Method for Setting Measurable Objectives

In the 180/400-Foot Aquifer Subbasin, the measurable objective for the seawater intrusion SMC is to move the 500 mg/L chloride isocontour to the line defined by Highway 1. This will improve the Subbasin's groundwater quality and provide access to usable groundwater to additional beneficial users. This measurable objective may be modified as the projects and actions to address seawater intrusion are refined.

### 8.8.3.2 Interim Milestones

The interim milestones for seawater intrusion are:

- 5-Year: identical to current conditions
- 10-year: one-third of the way to the measurable objective
- 15-year: two-thirds of the way to the measurable objective

These are only our initial estimates of interim milestones. Interim milestones for seawater intrusion will be modified once the SVIHM is available for use.

## 8.8.4 Undesirable Results

### 8.8.4.1 Criteria for Defining Seawater Intrusion Undesirable Results

The seawater intrusion undesirable result is a quantitative combination of chloride concentrations minimum threshold exceedances. There is only one minimum threshold for each of the three aquifers. Because even localized seawater intrusion is not acceptable, the basinwide undesirable result is zero exceedances of minimum thresholds. For the Subbasin, the seawater intrusion undesirable result is:

> *On average in any one year there shall be no exceedances of any minimum threshold.*

### 8.8.4.2 Potential Causes of Undesirable Results

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

- Increased coastal pumping that could draw seawater more inland.
- Unanticipated high sea level rise.

#### 8.8.4.3 Effects on Beneficial Users and Land Use

The primary detrimental effect on beneficial users and land uses from allowing seawater intrusion to continue or occur in the future is that the pumped groundwater may become saltier and thus impact domestic and municipal wells and associated land uses. Allowing seawater intrusion to continue or occur in the future may also impact agriculture. Chloride moves readily within soil and water and is taken up by the roots of plants. It is then transported to the stems and leaves. Sensitive berries and avocado rootstocks can tolerate only up to 120 mg/L of chloride, while grapes can tolerate up to 700 mg/L or more (University of California Agriculture and Natural Resources, 2002).

## 8.9 Degraded Water Quality SMC

### 8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were determined based on public meetings, and discussions with GSA staff. Significant and unreasonable changes in groundwater quality in the Subbasin are increases in a chemical constituent that either:

- Results in groundwater concentrations in a public supply well above an established MCL or SMCL, or
- Leads to reduced crop production.

### 8.9.2 Minimum Thresholds

Section §354.28(c)(2) of the GSP Regulations states that “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 by the Agency to be of concern for the basin” (CCR, 2016). The GSP Regulations allow three options for setting degraded water quality minimum thresholds. In this Subbasin, minimum thresholds are based on a number of supply wells that exceed concentrations of constituents determined to be of concern for the Subbasin. The definition of supply wells for constituents of concern that have an MCL or SMCL are public water system wells, small water system wells, and domestic wells. The definition of supply wells for constituents of concern that may lead to reduced crop production are agricultural irrigation supply wells.

As noted in Section 354.28 (c)(4) of the GSP Regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality (CCR, 2016). Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents that have already been identified in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. Constituents of concern must meet two criteria:

1. They must have an established level of concern such as an MCL or SMCL, or a level known to affect crop production.
2. They must have been found in the Subbasin at levels above the level of concern.

Based on the review of groundwater quality in Chapter 5, a variety of constituents of concern (COCs) were identified that may affect both agricultural wells and drinking water supply wells. The constituents of concern for drinking water supply wells include:

- 1,2,3-trichloropropane
- arsenic
- cadmium
- chloride
- fluoride
- hexavalent chromium
- iron
- manganese
- methyl tert-butyl ether (MTBE)
- nitrate
- perchlorate
- thallium
- total dissolved solids (TDS)

Since hexavalent chromium does not currently have an actionable limit, it was eliminated from this list. Should the state of California establish an MCL or SMCL for hexavalent chromium, it will be added to the list of parameters monitored in the drinking water supply wells.

The constituents of concern for agricultural wells include:

- boron
- chloride
- iron
- manganese

These constituents are monitored with the ILRP wells and are known to cause reductions in crop production when irrigation water includes them in concentrations above agricultural water quality objectives.

As discussed in Chapter 7, wells for 3 separate water quality monitoring networks were reviewed and used for developing SMCs:

- Municipal public water system wells, regulated by the SWRCB Department of Drinking Water.

- Small public water system wells, regulated by Monterey County Department of Public Health, which include both state small water systems and local small water systems.

- Agricultural and domestic wells, monitored as part of ILRP by the CCGC. This dataset was obtained from the SWRCB through the GAMA online portal. The data were separated into two data sets, one for domestic wells and the other for agricultural wells for purposes of developing initial draft minimum thresholds and measurable objectives for each type of well and associated beneficial use. Some rural residential wells in the northern part of the Subbasin with groundwater quality problems may not be reporting under the ILRP, and this may constitute a data gap that could be addressed if these landowners begin reporting under the ILRP. However, the SVBGSA will not initiate new sampling of these wells.

Each of these well networks are monitored for different purposes and overseen by different entities, and therefore include different types of water quality parameters. Furthermore, some groundwater quality impacts are detrimental to only certain networks. For example, high nitrates are detrimental to municipal and small water supply systems but are not detrimental to agricultural irrigation wells. Therefore, different sets of groundwater quality parameters are monitored at each monitoring network based on which parameters are reported in the network and which parameters are detrimental to the network (see Table 8-4).

- The municipal public water system wells are sampled for the full suite of 12 COCs. Minimum thresholds are set for these 12 COCs in the municipal public supply wells.

- The small public water system wells are only sampled for arsenic, nitrate and hexavalent chromium. Both arsenic and nitrate have established MCLs. Minimum thresholds are set for these two COC's in the small public water supply wells systems.

- The ILRP wells are sampled for general cations and anions, as well as nitrate and salinity. Minimum thresholds are established in the ILRP wells for both drinking water standards to protect domestic wells, and for agricultural irrigation water quality objectives.

Table 8-4. Summary of Constituents Monitored at Each Well Network

| Constituent | Municipal | Small System | Domestic | Agricultural |
|---|---|---|---|---|
| 1,2,3-TCP | ✓ | | | |
| Arsenic | ✓ | ✓ | | |
| Boron | | | | ✓ |
| Cadmium | ✓ | | | |
| Chloride | ✓ | | ✓ | ✓ |
| Fluoride | ✓ | | | |
| Iron | ✓ | | ✓ | ✓ |
| Manganese | ✓ | | ✓ | ✓ |
| MTBE | ✓ | | | |
| Nitrate | ✓ | ✓ | ✓ | |
| Perchlorate | ✓ | | | |
| Thallium | ✓ | | | |
| TDS | ✓ | | ✓ | |

The bases for establishing minimum thresholds for each constituent of concern in the 180/400-Foot Aquifer Subbasin are listed in Table 8-5. All MCL and SMCL values reflect California drinking water standards. The agricultural water quality objectives are listed in the Water Quality Control Plan for the Central Coastal Basin (SWRCB, 2017). This table does not identify the numerical minimum thresholds, but rather identifies the foundation for how many additional wells will be allowed to exceed the level of concern. Wells that already exceed this limit are not counted against the minimum thresholds.

Table 8-5. Groundwater Quality Minimum Thresholds Bases

| Constituent of Concern | Minimum Threshold Based on Number of Production Wells |
|---|---|
| **Municipal Wells in Monitoring Program** | |
| 1,2,3-trichloropropane | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the 1,2,3-trichloropropane MCL of 0.005 ug/L. |
| Arsenic | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the arsenic MCL of 0.010 mg/L. |
| Cadmium | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the cadmium MCL of 0.005 mg/L. |
| Chloride | Zero additional municipal production wells that are in the GSP monitoring program shall exceed the chloride Recommended SMCL of 250 mg/L. |
| Fluoride | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the fluoride SMCL of 2 mg/L. |
| Iron | Zero additional municipal production wells that are in the GSP monitoring program shall exceed the iron SMCL of 0.3 mg/L |
| Manganese | Zero additional municipal or domestic production wells that are in the GSP monitoring program shall exceed the manganese SMCL of 0.05 mg/L |
| MTBE | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the MTBE MCL of 0.013 mg/L. |
| Nitrate | Zero additional municipal production wells that are in the GSP monitoring program shall exceed the nitrate MCL of 10 mg/L, measured as nitrogen. |
| Perchlorate | Zero additional municipal production wells that are in the GSP monitoring program shall exceed the perchlorate MCL of 0.006 mg/L. |
| Thallium | Zero additional municipal production wells that are in the GSP monitoring area shall exceed the thallium MCL of 0.002 mg/L. |
| TDS | Zero additional municipal production wells that are in the GSP monitoring program shall exceed the TDS Recommended SMCL of 500 mg/L. |
| **Small Water System Wells in Monitoring Program** | |
| Arsenic | Zero additional small system production wells that are in the GSP monitoring area shall exceed the arsenic MCL of 0.010 mg/L. |
| Nitrate | Zero additional small system production wells that are in the GSP monitoring program shall exceed the nitrate MCL of 10 mg/L, measured as nitrogen. |
| **ILRP Wells in Monitoring Program - Domestic Well Constituents and Minimum Thresholds** | |
| Chloride | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the chloride MCL of 250 mg/L. |
| Iron | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the iron SMCL of 0.3 mg/L. |
| Manganese | Zero additional municipal or ILRP wells that are in the GSP monitoring program shall exceed the manganese SMCL of 0.05 mg/L. |
| Nitrate | Zero additional ILRP production wells that are in the GSP monitoring program shall exceed the nitrate MCL of 10 mg/L, measured as nitrogen. |
| Sulfate | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the sulfate Upper SMCL of 500 mg/L. |
| TDS | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the TDS Recommended SMCL of 500 mg/L. |

| Constituent of Concern | Minimum Threshold Based on Number of Production Wells |
|---|---|
| **ILRP Wells in Monitoring Program – Agricultural Irrigation Constituents and Minimum Thresholds** | |
| Boron | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the boron agricultural water quality objective of 0.75 mg/L. |
| Chloride | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the chloride agricultural water quality objective of 350 mg/L. |
| Iron | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the iron agricultural water quality objective 5 mg/L. |
| Manganese | Zero additional ILRP wells that are in the GSP monitoring program shall exceed the manganese agricultural water quality objective 0.2 mg/L. |

#### 8.9.2.1 Municipal Production Wells

The minimum thresholds for degraded water quality for the municipal production wells are based on the goal of zero additional exceedances in existing wells shown in Table 8-5. However, some exceedances already exist in those wells, and these exceedances will likely continue into the future. The minimum threshold for the number of allowed exceedances is therefore equal to the current number of exceedances. Based on the number of municipal production wells in the existing water quality monitoring network that is described in Chapter 7, the number of existing exceedances from 2015 to February, 2019 for each constituent is shown in Table 8-6.

In addition, exceedances are based on existing wells only. The well networks will be re-assessed every 5 years to identify any new wells that should be added to the monitoring networks. According to the GSP Regulations, the Minimum Thresholds are based on the same number of wells to have exceedances, not necessarily the same wells. An average of water quality samples is used for wells that are measured more than once a year.

Table 8-6. Minimum Thresholds for Degradation of Groundwater Quality for the Municipal Supply Wells Under the Current Monitoring Network (Data from 2015-February, 2019)

| Constituent of Concern (COC) | Regulatory Exceedance Standard | Standard Units | Number of Wells in Monitoring Network Sampled for COC | Minimum Threshold - Number of Wells Exceeding Regulatory Standard |
|---|---|---|---|---|
| **123-Trichloropropane** | 0.005 | ug/L | 60 | 2 |
| **Arsenic** | 10 | ug/L | 58 | 1 |
| **Cadmium** | 5 | ug/L | 61 | 0 |
| **Chloride** | 250 | mg/L | 41 | 2 |
| **Fluoride** | 2 | mg/L | 60 | 0 |
| **Iron** | 300 | ug/L | 43 | 8 |
| **Manganese** | 50 | ug/L | 42 | 3 |
| **MTBE (Methyl tert-butyl ether** | 13 | ug/L | 65 | 1 |
| **Nitrate** | 10 | mg/l | 74 | 9 |
| **Perchlorate** | 6 | ug/L | 59 | 0 |
| **Thallium** | 2 | ug/L | 61 | 0 |
| **Total Dissolved Solids** | 500 | mg/l | 41 | 18 |

#### 8.9.2.2 Small Public Water Systems Wells

The small water systems monitoring data are based on the County of Monterey Public Health Department routine monitoring of both Local and State Small Water Systems; and cover the period from 2015-2017 in a total of 136 wells. As described in Chapter 7, this network is not currently included in the water quality monitoring network for this GSP due to a lack of well construction and location information. However, an initial analysis on the water quality data for the current network was conducted to establish interim minimum thresholds and measurable objectives that will be updated once the data gap is lifted and a better assessment of this monitoring network can be established. The water quality data set used for this preliminary analysis was derived from an existing online GIS data compilation (Ostermayer, 2017).

The minimum thresholds for degraded water quality for the small public water supply system wells are similarly based on the goal of zero additional exceedances in existing wells shown in Table 8-5. Following a similar process as that of the municipal production wells, the minimum thresholds for degraded water quality in small public water systems is shown in Table 8-7. As with the municipal production wells, exceedances are based on existing wells only. The well networks will be re-assessed during the 5-year GSP Update development to identify any wells that should be included in the monitoring network for small public supply systems.

Table 8-7. Minimum Thresholds for Degradation of Groundwater for the Small Systems Supply Wells Under the Current Monitoring Network (Data from 2015-2017)

| Constituent of Concern (COC) | Regulatory Exceedance Standard | Standard Units | Number of Wells in Monitoring Network Sampled for COC from 2015-2017 | Minimum Threshold - Number of Wells Exceeding Regulatory Standard |
|---|---|---|---|---|
| Arsenic | 0.01 | mg/L | 47 | 1 |
| Nitrate | 10 | mg/l | 136 | 22 |

### 8.9.2.3 Agricultural and Domestic Wells – ILRP

As described in Chapter 7, this network is not currently included in the water quality monitoring network for this GSP because a revised monitoring network under Ag Order 4.0 will be established in 2020. However, an initial analysis of the water quality data for the current ILRP network was conducted to establish interim minimum thresholds and measurable objectives that will be updated once Ag Order 4.0 is finalized and a better assessment of this monitoring network can be established.

The minimum thresholds for degraded water quality for the ILRP wells are similarly based on the goal of zero additional exceedances shown in Table 8-5. Following the same process as that of the municipal production wells, the minimum thresholds for degraded water quality is shown in Table 8-8 for domestic drinking water wells, and in Table 8-9 for agricultural irrigation wells. Based on the number of ILRP wells in the existing water quality monitoring network that is described in Chapter 7, the number of existing exceedances for each constituent is shown for constituents monitored at wells since 2012 to represent recent measurements.

The monitoring well network for the ILRP will change in 2020 with the adoption of Ag Order 4.0. At that time, the new ILRP monitoring network will be incorporated into this GSP, replacing the current network, for water quality monitoring.

Table 8-8. Minimum Thresholds for Degradation of Groundwater Quality for ILRP Domestic Wells Under the Current Monitoring Network (Data from 2012-2018)

| Constituent of Concern (COC) | Regulatory Exceedance Standard | Standard Units | Number of Wells in Monitoring Network Sampled for COC from 2012-2018 | Minimum Threshold - Number of Wells Exceeding Regulatory Standard |
|---|---|---|---|---|
| Chloride | 250 | mg/L | 172 | 29 |
| Iron | 0.3 | mg/L | 37 | 12 |
| Manganese | 0.05 | mg/L | 37 | 4 |
| Nitrate | 10 | mg/l | 179 | 51 |
| Sulfate | 500 | mg/l | 172 | 43 |
| TDS | 500 | mg/l | 148 | 111 |

Table 8-9. Minimum Thresholds for Degredation of Groundwater Quality for Agricultural Use in ILRP Wells Under the Current Monitoring Network (Data from 2012-2018)

| Constituent of Concern (COC) | Agricultural Usage Water Quality Objective | Water Quality Objective Units | Number of Wells in Monitoring Network Sampled for COC from 2012-2018 | Minimum Threshold - Number of Wells Exceeding Water Quality Objective |
|---|---|---|---|---|
| Boron | 0.75 | mg/L | 95 | 0 |
| Chloride | 350 | mg/L | 311 | 28 |
| Iron | 5 | mg/L | 90 | 3 |
| Manganese | 0.2 | mg/L | 90 | 2 |

#### 8.9.2.4 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

The exceedances shown in Table 8-6, Table 8-7, Table 8-8, and Table 8-9 were based on a review of recent datasets. The information used for establishing the degradation of groundwater quality minimum thresholds includes:

- Historical groundwater quality data from municipal, small systems, agricultural, and domestic production wells in the Subbasin
- Federal and State drinking water quality standards
- Central Coast Basin Plan assessment of water quality objectives for agricultural water use
- Feedback from GSA staff members and public members

The historical groundwater quality data used to establish groundwater quality minimum thresholds are presented in Chapter 5. Based on the reviews of historical and current groundwater quality data, federal and state drinking water standards, and irrigation water quality needs, the SVBGSA agreed that these standards are appropriate to define groundwater quality minimum thresholds.

#### 8.9.2.5 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Because SGMA does not require projects or actions to improve groundwater quality, there will be no direct actions under the GSP associated with the groundwater quality minimum thresholds. Therefore, there are no actions that directly influence other sustainability indicators. However, preventing migration of poor groundwater quality may limit activities needed to achieve minimum thresholds for other sustainability indicators.

- **Chronic lowering of groundwater levels**. Groundwater quality minimum thresholds could influence groundwater elevation minimum thresholds by limiting the types of water that can be used for recharge to raise groundwater elevations. Water used for recharge cannot exceed any of the groundwater quality minimum thresholds. In addition, a change in groundwater elevations may cause a change in groundwater flow direction which in turn could cause poor water quality to migrate into areas of good water quality.
- **Change in groundwater storage**. Nothing in the groundwater quality minimum thresholds promotes pumping in excess of the sustainable yield. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the groundwater storage minimum threshold.
- **Seawater intrusion**. Nothing in the groundwater quality minimum thresholds promotes additional pumping that could exacerbate seawater intrusion. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the seawater intrusion minimum threshold.
- **Subsidence**. Nothing in the groundwater quality minimum thresholds promotes additional pumping that could cause subsidence. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the subsidence minimum threshold.
- **Depletion of interconnected surface waters.** Nothing in the groundwater quality minimum thresholds promotes additional pumping or lower groundwater elevations adjacent to interconnected surface waters. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of interconnected surface waters.

#### 8.9.2.6 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The 180/400-Foot Aquifer Subbasin has four neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Langley Subbasin to the north
- The Eastside Subbasin to the northeast
- The Forebay Subbasin to the south
- The Monterey Subbasin to the West

The SVBGSA is either the exclusive GSA, or is one of two coordinating GSAs for the adjacent Langley, Eastside, Forebay, and Monterey Subbasins. Because the SVBGSA covers all of these subbasins, the GSA Board of Directors opted to develop the minimum thresholds and measurable objectives for all of these neighboring subbasins in a single process that is coordinated with the 180/400-Foot Aquifer Subbasin. These neighboring subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of neighboring subbasins' GSPs and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. In addition, the Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the 180/400-Foot Aquifer Subbasin are to prevent migration of poor-quality water, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

#### 8.9.2.7 Effect on Beneficial Uses and Users

**Agricultural land uses and users.** The degradation of groundwater quality minimum thresholds generally provides positive benefits to the Subbasin's agricultural water users. Preventing additional agricultural supply wells from exceeding levels that could reduce crop production ensures that a supply of usable groundwater will exist for beneficial agricultural use.

**Urban land uses and users**. The degradation of groundwater quality minimum thresholds generally provides positive benefits to the Subbasin's urban water users. Preventing constituents of concern in additional drinking water supply wells from exceeding MCLs or SMCLs ensures an adequate supply of groundwater for municipal supplies.

**Domestic land uses and users**. The degradation of groundwater quality minimum thresholds generally provides positive benefits to the Subbasin's domestic water users. Preventing constituents of concern in additional drinking water supply wells from exceeding MCLs or SMCLs ensures an adequate supply of groundwater for domestic supplies.

**Ecological land uses and users**. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. Preventing constituents of concern from migrating will prevent unwanted contaminants from impacting ecological groundwater uses.

#### 8.9.2.8 Relation to State, Federal, or Local Standards

The degradation of groundwater quality minimum thresholds specifically incorporates state and federal standards for drinking water.

#### 8.9.2.9 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from existing or new municipal, domestic, or agricultural supply wells. Groundwater quality will be measured through existing monitoring programs.

- Exceedances of MCLs and SMCLs will be monitored from annual water quality reports submitted to the California Division of Drinking Water and the County of Monterey by municipalities and small water systems.
- Exceedances of crop production based minimum thresholds will be monitored as part of the ILRP as discussed in Chapter 7.

Initially, the review of MCLs and SMCLs will be centered around the constituents of concern identified above. If during review of the water quality data additional constituents appear to exceed MCLs and SMCLs, minimum thresholds and measurable objectives will be developed for these additional constituents.

### 8.9.3 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, the SVBGSA has set the measurable objectives identical to the minimum thresholds, as defined in Table 8-6, Table 8-7, Table 8-8, and Table 8-9.

#### 8.9.3.1 Method for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.7.2.4.

#### 8.9.3.2 Interim Milestones

Interim milestones show how the GSA anticipates the Subbasin will gradually move from current conditions to meeting the measurable objectives over the next 20 years of implementation. Interim milestones are set for each 5-year interval following GSP adoption.

The measurable objectives for degradation of groundwater quality are set at current conditions; there is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to current conditions.

### 8.9.4 Undesirable Results

#### 8.9.4.1 Criteria for Defining Undesirable Results

By regulation, the degradation of groundwater quality undesirable result is a quantitative combination of groundwater quality minimum threshold exceedances. For the Subbasin, any groundwater quality degradation is unacceptable as a direct result of GSP implementation. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities they do not constitute an undesirable result. Therefore, the degradation of groundwater quality undesirable result is:

> *During any one year, no groundwater quality minimum threshold shall be exceeded when computing annual averages at each well, as a direct result of projects or management actions taken as part of GSP implementation.*

#### 8.9.4.2 Potential Causes of Undesirable Results

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

- **Required Changes to Subbasin Pumping**. If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of one of the constituents of concern towards a supply well at concentrations that exceed relevant standards.
- **Groundwater Recharge**. Active recharge of imported water or captured runoff could modify groundwater gradients and move one of the constituents of concern towards a supply well in concentrations that exceed relevant limits.

- **Recharge of Poor-Quality Water**. Recharging the Subbasin with water that exceeds an MCL, SMCL, or level that reduces crop production will lead to an undesirable result.

#### 8.9.4.3 Effects on Beneficial Users and Land Use

The undesirable result for degradation of groundwater quality is avoiding groundwater degradation due to actions directly resulting from GSP implementation. Therefore, the undesirable result will not impact the use of groundwater and will not have a negative effect on the beneficial users and uses of groundwater. This undesirable result, however, only applies to groundwater quality changes directly caused by projects or management actions implemented as part of this GSP. This undesirable result does not apply to groundwater quality changes that occur due to other causes.

## 8.10 Subsidence SMC

### 8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were assessed based on public meetings and discussions with GSA staff. Significant and unreasonable rates of land subsidence in the Subbasin are those that lead to a permanent subsidence of land surface levels that impact infrastructure. Significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that impacts infrastructure and is caused by lowering of groundwater elevations occurring in the Subbasin is significant and unreasonable.

Subsidence can be elastic or inelastic. Inelastic subsidence is generally irreversible. Elastic subsidence is the small, reversible lowering and rising of the ground surface. This SMC only concerns inelastic subsidence. Currently, InSAR data provided by DWR shows that no inelastic subsidence has been measured in the 180/400-Foot Aquifer Subbasin.

### 8.10.2 Minimum Thresholds

Section 354.28(c)(5) of the Regulations states 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" (CCR, 2016). Because it is difficult to assess a-priori where subsidence may interfere with surface land uses and where it may not, a single minimum threshold is set for the entire Subbasin.

Based on an analysis of potential measurement errors in the InSAR data, as discussed in the following section, the subsidence minimum threshold is that the InSAR measured subsidence between June of one year and June of the subsequent year shall be no more than 0.1 foot, resulting in zero long-term subsidence.

#### 8.10.2.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

Minimum thresholds were established using InSAR data available from DWR. The general minimum threshold is for no long-term irreversible subsidence in the Subbasin. The InSAR data provided by DWR, however, is subject to measurement error. DWR has stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2018, the errors are as follows (Brezing, personal communication):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

By simply adding the errors 1 and 2, the combined error is 0.1 foot. While this is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR. A land surface change of less than 0.1 feet is therefore within the noise of the data and is not dispositive of subsidence in the Subbasin.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggest that elastic subsidence is largely seasonal. Figure 8-8 shows the ground level changes at a randomly selected point in the Subbasin (Latitude 36.69318, Longitude -121.72295). This figure demonstrates the general seasonality of the elastic subsidence. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

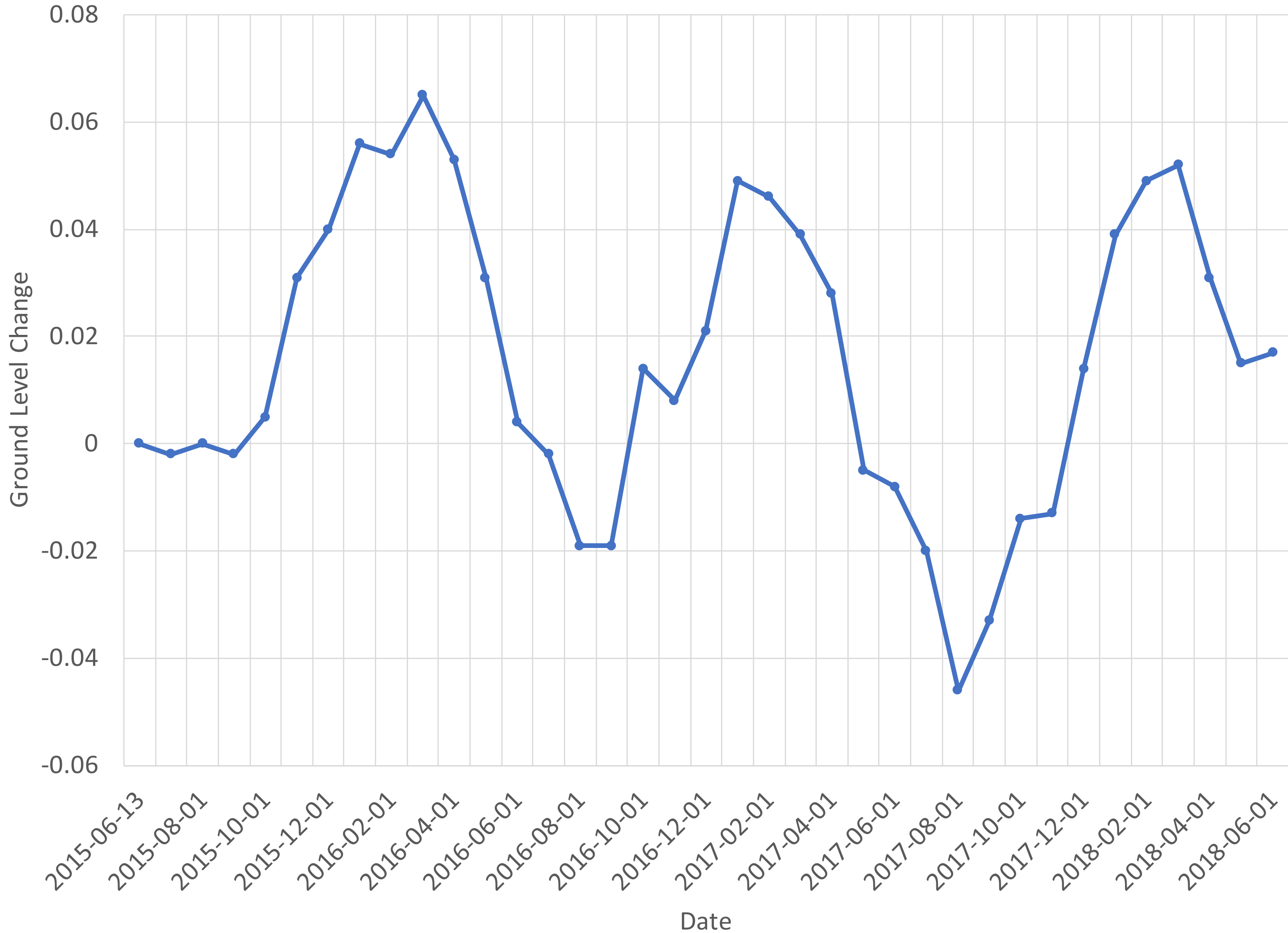



Figure 8-8. Seasonal Ground Surface Change at Point 36.69318, -121.72295

#### 8.10.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

Subsidence minimum thresholds have little or no impact on other minimum thresholds, as described below.

- **Chronic lowering of groundwater levels**. Subsidence minimum thresholds will not result in significant or unreasonable groundwater elevations.
- **Change in groundwater storage**. The subsidence minimum thresholds will not change the amount of pumping and will not result in a significant or unreasonable change in groundwater storage.
- **Seawater intrusion**. The subsidence minimum thresholds will not induce additional advancement of seawater intrusion along the coast.
- **Degraded water quality**. The subsidence minimum thresholds will not change the groundwater flow directions or rates, and therefore and will not result in a significant or unreasonable change in groundwater quality.
- **Depletion of interconnected surface waters**. The ground level subsidence minimum thresholds will not change the amount or location of pumping and will not result in a significant or unreasonable depletion of interconnected surface waters.

#### 8.10.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The 180/400-Foot Aquifer Subbasin has four neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Langley Subbasin to the north
- The Eastside Subbasin to the northeast
- The Forebay Subbasin to the south
- The Monterey Subbasin to the West

The SVBGSA is either the exclusive GSA, or is one of two coordinating GSAs for the adjacent Langley, Eastside, Forebay, and Monterey Subbasins. Because the SVBGSA covers all of these subbasins, the GSA Board of Directors opted to develop the minimum thresholds and measurable objectives for all of these neighboring subbasins in a single process that is coordinated with the 180/400-Foot Aquifer Subbasin. These neighboring subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of neighboring subbasins' GSPs and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. In addition, the Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the 180/400-Foot Aquifer Subbasin is zero subsidence, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

#### 8.10.2.4 Effects on Beneficial Uses and Users

The subsidence minimum thresholds are set to prevent any long-term inelastic subsidence that could harm infrastructure. Available data indicate that there is currently no long-term subsidence occurring in the Subbasin that affects infrastructure, and reductions in pumping are already required by minimum thresholds for other sustainability indicators. Therefore, the subsidence minimum thresholds do not require any additional reductions in pumping and there is no negative impact on any beneficial user.

#### 8.10.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

#### 8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

Minimum thresholds will be assessed using DWR-supplied InSAR data.

### 8.10.3 Measurable Objectives

The measurable objectives for ground surface subsidence represents target subsidence rates in the Subbasin. Because the minimum thresholds of zero net long-term subsidence are the best achievable outcome, the measurable objectives are identical to the minimum thresholds.

#### 8.10.3.1 Method for Setting Measurable Objectives

The measurable objectives are set to the groundwater elevations that result in zero long-term subsidence. These groundwater elevations are identical to the minimum threshold groundwater elevations.

#### 8.10.3.2 Interim Milestones

Subsidence measurable objectives are set at current conditions of no long-term subsidence. There is no change between current conditions and sustainable conditions. Therefore, the interim milestones are identical to current conditions of keeping groundwater elevations above historical lows.

### 8.10.4 Undesirable Results

#### 8.10.4.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the 180/400-Foot Subbasin, no long-term subsidence that impacts infrastructure is acceptable. Therefore, the ground surface subsided undesirable result is:

> *In any one year, there will be zero exceedances of the minimum thresholds for subsidence.*

Should potential subsidence be observed, the SVBGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the SVBGSA will undertake a program to correlate the observed subsidence with measured groundwater elevations.

#### 8.10.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include a shift in pumping locations. Shifting a significant amount of pumping to an area that is susceptible to subsidence could trigger subsidence that has not been observed before.

#### 8.10.4.3 Effects on Beneficial Users and Land Use

The undesirable result for subsidence does not allow any subsidence to occur in the Subbasin. Therefore, there is no negative effect on any beneficial uses and users.

## 8.11 Depletion of Interconnected Surface Water SMC

Areas exist in the Subbasin where shallow groundwater may be connected to the surface water system. There is evidence that shallow sediments occur above the confined 180-Foot aquifer that are connected to the surface water system. However, there is almost no groundwater pumping in this area and it is not identified as a principal aquifer.

### 8.11.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions were assessed based on public meetings, and discussions with GSA staff. Significant and unreasonable depletion of interconnected surface water in the Subbasin is depletion of interconnected surface water flows that may prevent the MCWRA from meeting biological flow requirements in the Salinas River, or would induce an unreasonable impact on other beneficial uses and users such as surface water rights holders. The GSA does not have authority to manage reservoir releases and is not required to manage surface waters.

The U.S. Army Corps of Engineers has re-initiated consultation with the National Marine Fisheries Service (NMFS) on the Biological Opinion for the Salinas Valley Water Project (NMFS, 2007). Therefore, no biological opinion currently regulates environmental flows in the Salinas River. MCWRA, however, continues to manage flows in the Salinas River under the previous, 2007 biological opinion as a safe harbor practice. Until a new biological opinion is developed, and a Habitat Conservation Plan (HCP) is drafted by MCWRA, this GSP will use the 2007 biological opinion as guidance to establish the effects of stream depletion due to groundwater pumping.

The 2007 NMFS biological opinion was developed using measured streamflows between 1995 and 2005. The measured streamflows used in the biological opinion reflect current surface water depletion rates, and therefore current depletion rates are already incorporated into the river management plan. Furthermore, releases from Nacimiento Reservoir and San Antonio Reservoir are designed to maintain required environmental flows with current groundwater pumping. Because steelhead flow requirements were being met under the 2007 biological opinion, surface water depletion rates were not unreasonable with regards to maintaining environmental flow requirements. This assessment will be revisited after the new HCP is drafted by MCWRA.

In addition to managing the river for environmental needs, the Salinas River is managed to maintain adequate water supply for other beneficial uses. The Nacimiento and San Antonio reservoirs provide flood control benefits as well as groundwater recharge benefits through its sandy channels, where water rights holders along the river can pump out water according to their water rights.

Currently, there is significant leakage from the Salinas River to the underlying groundwater, but it is not considered unreasonable with regards to riparian rights holders. To the extent that groundwater pumping depletes surface water flows, these depletions, and the potential surface water limitations, would be injurious only if the surface water right holders held rights senior to the groundwater pumpers. Riparian rights holders and groundwater pumpers both have correlative rights to the common water pool. As stated in the SVWC v. MCWRA Report of Referee (SWRCB Referee, 2019):

> *The common source doctrine applies to groundwater and surface waters that are hydrologically connected and integrates the relative priorities of the rights without regard to whether the diversion is from surface or groundwater.*

Because groundwater pumping rights and riparian surface water rights are correlative under this finding, groundwater pumping-induced depletions that limit surface water rights are considered potentially significant, but not unreasonable.

## 8.11.2 Minimum Thresholds

Section 354.28(c)(6) of the Regulations states that "The minimum threshold for 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" (CCR, 2016). Minimum thresholds only apply to the interconnected stream reaches.

As stated in Chapter 6, the estimated average future surface water depletion rate in the 180/400-Foot Aquifer Subbasin is approximately 69,700 AF/yr. based on the SVIHM. This is considered a reasonable estimate of the current surface water depletion. However, without good historical data or a numerical model, it is difficult to assess whether and where the stream is connected to underlying groundwater. Furthermore, without simulating a no-pumping scenario and comparing it to a current pumping scenario, it is not possible to determine how much of the surface water depletion is due to pumping.

As stated above, the current rate of stream depletion from pumping is not considered significant and unreasonable. Therefore, the minimum threshold for depletion of interconnected surface water is currently set to the current average rate of 69,700 AF/yr. This estimate will be modified when the SVIHM becomes available. As soon as the model is available, new depletions will be computed based on more complete analysis, and new minimum threshold will be set during implementation of the GSP.

### 8.11.2.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds

The minimum thresholds for depletion of interconnected surface water are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, public information about water rights described below, and the Subbasin water budget analysis.

A summary of surface water diversions by riparian water rights holders on the Salinas River and its tributaries within the 180/400-Foot Aquifer Subbasin is provided in Table 8-10. The diversion data were obtained from queries of the DWR eWRIMS water rights management system and represent all surface water diversions as self-reported by water-rights holders with points of diversion located within the Subbasin boundaries. Some of the diversions shown in Table 8-10 may be reported to MCWRA as groundwater pumping, resulting in a double counting of these extractions.

Table 8-10. Surface Water Diversions on the Salinas River and its Tributaries in the 180/400-Foot Aquifer Subbasin

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **Diversions (Acre-Feet)** | 6,359 | 6,498 | 7,277 | 9,579 | 8,689 | 8,164 | 8,065 | 7,431 |

Figure 8-9 presents the average monthly total diversions on the Salinas River for the period 2010 to 2017. In the 180/400-Foot Aquifer Subbasin, the largest diversions occur in the summer months, as expected, to satisfy agricultural irrigation needs.

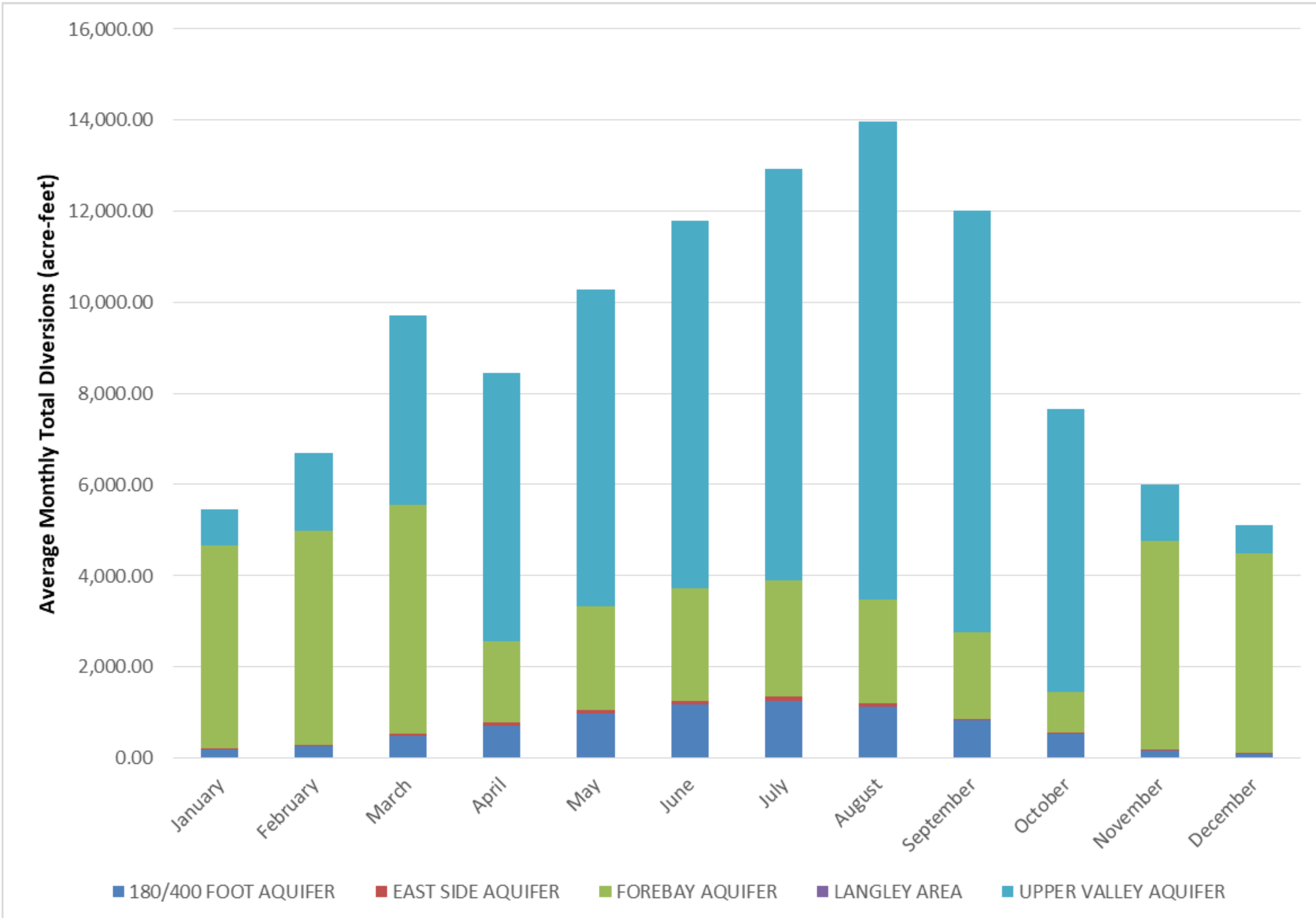



Figure 8-9. Average Monthly Total Salinas River Diversions by Subbasin

#### 8.11.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum threshold for depletion of surface water is a single value for the entire Subbasin. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

The depletion of surface water minimum threshold could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels**. Capping the amount of surface water depletion could limit the amount of natural streamflow percolation that would otherwise maintain groundwater elevations. However, the surface water depletion minimum thresholds do not directly influence the chronic lowering of groundwater elevations minimum thresholds
- **Change in groundwater storage**. The depletion of surface water minimum threshold may limit the amount of pumping near rivers and streams. This limitation on pumping could also limit losses of groundwater storage. The depletion of surface water minimum threshold is therefore consistent with the change in groundwater storage minimum threshold.
- **Seawater intrusion**. Seawater intrusion will not be affected by the depletion of surface water minimum thresholds.
- **Degraded water quality**. Water quality will not be affected by the depletion of surface water minimum thresholds.
- **Inelastic subsidence**. Inelastic subsidence will not be affected by the depletion of surface water minimum thresholds.

#### 8.11.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The 180/400-Foot Aquifer Subbasin has four neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Langley Subbasin to the north
- The Eastside Subbasin to the northeast
- The Forebay Subbasin to the south
- The Monterey Subbasin to the West

The SVBGSA is either the exclusive GSA, or is one of two coordinating GSAs for the adjacent Langley, Eastside, Forebay, and Monterey Subbasins. Because the SVBGSA covers all of these subbasins, the GSA Board of Directors opted to develop the minimum thresholds and measurable objectives for all of these neighboring subbasins in a single process that is coordinated with the 180/400-Foot Aquifer Subbasin. These neighboring subbasins are in the process of GSP development for submittal in January 2022. Minimum thresholds for the 180/400-Foot Aquifer Subbasin will be reviewed relative to information developed during the preparation of neighboring subbasins' GSPs and will be updated, as appropriate, to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability. In addition, the Pajaro Valley Basin occurs directly to the north. There is no surface water connection between the Pajaro Valley and the 180/400-Foot Aquifer Subbasin, and therefore the minimum thresholds for depletion of interconnected surface waters does not influence the ability of Pajaro Valley to achieve sustainability.

#### 8.11.2.4 Effect on Beneficial Uses and Users

Table 3-9 of the *Salinas River Long-Term Management Plan* (MCWRA, 2019) includes a list of 18 different designated beneficial uses on certain reaches of the river. In general, the major beneficial uses on the Salinas River are:

- Surface water diversions for agricultural, urban/industrial and domestic supply
- Groundwater pumping from recharged surface water
- Freshwater habitat
- Rare, threated or endangered species, such as the Steelhead Trout
- CSIP diversions

The depletion of surface water minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin.

**Agricultural land uses and users**. The depletion of surface water minimum threshold prevents lowering of groundwater elevations adjacent to certain parts of streams and rivers. This has the effect of limiting the amount of groundwater pumping in these areas. Limiting the amount of groundwater pumping may limit the quantity and type of crops that can be grown in these adjacent to streams and rivers.

**Urban land uses and users**. The depletion of surface water minimum threshold prevents lowering of groundwater elevations adjacent to certain parts of streams and rivers. This may limit the amount of urban pumping near rivers and streams, which could limit urban growth in these areas. Also, if pumping is limited, municipalities may have to obtain alternative sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

**Domestic land uses and users**. The depletion of surface water minimum threshold may benefit existing domestic land users and uses by maintaining shallow groundwater elevations near streams and protecting the operability of relatively shallow domestic wells. However, these minimum thresholds may limit the number of new domestic wells that can be installed near rivers or streams in order to limit the additional drawdown from the new wells.

**Ecological land uses and users**. The depletion of surface water minimum thresholds prevents further degradation of ecological impacts from groundwater pumping.

#### 8.11.2.5 Relation to State, Federal, or Local Standards

The minimum thresholds are developed in accordance with NMFS streamflow requirements.

#### 8.11.2.6 Method for Quantitative Measurement of Minimum Threshold

The updated SVIHM will serve as the primary approach for monitoring depletion of surface water when it becomes available. At a minimum, the model will be updated every 5 years and the amount of surface water depletion that occurred in the previous 5 years will be estimated.

The model's ability to estimate surface water depletion relies on it reasonably simulating shallow groundwater elevations adjacent to interconnected surface water bodies. Therefore, additional shallow wells will be installed adjacent to interconnected stream reaches to verify the representativeness of the updated SVIHM. Further details on the number and locations of these shallow wells are included in Chapter 7.

### 8.11.3 Measurable Objectives

The measurable objective for depletion of surface water is the same as the minimum threshold. The measurable objective is set at the long-term depletion rate of 69,700 AF/yr.

#### 8.11.3.1 Method for Setting Measurable Objectives

Discussions with GSA staff and stakeholder suggested that stakeholder prefer improving the health of the Salinas River during times of natural flow, but agree that summer flows are reservoir dominated and do not necessarily mimic the natural flow system. Stakeholders showed no preference for reducing leakage from river flows that are meant to intentionally recharge the groundwater basin. Therefore, there is no need to set a measurable objective different than the minimum threshold.

#### 8.11.3.2 Interim Milestones

Depletion of interconnected surface water measurable objectives are set at current conditions; there is no anticipated increase or decrease in surfaced water depletion during GSP implementation. Therefore, the expected interim milestones are identical to current conditions. The interim milestones for the total calculated depletion of interconnected surface water is shown in Table 8-11.

Table 8-11. Depletion of Interconnected Surface Water Interim Milestones

| 5-Year Depletion Rate (AF/yr.) | 10-Year Depletion Rage (AF/yr.) | 15-Year Depletion Rate (AF/yr.) |
|---|---|---|
| **69,700** | 69,700 | 69,700 |

## 8.11.4 Undesirable Results

### 8.11.4.1 Criteria for Defining Undesirable Results

By regulation, the depletion of interconnected surface water undesirable result is a quantitative combination of minimum threshold exceedances. There is only one reduction in depletion of interconnected surface water minimum threshold. Therefore, no minimum threshold exceedances are allowed to occur and the reduction in groundwater storage undesirable result is:

> *During average hydrogeologic conditions, and as a long-term average over all hydrogeologic conditions, the depletion of interconnected surface waters shall not exceed the single minimum threshold.*

### 8.11.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the depletion of interconnected surface waters include the following:

- **Localized pumping increases**. Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping near interconnected surface water bodies could unreasonably increase surface water depletion.
- **Expansion of riparian water rights**. Riparian water rights holders often pump from wells adjacent to the Salinas River. Pumping by these riparian water rights holder users is not regulated under this GSP. Additional riparian pumpers near interconnected reaches of rivers and streams may result in excessive localized surface water depletion.
- **Changes in Nacimiento and San Antonio Reservoir Releases**. Since the Salinas River is dependent on reservoir releases for sustained summer flows, when diversions are at the highest level, any decrease in reservoir flows during that time could be detrimental to the interconnected surface waters by increases depletions and could cause undesirable results to beneficial users.

- **Extensive, unanticipated drought**. Minimum thresholds were established based on anticipated future climatic conditions. Extensive, unanticipated droughts may lead to excessively low groundwater elevations that increase surface water depletion rates.

#### 8.11.4.3 Effects on Beneficial Users and Land Use

The depletion of surface water undesirable result is to have no net change in surface water depletion during average hydrologic conditions and over the long-term. Therefore, during average hydrologic conditions and over the long-term, the undesirable result will not have a negative effect on the beneficial users and uses of groundwater. However, pumping during dry years could temporarily increase rates of surface water depletions. Therefore, there could be short-term impacts on all beneficial users and uses of the surface water during dry years.

# 9 PROJECTS AND MANAGEMENT ACTIONS

## 9.1 Introduction

This chapter describes the projects and management actions that will allow the Subbasin to attain sustainability in accordance with §354.42 and §354.44 of the SGMA regulations. This chapter includes a description of a water charges framework, proposed groundwater management actions, and proposed projects. In this GSP, the term groundwater management actions generally refers to activities that support groundwater sustainability without infrastructure; projects are activities supporting groundwater sustainability that require infrastructure.

The water charges framework, management actions, and projects in this GSP are designed to achieve a number of outcomes including:

- Achieving groundwater sustainability by meeting Subbasin-specific sustainable management criteria by 2040
- Providing equity between who benefits from projects and who pays for projects
- Providing a source of funding for project implementation
- Providing incentives to constrain groundwater pumping within limits

The management actions and projects included in this chapter outline a framework for achieving sustainability, however many details must be negotiated before any of the projects and management actions can be implemented. Costs for implementing projects and actions are in addition to the agreed-upon funding to sustain the operation of the GSA, and the funding needed for monitoring and reporting. The collection of projects and management actions included in this chapter demonstrate that sufficient options exist to reach sustainability. Not all projects and actions have to be implemented to attain sustainability, and they have not yet all been agreed-upon by stakeholders. Therefore, the projects and management actions included here should be considered a list of options that will be refined during GSP implementation.

This GSP is developed as part of an integrated sustainability plan that is being developed by the SVBGSA to achieve groundwater sustainability in all six of the Salinas Valley Groundwater Basin subbasins under its authority. Therefore, the projects and actions included in this GSP are part of a larger set of integrated projects and actions for the entire Salinas Valley Groundwater Basin. All of the integrated projects and management actions for the Salinas Valley Groundwater Basin are included in this GSP, although the benefit may be limited in this Subbasin.

The negotiations and discussions regarding specific projects will occur while the GSPs for the five remaining subbasins in the Valley are being drafted. The discussions will likely continue during the early years of GSP implementation. Members of the SVBGSA and stakeholders in the

Subbasin should view the list of projects and management actions as a starting point for more detailed discussions. Where appropriate, details that must be agreed upon are identified for each management action or project. The projects and management actions included in this chapter are supported by the best available information and best available science; however, further information may need to be collected in the implementation period to refine projects and management actions.

As a means to compare projects, this chapter estimates the cost per acre-foot for each project or action as appropriate. The cost per acre-foot is the amortized cost of the project divided by the annual yield. It is not the cost of irrigation. Because most growers will be allowed to pump some groundwater and irrigate with that groundwater, water supplied by the projects in this chapter represent only a portion of each grower's irrigation water. Therefore, actual costs seen by growers are proportional to the grower's individual need for project water.

The approach to implementing the water charges framework, management actions, and projects will provide individual landowners and public entities flexibility in how they manage water and how the Subbasin achieves groundwater sustainability. All groundwater pumpers will be allowed to make individual decisions on how much groundwater they pump based on their perceived best interests.

## 9.2 Water Charges Framework

The proposed water charges framework is the fundamental structure for managing groundwater pumping and funding projects. This framework is designed to achieve two important outcomes:

1. Promote voluntary pumping reductions; and
2. Fund new water supply projects by charging fees for various levels of pumping.

Many details of the water charges framework will be developed through negotiations during the first three years of GSP implementation. Depending on the outcome of the negotiations, long-term GSP implementation may be funded by the water charges framework, other financing method as permitted by SGMA and other state law, or a combination thereof.

If implemented as outlined in this chapter, a similarly structured water charges framework with a tiered structure of charges will be applied in all subbasins of the Salinas Valley Groundwater Basin. However, details such as pumping allowance quantities and tier charges will be different for each subbasin, because the demand and sustainable yield varies by subbasin. Each subbasin's water charges framework will reflect the specific hydrogeology and conditions of that subbasin.

The water charges framework includes the following components, described further below.

- **Exempt Groundwater Pumpers** may include *de-minimis* pumpers or other classes of pumpers that are not managed by this GSP.
- **Sustainable Pumping Allowances** are a base amount of groundwater pumping assigned to each non-exempt groundwater pumper. The sum of all sustainable pumping allowances and exempt groundwater pumping is the sustainable yield of the Subbasin. The sustainable yield will be regularly reassessed based on improved data and tools.
- **Transitional Pumping Allowances** are the difference between current assumed pumping and the sustainable pumping allowance. These transitional pumping allowances may be reduced over time to move from current pumping practices to sustainable pumping.
- **Supplementary Pumping** is all groundwater pumping above the sustainable and transitional pumping allowance.
- Sustainable and transitional pumping allowances are quantified for every non-exempt groundwater pumper. These allowances are not water rights. Instead, they are pumping amounts that form the basis of a financial fee structure to both implement the regulatory functions of the SVBGSA and fund new water supply projects.
- Pumping is recorded annually for all non-exempt pumpers.
- All pumpers are charged based on a tiered rate structure. Groundwater pumped within the sustainable pumping allowance is charged a base rate called Tier 1 – Sustainable Pumping Charge. Groundwater pumped in excess of the sustainable pumping allowance is charged a rate called Tier 2 – Transitional Pumping Charge. This charge is for any pumping above the sustainable pumping allowance but within their transitional allowance. Any groundwater pumped above the transitional pumping allowance is subject to Tier 3 - Supplementary Pumping Charge. This charge is for the excess amount that is pumped above the Tier 1 and Tier 2 charges.
- Tier 1 funds are used to implement the regulatory functions of implementing SGMA. This may include developing and implementing an improved water metering program, regular data collection and monitoring, negotiating program details, acquiring water rights or contracts, conducting feasibility studies for projects, and permitting and developing one or more of the management actions or projects described in this chapter.
- Tier 2 and Tier 3 funds are used to build projects and pay annual costs of purchasing and treating water supplies that have a defined benefit to individuals or groups.
- Transitional pumping allowances are phased out over 10 to 15 years to encourage pumping within the sustainable yield.

The fee structure in the water charges framework is designed to promote conservation and voluntary pumping reductions. Individual groundwater pumpers may choose to switch to less water-intensive crops, implement water use efficiencies, fallow a portion of their land, or transition to non-groundwater sources. Alternatively, if reducing pumping is not the best economic option, a pumper may instead opt to pay the overproduction Tier 2 and Tier 3 charges.

The tiered fee structure and allowances will not be uniform across the subbasins of the Salinas Valley Groundwater Basin in the final water charges framework agreement. The fee structures and pumping allowances in each subbasin will be developed in accordance with, or acknowledging, all existing laws, judgments, water management agreements, and established water rights.

The following sections detail the components of the suggested water charges framework outlined above.

### 9.2.1 Well Registration and Metering

All groundwater production wells, including wells used by *de-minimis* pumpers, must be registered with the SVBGSA. If the well has a meter, the meter must be calibrated on a regular schedule in accordance with manufacturer standards and any programs developed by the SVBGSA or MCWRA. Well registration is intended to establish a relatively accurate count of all the active wells in the Subbasin. Well metering is intended to improve estimates of the amount of groundwater extracted from the Subbasin. SGMA does not allow metering of *de-minimis* well users, and therefore well metering is limited to non-*de minimis* wells. The details of the well registration program, and how it integrates with existing ordinances and requirements, will be developed during the first 2 years of GSP implementation.

### 9.2.2 Pumping Allowances

Pumping allowances are established to enable development of the tiered pumping charge system, and calculation of over-pumping surcharges and supplemental charges. Pumping allowances are not a water right. The proposed process for establishing initial pumping allowances is as follows. This process may be modified based on negotiations during the first three years of implementation:

- **Sustainable Pumping Allowances**: All land parcels located outside of the service area of a municipal water provider, and land parcels located within the service area of a municipal water provider that are actively farmed as of 2017, will receive a sustainable yield pumping allowance based on a pro-rata share of their subbasin's sustainable yield. The methodology for determining pro-rata shares will be developed during the first three years of GSP implementation. The pro-rata shares may be based on some combination of land acreage, historical crop types grown on the parcel, standardized crop duties for the particular subbasin, historical groundwater use, or other factors. Because the sustainable pumping allowances are designed to limit pumping to the Subbasin's sustainable yield, it is likely that in the 180/400-Foot Aquifer Subbasin, the pro-rata sustainable allowances will be less than the current groundwater use in the Subbasin.

Sustainable allowances for municipal and industrial groundwater pumpers will be addressed when sustainable pumping allowances are being developed for agricultural pumpers. Because these allowances are not water rights, municipal and industrial water users will be able to pump groundwater even without a quantified sustainable allowance. However, if municipal and industrial groundwater pumpers are not provided a sustainable allowance, any groundwater pumping by these entities will be subject to the Tier 2 Transitional Pumping Charge and Tier 3 Supplemental Pumping Charge.

- **Transitional Pumping Allowances**: In addition to any sustainable pumping allowance that may be assigned, agricultural, municipal, industrial, and other groundwater pumpers will receive a transitional pumping allowance. The transitional pumping allowance will be quantified based on the difference between a groundwater user's actual historical pumping amounts (estimated or measured) and their sustainable allowance. The purpose of this transitional allowance is to ensure that no pumper is required to immediately reduce their pumping, but rather pumpers have an opportunity to reduce their pumping over a set period of time. Maximum annual pumping between 2012 and 2017 will be used to determine transitional pumping allowances. These years are chosen for general consistency with the future water budget calculations which is based on current land use.
- **Transitional Pumping Allowance Phase-out**: Transitional pumping allowances will be phased out until total pumping allowances in each subbasin are less than or equal to the calculated sustainable yield. The phase-out may occur over a time span of 10 to 15 years. The extent and timing of the phase-outs will vary by subbasin to achieve sustainability. The specific phase-out amounts and timing will be determined in negotiations during the first three years of GSP implementation and may be periodically modified by the SVBGSA.
- ***De minimis* Pumpers**: Notwithstanding the foregoing, *de minimis* pumpers are exempt from the fees under the water charges framework.
- **CSIP Water Users**: Some of the projects proposed below will decrease groundwater pumping through additional CSIP deliveries. CSIP water users may have separate allowances that promote CSIP use and acknowledge limitations on the ability to pump groundwater in the CSIP area.

Figure 9-1 shows an example of how the sustainable allowance, transitional allowance, and supplemental charges work together for pumpers not relying on CSIP. In this example, a parcel is assigned a sustainable allowance of 100 AF/yr., which is shown in blue. The SVBGSA will apply the Tier 1 Sustainable Pumping Charge to any pumping within that allowance. The example parcel shown on Figure 9-1 currently pumps 128 AF/yr. Therefore, the initial transitional pumping allowance is 28 AF/yr., which is shown in yellow. This transitional allowance will be phased out over 10 years. The SVBGSA will apply the Tier 2 Transitional Pumping Charge to any pumping within the transitional allowance. Any pumping above the transitional allowance will be subject to the Tier 3 Supplemental Pumping Charge. This is shown by the dark orange bars. Beginning in year 10, any pumping above the sustainable allowance will be subject to the Tier 3 Supplemental Pumping Charge because there is no transitional allowance beginning in that year.

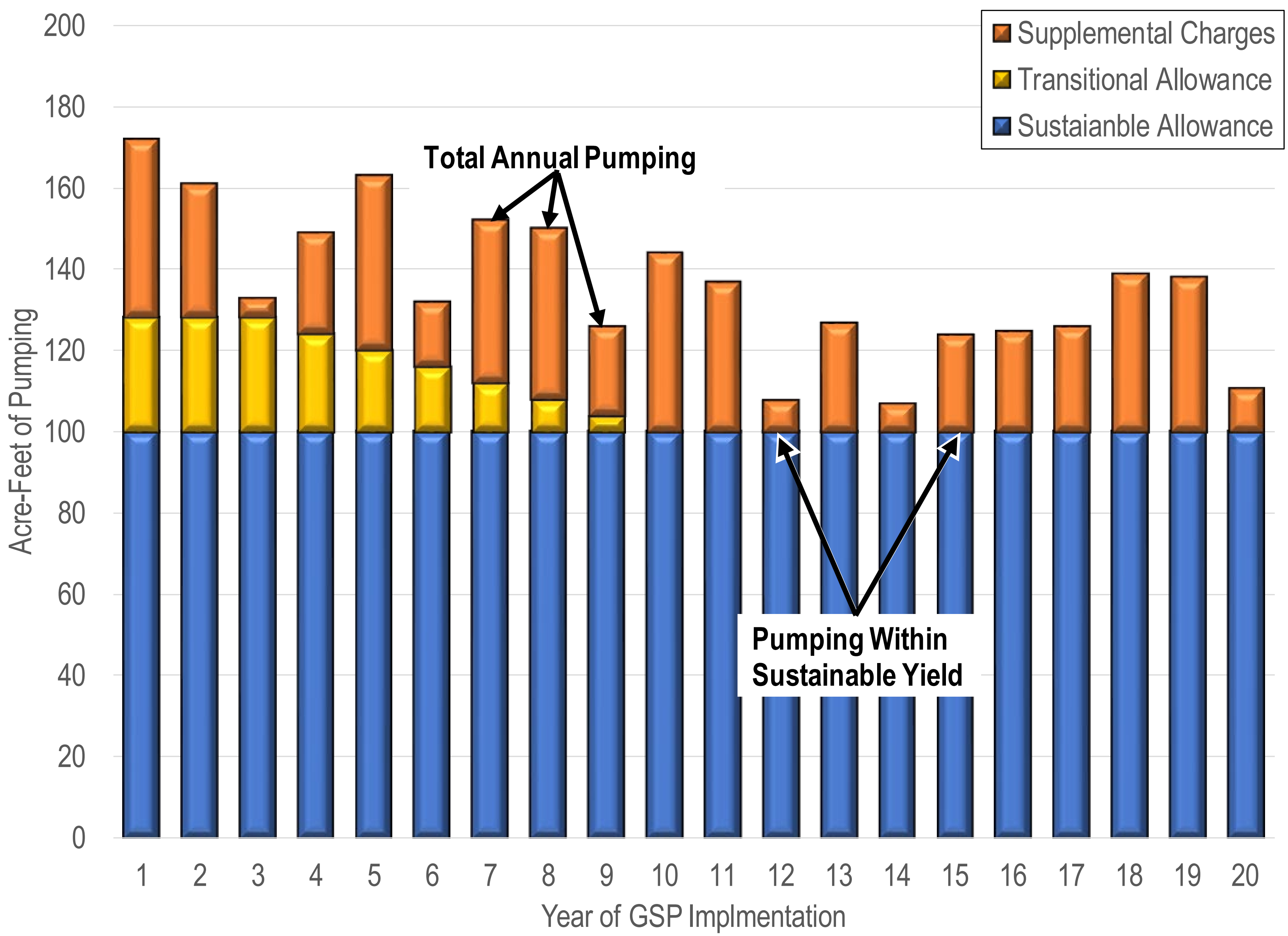



Figure 9-1. Example Pumping Allowances

### 9.2.3 **Carryover and Recharge**

To provide pumpers the flexibility to pump more during dry years and less during wet years, the unused portion of a pumping allowance for a given year may be carried over for use in subsequent years. The maximum amount a pumper can carryover is limited to an amount equal to that pumper's current, single year, sustainable pumping allowance. The SVBGSA may elect to impose an annual loss factor that reduces a pumper's carryover credits due to natural hydrogeologic losses from the Subbasin. The exact loss percentage will be agreed to in the final water charges framework.

The carryover element of pumping allowances allows groundwater pumpers to pump more water only if they have previously banked pumping credits. This prevents a pumper from pumping carryover credits that they assume may occur in the future, and directly addresses the requirements of the SGMA regulations §354.44(b)(9) which requires that, "chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods" (CCR, 2016).

Water intentionally recharged by an individual or entity will be recognized by award of recharge credit to the recharging individual or entity on a 1 AF for 1 AF basis, subject to losses that the SVBGSA may elect to impose. Recharge credit balances will be reduced or debited when the recharged water is recovered. The SVBGSA will develop a system of confirming and accounting for recharge credits and debits as discussed in Section 9.2.6.

### 9.2.4 **Relocation and Transfer of Pumping Allowances**

Pumping allowances may be moved between properties temporarily or permanently within the Subbasin. Such re-location of pumping allowances is subject to review by the SVBGSA to ensure that such relocation or transfer does not prevent the sustainability goal from being met. The SVBGSA will model the effects of the relocation to assess any significant and unreasonable impacts from the proposed relocation. Relocating pumping allowances provides pumpers with flexibility to manage their land, water resources, and finances as they desire. Pumping allowances could also be permanently or temporarily transferred between different owners and could be used for another pumping purpose.

### 9.2.5 **Non-Irrigated Land**

Although much of the land in the 180/400-Foot Aquifer Subbasin is either currently under irrigation or is supplied by municipalities, there is some land that may be currently fallow. The GSP recognizes that owners of such land may wish to begin pumping in the future consistent with their overlying rights. Such pumping is not limited by this GSP. The SVBGSA may wish to provide sustainable allowances to all landowners, effectively diminishing the allowance of current irrigators. Optionally, non-exempt pumpers who do not receive an initial pumping allowance may:

1. Acquire pumping allowance from willing sellers subject to SVBGSA approval, and/or
2. Pay the surcharges associated with pumping above their pumping allowance.

The final approach to addressing allowances for fallow land will be developed in the first three years of GSP implementation.

### 9.2.6 Administration, Accounting, and Management

The SVBGSA will administer the water charges program. Administrative duties will include developing initial pumping allowances; tracking pumping allowance ownership; accounting for water use; accounting for carryover credits and recharge credits; calculating, assessing, and collecting fees; and reviewing proposed re-location and transfer of pumping allowances. The SVBGSA would use water charges revenues to fund projects that develop new water supplies for the benefit of the 180/400-Foot Aquifer Subbasin.

### 9.2.7 Details to be Developed

The sections above present an initial structure for the water charges framework; however, stakeholders must agree to a number of details before the SVBGSA initiates the water charges framework. An initial list of details that must be negotiated are presented below to provide SVBGSA members and stakeholders an understanding of the range of specifics that are open for negotiation during the first three years of implementation.

- Are *de-minimis* pumpers that pump less than 2 AF/yr. for domestic purposes exempt from the water charge framework and other management actions?
- Are any class of pumpers other than *de-minimis* pumpers exempt from the water charge framework and other management actions?
- How are sustainable pumping allowances set?
- How are transitional allowances phased out in the Subbasin? Over what time frame are pumping allowances ramped down?
- What is the Tier 1 Sustainable Pumping Charge?
- What is the Tier 2 Transitional Pumping Charge?
- What is the Tier 3 Supplemental Pumping Charge?

- What is an equitable balance between the Tier 1 Sustainable Pumping Charge collected in the 180/400-Foot Aquifer Subbasin and the Tier 1 Sustainable Pumping Charge collected in other subbasins?
- What is an equitable balance between the Tier 2 Transitional Pumping Charge collected in the 180/400-Foot Aquifer Subbasin and the Tier 2 Transitional Pumping Charge collected in other subbasins?
- What is an equitable balance between the Tier 3 Supplemental Pumping Charge collected in the 180/400-Foot Aquifer Subbasin and the Tier 3 Supplemental Pumping Charge collected in other subbasins?
- How is currently non-irrigated (e.g., fallowed) land addressed?
- How are municipalities addressed?
- What are the limits and parameters of the carryover and recharge options?
- What is involved in approving relocation or transfer of pumping credits?

## 9.3 Management Actions

Management actions are new or revised non-structural programs or policies that are intended to reduce or optimize local groundwater use. Management actions will be implemented only if they are deemed cost effective or necessary to achieve sustainability.

### 9.3.1 All Management Actions Considered for Integrated Management of the Salinas Valley Groundwater Basin

This GSP is part of an integrated plan for managing groundwater in all six subbasins of the Salinas Valley Groundwater Basin that are managed by the SVBGSA. The projects and management actions described in this GSP constitute an integrated management program for the entire Valley. The program's projects and management actions were selected from a larger set of potential actions. Appendix 9A includes the full list of potential management actions that were considered for the Valley-wide integrated management program.

The SVBGSA assessed the potential management actions listed in Appendix 9A for effectiveness in achieving sustainability throughout the Basin. It selected five management actions as the most reliable, implementable, cost-effective, and acceptable to stakeholders. The first three management actions benefit the entire Salinas Valley Groundwater Basin; the last three management actions are specific to the 180/400-Foot Aquifer Subbasin. The sections below describe how the SVBGSA will implement each management action, if stakeholders decide to pursue them.

### 9.3.2 Priority Management Action 1: Agricultural Land and Pumping Allowance Retirement

The SVBGSA may use water charges revenues to acquire and retire irrigated land and/or pumping allowances (potentially including carryover credits and recharge credits) to reduce pumping. If pursued, the SVBGSA will complete all acquisitions on a voluntary basis from willing sellers at negotiated market prices. The SVBGSA would cease irrigation on acquired land to reduce pumping. The SVBGSA will coordinate with other local agencies and stakeholders to determine beneficial uses of the acquired land, such as establishing native vegetation or converting to other habitat.

Landowners selling pumping allowances to the SVBGSA separate from land will be permitted to convert their land to other uses in compliance with the County of Monterey's General Plan. The number of *de-minimis* wells authorized on converted land will be based on the amount of pumping allowance sold to the SVBGSA. The final ratio of sold pumping allowance to the number of *de-minimis* wells allowed will be agreed to in the final water charges framework. For illustrative purposes, one *de-minimis* well could be authorized for every 20 to 40 AF of pumping allowance sold to the SVBGSA. The details of how much pumping must be retired for every *de-minimis* pumper allocation will be developed during the first three years of GSP implementation.

#### 9.3.2.1 Relevant Measurable Objectives

The measurable objectives benefiting from land retirement include:

- Groundwater elevation measurable objectives, depending on the location of the land retirement. Less pumping will result in higher groundwater elevations.
- Groundwater storage measurable objective. This measurable objective is based on total pumping in the Subbasin, therefore land retirement with reduced pumping contributes to meeting this objective and will help achieve the goal of reducing total extractions to the long-term sustainable yield.
- Land subsidence measurable objectives, depending on the location of the land retirement. Land retirement will reduce the pumping stress on the local aquifer(s) and thereby reduce the potential for subsidence.
- Seawater intrusion measurable objective, depending on the location of the land retirement. Land retirement near the coast will reduce the pumping stress that causes groundwater elevations to drop below levels that cause seawater intrusion.

#### 9.3.2.2 Expected Benefits and Evaluation of Benefits

The primary benefit from land retirement is reduced Subbasin pumping. A second benefit is either halting the decline of or raising groundwater elevations. Depending on the location of the land retirement, ancillary benefits of shallower groundwater elevations may include avoiding subsidence, reducing surface water depletion rates, and reducing seawater intrusion rates. Because it is unknown how many landowners will willingly enter the land retirement program, it is difficult to quantify the expected benefits at this time.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater elevation monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. A direct correlation between agricultural land retirement and changes in groundwater elevations is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

#### 9.3.2.3 Circumstances for Implementation

Agricultural land retirement relies on willing sellers. No other triggers are necessary or required. The circumstance for implementation is for willing sellers to contact the SVBGSA.

#### 9.3.2.4 Public Noticing

Any agricultural land retirement achieved through a land sale will be recorded with the County of Monterey Office of the Tax Assessor. All agricultural land retirement, whether through sale of land or pumping allowance, will be recorded in the publicly accessible portion of the water charges framework database.

#### 9.3.2.5 Permitting and Regulatory Process

No permitting or regulatory processes are necessary for buying land or pumping allowances.

#### 9.3.2.6 Implementation Schedule

The option for land retirement will begin immediately after the water charges framework is finalized and adopted. Although the land retirement program is ongoing, it is reliant on willing sellers and will likely be implemented intermittently.

#### 9.3.2.7 Legal Authority

California Water Code §10726.2 provides GSAs the authority to purchase, among other things, land, water rights, and privileges.

#### 9.3.2.8 Estimated Cost

Market values for agricultural land eligible for sustainable yield and transitional pumping allowances are reported to range from $26,000 per acre to $70,000 per acre (American Society of Farm Managers and Rural Appraisers, 2019). While some vineyards have sold for higher prices, it is unlikely that the SVBGSA will seek to acquire and retire the Subbasin's highest-quality vineyard land due to cost considerations.

As an example, assuming that retiring one acre of eligible land would reduce pumping by 3 AF and that the SVBGSA can acquire and retire land for $26,000 per acre to $70,000 per acre, the cost per acre-foot of pumping reduction will range from approximately $8,700 per acre-foot to $23,300 per acre-foot. If amortized over 25 years at a 6% interest rate, these one-time capital expenditures are equivalent to annualized costs of approximately $680 per acre-foot to $1,820 per acre-foot.

### 9.3.3 Priority Management Action 2: Outreach and Education for Agricultural BMPs

Priority Management Action 2 advances outreach and education programs that support innovative irrigation and agricultural practices across the Salinas Valley Groundwater Basin. These programs will educate farmers, promote water conservation, crop sustainability, and crop advancements. They will include improving data collection for agricultural efficiency. These programs will help minimize the impacts of potentially reduced groundwater supplies to the agricultural community.

Outreach and education for agricultural BMPs will provide funding to farmers for outreach and education on new technologies, potential pilot programs, and other innovative ideas that support the overall advancement of the farming community and ultimately provide an overall benefit to the sustainability of the groundwater basin. Outreach and education may include education on GDEs and surface water depletions to promote overall water management in the Valley.

#### 9.3.3.1 Relevant Measurable Objectives

The measurable objectives benefiting from outreach and education include:

- Groundwater elevation measurable objectives. Outreach and education will focus on reducing pumping and water conservation methods. Less pumping will result in higher groundwater elevations.

- Groundwater storage measurable objective. This measurable objective is based on total pumping in the Subbasin; therefore, the education and outreach will focus on identifying best management practices that will reduce pumping and will help achieve the goal of reducing total extractions to the long-term sustainable yield.

- Land subsidence measurable objectives. Outreach and education will focus on reducing pumping and water conservation methods, thereby reducing the pumping stress on the local aquifer(s) and reducing the potential for subsidence.

- Seawater intrusion measurable objective, depending on the location. Decreased water use near the coast will reduce the pumping stress that causes groundwater elevations to drop below the level that causes seawater intrusion.

- Depletion of interconnected surface water measurable objective. Education on GDEs and interconnected surface water may result in reduced surface water depletions.

#### 9.3.3.2 Expected Benefits and Evaluation of Benefits

The primary benefit of implementing an outreach and education program is to provide the latest technologies and opportunities to farmers, allowing them to reduce pumping while realizing the same crop yields. This program could also be a mechanism for grant opportunities, funded through the SVBGSA to identify pilot programs and other innovative technological advancements that could provide an overall groundwater basin benefit.

#### 9.3.3.3 Circumstances for Implementation

The circumstance for implementation is for willing farmers to participate in an education and outreach program and to work with the SVBGSA to identify conservation opportunities. No other triggers are necessary or required.

#### 9.3.3.4 Public Noticing

There will be public noticing of education and outreach programs.

#### 9.3.3.5 Permitting and Regulatory Process

No permitting or regulatory processes are necessary for an education and outreach program.

#### 9.3.3.6 Implementation Schedule

The option for an outreach and education program will begin immediately after the water charges framework is finalized and adopted. This program will be ongoing.

#### 9.3.3.7 Legal Authority

No authority is needed to promote outreach and education.

#### 9.3.3.8 Estimated Cost

The Outreach and Education Program would be an annual program that would be implemented. The SVBGSA would set aside approximately $100,000 each year to promote opportunities for education seminars, grant writing tasks, etc. focused on best management practices in the agricultural industry.

### 9.3.4 Priority Management Action 3: Reservoir Reoperation

Reservoir reoperation entails working closely with MCWRA, National Marine Fisheries Service, and other stakeholders on developing a revised HCP, and a related plan for managing Nacimiento and San Antonio Reservoir flows into the Salinas River. The purpose of this management action is to operate the reservoirs to achieve two goals:

1. Allow surface flow releases to recharge groundwater in the various subbasins of the Salinas Valley Groundwater Basin almost every winter
2. Allow river flows to better reach the SRDF diversion when needed

Reservoir reoperations would more tightly integrate environmental flows with sustainable groundwater management activities in the Valley to improve water availability for agricultural users and other groundwater users. The major beneficiaries of this management action would be the Upper Valley and Forebay Subbasins, as they receive most of the river percolation. There is limited benefit for the 180/400-Foot Aquifer Subbasin, primarily to allow enough water to flow to the SRDF for CSIP operations.

Reservoir operations are controlled by MCWRA, and therefore the SVBGSA cannot directly modify reservoir operations. Over the next few years, MCWRA will develop an HCP that establishes the reservoir operating rules for the Nacimiento and San Antonio Reservoirs. The HCP offers an opportunity for reservoirs to be explicitly operated for improved groundwater management as well as environmental flows and flood control. The SVBGSA will participate in developing the HCP to implement the reservoir operations in a way that promotes this management action.

#### 9.3.4.1 Relevant Measurable Objectives

The measurable objectives benefiting from reservoir reoperation include:

- Groundwater elevation measurable objectives. Re-operating the Salinas River reservoirs will allow for more surface water to percolate to groundwater, primarily in the Upper Valley and the Forebay Subbasins, and would recharge groundwater subbasins and raise groundwater elevations.

- Groundwater storage measurable objective. Increased groundwater recharge near the Salinas River will help improve groundwater storage.
- Land subsidence measurable objectives. Increased groundwater recharge near the Salinas River will help reduce or prevent subsidence.
- Seawater intrusion measurable objective. By allowing additional surface flows to reach the SRDF, more surface water will be used in the CSIP area with reduced pumping which would result in lower seawater intrusion potential.
- Interconnected surface water measurable objective. By allowing more flows to stay in the Salinas River year-round, the areas that are interconnected would stay connected to groundwater and benefit all beneficial users on the river.

#### 9.3.4.2 Expected benefits and evaluation of benefits

The primary benefit from reservoir reoperation is additional groundwater recharge in the subbasins and more flexible use of the groundwater in storage. A second benefit is the availability of water at the SRDF diversion to allow for greater surface water use in the CSIP area. HCP development will also assess and likely enhance environmental benefits.

Because of the pending HCP on the Salinas River, the details of the future reservoir operations are unknown. The SVBGSA will work collaboratively with MCWRA to make sure the reservoirs are operated in a manner to benefit groundwater recharge and help with the sustainable management of the Salinas Valley Groundwater Basin.

#### 9.3.4.3 Circumstances for implementation

The San Antonio and Nacimiento Reservoirs are currently operated by MCWRA to satisfy multiple beneficial uses. This management action will be implemented when MCWRA develops the HCP. The pending HCP will prescribe additional criteria for reservoir operations. As part of these new rules, the SVBGSA will work with MCWRA to work winter flow releases into the criteria for operations.

#### 9.3.4.4 Public noticing

This management action is part of the MCWRA HCP process, and the public noticing will occur as part of the HCP development.

#### 9.3.4.5 Permitting and Regulatory Process

This management action will follow the ongoing permitting and regulatory process used by MCWRA for reservoir operations.

#### 9.3.4.6 Legal Authority

The SVBGSA does not have any authority over surface water management or reservoir operations. Thus, the SVBGSA will work collaboratively with MCWRA on developing appropriate reservoir operation rules that benefit groundwater recharge.

#### 9.3.4.7 Implementation Schedule

The reservoir reoperation management action schedule will be contingent upon the development and finalization of the HCP and other reservoir operations criteria. The implementation schedule will start as soon as new reservoir operations criteria are developed in collaboration with MCWRA. The HCP is scheduled to be completed within the next three to five years.

#### 9.3.4.8 Estimated Cost

The estimated costs are related to SVBGSA participation in the HCP process. This will include attending meetings and providing comments to the HCP. MCWRA will fund the completion of the HCP, therefore, the costs for development of the HCP are not included in the cost estimate. For costing purposes, we have assumed the HCP is a three-year process. SVBGSA participation will cost approximately $50,000 per year, for a total cost of $150,000.

### 9.3.5 Priority Management Action 4: Restrict Pumping in CSIP Area

A number of the priority projects included in Section 9.4 are designed to ensure a reliable, year-round supply of water to growers in the CSIP area. These projects will remove any need for groundwater pumping in the CSIP area. To promote use of CSIP water, the SVBGSA will pass an ordinance preventing any pumping for irrigating agricultural lands served by CSIP. To ensure adequate water supplies for CSIP, the CSIP supplementary wells will be exempt from the restrictions in this ordinance.

#### 9.3.5.1 Relevant Measurable Objectives

The measurable objectives benefiting from pumping restriction in the CSIP Area include:

- Groundwater elevation measurable objectives. Restricting pumping will limit drawdowns that may lead to significant and unreasonable groundwater elevations.
- Groundwater storage measurable objective. Reducing pumping will directly help the SVBGSA reach the pumping goals in the groundwater storage measurable objective.
- Land subsidence measurable objectives. Reduced groundwater pumping yields higher groundwater elevations, helping reduce or prevent subsidence.

- Seawater intrusion measurable objective. Reducing pumping may reduce landward gradients that induce seawater intrusion. This will lower seawater intrusion potential.

#### 9.3.5.2 Expected benefits and evaluation of benefits

The primary benefit from the CSIP pumping restrictions is controlling Subbasin pumping. A secondary benefit is either halting the decline of, or raising, groundwater elevations from the reduced pumping. An ancillary benefit from shallower groundwater elevations may include avoiding subsidence and reducing seawater intrusion.

Reductions in groundwater pumping will be measured directly through the improved metering program and recorded in the data management system. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using DWR's InSAR maps as detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing mapping approach as detailed in Chapter 7. A direct correlation between the CSIP pumping restrictions and changes in groundwater elevations is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

#### 9.3.5.3 Circumstances for implementation

CSIP pumping restrictions will only be implemented after the CSIP optimization projects are implemented, providing a reliable supply of water to growers in the CSIP area.

#### 9.3.5.4 Public Noticing

Public meetings will be held to inform groundwater pumpers and other stakeholders that the CSIP pumping reduction program is being developed. The CSIP pumping reduction program will be developed in an open and transparent process. Groundwater pumpers and other stakeholders will have the opportunity at these meetings to provide input and comments on the process and the program elements.

#### 9.3.5.5 Permitting and Regulatory Process

The CSIP pumping reduction program is subject to CEQA. The CSIP pumping reduction program would be developed in accordance with all applicable groundwater laws and respect all groundwater rights.

#### 9.3.5.6 Legal Authority

California Water Code §10726.4 (a)(2) provides GSAs the authorities to control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate (CWC, 2014).

#### 9.3.5.7 Implementation Schedule

CSIP pumping restrictions will be implemented within 1 year of substantially completing the CSIP projects (Priority Projects 2, 3, 4, and 5).

#### 9.3.5.8 Estimated cost

The SVBGSA will support the development of a mandatory pumping reduction program. The implementation of the program will be through MCWRA and is estimated to take 2 years to develop. The support of the implementation program will be $50,000 for 2 years or a total of $100,000. This does not include the cost of the CEQA permitting or any ongoing program oversight.

### 9.3.6 Priority Management Action 5: Support and Strengthen Monterey County Restrictions on Additional Wells in the Deep Aquifers

Monterey County Ordinance 5302 temporarily restricts drilling new wells in the Deep Aquifers in portions of the 180/400-Foot Aquifer Subbasin: generally northwest of Davis Road. In the portions of the Subbasin southeast of Davis Road, it is the intent and purpose of the ordinance to require testing to ensure new wells do not extract water from the Deep Aquifers. Exceptions are made for replacement wells, domestic wells, and municipal supply wells. This is a temporary urgency ordinance pending development of permanent regulations.

SVBGSA will work with Monterey County to extend this ordinance to prevent any new wells from being drilled into the Deep Aquifers until more information is known about the Deep Aquifers' sustainable yield. MCWRA plans to complete this study of the Deep Aquifers over the next three years, when funding becomes available. SVBGSA will comment on the MCWRA study of the Deep Aquifers to ensure that the study and the resulting permanent regulations will promote groundwater sustainability as defined in this GSP.

#### 9.3.6.1 Relevant Measurable Objectives

The measurable objectives benefiting from Deep Aquifers pumping restrictions include:

- Groundwater elevation measurable objectives. Restricting the number of pumping wells will limit groundwater drawdown that may lead to significant and unreasonable groundwater elevations.
- Groundwater storage measurable objective. Restricting the number of pumping wells will directly help the SVBGSA reach the pumping goals in the groundwater storage measurable objective.

- Land subsidence measurable objectives. Restricting the number of pumping wells yields higher groundwater elevations, helping reduce or prevent subsidence.
- Seawater intrusion measurable objective. Restricting the number of pumping wells may reduce landward gradients that induce seawater intrusion. This will lower seawater intrusion potential. Restricting the number of pumping wells in the Deep Aquifers will also reduce the likelihood of vertical migration of impaired groundwater from overlying aquifers.

#### 9.3.6.2 Expected benefits and evaluation of benefits

The primary benefit from the Deep Aquifers pumping restrictions is reduced Subbasin pumping in an aquifer with limited data. A second benefit is either halting the decline or raising groundwater elevations from the restricted pumping. An ancillary benefit from shallower groundwater elevations may include avoiding subsidence and reducing seawater intrusion.

Restrictions in groundwater pumping will be measured directly through the improved metering program and recorded in the data management system. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using DWR's InSAR maps as detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing mapping approach as detailed in Chapter 7. A direct correlation between the Deep Aquifers pumping restrictions and changes in groundwater elevations is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

#### 9.3.6.3 Circumstances for implementation

SVBGSA will support extension of Ordinance 5302 immediately. Deep Aquifers pumping will only be allowed after MCWRA completes its study of the Deep Aquifers' sustainable yield.

#### 9.3.6.4 Public Noticing

Public meetings will be held to inform groundwater pumpers and other stakeholders that the Deep Aquifers study is being developed, and that additional pumping restrictions may result from this study. The Deep Aquifers pumping restriction program will be developed in an open and transparent process. Groundwater pumpers and other stakeholders will have the opportunity at these meetings to provide input and comments on the process and the program elements.

#### 9.3.6.5 Permitting and Regulatory Process

The pumping restriction program would be developed in accordance with all applicable groundwater laws and respect all groundwater rights.

#### 9.3.6.6 Legal Authority

California Water Code §10726.4 (a)(2) provides GSAs the authorities to control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate (CWC, 2014).

#### 9.3.6.7 Implementation Schedule

SVBGSA will support extension of Ordinance 5302 immediately.

#### 9.3.6.8 Estimated cost

The Deep Aquifers study and subsequent regulations will be developed by MCWRA. SVBGSA will supply oversight and support. The estimated cost for this oversight and support is $40,000 per year for 4 years for a total of $160,000.

### 9.3.7 Priority Management Action 6: Seawater Intrusion Working Group

SVBGSA will develop and coordinate a working group to address the issues associated with seawater intrusion. The working group will develop consensus on the current understanding of seawater intrusion in the Subbasin and adjacent subbasins subject to seawater intrusion, identify data gaps, and develop a broad-based plan for controlling seawater intrusion. The working group will include local agencies, landowners, stakeholders, and technical experts. The preliminary goal of the working group will be to develop consensus on the science of seawater intrusion in the Salinas Valley Groundwater Basin. The ultimate goal of the working group is to develop a comprehensive set of projects and management actions that control seawater intrusion while providing cost effective water supplies for the region.

#### 9.3.7.1 Relevant Measurable Objectives

The measurable objective benefiting from a seawater intrusion working group includes:

- Seawater intrusion measurable objective.

#### 9.3.7.2 Expected benefits and evaluation of benefits

The primary benefit from this seawater intrusion working group is to pull together the best available science, data, and understanding of local seawater intrusion causes and potential resolutions. The outcome of this working group is an agreed-to approach for managing seawater intrusion.

#### 9.3.7.3 Circumstances for implementation

The working group will be implemented within one year of GSP adoption. No additional circumstances are needed. SVBGSA will lead the formation of such a working group and identify interested parties. In addition, SVBGSA will schedule and lead the meetings and outcomes of this group.

#### 9.3.7.4 Public Noticing

Meetings and outcomes of this working group will be made publicly available.

#### 9.3.7.5 Permitting and Regulatory Process

No permitting and regulatory processes apply to this Management Action.

#### 9.3.7.6 Legal Authority

No authority is needed to develop a working group.

#### 9.3.7.7 Implementation Schedule

SVBGSA will start the working group in 2020.

#### 9.3.7.8 Estimated Cost

The estimated cost for consultant support to this working group is $125,000 per year for two years for a total of $250,000.

## 9.4 Projects

Projects involve new or improved infrastructure that are intended to help the SVBGSA meet SMCs in the Subbasin. Several potential projects that are currently being pursued by other agencies are included in this GSP. These projects are considered sufficiently established and will be constructed independently of, or in cooperation with, this GSP.

Projects fall into two categories:

- **Priority Projects**: The priority projects are the generally more cost-effective projects that could be implemented under the GSP. However, not all Priority Projects may be required depending on final benefit of each project.

- **Alternative Projects**: The alternative projects are the generally less cost-effective projects. Depending on the efficacy of the priority projects, one or more of the alternative projects may be implemented to meet the SMCs.

An overview of the project types and process through which all projects were considered are described in Sections 9.4.1 and 9.4.2. Priority Projects and Alternative Projects are described in Sections 9.4.3 and 9.4.4. General project provisions for all projects are listed together in Section 9.4.5, including permitting and regulatory processes, public noticing, and legal authority required for projects.

### 9.4.1 Overview of Project Types

There are four major types of projects that can be developed to supplement the Subbasin's groundwater supplies or limit seawater intrusion:

1. In-lieu recharge through direct delivery of water to replace groundwater pumping
2. Direct recharge through recharge basins or wells
3. Indirect recharge through decreased evapotranspiration or increased infiltration
4. Hydraulic barrier to control seawater intrusion

#### 9.4.1.1 Project Type 1: In-Lieu Recharge through Direct Delivery

Direct delivery projects use available water supplies in lieu of groundwater. This option offsets the use of groundwater, allowing the groundwater basin to recharge naturally. Direct delivery projects rely on the construction of a pipeline to deliver the water to agricultural or municipal users, as well as pump stations and storage facilities to handle supply and demand variations. Direct delivery is a highly efficient method to reduce groundwater pumping because it directly offsets and decreases the amount of water pumped from the aquifer, allowing the principal aquifer groundwater elevations to rebound through natural recharge. One of the drawbacks of direct delivery is that the delivered water must be available during the dry season, a time period when water supplies are less likely to be available, especially during a dry year.

#### 9.4.1.2 Project Type 2: Direct Recharge through Recharge Basins and Wells

Direct recharge of aquifers can be done through recharge basins or injection wells. Intentional, direct recharge is commonly referred to as Managed Aquifer Recharge (MAR), or Flood-Managed Aquifer Recharge (Flood-MAR) if recharge is done with flood water. Several of the projects listed in this chapter fall into this project type.

Recharge basins are large artificial ponds that are filled with water that seeps from the basin into the groundwater system. Recharge efficiencies can range greatly and the recharge efficiency of a recharge basin is contingent on the properties of the underlying soil, losses to evaporation, and potential seepage into streams or shallow sediments before it can recharge the deeper aquifers. Recharge efficiencies are difficult to measure without sophisticated subsurface monitoring.

Recharge through recharge basins can occur year-round; although efficiency might be lower during the rainy seasons if underlying soils are already saturated. Recharge basins have the advantage of generally being less expensive to build and operate than in-lieu distribution systems or injection systems.

Injection wells are used to inject available water supplies directly into the groundwater basin. Injection can occur year-round, including during the rainy season. Injection wells are typically more efficient at raising groundwater elevations than recharge basins because they target specific aquifers; although a well's recharge ability is affected by the surrounding aquifer properties. The injected water typically flows through the aquifer from the injection location to locations with lower groundwater elevations. The rate of travel depends on the hydraulic conductivity of the aquifer. Although they have a very high efficiency, injection wells are generally more expensive to operate than recharge basins. Additionally, injection wells require higher quality water than recharge basins.

#### 9.4.1.3 Project Type 3: Indirect Recharge through Decreased Evapotranspiration or Increased Percolation

Increased groundwater supply can be achieved through either a decrease in evapotranspiration or an increase in rainfall percolation. Example projects include removal of invasive species from riparian corridors (decreased evapotranspiration) and stormwater capture (increased percolation).

Stormwater capture projects are typically relatively low yield per acre compared to direct recharge basins (Section 9.4.1.2), however they can cover relatively large areas without negative impacts to land use. Stormwater capture may additionally provide water quality benefits. Removal of invasive species in riparian corridors may provide multiple benefits such as flood control benefits. Implementation costs for these projects are typically capital intensive with only minor long-term maintenance costs. Thus, the water supply benefit/cost ratio can increase significantly over the long term.

#### 9.4.1.4 Project Type 4: Hydraulic Barrier to Control Seawater Intrusion

A proposed hydraulic barrier would consist of a network of wells drilled a short distance inland from the coast and aligned approximately parallel to the coastline, across the width of the Subbasin. A hydraulic barrier can be operated as a recharge barrier, wherein water is injected into the wells and the resulting groundwater level mound creates the hydraulic barrier; Or the barrier can be operated as an extraction barrier, wherein the wells are pumped and the resulting groundwater level trough creates the hydraulic barrier. Recharge barriers require a source of water for recharge; extraction barriers require an end-use for the pumped water. Either configuration would require conveyance piping and may require water treatment.

### 9.4.2 All Projects Considered for Integrated Management of the Salinas Valley Groundwater Basin

This GSP is part of an integrated plan for managing groundwater in all six subbasins of the Salinas Valley Groundwater Basin under the jurisdiction of the SVBGSA. The projects listed in this GSP constitute an integrated management program for the entire Valley. The SVBGSA selected these projects from a larger set of potential projects. Appendix 9B lists the potential projects that were considered for the Valley-wide integrated management program.

The SVBGSA assessed potential projects listed in Appendix 9B for cost effectiveness in achieving sustainability throughout the Basin. It selected thirteen projects for further consideration based on the projects being the most reliable, implementable, cost-effective, and acceptable to stakeholders. These 13 projects were separated into priority projects and alternative projects. The priority projects are generally the most cost effective, and some subset of the priority projects will be implemented in the Salinas Valley Groundwater Basin as part of the six Salinas Valley GSPs. Alternative projects may be implemented in the Basin based on further analysis of the effectiveness of the priority projects, water availability, and refined cost estimates.

### 9.4.3 Selected Priority Projects for Integrated Management of the Salinas Valley Groundwater Basin

This GSP includes nine projects as priority projects. Some subset of these priority projects will be implemented as part of the six Salinas Valley Groundwater Subbasin GSPs. The priority projects may need to be supplemented by additional alternative projects in each subbasin to achieve sustainability. The alternative projects are described in Section 9.4.4 of this GSP. The nine priority projects are summarized in Table 9-1.

Table 9-1. Priority Projects

| Priority Project # | Project Name | Water Supply | Project Type |
|---|---|---|---|
| 1 | Invasive Species Eradication | N/A | Indirect Recharge |
| 2 | Optimize CSIP Operations | Recycled Water | In Lieu Recharge |
| 3 | Modify M1W Recycled Water Plant | Recycled Water | In Lieu Recharge |
| 4 | Expand Area Served by CSIP | Recycled Water | In Lieu Recharge |
| 5 | Maximize Existing SRDF Diversion | Salinas River | In Lieu Recharge |
| 6 | Seawater Intrusion Pumping Barrier | N/A | SWI Barrier |
| 7 | 11043 Diversion Facilities Phase I: Chualar | Salinas River | Direct Recharge |
| 8 | 11043 Diversion Facilities Phase II: Soledad | Salinas River | Direct Recharge |
| 9 | SRDF Winter Flow Injection | Salinas River | Direct Recharge |

Short descriptions of each priority project are included below. Generalized costs are also included for planning purposes. Components of these projects, including facility locations, pipeline routes, recharge mechanisms, and other details may change in future analyses. Therefore, each of the projects listed below should be treated as a generalized project representative of a range of potential project configurations.

#### 9.4.3.1 Project Cost Assumptions and Analysis Tools

Assumptions that were used to develop project cost estimates are provided in Appendix 9C. Assumptions and issues for each project need to be carefully reviewed and revised during the pre-design phase of each project. Project designs, and therefore costs, could change considerably as more information is gathered.

The cost estimates included below are order of magnitude estimates. These estimates were made with little to no detailed engineering data. The expected accuracy range for such an estimate is within +50% or –30%. The cost estimates are based on our perception of current conditions at the project location. They reflect our professional opinion of costs at this time and are subject to change as project designs mature.

Capital costs include major infrastructure, such as pipelines, pump stations, customer connections, turnouts, injection wells, recharge basins, and storage tanks. Capital costs also include 30% contingency for plumbing appurtenances, 15% increase for general conditions, 15% increase for contractor overhead and profit, and 8.75% for sales tax. Engineering, legal, administrative, and project contingencies were assumed to be 30% of the total construction cost and included within the capital cost. Land acquisition at $45,000/acre was also included within capital costs.

Annual operations and maintenance (O&M) fees include the costs to operate and maintain new project infrastructure. O&M costs also include any pumping costs associated with new infrastructure. O&M costs do not include O&M or pumping costs associated with existing infrastructure, such as existing Salinas Valley Reclamation Plant (SVRP) costs, because these are assumed to be part of water purchase costs. Water purchase costs are assumed to include repayment of loans for existing infrastructure; however, these purchase costs will need to be negotiated. The terms of such a negotiation could vary widely.

Capital costs were annualized over 25 years and added with annual O&M costs and water purchase costs to determine an annualized dollar per acre-foot ($/AF) cost for each project.

Because the SVIHM was not available to SVBGSA, a simplified groundwater model was developed to assess the approximate benefits of each project. While the simplified model is not as accurate as the SVIHM, it is adequate for comparing projects and actions. A description of the groundwater model is included in Appendix 9D.

#### 9.4.3.2 Preferred project 1: Invasive Species Eradication

The SVBGSA will support and enhance existing programs eradicating *arundo donax* and other invasive species along the Salinas River in partnership with the Resource Conservation District of Monterey County. This project will reduce evapotranspiration from these invasive plants, leaving more water in the Salinas River and increasing aquifer recharge or reducing the amount of water required to be released from Nacimiento and San Antonio Reservoirs.

The Salinas River watershed has a significant population of the invasive weed *arundo donax* and a smaller population of tamarisk, mostly from Gonzales to King City. The Salinas River watershed has the second-largest infestation of non-native *arundo donax* in California: approximately 1,500 to 1,800 acres. The Resource Conservation District of Monterey County is the lead agency on an estimated 15 to 20-year effort to fully eradicate *arundo donax* from the Salinas River Watershed. Concurrent with this program, *arundo donax* is also removed by landowners participating in the Salinas Stream Maintenance Program. The Salinas River Stream Maintenance Program is managed by the Salinas River Management Unit Association and the Monterey County Water Resource Agency. The two programs complement one another with regards to goals and eradication techniques for *arundo donax* and tamarisk within the Salinas River.

Demonstration efforts beginning in 2014 included removal of *arundo donax* from approximately 75 acres in the Chualar and Gonzales areas. Additional phases, which have or are being funded through grants by the Wildlife Conservation Board and USDA and with support from other agencies and voluntary landowners, are removing *arundo donax* from an additional 425 acres between Gonzales and Soledad and to re-treat other areas as necessary to prevent re-growth. An estimated 1,000 to 1,300 acres of invasive species still remains in the river channel and removal is currently unfunded.

This preferred project proposes continuing the efforts of clearing all invasive species throughout the entire Salinas River channel. Although the aerial imagery and ground surveys show the largest infestations between King City and Chualar, there are patches upstream of King City and downstream of Chualar. The proposed project would include three distinct phases: initial treatment, re-treatment, and on-going monitoring and maintenance treatments.

The initial treatment phase includes mechanical and/or chemical treatment of the remaining 1,000 to 1,300 acres of invasive species removal in all areas of the river that have yet to be treated. The re-treatment phase includes re-treatment of the initial 500 acres that have already had an initial treatment and re-treatment of all 1,500 to 1,800 acres over a 3-year period. The final phase is the on-going monitoring and maintenance treatment phase. This phase requires annual monitoring for re-growth of the invasive species or new invasive species and chemical treatment every three to five years.

##### *9.4.3.2.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective

##### *9.4.3.2.2 Expected Benefits and Evaluation of Benefits*

This project is included here as part of the complete Valley-wide groundwater management program. The primary benefit from this project is increased groundwater recharge due to reduced evapotranspiration in the southern Salinas Valley subbasins. Based on currently available data, the expected benefit of this project is between 4 and 20 AF/yr. per acre which results in 6,000 AF to 36,000 AF/yr. of water that would remain in the river, or would not be required to be released from Nacimiento and/or San Antonio Reservoirs. During the implementation period, these numbers will be refined with evaporation studies that are more regionally specific and accurate; and that will demonstrate the variation between dry, wet, and normal years. Actual benefits will be further documented following completion of ongoing evapotranspiration studies being conducted by the Resource Conservation District of Monterey County, California State University Monterey Bay and University of California Santa Barbara.

Figure 9-2 shows the expected groundwater elevation benefit, in feet, in the 180-Foot Aquifer from this project. Figure 9-3 shows the expected groundwater elevation benefit, in feet, in the

400-Foot Aquifer from this project. The benefit is greatest at the south end of the 180/400-Foot Aquifer Subbasin, where there is no extensive aquitard separating the aquifers from the Salinas River. Model results suggest that this project reduces seawater intrusion by approximately 890 AF/yr. on average.

Invasive species removal has other benefits in addition to water savings. Thick stands of invasive species can, over time, lead to a narrower river channel, increasing flow velocities, eroding channel banks, and blocking bridge structures when large portions of vegetation break loose. Invasive species also crowd out native species and remove valuable riparian habitats which harbor bird species and provide shading, bank stability, and lower temperatures for instream habitat and associated species such as steelhead.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between invasive species eradication and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

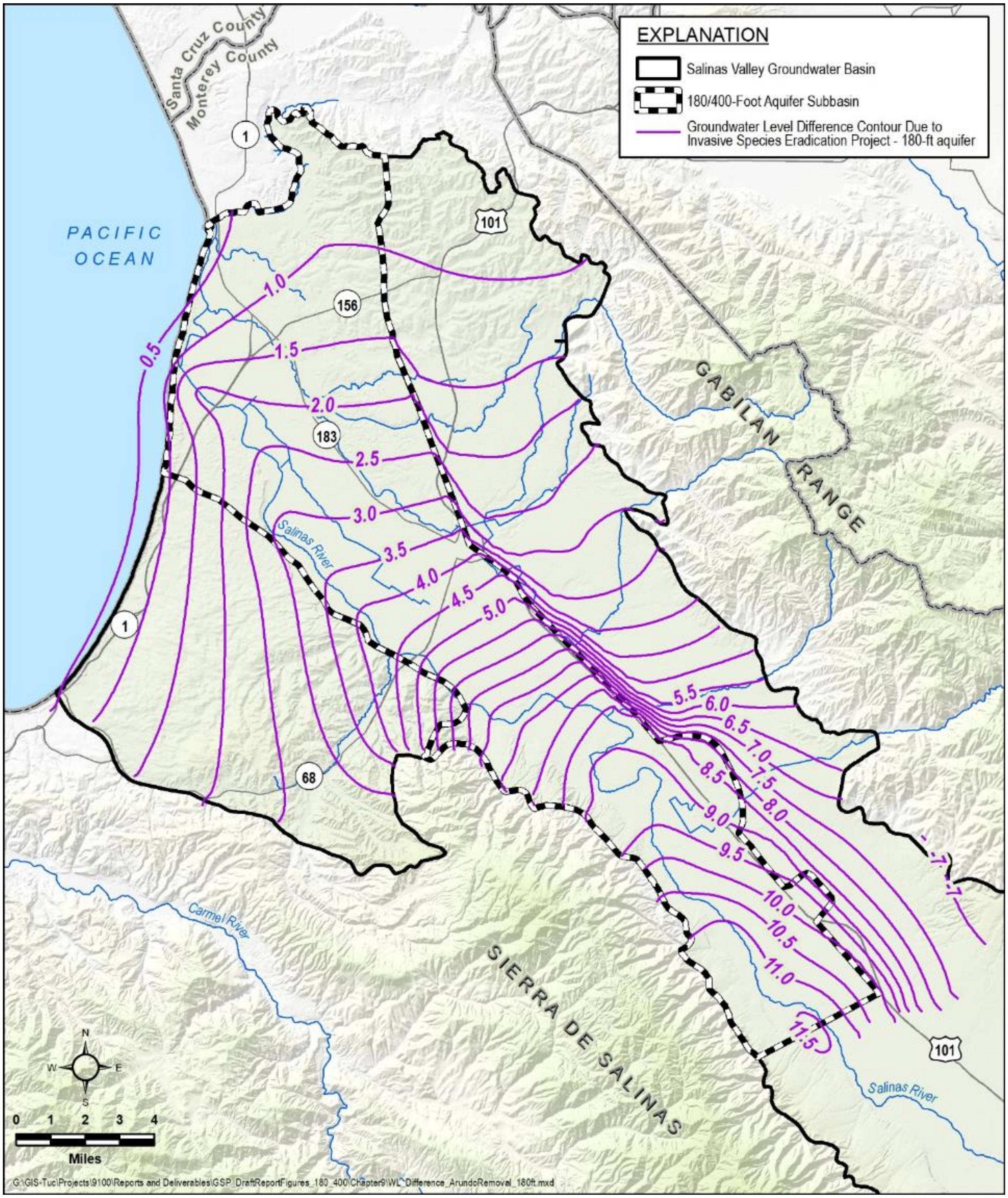



Figure 9-2. Estimated Groundwater Elevations Benefit in the 180-Foot Aquifer from Arundo Removal

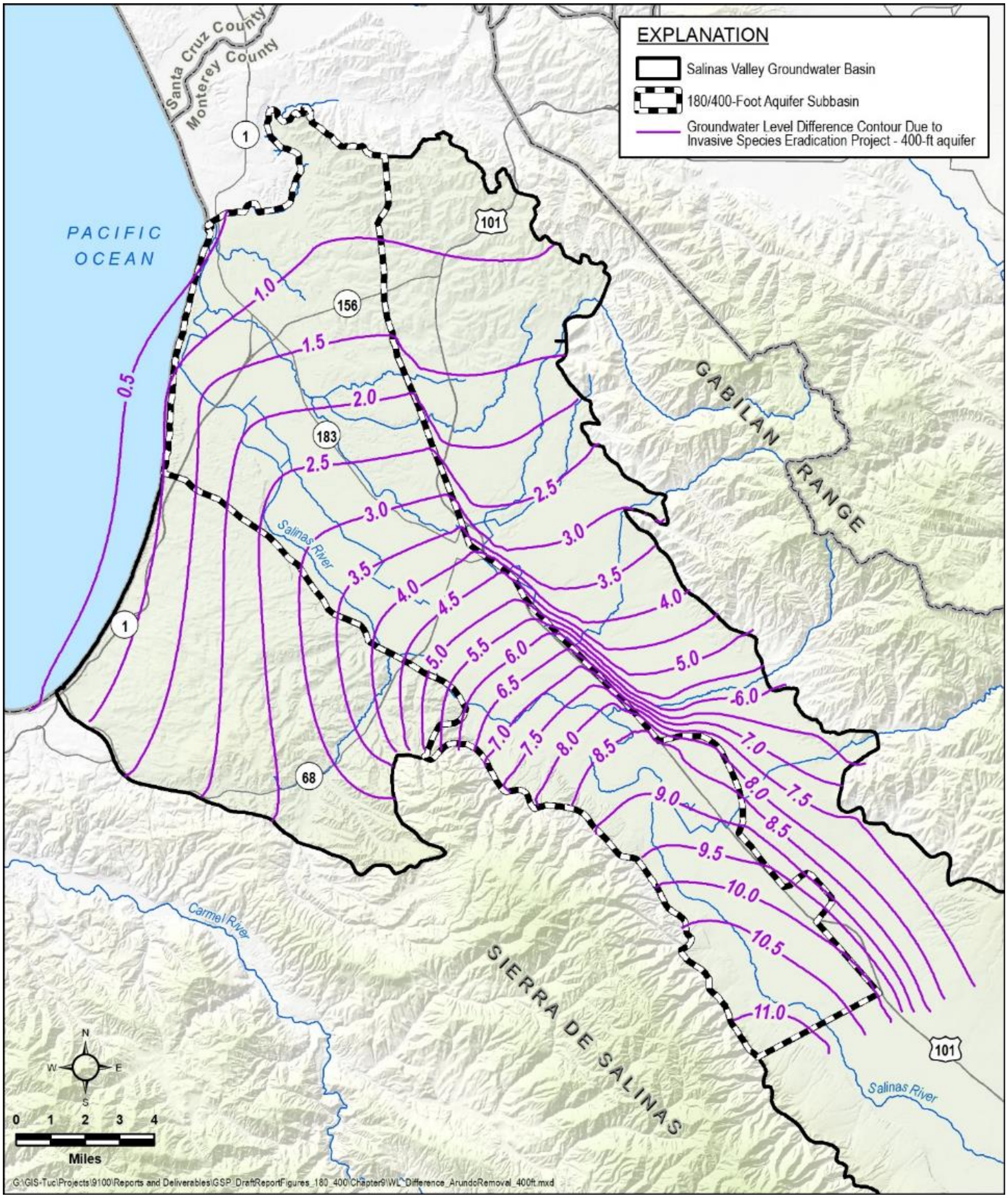



Figure 9-3. Estimated Groundwater Elevations Benefit in the 400-Foot Aquifer from Arundo Removal

#### *9.4.3.2.3 Circumstances for Implementation*

Invasive species eradication is a preferred project that is already ongoing in the Salinas Valley Groundwater Basin. Supporting these ongoing efforts will be initiated as soon as funds become available. No additional circumstances for implementation are necessary.

#### *9.4.3.2.4 Public Noticing*

The public noticing practices and requirements of the existing invasive species eradication programs will be continued as part of this project.

#### *9.4.3.2.5 Permitting and Regulatory Process*

The permitting process of the existing invasive species eradication programs will be continued as part of this project.

#### *9.4.3.2.6 Implementation Schedule*

The implementation schedule is presented on Figure 9-4. It is anticipated that Phase I will take two years. Phase II will overlap with Phase I and take an additional two to three years. Phase III, which is on-going maintenance will continue past Year three.

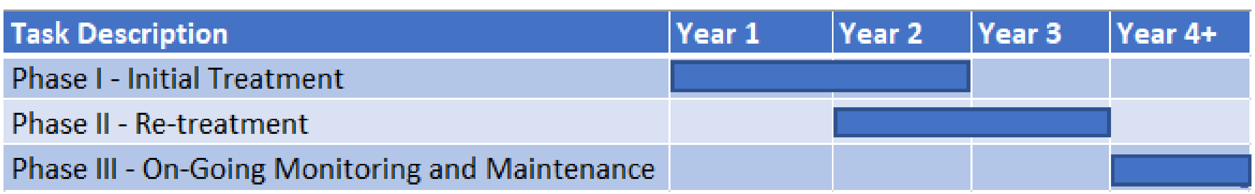



Figure 9-4. Implementation Schedule for Invasive Species Eradication

#### *9.4.3.2.7 Legal Authority*

The SVBGSA will use the legal authority for invasive species eradication contained in the existing eradication program.

#### *9.4.3.2.8 Estimated Cost*

Estimated capital cost for the invasive species eradication project is estimated at $35,230,000. Annual O&M costs are anticipated to be approximately $325,000. The indirect projected yield for the invasive species eradication project is estimated at 20,000 AF per year. The amortized cost of water for this project is estimated at $160/AF/yr.

### CSIP PROJECTS

Preferred projects 2, 3, 4, and 5 all work together to improve and expand the performance of the CSIP system. The goal of these four projects, taken together, is to provide a reliable, year-round supply of water to all growers in the current CSIP system, and to expand the system as possible. The four projects are presented here as individual projects, even though they are all part of an integrated CSIP strategy.

#### 9.4.3.3 Preferred Project 2: Optimize CSIP Operations

The CSIP system is operated and maintained by M1W under a contract with MCWRA. MCWRA and M1W have started evaluating opportunities to optimize the CSIP distribution system. This preferred project provides support for various elements of the MCWRA optimization project that is directly beneficial to the sustainability of the groundwater basin. The costs for a portion of this project will be funded directly through MCWRA. Additional funding will be provided by SVBGSA.

The CSIP distribution system has known flow and pressure constraints. The CSIP system will be optimized to better accommodate diurnal and seasonal fluctuation in irrigation demand, maximizing use of water supplied from the SVRP and the SRDF, thereby reducing the need for groundwater pumping. Furthermore, this project aligns CSIP irrigation with water availability, rather than on demand, to ensure the available supply water can be used to a greater extent.

The downsizing of flow meters and isolation valves at the time of construction of the CSIP system resulted in water delivery constraints. In addition, there is not enough water storage within the system to take advantage of all the available supplies. These bottlenecks in the system and lack of storage lead to the need for CSIP supplementary wells to meet total irrigation needs when either the treated or diverted water is not available, or the pressure is not sufficient.

The approach for CSIP system optimization includes the following general activities:

1. Hydraulic Modeling. This activity will develop and calibrate a hydraulic model of the CSIP water distribution system, will identify the hydraulic deficiencies in the system, and recommend upgrades to enhance the delivery system. This activity is currently being completed by MCWRA, therefore the costs for this component of the project are not included in the costs identified below.
2. Irrigation/Scheduling System Development. This activity will develop a program that will allow growers to order and schedule their water deliveries; reducing peak demands in the system. Part of the irrigation scheduling program will introduce incentives for farmers to modify irrigation practices (e.g., tiered charge pricing) which will promote use of water during off-peak times. In addition, real-time SCADA monitoring capabilities of the distribution system would be added.

3. Add Water Storage. This activity will add storage capacity for recycled water and SRDF water deliveries throughout the water distribution system. The hydraulic modeling will identify preferred locations for storage that would provide the most benefit to the system. Additional storage reservoirs will allow the CSIP system to store water produced by the SVRP or diverted by SRDF during low demand periods for later delivery when demand is high. Storage reservoirs would also assist in maintaining adequate pressure in the existing system and provide more flexibility in the timing of SVRP and SRDF deliveries. Additional storage may also reduce the need to drill additional CSIP supplementary wells.
4. Piping Upgrades. The hydraulic model will identify deficiencies in the water distribution system that will require piping upgrades. The exact piping upgrades are unknown. This component of the project is a placeholder for anticipated upgrades required to the system to assist in the regulation of flow and pressure.

##### *9.4.3.3.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

##### *9.4.3.3.2 Expected Benefits and Evaluation of Benefits*

The primary benefit from CSIP optimization includes reduction or avoidance of groundwater pumping from wells in the CSIP area throughout the year. Two sets of wells pump groundwater in the CSIP area: CSIP standby wells and CSIP supplementary wells. CSIP standby wells are privately owned wells used to provide groundwater for irrigation either in lieu of, or in addition to, irrigation water provided by the CSIP system. CSIP supplementary wells are MCWRA owned wells that provide water to the CSIP system when the combination of SVRP and SRDF water is insufficient to meet demands. This project will benefit other subbasins, such as the Monterey and Eastside subbasins by reducing pumping that impacts the neighboring subbasins.

Figure 9-5 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from projects 2, 3, and 5, combined. Figure 9-9 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from projects 2, 3, and 5, combined. These projects were combined into a single simulation because of how closely they are intertied. Model results suggest that these projects reduce seawater intrusion by approximately 2,200 AF/yr. on average.

Figure 9-7 presents the CSIP standby well pumping data since 1993. Historical pumping data provided by MCWRA indicates that since 2010, the average pumping of CSIP standby wells located within the CSIP distribution area is around 2,000 AF/yr.  The combination of projects 2, 3, and 5 are intended to eliminate this pumping by standby wells.

Figure 9-8 presents the historical pumping for CSIP supplementary wells. A sharp decline in pumping occurred in 2010 when the SRDF came online. Omitting years 2014 through 2016 when the SRDF was offline, the average CSIP supplementary well yield since 2010 is approximately 3,350 AF/yr. Combining the average CSIP standby well pumping and the CSIP supplementary well pumping yields an average benefit of approximately 5,500 AF/yr. of reported well pumping within the CSIP area that could be offset by projects 2, 3, and 5.

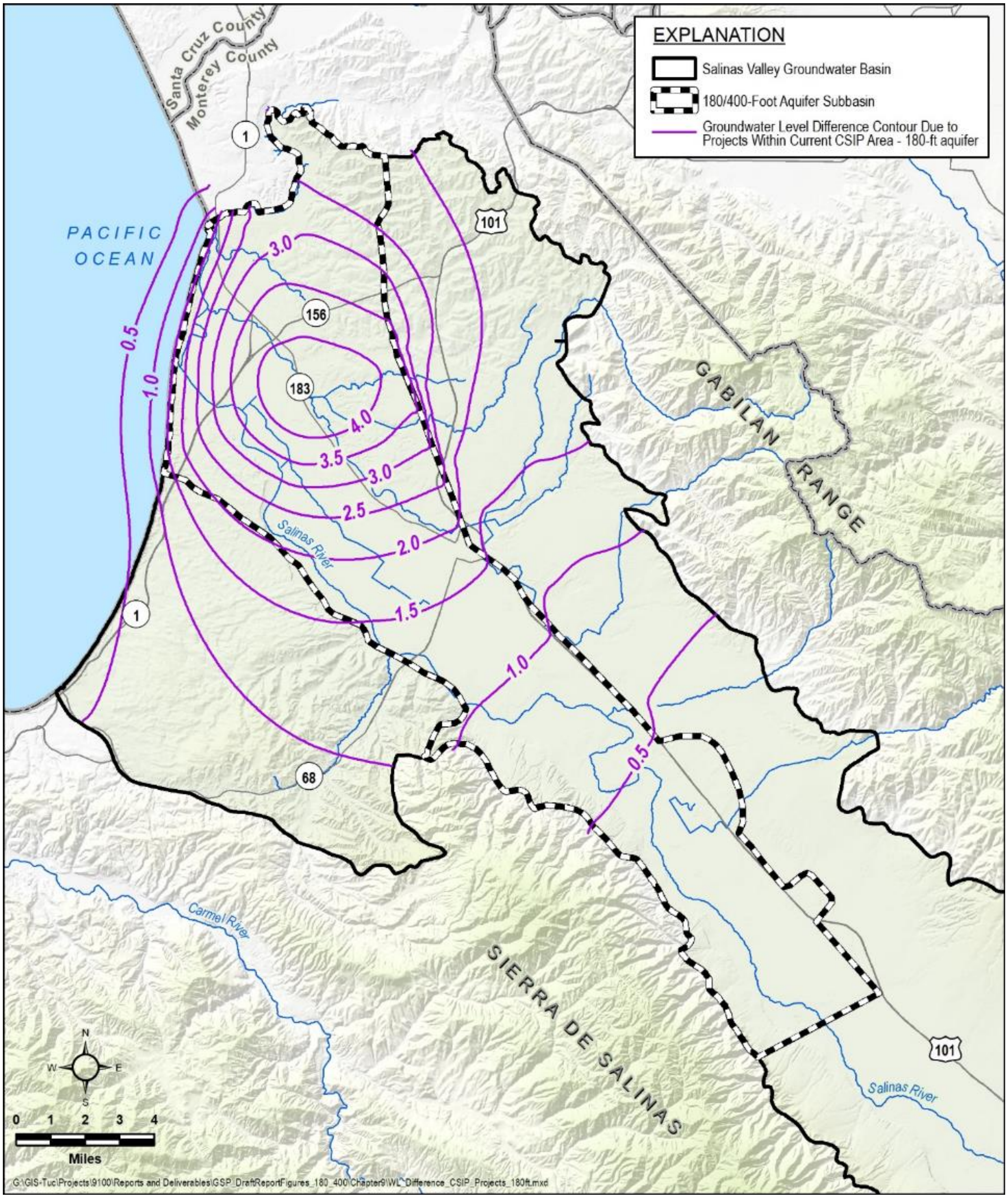



Figure 9-5. Estimated Groundwater Elevation Benefit in the 180-Foot Aquifer from All CSIP Projects

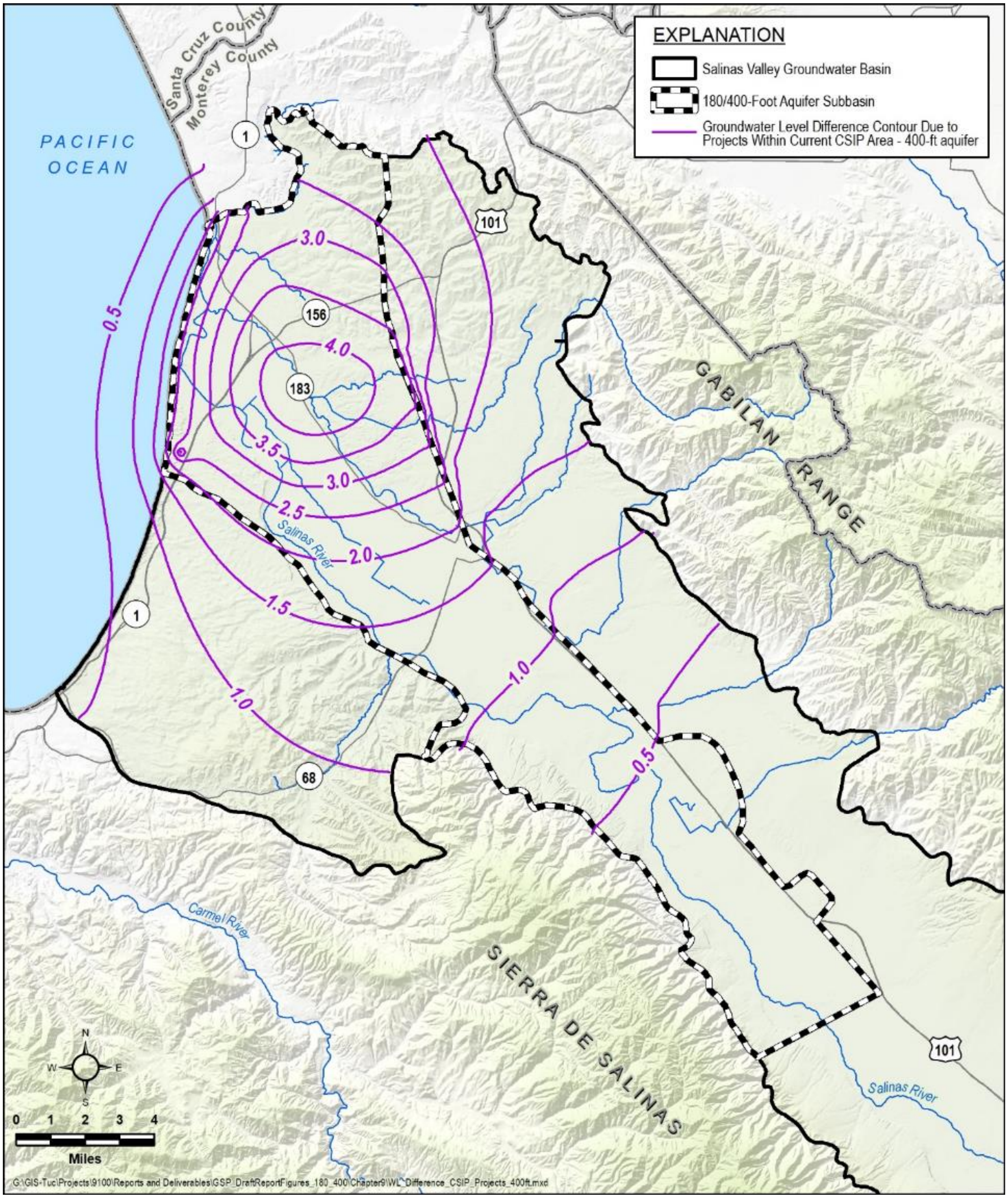



Figure 9-6. Estimated Groundwater Elevation Benefit in the 400-Foot Aquifer from All CSIP Projects

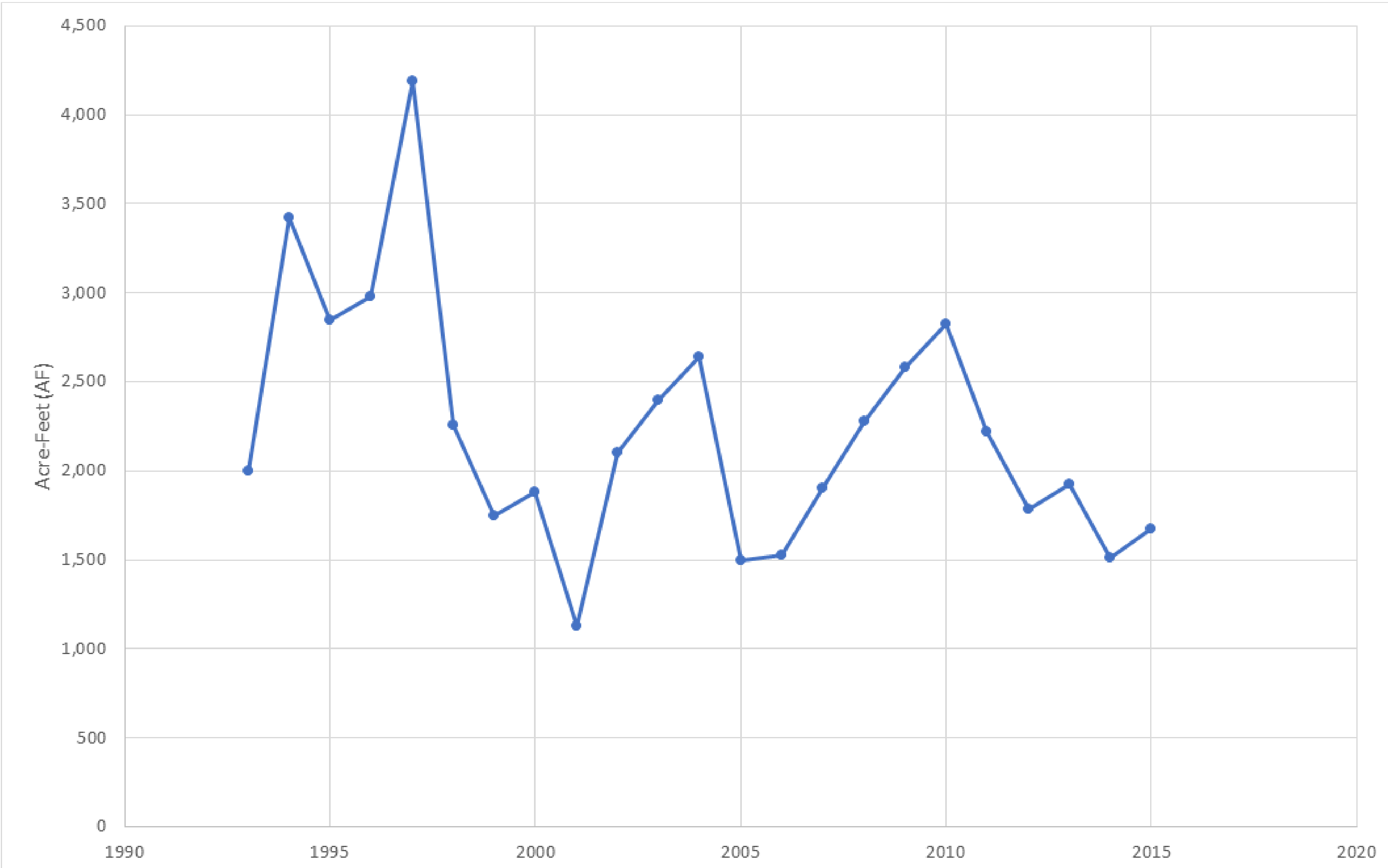



Figure 9-7. CSIP-Standby Wells within the CSIP Program Area - Standby Active (CSIP-SBA) Well Production 1993 to 2015

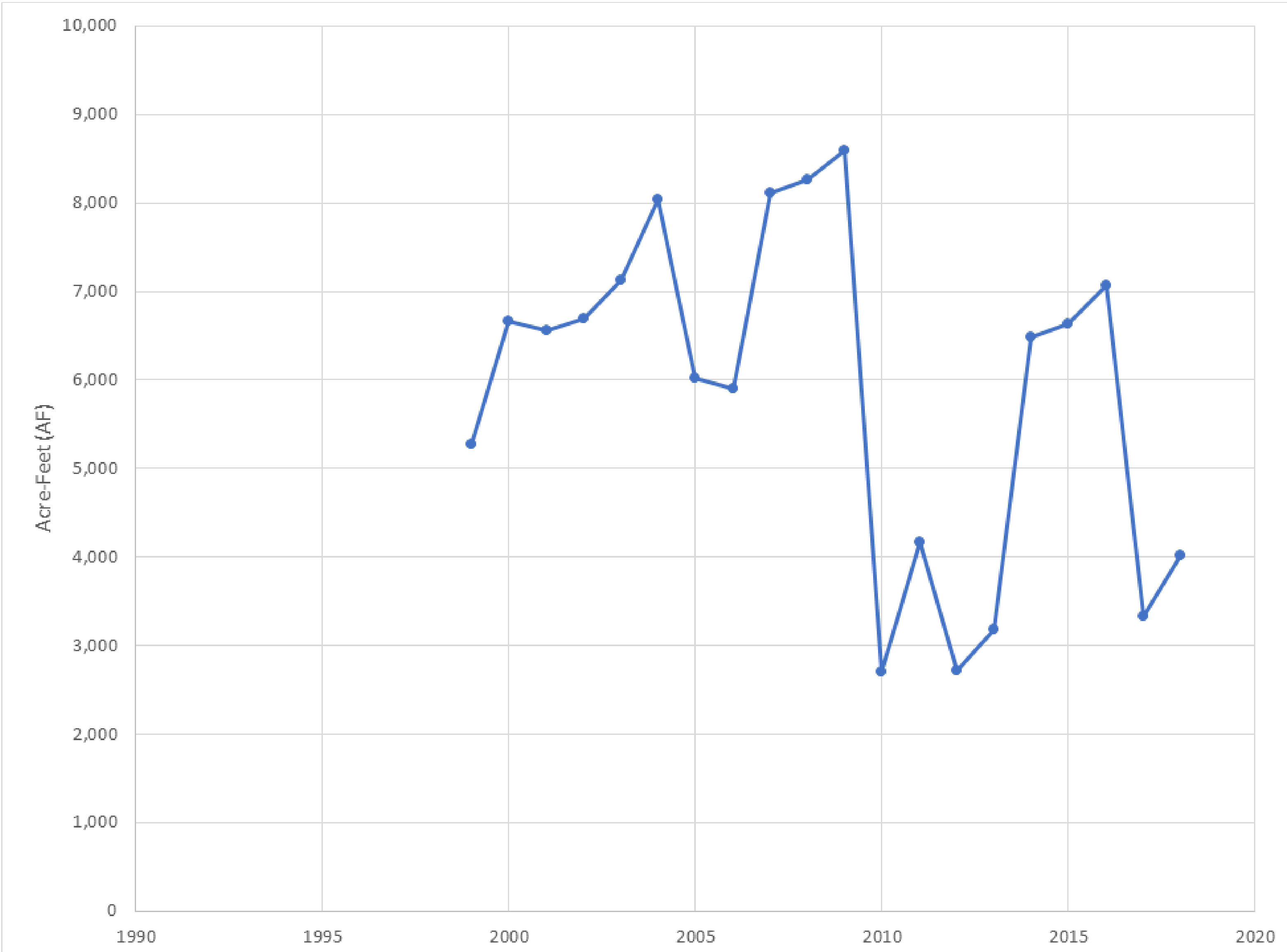



Figure 9-8. CSIP Supplementary Well Production 1999 to 2018

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between CSIP optimization and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

##### 9.4.3.3.3 *Circumstances for Implementation*

The CSIP optimization project is a preferred project that builds on plans currently being initiated by MCWRA. Supporting and expanding these ongoing efforts will be initiated as soon as funds become available. No additional circumstances for implementation are necessary.

##### 9.4.3.3.4 *Legal Authority*

MCWRA, who owns and operates the CSIP system, is a member of the SVBGSA. Therefore, optimizing the CSIP system is a benefit to one of the SVBGSA members. The SVBGSA will work in cooperation with MCWRA to modify and optimize the CSIP system.

##### 9.4.3.3.5 *Implementation Schedule*

The implementation schedule is presented on Figure 9-9. It is anticipated to take three to six years to implement.

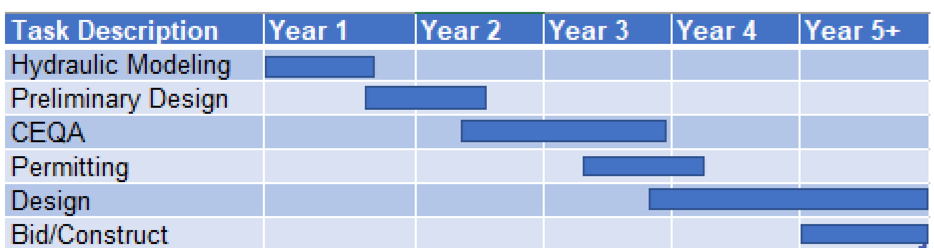



Figure 9-9. Implementation Schedule for CSIP Optimization

##### 9.4.3.3.6 *Estimated Cost*

Estimated capital cost for the CSIP optimization project is estimated at $16,400,000. Annual O&M costs are anticipated to be approximately $200,000. The projected yield for the CSIP optimization project is estimated at 5,500 AF/yr. The amortized cost of water for this project is estimated at $270/AF/yr.

#### 9.4.3.4 Preferred Project 3: Modify Monterey One Water Recycled Water Plant – Winter Modifications

Monterey One Water's Regional Wastewater Treatment Plant (RTP) has a maximum capacity of 29.6 mgd. Currently, the facility is only treating 16 to18 mgd of influent wastewater. During the wet weather months, 100% of all secondary treated wastewater is discharged to the ocean, forgoing the opportunity for beneficial reuse. During the wet weather months, there is some demand for recycled water in the CSIP system; however, M1W cannot produce tertiary treated water at a rate lower than 5 mgd, which is needed to supply the growers in the winter. As a result, growers turn to the groundwater basin for their irrigation needs during these months. Modifications are required at the M1W RTP in order to efficiently treat and deliver recycled water during the wet weather months.

Under the M1W Recycled Water Plant Modifications Project, the SVRP will be improved to allow delivery of tertiary treated wastewater to the CSIP system when recycled water demand is less than 5 mgd. Monterey One Water (M1W) is currently designing and permitting this project (Monterey One Water, 2018). SVBGSA will work closely with M1W to support and implement this project.

Table 9-2 provides the groundwater well pumping for the past 7 years during the winter months when the SVRP plant is not on-line. This results in an average wet weather pumping rate of 1,100 AF/yr.; with a minimum of 300 AF/yr. in wet years, and a maximum of 1,790 AF/yr. in dry years. The SVRP improvements would largely eliminate the need for this wintertime pumping. The demand for water during the winter from the SVRP will also increase with the Preferred Project 4; increasing the potential Project Yield from 1,100 AF/yr. to an estimated 1,300 AF/yr.

Table 9-2. Groundwater Winter Well Pumping FY 2011-2012 to FY 2017-2018

| | Dec 2011-Jan 2012 | Dec 2012-Jan 2013 | Dec 2013 - Jan 2014 | Nov 2014-Jan 2015 | Nov 2015-Feb 2016 | Nov 2016-Mar 2017 | Nov 2017-Mar 2018 |
|---|---|---|---|---|---|---|---|
| November | | | | 303 | 213 | 325 | 28 |
| December | 723 | 52 | 730 | 38 | 199 | 223 | 38 |
| January | 1,067 | 253 | 509 | 516 | 96 | 62 | 183 |
| February | | | | | 520 | 102 | 907 |
| March | | | | | | 580 | 90 |
| **Total** | **1,790** | **305** | **1,239** | **857** | **1,028** | **1,292** | **1,246** |

##### 9.4.3.4.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective

- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

##### *9.4.3.4.2 Expected Benefits and Evaluation of Benefits*

The primary benefit from M1W SVRP Modifications is additional water supply to the CSIP system during low-demand wet weather months, reducing groundwater pumping. The M1W SVRP Modifications project has the potential to yield up to 1,100 AF/yr. through in-lieu recharge, providing an alternative to groundwater sources in the existing CSIP area and an additional 200 AF/yr. in the expanded CSIP area. This project will benefit other subbasins, such as the Eastside and Monterey Subbasins by reducing pumping that impacts the neighboring subbasins.

Figure 9-5 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from projects 2, 3, and 5, combined. Figure 9-9 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from projects 2, 3, and 5, combined. These projects were combined into a single simulation because of how closely they are intertied. Model results suggest that these projects reduce seawater intrusion by approximately 2,200 AF/yr. on average.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between M1W improvements and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

##### *9.4.3.4.3 Circumstances for Implementation*

The SVRP modifications project is currently being planned and implemented by M1W as part of the Pure Water Monterey Groundwater Replenishment Project. No other circumstances for implementation are necessary.

##### *9.4.3.4.4 Legal Authority*

The SVRP modification project is currently being planned and implemented by M1W. No legal authority is necessary.

#### 9.4.3.4.5 Implementation Schedule

The implementation schedule is presented on Figure 9-10. It is anticipated to take approximately two years to implement.

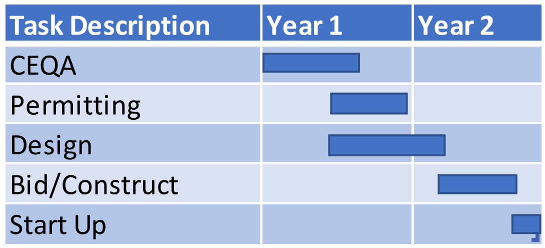



Figure 9-10. Implementation Schedule for M1W SVRP Modifications

#### 9.4.3.4.6 Estimated Cost

The project cost will be covered through delivery charges to existing CSIP customers. Because a funding mechanism for this project has already been identified, these costs will not be incorporated into the Water Charges Framework.

The following estimates are provided by the MCWRA's *New Source Water Supply Study, Final Report*. Estimated capital cost for the M1W Winter Modification project was estimated at $1,493,000 (Raftelis Financial Consultants, 2018). The amortized cost of water for this project is estimated at $90/AF.

### 9.4.3.5 Preferred Project 4: Expand Area Served by CSIP

The CSIP expansion project involves enlarging the system's service area, thereby increasing the demand for recycled water in the spring and fall and lessening dependence on existing groundwater wells. The existing CSIP supplies may not be sufficient to meet the summertime demand of the expanded CSIP area without an increase in water supply from the SRDF or another source. If additional water supply sources are available in the summer, the expanded service area will be supplied summer irrigation water. The CSIP Optimization Project (Priority Project 2) will be required to be implemented before water has the potential to be supplied to the expanded CSIP area during the summer.

In previous studies, approximately, 8,500 acres have been identified on the north, east and south sides of the existing CSIP service area that could be included in the expanded service area. These areas were identified in the *Cal-Am Coastal Water Project Draft Environmental Impact Report* (ESA, 2009), and are shown on Figure 9-11. Other studies have suggested smaller expansions. In 2011, MCRWA considered approximately 3,500 acres for annexation into the CSIP service area as displayed on Figure 9-12. More recently, the May 2018 *Progress Report on Pure Water Monterey Expansion*, stated the current plan for expansion considers an additional 3,500 acres, a 29% increase in its service area (Monterey One Water, 2018).

Based on the report *Recommendations to Address the Expansion of Seawater Intrusion in the Salinas Valley Groundwater Basin*, a working group was established that recommended beginning an annexation plan for expanding the CSIP service area concurrently with optimizing the existing CSIP system (MCWRA, 2017b). The working group recommended expanding into areas nearest the advancing seawater intrusion front. The annexation plan would be implemented after 2020.

Assuming 3,500 acres of new farmland are annexed into the system, and with an assumed unit agricultural water demand of 2.8 AF/acre (MCWRA, 2017b), the expanded area may present an additional demand of 9,900 AF/yr. Initial estimates reported in the 2009 *Cal-Am Coastal Project Draft EIR* (ESA, 2009) suggested the 8,500 acre expansion proposal might require an additional 14,000 AF/yr. of water. Assuming the lesser of these two estimates, the 9,900 AF/yr. of deliveries would offset an equal amount of pumping from the Subbasin. The final size and location of CSIP expansion will be determined through additional hydraulic modeling and engineering that identifies the most cost-effective areas for expansion.

The CSIP expansion would include construction of a new distribution network. The distribution network will be developed only after the final location of CSIP expansion is agreed upon. Extrapolating from the existing CSIP system, the expanded area may include on the order of 13 miles of new pipeline. Because the existing distribution system is at its hydraulic capacity, the new network would likely be a pressurized system separate from the existing distribution system pipelines. A new 48" transmission main would extend from the existing SVRP storage pond to the expanded service area; with the exception of a smaller diameter pipeline serving an area southwest of the M1W SVRP. A crossing of the Salinas River would be required. Pipeline diameters would decrease further downstream in the distribution network. Turnouts would be installed for each new agricultural use customer.

Locations to be served in the expanded area would prioritize areas where risk of seawater intrusion is highest. Additional considerations include the cost of tank storage and booster pumps needed to supply areas east of Castroville along Highway 156.

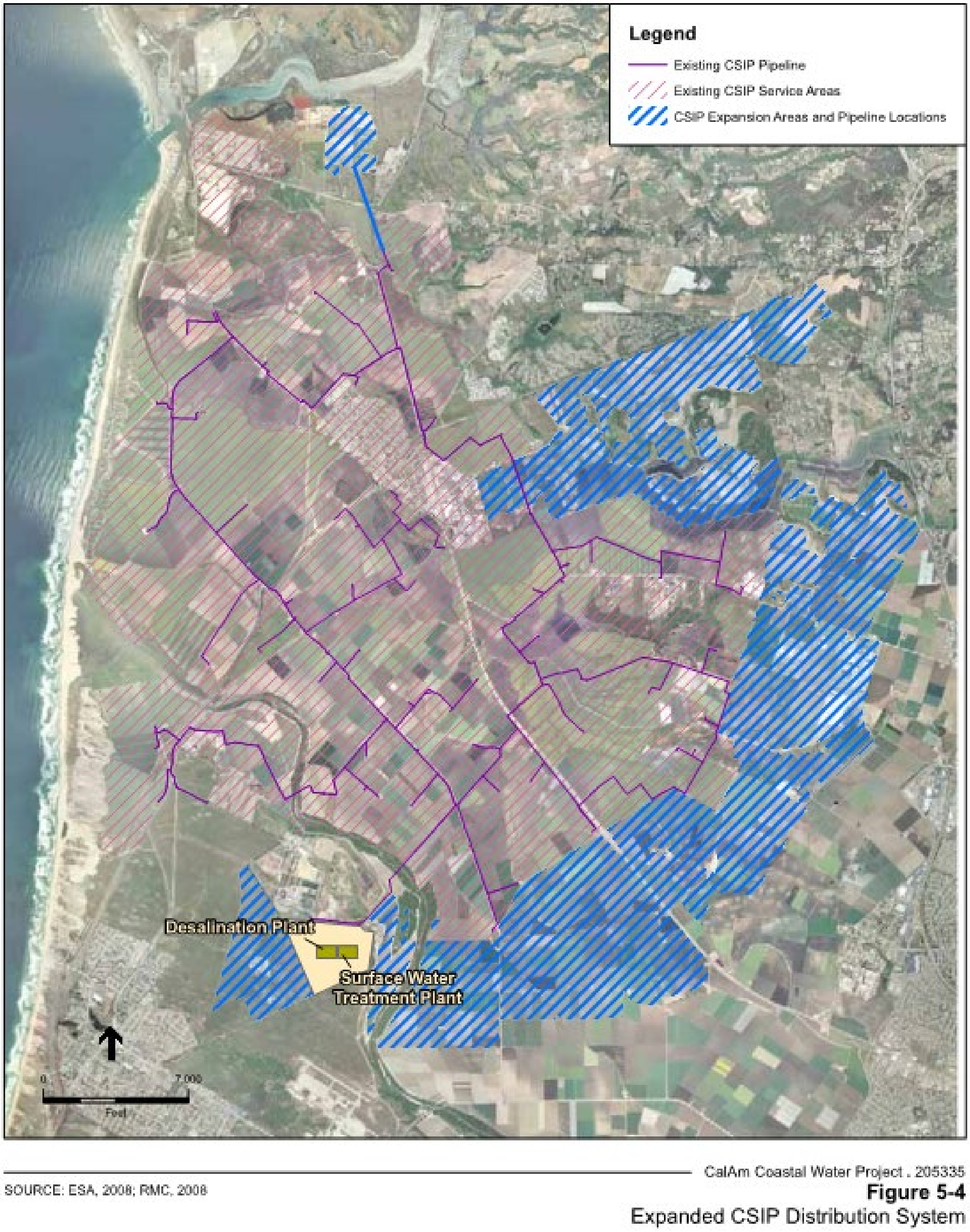



Figure 9-11. Potential CSIP Distribution System Expansion Areas
(Image from Cal-Am Coastal Water Project Draft EIR, 2005)

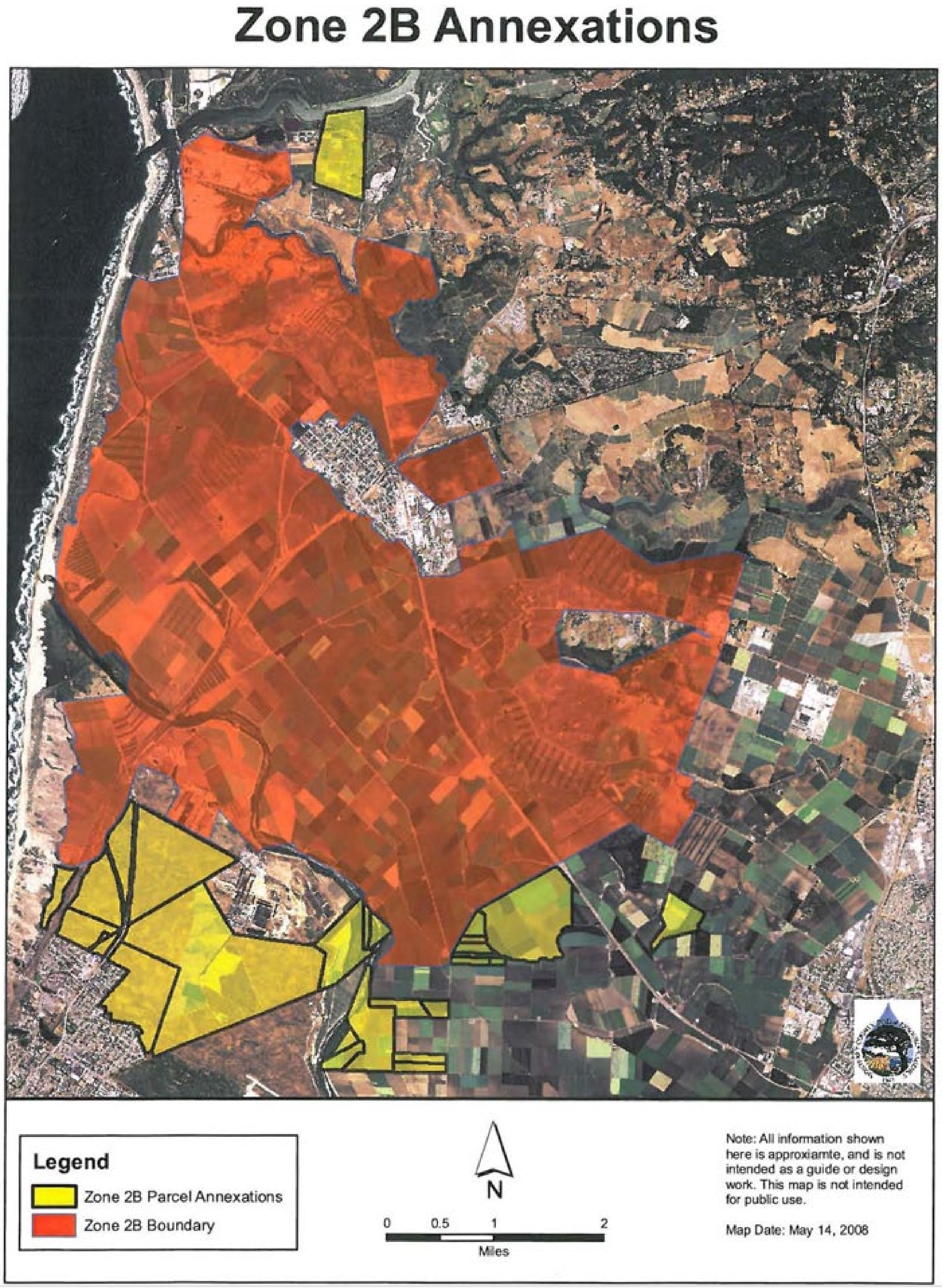



Figure 9-12. Zone 2B Requests for Annexation from 2011
(Courtesy of MCWRA)

##### *9.4.3.5.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

##### *9.4.3.5.2 Expected Benefits and Evaluation of Benefits*

The primary benefits from CSIP expansion include the increase in demand for recycled water and river diversion water supplies, thus reducing groundwater pumping in the Subbasin. This increased demand could be supplied to the new service area during the winter, spring and fall when excess supply is available to the CSIP system. If additional water supplies are available in the summer, the new service area could also be supplied in the summer. The expanded service area would lessen groundwater pumping by an amount equal to the quantity delivered: approximately 9,900 AF/yr. This project will benefit other subbasins, such as the Monterey and Eastside subbasins by reducing pumping that impacts the neighboring subbasins.

Figure 9-13 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from the CSIP expansion project. Figure 9-14 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from the CSIP expansion project. Model results suggest that this project reduces seawater intrusion by approximately 2,800 AF/yr. on average.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between CSIP expansion and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

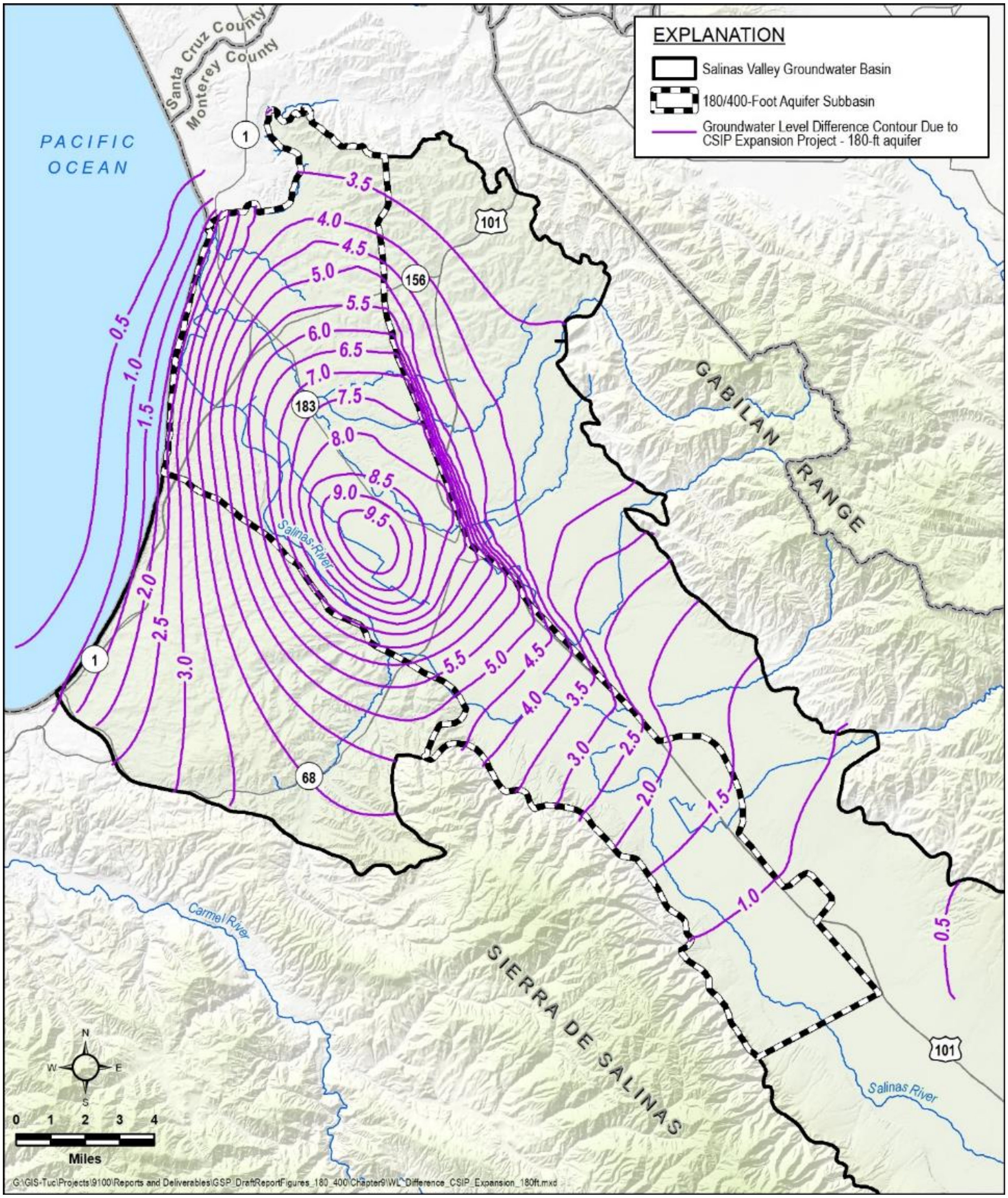



Figure 9-13: Estimated Groundwater Elevation Benefit in the 180-Foot Aquifer from the CSIP Expansion Project

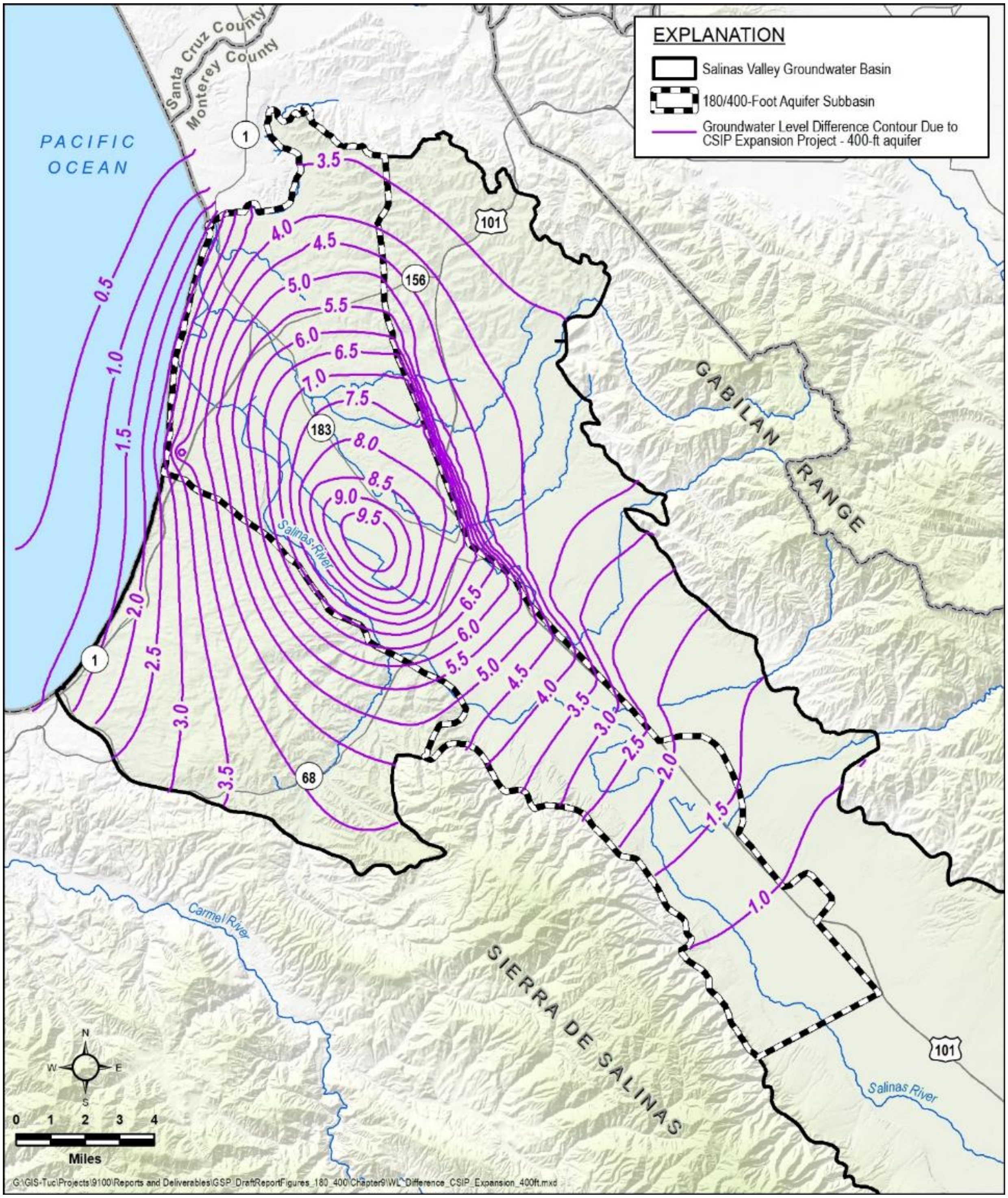


Figure 9-14. Estimated Groundwater Elevation Benefit in the 400-Foot Aquifer from the CSIP Expansion Project

##### 9.4.3.5.3 *Circumstances for Implementation*

The CSIP expansion project will be implemented after completion of the CSIP optimization project.

##### 9.4.3.5.4 *Legal Authority*

MCWRA, who owns and operates the CSIP system, is a member of the SVBGSA. Therefore, expanding the CSIP system is a benefit to one of the SVBGSA members. The SVBGSA will work in cooperation with MCWRA to design and construct the CSIP expansion.

##### 9.4.3.5.5 *Implementation Schedule*

The implementation schedule is presented on Figure 9-15. It is anticipated to take five years to implement. Year one for this project would not start until the CSIP Optimization Project has been implemented.

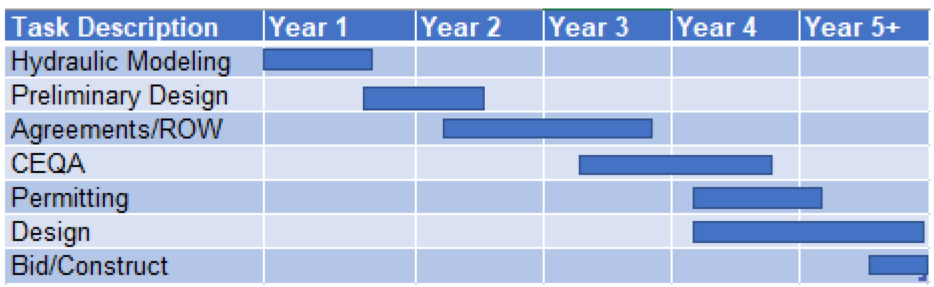



Figure 9-15. Implementation Schedule for CSIP Distribution System Expansion

##### 9.4.3.5.6 *Estimated Cost*

Capital cost for the CSIP expansion project is estimated at $73,366,000. Annual O&M costs are approximately $480,000. The estimated projected yield for the project is 9,900 AF/yr. The amortized cost of water for this project is estimated at $630/AF.

#### 9.4.3.6 Preferred Project 5: Maximize Existing SRDF Diversion

MCWRA owns and operates the SRDF. The SRDF operates normally at 36 cfs and has a maximum capacity of 48 cfs if necessary. The facility operates between April 1st and October 31st and can deliver annually up to approximately 15,000 AF/yr. to the CSIP system. The original Engineer's Report for the SRDF proposed a facility that could instantaneously deliver 85 cfs with a total annual diversion between 9,700 and 12,800 AF/yr. The instantaneous delivery was scaled back during design to reduce costs for the project.

The existing SRDF can theoretically divert up to 15,000 AF/yr. to the CSIP system, although since its startup in 2010 it has provided an average of 3,400 AF/yr. between the months of April and October, with a maximum delivery in WY 18-19 of 6,500 AF/yr. This deficit between the facility's capacity and its actual deliveries is largely attributable to a misalignment between the timing of supply and demand for the water. Currently, the CSIP's agricultural demand is primarily during the day. Recycled water is used as the first priority in supplying the CSIP, so the need for SRDF water during the day is limited. This results in the farmers and MCWRA turning on their wells to supplement the water supplies on average of 5,500 AF/yr. (see Priority Project 2).

Between 2002 and 2018, the average April through October demand in the CSIP system was 17,538 AF/yr. The SVRP supplied approximately 11,482 AF/yr. of that annual average demand. Under these operational parameters, in order to eliminate pumping from CSIP supplementary wells, the SRDF would need to provide an average annual diversion of approximately 6,506 AF/yr. Since operation of the SRDF began in 2010 there has been a minimum of 8,500 AF/yr. available for diversions to CSIP, with an average annual diversion capacity of up to 11,600 AF/yr.

Therefore, after the CSIP system is optimized, the SVBGSA could increase the production from the SRDF with no added capital expenditures. In addition, there would be additional capacity available to offset a portion of the demand from the expanded CSIP area (Priority Project 4), up to an additional 4,300AF/yr. CSIP Optimization (Priority Project 2) must be completed to be able to maximize the SRDF deliveries.

##### *9.4.3.6.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

##### *9.4.3.6.2 Expected benefits and Evaluation of Benefits*

The primary benefits from maximizing the existing SRDF facilities includes additional water supply to the CSIP system, allowing for its expansion into new service areas as well as providing a potential source of water for aquifer recharge through injection wells (See Priority Project 10 Winter Flow Injection). Maximizing the existing SRDF has the potential to yield up to 11,600 AF/yr. when operated April through October.

Figure 9-5 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from projects 2, 3, and 5, combined. Figure 9-9 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from projects 2, 3, and 5, combined. These projects were combined into a single simulation because of how closely they are intertied. Model results suggest that these projects reduce seawater intrusion by approximately 2,200 AF/yr. on average.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between SRDF improvements and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

##### *9.4.3.6.3 Circumstances for Implementation*

Maximizing the existing SRDF improvement project will be implemented following the completion of Priority Project 2, CSIP Optimization and Priority Project 3, Expand Area Served by CSIP Area.

##### *9.4.3.6.4 Legal Authority*

No additional legal authority is needed to maximize the use of the existing SRDF.

##### *9.4.3.6.5 Implementation Schedule*

This project is to be implemented following the completion of Priority Project 2 and 3.

##### *9.4.3.6.6 Estimated Cost*

There is no capital cost required for this project because the facilities are already sized to deliver 15,000 AF/yr. The project requires additional $2,500,000 annual O&M including higher energy and treatment costs to supply the water. The estimated projected yield for the project is 11,600 AF/yr. The yield for this project will facilitate achieving the yield that is identified in Priority Project 2 and a portion of the yield identified in Priority Project 4. The amortized cost of water for this project is estimated at $220/AF.

#### 9.4.3.7 Preferred Project 6: Seawater Intrusion Pumping Barrier

Seawater intrusion will be halted using a pumping barrier along the coast. The barrier will be approximately 8.5 miles in length between Castroville and Marina. The intrusion barrier comprises 18 extraction wells; although this number may change as the project is refined. Nine wells will be located in the 180-Foot Aquifer and 9 wells will be located in the 400-Foot Aquifer. Supplemental water to replace the extracted water would come from one or a number of other sources. For costing purposes, the initial barrier alignment is assumed to largely parallel

Highway 1, diverging to the northeast on the northern side of Castroville. This alignment will be refined as land access agreements are developed and cost estimates are refined. Wells will be installed spaced approximately every 2,000 feet. The deepest wells would be installed to the depth of the base of the 400-Foot Aquifer, approximately 750 feet below ground surface.

The 9 wells in the 180-Foot Aquifer are assumed to produce 700 gpm each, for a total extraction rate of 6,300 gpm or 14 cfs. The 9 wells in the 400-Foot Aquifer are assumed to produce 1,400 gpm each, for a total extraction of 12,600 gpm or 28 cfs. The 18 wells would withdraw up to 30,000 AF/yr. Of this 30,00 AF/yr., 22,000 AF/yr. would be extracted from the 180/400-Foot Subbasin, the remainder would be extracted from neighboring subbasins. Half of this 22,000 AF/yr. comes from the inland side of the barrier. This number is conservatively high and will be refined as the project design is refined. Extracted groundwater would be conveyed in a new pipeline for ultimate discharge back into the Pacific Ocean. Alternatively, the extracted water or a portion thereof could be conveyed to a new or existing desalination facility where it can be treated for potable and/or agricultural use. The water extracted from these wells will be brackish due to historical seawater intrusion, therefore, the extraction will serve to remove the brackish water and allow replacement for fresh water from other sources, most likely a combination of desalinated water, excess surface water from the Salinas River, and/or purified recycled water.

An optional barrier using injection instead of extraction was also considered. This option would use the same 9 wells in the 180-Foot Aquifer and 9 wells in the 400-Foot Aquifer but would use these wells to develop an injection mound rather than a drawdown barrier. The mound developed by injection would need to be high enough to compensate for the density of seawater at the coast. Assuming the 180-Foot Aquifer has an average depth of 270 feet and using the Ghyben-Herzberg relationship for saltwater intrusion, the injection mound in the 180-Foot Aquifer at the coastline would need to be 6.75 feet above sea level to fully stop seawater intrusion. Assuming the 400-Foot Aquifer has an average depth of 550 feet, and using the same relationships, the injection mound in the 400-Foot Aquifer at the coastline would need to be 13.75 feet above sea level to fully stop seawater intrusion.

Mounding calculations presented in Appendix 9D suggest that approximately 46,000 AF/yr. of water would need to be injected to create the required mounding. Of this 46,000 AF/yr., 34,500 AF/yr. would be injected into the 180/400-Foot Aquifer Subbasin. Water that could be injected in accordance with existing regulations and ordinances includes treated Salinas River water, desalinated ocean water, and advanced purified recycled water. Treated Salinas River water and desalinated ocean water would be preferentially delivered to growers and municipalities rather than injected. The only likely source of water for injection is therefore advanced purified recycled water. Because it is unlikely that a reliable year-round supply of advanced purified recycled water will be available for a reasonable cost, the injection option was temporarily tabled.

#### 9.4.3.7.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- Seawater intrusion measurable objectives

#### 9.4.3.7.2 Expected Benefits and Evaluation of Benefits

The project will stop and reverse seawater intrusion, helping to remediate and restore the 180/400-Foot Aquifer Subbasin.

#### 9.4.3.7.3 Circumstances for Implementation

The seawater intrusion barrier project is a preferred project and will be implemented as soon as financially and legally possible. A number of land and access agreements will be needed before the project can be implemented.

#### 9.4.3.7.4 Legal Authority

Section 10726.2(a) of the California Water Code gives the SVBGSA the right to acquire the land necessary for the required infrastructure (CWC, 2014).

#### 9.4.3.7.5 Implementation Schedule

The implementation schedule is presented on Figure 9-16. It is anticipated to take 5 years to implement.

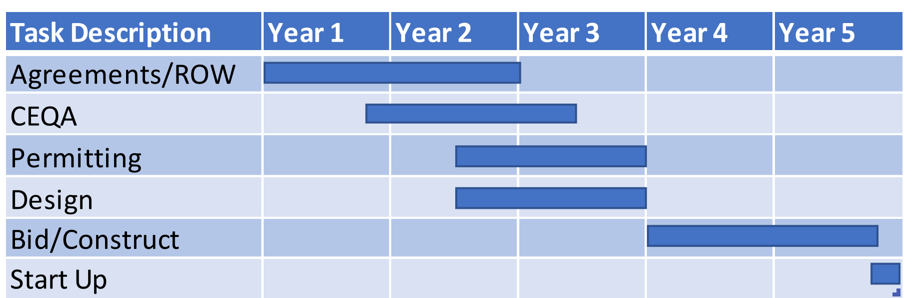



Figure 9-16. Implementation Schedule for Seawater Intrusion Extraction Barrier

#### 9.4.3.7.6 Estimated Cost

Capital cost for the Seawater Intrusion Pumping Barrier project is estimated at $102,389,000. This includes 44,000 LF of 8-inch to 36-inch pipe and rehabilitation of the existing M1W outfall. Annual O&M costs are anticipated to be approximately $9,800,000. To make the project cost comparable to other projects, the total projected yield of 30,000 AF/yr. is used to estimate a cost per acre-foot. This project does not benefit the Subbasin in the same way as those that mitigate overdraft, and thus the yield is not directly comparable; the yield is only used to calculate the cost comparison. The amortized cost of water for this project is estimated at $590/AF. This project assumes the water will be discharged through the existing M1W outfall. If Alternative Project 1 is pursued, the upgrade to the outfall will not be required.

#### 9.4.3.8 Preferred Project 7: 11043 Diversion Facilities Phase I: Chualar

MCWRA holds Permit 11043 (Permit), which is a wet weather diversion right on the Salinas River. The diversion can only occur in two identified locations: near Soledad and Chualar. The Permit has an annual maximum diversion limit of 135,000 AF. Permit Condition 13 only allows water to be diverted when there are natural flows in the river that exceed minimum specified flows. In addition, under Condition 13, the maximum allowed diversion is 400 cfs. Based on the conditions of the permit, a conservative estimate is that approximately 63,000 AF of water can be diverted during average years from either diversion point between the months of December through March. Diverting an average of 63,000 AF/yr., however, would require very large diversion structures. SVBGSA reviewed how much water could be reliably diverted using smaller diversions structures. Figure 9-17 illustrates the volume of water that can be diverted, based on historical flows and the size of the diversion structure.

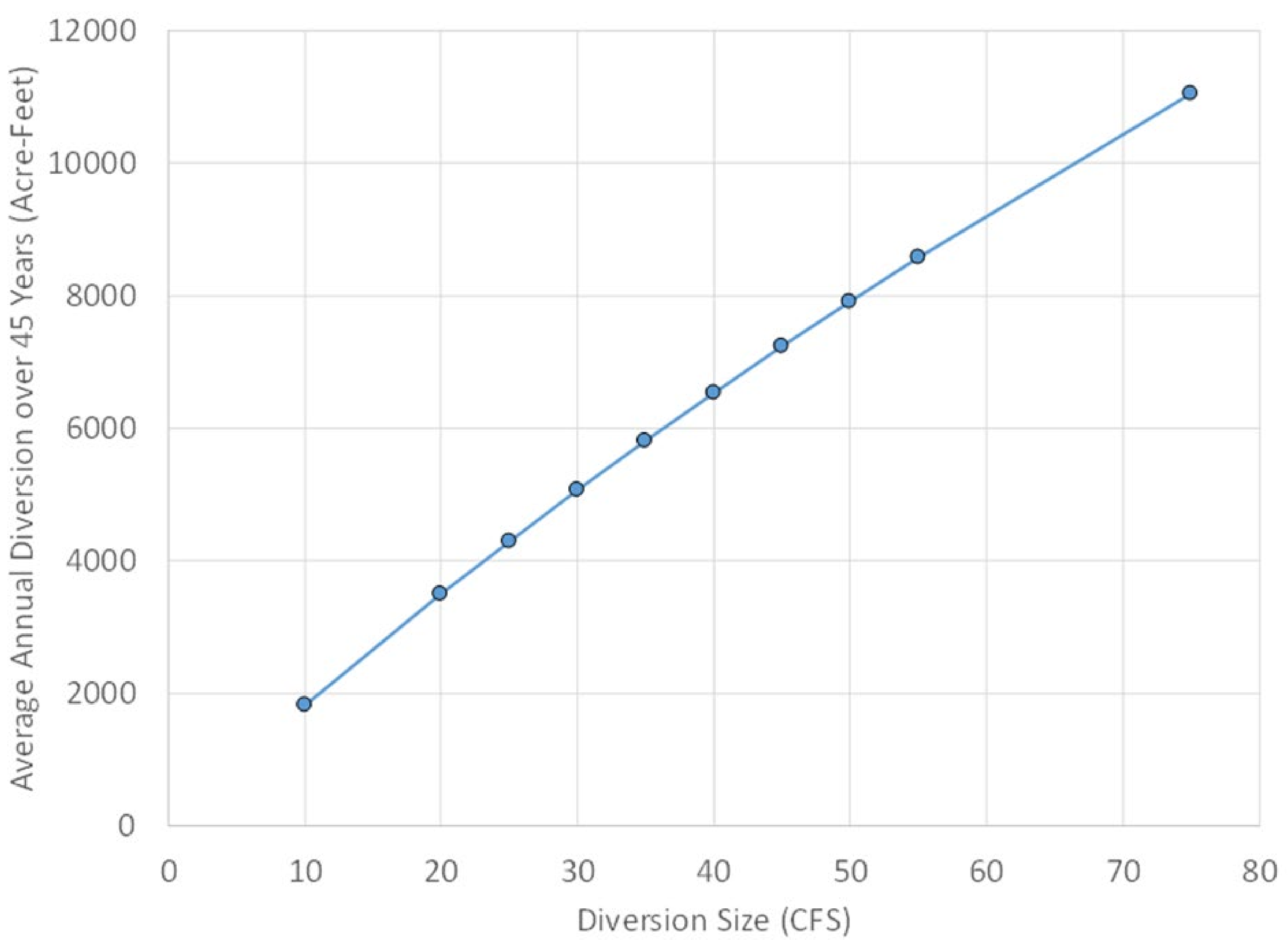


Figure 9-17: Water Right 11043 Average Annual Historical Diversions Volume for Various Sized Diversion Structures

Preferred Project 7 proposes to construct extraction facilities at the Chualar location and pump the water to the Eastside Subbasin where the water can then be infiltrated or injected into the groundwater basin at known pumping depressions. The first phase includes a diversion facility at the Chualar diversion site that would be sized to provide approximately 6,000 to 10,000 AF/yr. of water to the southeast edge of the City of Salinas. To obtain this volume of water, a diversion structure that can pump between 35 and 65 cfs is required. The diversion structure could be sized to extract more than 10,000 AF/yr.; however, it may not be economical to construct a larger facility. This issue can be further evaluated during the preliminary design stages of the project. The project would require the following facilities:

- A radial collector diversion facility with pump house capable of pumping between 35 and 65 cfs, equivalent to a rate of between 15,700 and 29,000 gpm.
- An infiltration basin that could be farmed in the summer and fallowed during the winter. It is estimated between 100 and 200 acres (estimating 0.25 in/hr. infiltration rate) would be required for the infiltration basin.
- An alternative to the infiltration basin is to construct a filtration and chlorination treatment facility and injection wells near the pumping depression. This alternative is more expensive but potentially more effective than the infiltration basins.

A radial collector well consists of a vertical, large diameter caisson which is sunk to a level below the water table; caisson diameters typically range between 8 to 20 feet. Extending from the central caisson is one or more lateral perforated screens which are typically 125 to 250 feet in length. The horizontal laterals collect water from the subsurface and convey it to the central caisson which also serves as a pump station. From the caisson, the water is pumped to its destination. Water collected in this manner offers the advantage of having undergone riverbank filtration, generally offering improved and more consistent water quality than that of water collected directly from a surface water. The radial collector wells also have a lower ground surface footprint than the equivalent number of vertical wells that would be needed to extract the same amount of water. Radial collector wells such as the Ranney Well™, have capacities ranging from 0.1 to 50 mgd. The radial collector for the 11043 Chualar Diversion would be sized for a capacity of 19 to 42 mgd.

For conceptual project evaluation purposes, the system is assumed to include:

- One 16’ diameter caisson to 100’ depth
- Six 12” diameter laterals, 150’ in length
- Elevated pump house and control room for four 350-HP, 7,500 gpm pumps.
- A 48” diameter, 23,750 linear foot transmission pipe to convey water from the diversion facility to the injection well sites.

An alternative to the Diversion Facility at Chualar would be to modify the 11043 permit to allow diversions closer to the City of Salinas. The City of Salinas owns infrastructure, land, and permanent pipeline easements that were previously part of the abandoned wastewater treatment plant. This plant discharged treated wastewater into the Salinas River. The City also owns and operates the Industrial Wastewater Treatment Facility, a 200-acre facility north of the Salinas River and west of Davis Road with pumping facilities, aeration basin, three large percolation/evaporation ponds, and smaller drying beds. The Industrial Wastewater Treatment Facility site contains a solar array which generates enough power to offset over half the current consumption at the facility. The modified project would still incorporate the radial collectors as described above but would use the City's existing infrastructure for treatment and distribution.

##### *9.4.3.8.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Land subsidence measurable objectives

##### *9.4.3.8.2 Expected Benefits and Evaluation of Benefits*

There is no direct benefit from this project on the 180/400-Foot Aquifer Subbasin. This project is included here as part of the complete Valley-wide groundwater management program. The primary expected benefit of Preferred Project 7 is to provide an alternative water supply source to recharge the Eastside groundwater basin near the cone of depression, thereby either raising groundwater elevations or lowering the rate of groundwater elevation decline.

Figure 9-18 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from this project. Figure 9-19 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from this project. Model results suggest that this project reduces seawater intrusion by approximately 660 AF/yr. on average.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between the 11043 diversion and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

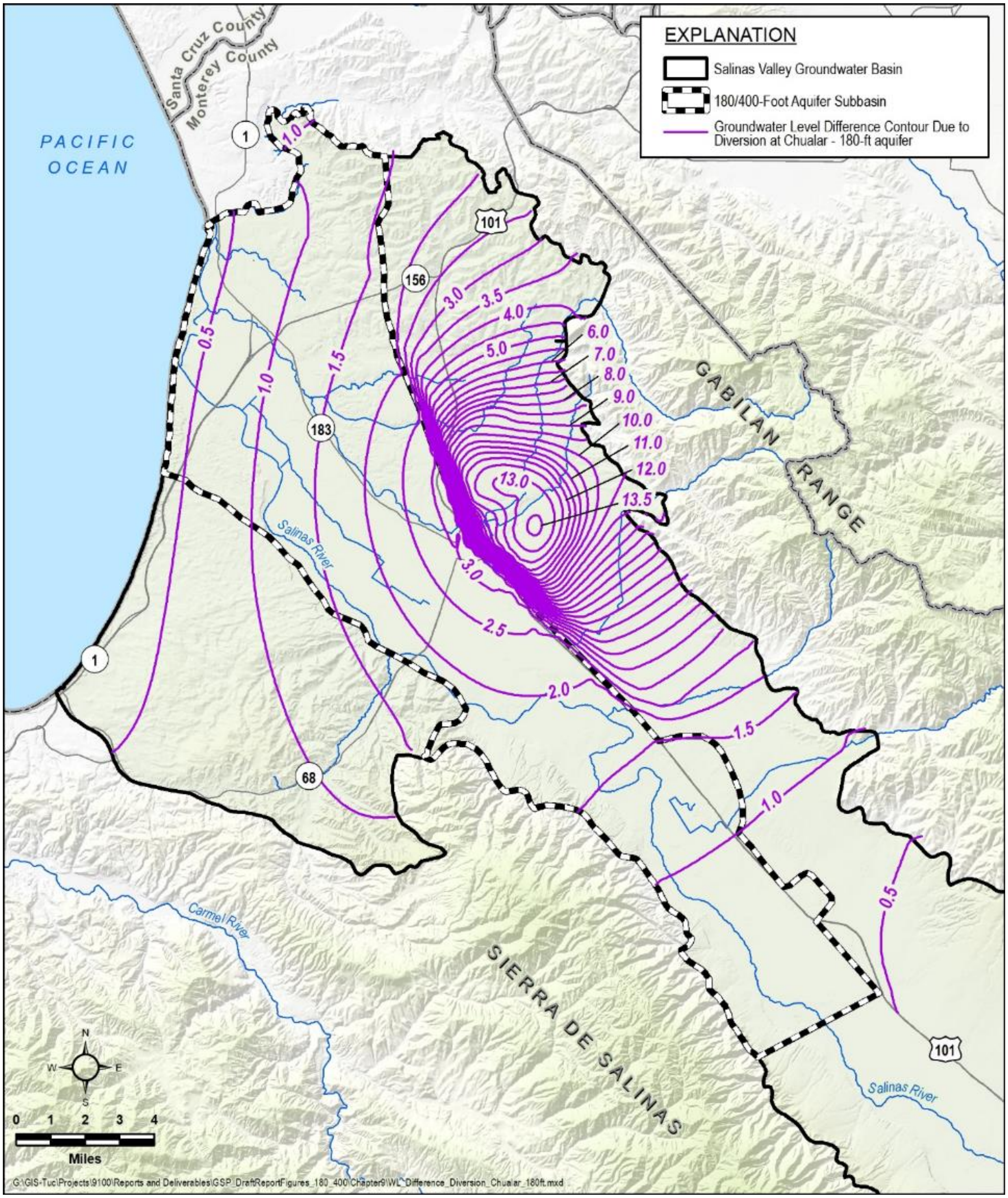



Figure 9-18: Estimated Groundwater Elevation Benefit in the 180-Foot Aquifer from the 11043 Diversion at Chualar

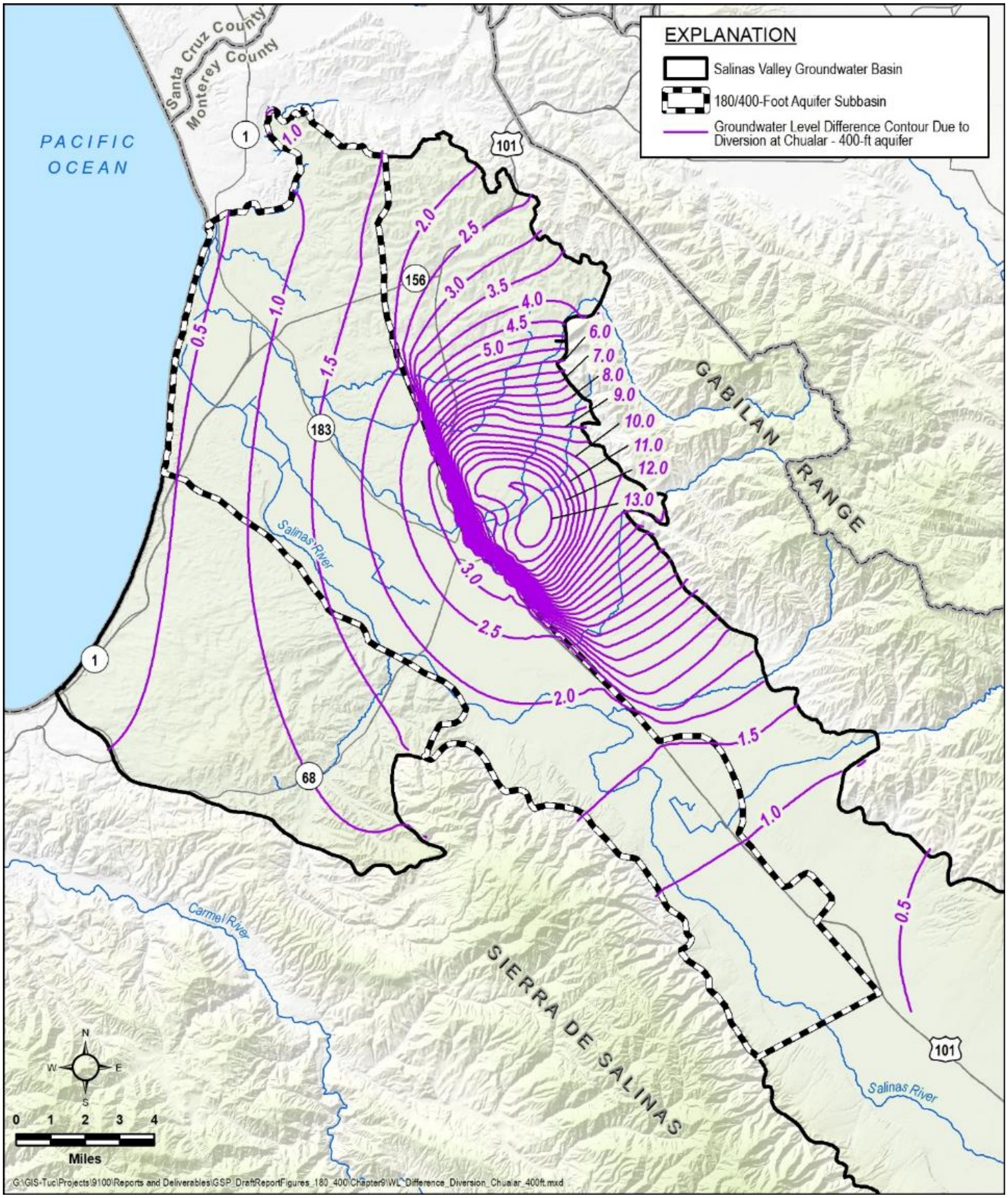



Figure 9-19: Estimated Groundwater Elevation Benefit in the 400-Foot Aquifer from the 11043 Diversion at Chualar

#### 9.4.3.8.3 *Circumstances for Implementation*

The 11043 Diversion Project; Phase I Chualar is a preferred project and will be implemented as soon are financially and legally possible. A number of land and access agreements will be needed before the project can be implemented.

#### 9.4.3.8.4 *Legal Authority*

MCWRA, who holds the 11043 permit, is a member of the SVBGSA. Either MCWRA will use the permit as a member of the SVBGSA, or MCWRA will transfer the permit to SVBGSA.

The SVBGSA has the right to divert and store water once it has access to the 11043 Permit. Section 10726.2 (b) of the California Water Code provides GSAs the authority to, "Appropriate and acquire surface water or groundwater and surface water or groundwater rights, import surface water or groundwater into the agency, and conserve and store within or outside the agency" (CWC, 2014).

#### 9.4.3.8.5 *Implementation Schedule*

The implementation schedule is presented on Figure 9-20. It is anticipated to take 9 years to implement.

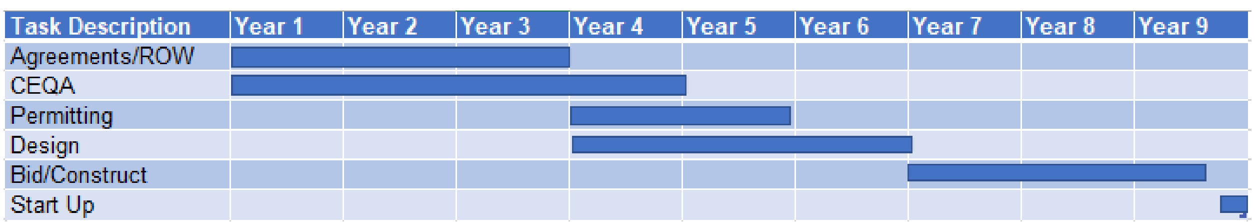



Figure 9-20. Implementation Schedule for 11043 Diversion at Chualar

#### 9.4.3.8.6 *Estimated Cost*

The capital cost for the 11043 Diversion Facilities: Phase I, Chualar is estimated at $47,654,000. Annual O&M costs for the 8,000 AF project are anticipated to be approximately $2,296,000. The amortized cost of water for this project is estimated at $750/AF.

### 9.4.3.9 Preferred Project 8: 11043 Diversion Facilities Phase II: Soledad

As noted in Preferred Project 7, MCWRA holds Permit 11043 (Permit), which is a diversion right on the Salinas River. The diversion can only occur in two identified locations: Near Soledad and Chualar. The Permit has an annual maximum diversion limit of 135,000 AF. Permit Condition 13 only allows water to be diverted when there are natural flows in the river. In addition, under Condition 13, the maximum allowed diversion is 400 cfs. Based on the conditions of the permit, a conservative estimate is that approximately 63,000 AF of water can be diverted during average years from either diversion point between the months of December through March.

Preferred Project 8 proposes to construct extraction facilities similar to Preferred Project 7, at the Soledad location and pump the water to the Eastside Subbasin where the water can then be infiltrated into the groundwater basin at known pumping depressions or areas of poor water quality. The diversion facility would be sized to provide approximately 6,000 to 10,000 AF of water to the farmland between Soledad and Gonzales along the foothills of the Gabilan Range. The diversion structure may be sized to extract more than 10,000 AF/yr.; however, it may not be economical to construct a larger facility. This issue can be further evaluated during the preliminary design stages of the project. The SVBGSA will coordinate and consult with MCWRA on planning, construction, and operation of this project. The project would require the following facilities:

- A radial collector diversion facility with pump house capable of pumping between 35 and 65 cfs, equivalent to a rate of between 15,700 and 29,000 gpm.
- A 48” diameter, 23,750 linear foot (4.5 miles) transmission pipe to convey water to an infiltration basin or injection wells.
- An infiltration basin that could be farmed in the summer and fallowed during the winter. It is estimated between 100 and 200 acres (estimating 0.25 in/hr. infiltration rate) would be required for the infiltration basin.
- An alternative to the infiltration basin is to construct a filtration and chlorination treatment facility and injection wells near the pumping depression.

#### *9.4.3.9.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Land subsidence measurable objectives

#### *9.4.3.9.2 Expected Benefits and Evaluation of Benefits*

There is no direct benefit from this project on the 180/400-Foot Aquifer Subbasin. This project is included here as part of the complete Valley-wide groundwater management program. The primary expected benefit of Preferred Project 8 is to provide an alternative water supply source to recharge the Eastside Subbasin, thereby either raising groundwater elevations or lowering the rate of groundwater elevation decline.

Figure 9-21 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from this project. Figure 9-22 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from this project. Model results suggest that this project will produce an indirect effect of reducing seawater intrusion by approximately 100 AF/yr. on average.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between the 11043 diversion and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

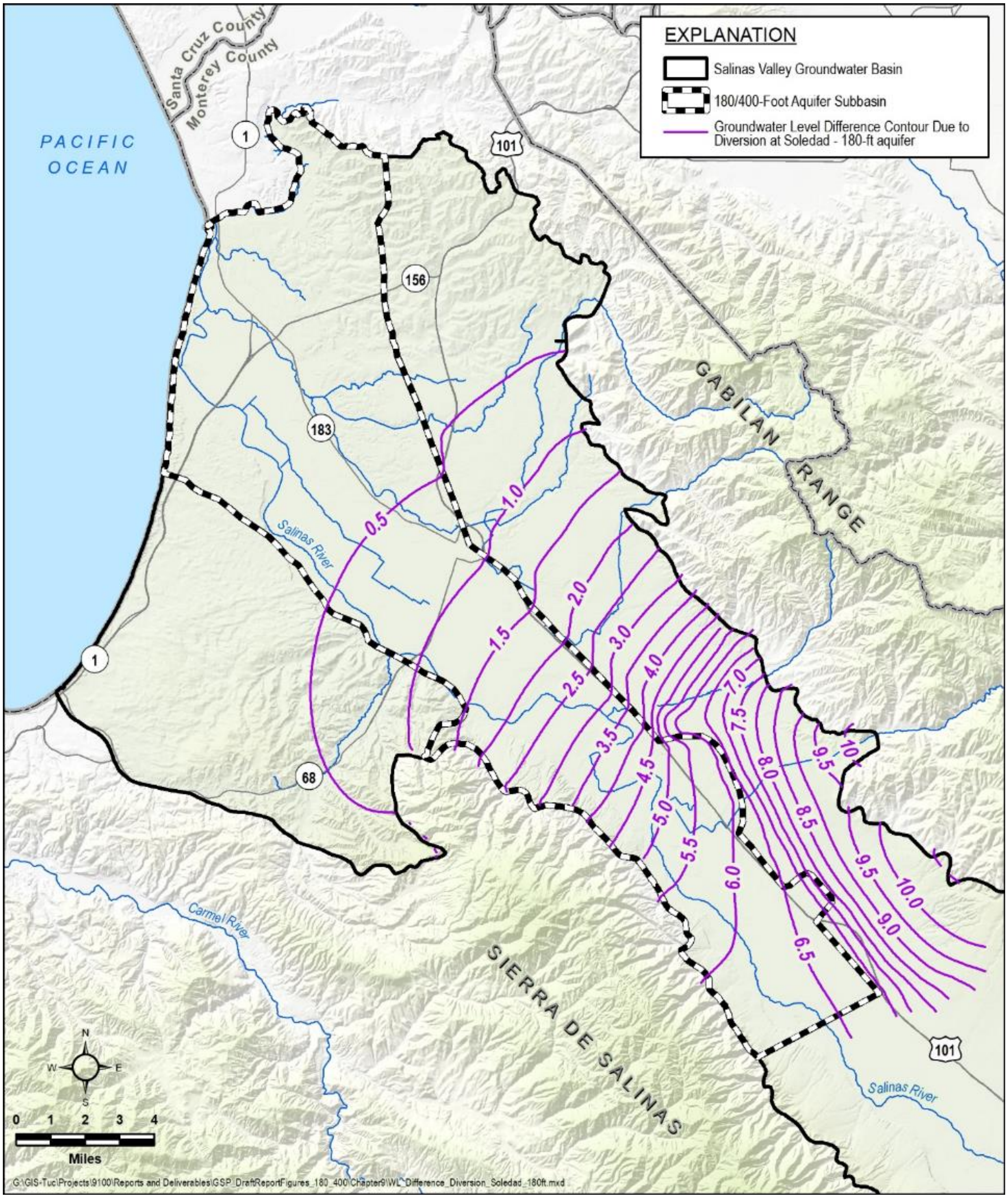



Figure 9-21: Estimated Groundwater Elevation Benefit in the 180-Foot Aquifer from the 11043 Diversion at Soledad

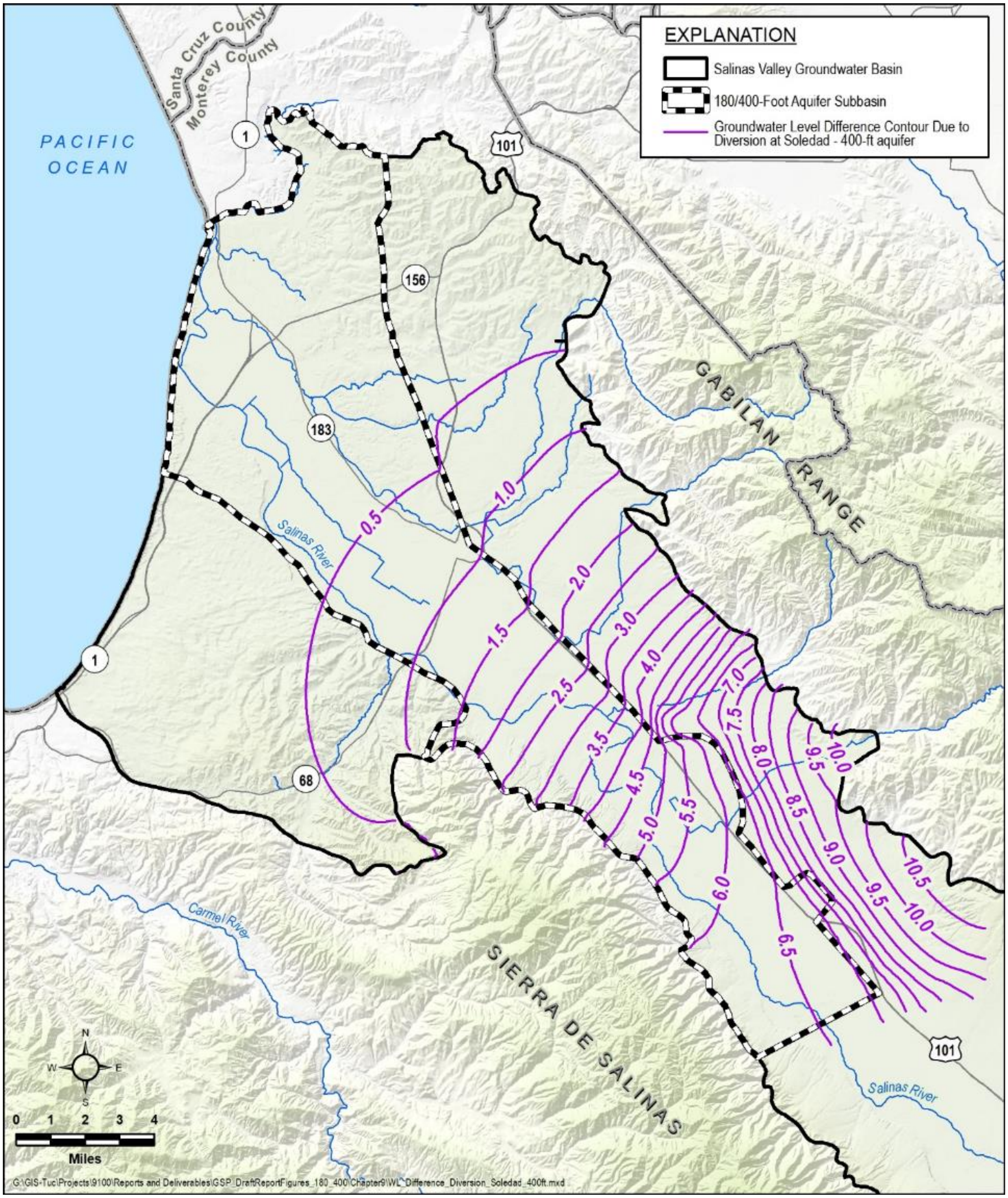



Figure 9-22: Estimated Groundwater Elevation Benefit in the 400-Foot Aquifer from the 11043 Diversion at Soledad

#### *9.4.3.9.3 Circumstances for Implementation*

The 11043 diversion project is a preferred project and will be implemented as soon are financially and legally possible. A number of land and access agreements will be needed before the project can be implemented.

#### *9.4.3.9.4 Legal Authority*

MCWRA, who holds the 11043 permit, is a member of the SVBGSA. Either MCWRA will use the permit as a member of the SVBGSA, or MCWRA will transfer the permit to SVBGSA.

The SVBGSA has the right to divert and store water once it has access to the 11043 Permit. Section 10726.2 (b) of the California Water Code provides GSAs the authority to, "Appropriate and acquire surface water or groundwater and surface water or groundwater rights, import surface water or groundwater into the agency, and conserve and store within or outside the agency" (CWC, 2014).

#### *9.4.3.9.5 Implementation Schedule*

The implementation schedule is presented on Figure 9-23. It is anticipated to take 9 years to implement.

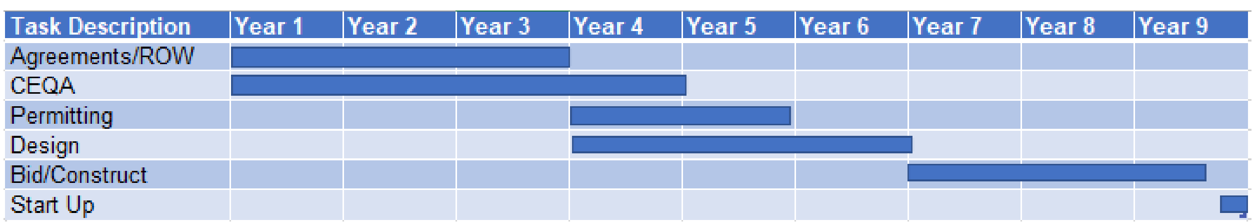



Figure 9-23. Implementation Schedule for 11043 Diversion at Soledad

#### *9.4.3.9.6 Estimated Cost*

The capital cost for the 11043 Diversion Facilities is estimated at $60,578,000. Annual O&M costs for the 8,000 AF project are anticipated to be approximately $5,050,000. The amortized cost of water for this project is estimated at $880/AF.

### 9.4.3.10 Preferred Project 9: SRDF Winter Flow Injection

Preferred Project 9 would divert winter flows from the Salinas River using the existing SRDF facilities and inject the water into the 180/400-Foot Aquifer Subbasin to maintain groundwater elevations, improve water quality, and prevent further seawater intrusion. An alternative to groundwater injection could be to treat the diverted water at the City of Salinas' Industrial Wastewater Treatment Facility. This treated water could be used for beneficial reuse that would reduce groundwater pumping. This project could benefit other subbasins, such as the Monterey and Eastside subbasins by providing potable water to these subbasins for direct recharge and/or municipal potable use.

One potential constraint on this project is clarifying water rights and establishing reservoir operation rules that can take advantage of the water rights. The operation of the SRDF is subject to the environmental flow prescriptions outlined in the Biological Opinion issued by NOAA's National Marine Fisheries Service (NMFS) in 2007 and incorporated into MCWRA's water diversion permit 21089 (NMFS, 2007);

For diversions to occur, there must be adequate flow in the Salinas River and flows for fish migration must be satisfied. At the SRDF fish ladder bypass, flows are maintained at 45 cfs for migration when the lagoon sandbar is open to the ocean, and 15 cfs for migration when the lagoon sandbar is closed, and flow is routed to the Old Salinas River channel. A minimum flow of 2 cfs is maintained to the lagoon when SRDF irrigation diversions are occurring or aquifer conservation releases from Nacimiento and/or San Antonio reservoirs are being made to the Salinas River.

Under this alternative project, water would be diverted from the Salinas River at a maximum flow rate of 36 cfs. Water would then be pumped to an expanded surface water treatment plant where it would be chlorinated, filtered, and conveyed to new injection wells in the 180/400-foot Aquifer Subbasin. Likely increased volumes of sediment in the river water during the winter will possibly require additional filtration or higher levels of maintenance on the existing filtration system. If river levels are low (less than 5 feet), the existing inflatable dam would be needed to operate the diversion. If river levels are higher than 5 feet, the inflatable dam would not be required.

Winter extractions are assumed to yield flows of 36 cfs, or 16,000 gpm. New injection wells will include wells completed in both the 180- and 400- Foot Aquifers, back-flush facilities including back wash pumps and percolation basin for water disposal into the vadose zone, electrical and power distribution and motor control facilities. The existing CSIP supplementary wells will be evaluated and considered as injection wells, which could result in a cost savings for this project.

Based on an injection rate of 1,000 gpm per injection well, 16 new injection wells would be installed. The wells would be located to the east toward the City of Salinas where they would inject water into the 180/400-Foot Aquifer Subbasin.

#### *9.4.3.10.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation
- Groundwater storage

- Seawater intrusion
- Land subsidence

#### *9.4.3.10.2 Expected Benefits and Evaluation of Benefits*

The expected benefits were estimated assuming approximately 12,900 AF of water is available for winter recharge. Additional water could be available for recharge if water rights permit it. These estimates will be refined during preparation of the HCP.

Figure 9-24 shows the expected groundwater elevation benefit in the 180-Foot Aquifer from this project. Figure 9-25 shows the expected groundwater elevation benefit in the 400-Foot Aquifer from this project. Model results suggest that this project reduces seawater intrusion by approximately 1,600 AF/yr. on average.

Changes in groundwater elevation will be measured with the groundwater elevation monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between injecting winter streamflow in the Subbasin and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

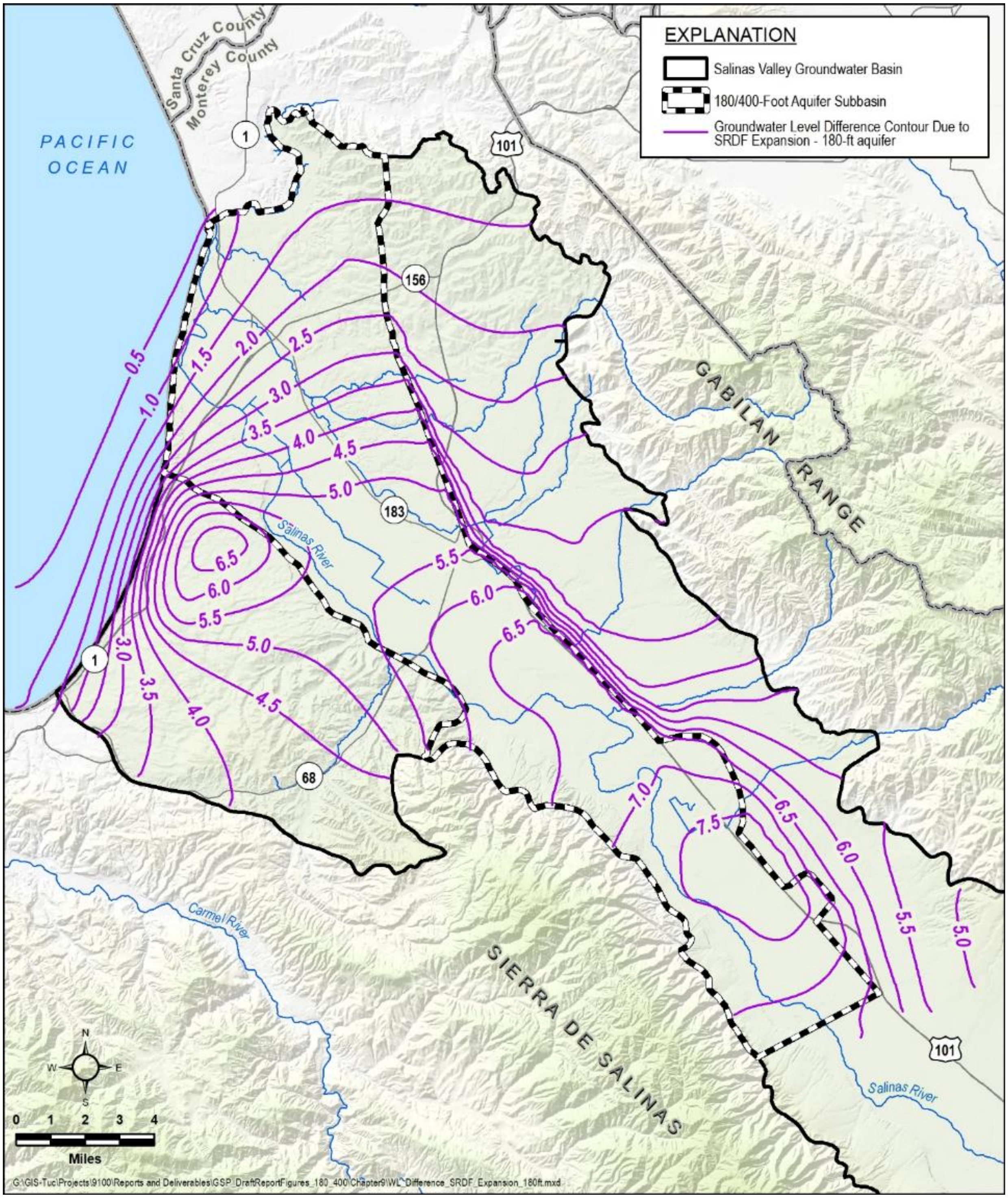


Figure 9-24: Estimated Groundwater Elevation Benefit in the 180-Foot Aquifer from the 11043 Diversion at Soledad

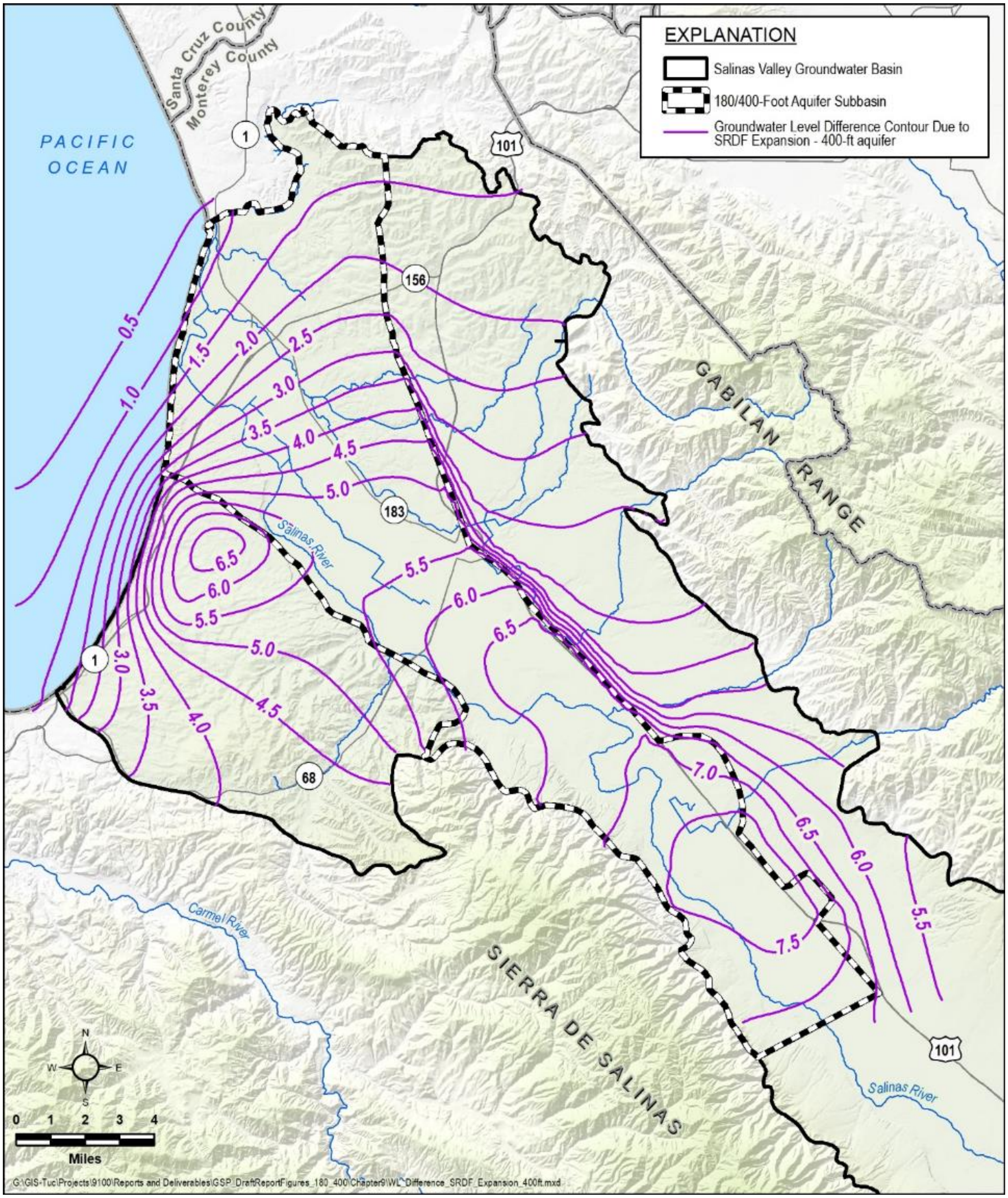



Figure 9-25: Estimated Groundwater Elevation Benefit in the 400-Foot Aquifer from the 11043 Diversion at Soledad

#### *9.4.3.10.3 Circumstances for Implementation*

Winter recharge will be implemented only if the existing water right permit is modified to allow for diversions between November and March. At this time, SVBGSA is not proposing to modify the volume of water being diverted.

This project will likely be subject to new flow restrictions and reservoir operations resulting from the planned HCP. This project will not proceed until the water rights and flow prescriptions from the HCP have been determined.

#### *9.4.3.10.4 Legal Authority*

The SVBGSA can acquire water for recharge under California Water Code section 10726.2 (b) which give the SVBGSA authority to "Appropriate and acquire surface water or groundwater …" as well as "the spreading, storing, retaining, or percolating into the soil of the waters for subsequent use" (CWC, 2014).

#### *9.4.3.10.5 Implementation Schedule*

The implementation schedule is presented on Figure 9-26. It is anticipated to take four years to implement which excludes any improvements performed under Preferred Project 5.

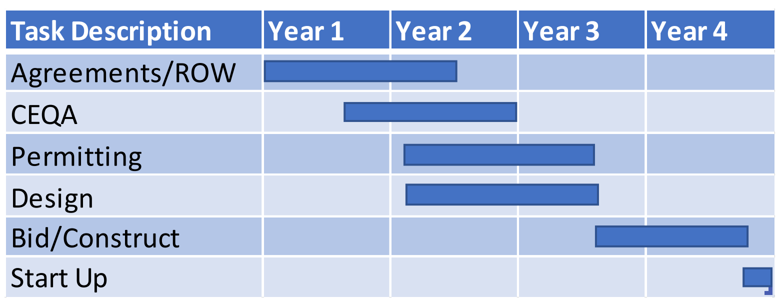



Figure 9-26. Implementation Schedule for Radial Collector Water Injection

#### *9.4.3.10.6 Estimated Cost*

Costs for the injection of winter flows from the expanded SRDF were estimated based upon using the existing SRDF facilities. The majority of the costs are for the construction of the injection wells. Capital costs are assumed to be $51,191,000 for construction of an injection well field consisting of 16 wells as well as construction of a 4-mile conveyance pipeline between the SRDF site and the injection well system. The cost of an expanded surface water treatment system for the SRDF expansion is not included in this estimate.

Annual O&M costs are estimated at $3,624,000 for the operation of the injection well field. Total annualized cost is $7,629,000. Based on a project yield of 12,900 AF/yr., the unit cost of water is $590/AF/yr.

### 9.4.4 Alternative Projects

The priority projects listed above, coupled with the management actions described in Section 9.3, might not lead to full sustainability in the 180/400-Foot Aquifer Subbasin. Four alternative projects are included in this GSP. These alternative projects supply additional water to the 180/400-Foot Aquifer Subbasin. Not all projects will necessarily be implemented by the SVBGSA. Projects will be implemented only if they are deemed cost effective or necessary to achieve sustainability.

One or more of these projects may be implemented based on future need and cost. The alternative projects are summarized in Table 9-3 and described below.

Table 9-3. Alternative Projects

| Alternative Project # | Project Name | Water Supply | Project Type |
|---|---|---|---|
| 1 | Desalinate Water from the Seawater Barrier Extraction Wells | Brackish Groundwater | In Lieu Recharge |
| 2 | Recharge Local Runoff from Eastside Range | Stormwater | Direct Recharge |
| 3 | Winter Potable Reuse Water Injection | Recycled Water | Direct Recharge |
| 4 | Seasonal Water Storage in 180/400 Aquifer | Salinas River | In Lieu Recharge |

#### 9.4.4.1 Alternative Project 1: Desalinate Water from the Seawater Barrier Extraction Wells

This project would treat water extracted from the seawater intrusion barrier under Priority Project 6, and allow for local reuse.  Local reuse could include providing municipal supply, providing agricultural supply, or reinjection in the 180-Foot Aquifer and 400-Foot Aquifer. The project relies upon the desalination of brackish water extracted from the 180/400-foot aquifer Subbasin to feed a treatment facility and discharge the treated water in injection wells east of the intrusion barrier.

The desalination treatment could be provided as a standalone plant or supply one of three proposed desalination plants in the region. The final decision on whether to implement this alternative project, and whether to desalinate the source water with a standalone plan or one of the three planned plants will depend on which of these alternatives is the most cost effective. The following plants are in various planning and design stages in the Monterey Bay Area:

- Monterey Peninsula Water Supply Project desalination plant, 6.4 mgd (7,100 AF/yr.)
- Deep Water Desalination Plant, 22 mgd (25,000 AF/yr.)
- People's Water Supply Project desalination plant, 12 mgd (13,400 AF/yr.)

Two of the desalination plants are being considered at Moss Landing: DeepWater Desal Project and the People's Desalination Project. These two plants are currently envisioned to be able to receive influent source water flows of 49 mgd (55,000 AF/yr.) in the case of DeepWater Desal and 30 mgd (33,600 AF/yr.) for the People's Desalination Project. Construction of the Cal-Am MPWSP desalination plant adjacent to M1W's RTP is anticipated to commence in 2020.

Depending on the desalination plant selected, the source water pipeline would consist of approximately 11 miles of source water pipeline to convey up to 22,000 gpm (32 mgd or 35,500 AF/yr.) of flow to the plant. The pipeline would range from 18" to 36" in diameter.

Assuming a 42% recovery efficiency, 12,700 gpm of brine would need to be sent to an ocean outfall. For costing purposes, SVBGSA assumed the 9,200 gpm of treated water would be sent for injection east of the seawater intrusion barrier. An additional 9 miles of 24" pipeline would be needed to convey this desalinated water to an injection well field or recharge basin.

###### *9.4.4.1.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

###### *9.4.4.1.2 Expected Benefits and Evaluation of Benefits*

The desalination plants may provide up to approximately 15,000 AF of water for both in-lieu and direct recharge to the Subbasin. This project could benefit other subbasins, such as the Monterey and Eastside subbasins by providing potable water to these subbasins for both in-lieu and direct recharge.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between providing desalinated water to the Subbasin and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

#### 9.4.4.1.3 Circumstances for Implementation

The desalination alternative project is one of four alternative projects that may provide additional water to the Subbasin. The project will only be implemented after all four alternative projects have been refined. The most cost-effective project of the four will be selected to supply additional water to the Subbasin.

Using an existing or planned plant for desalination requires the plant be permitted and fully designed. The desalination alternatives using existing plants will not proceed until one or more of the plants have been fully permitted for construction.

#### 9.4.4.1.4 Legal Authority

Water used for desalination would be pumped from the seawater intrusion barrier wells and can be used by SVBGSA as long as the water is not exported out of the basin.

#### 9.4.4.1.5 Implementation Schedule

The implementation schedule is presented on Figure 9-27. It is anticipated to take eight years to implement. The schedule is highly contingent upon whether a completely new desalination plant is conceived or if an existing plant already in the planning stages is elected.

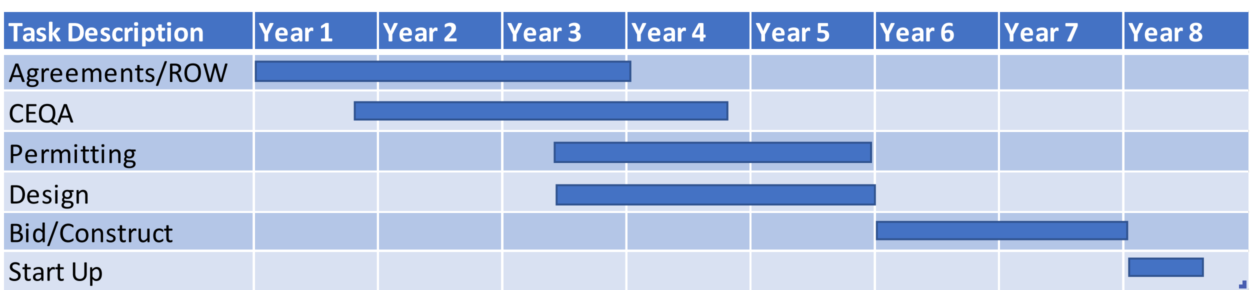



Figure 9-27. Implementation Schedule for Desalination of Extraction Barrier Seawater

#### 9.4.4.1.6 Estimated Cost

Estimated costs for desalination depend on the facility used to desalinate the extracted water. For comparison purposes, a high-level estimate was developed for a 13 mgd facility. Capital costs are assumed to be $182,000,000 based on a construction unit cost of $14 million/mgd for desalination plants and associated intake/outfall facilities, a unit cost consistent with other desalination plant projects evaluated by WaterReuse (Kennedy-Jenks, 2014). As a point of comparison, the 6.4-mgd Cal-Am MPWSP project has an estimated capital construction cost of $226,900 equivalent to approximately $35 million/mgd. The total capital costs with the markups and the addition of the source water pipelines from the extraction barrier well field and desalinated water pump station and pipelines to a groundwater recharge site to the east, would be $341,472,000.

Annual O&M costs are estimated at $9,890,000 for the desalination plant and distribution of desalinated water. Based on a project yield of 15,000 AF/yr. of desalinated water, the unit cost of water is $2,440/AF/yr. This is a very rough estimate and will be refined in the first three years on GSP implementation.

#### 9.4.4.2 Alternate Project 2: Recharge Local Runoff from Eastside Range

This project recharges local runoff from the Gabilan Range and diverts it to groundwater recharge basins before it reaches the Salinas River. This project will require additional legal and engineering analysis to evaluate water rights and actual available water supply from each of the watersheds. The project assumes that the stormwater is not being diverted upstream, however, many of the mountain ranges have diversion operations already occurring upstream in the watershed. Rain gauges and studies will be required to determine the true estimate of water available from each watershed.

This project can be implemented in two forms: on-farm recharge and stream diversion recharge. On farm recharge would be similar to the program initiated in Pajaro Valley that compensates landowners for retaining and recharging stormwater before it reaches any identified waterway. This program likely leads to less benefit but is also less expensive to develop.

The diversion recharge alternative diverts water from the major tributaries in the Eastside Subbasin to groundwater recharge basins. Figure 9-28 shows the watersheds in the Gabilan Range adjacent to the Eastside Subbasin. Figure 9-28 also provides an approximate volume of water, in AF, available during a 2-, 5-, 10-, and 25-year storm event for each of the watersheds. A series of recharge basins and piping network will be required. The system will operate by gravity. For costing purposes, it is estimated that approximately 10,000 feet of pipeline would be required in addition to what is constructed in Preferred Projects 7 and 8. In addition, 6 to 8 recharge basins at approximately 50 to 100 acres each will be required to infiltrate stormwater.

##### *9.4.4.2.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Land subsidence measurable objectives
- Groundwater quality measurable objective

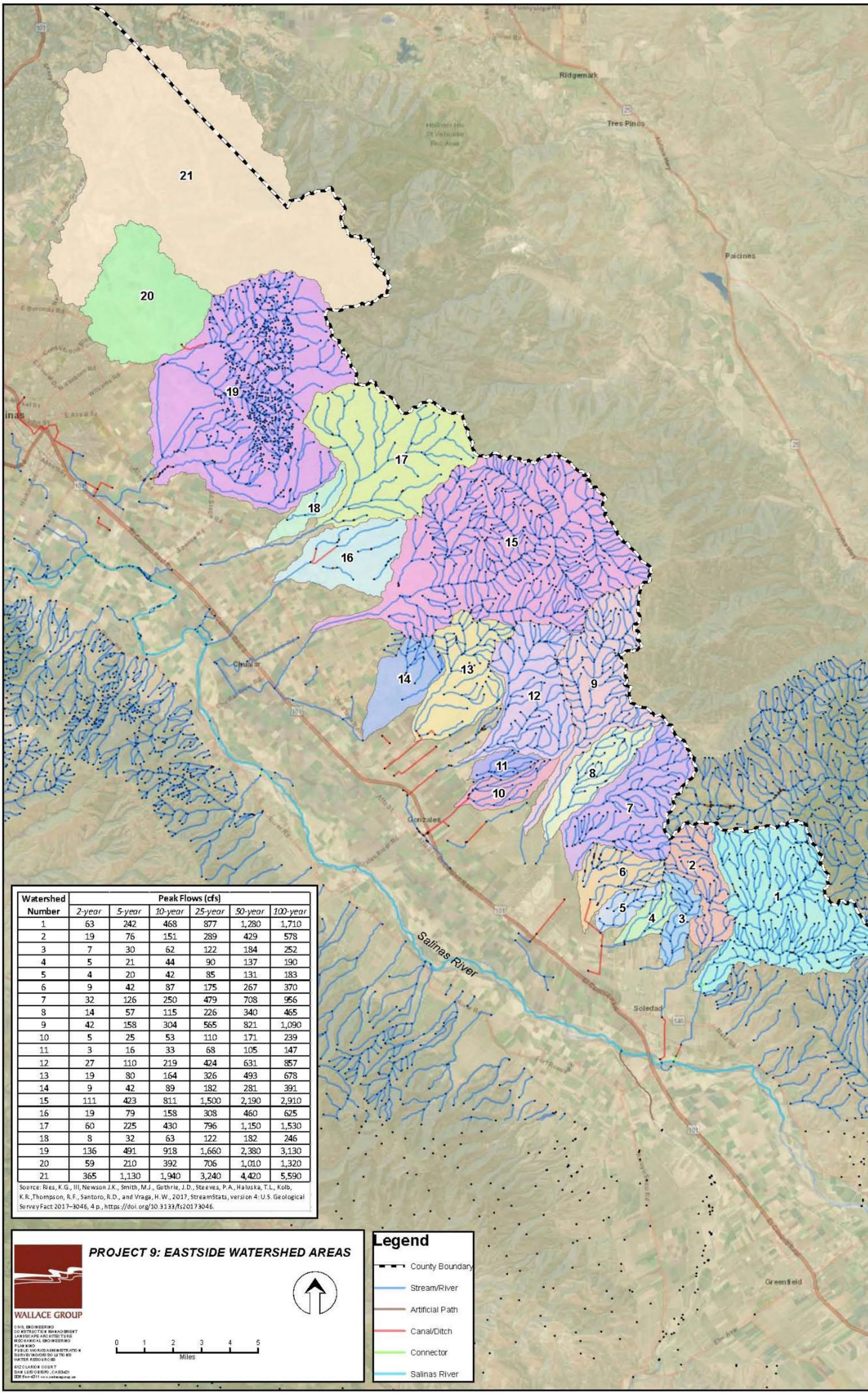
##### 9.4.4.2.2 Expected Benefits and Evaluation of Benefits

There is no direct benefit from this project on the 180/400-Foot Aquifer Subbasin. This project is included here as part of the complete Valley-wide groundwater management program. The primary expected benefit of Alternative Project 2 is to provide an alternative water supply source to recharge the Eastside Subbasin and improve water quality in the Eastside Subbasin.

Reductions in groundwater pumping will be measured directly and recorded in the water charges framework database. Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between the recharging local runoff and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

##### 9.4.4.2.3 Circumstances for Implementation

The local recharge project is an alternative project and will be implemented only if additional water is required to reach sustainability. A number of agreements and rights must be secured before the project is implemented. Primarily, a more formal cost/benefit analysis must be completed to determine if the on-farm recharge or stream diversion recharge options are preferable. If on-farm recharge is preferable, an incentive program must be developed that works with the proposed water charges framework. If the stream diversion option is preferable, water diversion rights must be secured, which may take a significant number of years.



| Watershed Number | Peak Flows (cfs) | | | | | |
|---|---|---|---|---|---|---|
| | *2-year* | *5-year* | *10-year* | *25-year* | *50-year* | *100-year* |
| 1 | 63 | 242 | 468 | 877 | 1,280 | 1,710 |
| 2 | 19 | 76 | 151 | 289 | 429 | 578 |
| 3 | 7 | 30 | 62 | 122 | 184 | 252 |
| 4 | 5 | 21 | 44 | 90 | 137 | 190 |
| 5 | 4 | 20 | 42 | 85 | 131 | 183 |
| 6 | 9 | 42 | 87 | 175 | 267 | 370 |
| 7 | 32 | 126 | 250 | 479 | 708 | 956 |
| 8 | 14 | 57 | 115 | 226 | 340 | 465 |
| 9 | 42 | 158 | 304 | 565 | 821 | 1,090 |
| 10 | 5 | 25 | 53 | 110 | 171 | 239 |
| 11 | 3 | 16 | 33 | 68 | 105 | 147 |
| 12 | 27 | 110 | 219 | 424 | 631 | 857 |
| 13 | 19 | 80 | 164 | 326 | 493 | 678 |
| 14 | 9 | 42 | 89 | 182 | 281 | 391 |
| 15 | 111 | 423 | 811 | 1,500 | 2,190 | 2,910 |
| 16 | 19 | 79 | 158 | 308 | 460 | 625 |
| 17 | 60 | 225 | 430 | 796 | 1,150 | 1,530 |
| 18 | 8 | 32 | 63 | 122 | 182 | 246 |
| 19 | 136 | 491 | 918 | 1,660 | 2,380 | 3,130 |
| 20 | 59 | 210 | 392 | 706 | 1,010 | 1,320 |
| 21 | 365 | 1,130 | 1,940 | 3,240 | 4,420 | 5,590 |

Source: Ries, K.G., III, Newson J.K., Smith, M.J., Guthrie, J.D., Steeves, P.A., Haluska, T.L., Kolb, K.R.,Thompson, R.F., Santoro, R.D., and Vraga, H.W., 2017, StreamStats, version 4: U.S. Geological Survey Fact 2017–3046, 4 p., https://doi.org/10.3133/fs20173046.



Figure 9-28. Eastside Watersheds

Table 9-4. Estimated Eastside Watershed Runoff

| Storm | Runoff (AF) | Storm | Runoff (AF) | Storm | Runoff (AF) |
|---|---|---|---|---|---|
| **Watershed 1, 9600 Acres** | | **Watershed 8, 2368 Acres** | | **Watershed 15, 17536 Acres** | |
| 2-Year Storm | 136 | 2-Year Storm | 33.5 | 2-Year Storm | 449.9 |
| 5-Year Storm | 294.3 | 5-Year Storm | 72.6 | 5-Year Storm | 1,026.60 |
| 10-Year Storm | 463.9 | 10-Year Storm | 114.4 | 10-Year Storm | 1,591.80 |
| 25-Year Storm | 752.7 | 25-Year Storm | 185.7 | 25-Year Storm | 2,445.90 |
| **Watershed 2, 2816 Acres** | | **Watershed 9, 5376 Acres** | | **Watershed 16, 3264 Acres** | |
| 2-Year Storm | 39.9 | 2-Year Storm | 76.2 | 2-Year Storm | 83.7 |
| 5-Year Storm | 86.3 | 5-Year Storm | 164.8 | 5-Year Storm | 191.3 |
| 10-Year Storm | 136.1 | 10-Year Storm | 259.8 | 10-Year Storm | 296.3 |
| 25-Year Storm | 220.8 | 25-Year Storm | 421.5 | 25-Year Storm | 455.3 |
| **Watershed 3, 1152 Acres** | | **Watershed 10, 1280 Acres** | | **Watershed 17, 8000 Acres** | |
| 2-Year Storm | 16.3 | 2-Year Storm | 17.9 | 2-Year Storm | 204.1 |
| 5-Year Storm | 35.3 | 5-Year Storm | 39.2 | 5-Year Storm | 468.8 |
| 10-Year Storm | 55.7 | 10-Year Storm | 61.9 | 10-Year Storm | 726.2 |
| 25-Year Storm | 90.3 | 25-Year Storm | 100.4 | 25-Year Storm | 1,115.80 |
| **Watershed 4, 896 Acres** | | **Watershed 11, 704 Acres** | | **Watershed 18, 1024 Acres** | |
| 2-Year Storm | 12.7 | 2-Year Storm | 9.9 | 2-Year Storm | 26.1 |
| 5-Year Storm | 27.5 | 5-Year Storm | 21.6 | 5-Year Storm | 60 |
| 10-Year Storm | 43.3 | 10-Year Storm | 34 | 10-Year Storm | 93 |
| 25-Year Storm | 70.3 | 25-Year Storm | 55.2 | 25-Year Storm | 142.8 |
| **Watershed 5, 896 Acres** | | **Watershed 12, 4672 Acres** | | **Watershed 19, 17344 Acres** | |
| 2-Year Storm | 12.7 | 2-Year Storm | 66.2 | 2-Year Storm | 443.2 |
| 5-Year Storm | 27.5 | 5-Year Storm | 143.2 | 5-Year Storm | 1,016.40 |
| 10-Year Storm | 43.3 | 10-Year Storm | 225.8 | 10-Year Storm | 1,574.40 |
| 25-Year Storm | 70.3 | 25-Year Storm | 366.3 | 25-Year Storm | 2,419.10 |
| **Watershed 6, 1984 Acres** | | **Watershed 13, 3904 Acres** | | **Watershed 20, 6016 Acres** | |
| 2-Year Storm | 12.7 | 2-Year Storm | 55.1 | 2-Year Storm | 199.1 |
| 5-Year Storm | 60.8 | 5-Year Storm | 119.7 | 5-Year Storm | 386.3 |
| 10-Year Storm | 95.9 | 10-Year Storm | 188.7 | 10-Year Storm | 565.2 |
| 25-Year Storm | 155.6 | 25-Year Storm | 306.1 | 25-Year Storm | 828.5 |
| **Watershed 7, 5120 Acres** | | **Watershed 14, 2240 Acres** | | **Watershed 21, 25664 Acres** | |
| 2-Year Storm | 72.5 | 2-Year Storm | 31.3 | 2-Year Storm | 854 |
| 5-Year Storm | 156.9 | 5-Year Storm | 68.7 | 5-Year Storm | 1,647.80 |
| 10-Year Storm | 247.4 | 10-Year Storm | 108.2 | 10-Year Storm | 2,411.00 |
| 25-Year Storm | 401.4 | 25-Year Storm | 175.6 | 25-Year Storm | 3,534.20 |

#### *9.4.4.2.4 Legal Authority*

The SVBGSA has the right to divert and store water once it has access to the appropriate water rights. Water rights are not needed to infiltrate on-farm runoff. Section 10726.2 (b) of the California Water Code provides GSAs the authority to, “Appropriate and acquire surface water or groundwater and surface water or groundwater rights, import surface water or groundwater into the agency, and conserve and store within or outside the agency” (CWC, 2014).

#### *9.4.4.2.5 Implementation Schedule*

The implementation schedule for the stream diversion option is presented on Figure 9-29. It is anticipated to take 11 years to implement. The on-farm recharge project may take less time to implement.

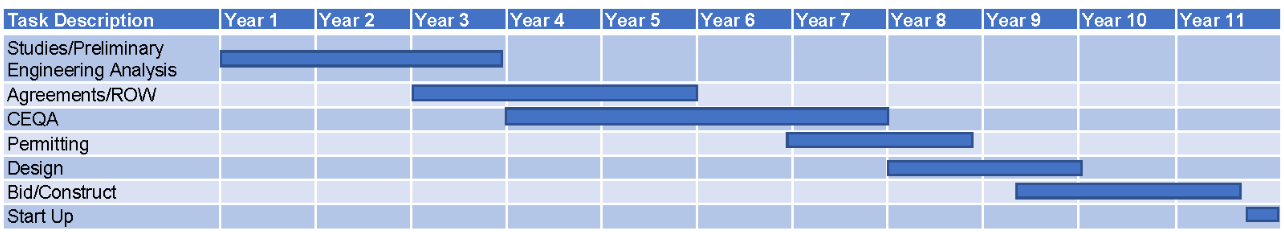



Figure 9-29. Implementation Schedule for Local Runoff with Stream Diversion Project

#### *9.4.4.2.6 Estimated Cost*

Estimated capital cost for the Stream Diversion option of the Recharge Local Runoff from Eastside project is estimated at $60,340,800. Annual O&M costs are anticipated to be approximately $1,261,000. The amortized cost of water for this project is estimated at $1,709/AF. The estimated cost for the on-farm recharge option is likely less but must still be developed.

### 9.4.4.3 Alternative Project 3: Winter Potable Reuse Water Injection

This project would treat additional secondary wastewater effluent through an expanded Advanced Water Purification Facility (AWPF) at M1W’s RTP and inject it into the 180/400-foot aquifer Subbasin for maintenance of groundwater elevations, improvement of water quality, and prevention of further seawater intrusion. This alternative project assumes the extra AWPF capacity planned under the Expanded Pure Water Monterey (PWM) project is built, but that Cal-Am does not require the additional purified recycled water. Instead, the water could be provided to MCWRA for groundwater recharge in the Salinas Valley Groundwater Basin.

Pure Water Monterey Groundwater Replenishment Project is under construction and a Supplemental EIR for an expanded PWM Project is being developed. This supplemental EIR covers an expansion which would raise the maximum production rate at the AWPF to 7.6 mgd.

Under this expansion, the project would provide up to 5,750 AF/yr. for groundwater recharge in the Seaside Basin, 200 AF/yr. for drought reserve, and 600 AF/yr. for MCWD irrigation, for a total production of 6,550 AF/yr.

The proposed Expanded PWM project also includes associated conveyance, injection and extraction facilities. Because the project depends on M1W's use of secondary wastewater effluent as a source of feed water to the AWPF, there will be a reduction in discharge of secondary effluent to Monterey Bay

If Cal-Am does not take the AWPF water, it could be available for injection into the 180/400-Foot Aquifer Subbasin, or other subbasins in the Salinas Valley Groundwater Basin. In particular, MCWD is currently conducting a feasibility study on injecting purified recycled water into the Monterey Subbasin. The project proposes using purified recycled water available to MCWD from the AWPF, some of which is available year-round per the district's agreement with M1W, for indirect potable reuse and prevention of further seawater intrusion. This project is consistent with, and can readily be implemented in conjunction with, the winter potable reuse project.

This project would involve the treatment of an additional 2.6 mgd at the AWPF. The project assumes that M1W installs the additional facilities needed at the AWPF, including additional treatment and pumping equipment, chemical storage, pipelines, and appurtenances within the existing 3.5-acre existing building area, that are needed to achieve a peak production rate of 7.6 mgd.

Assuming production of the purified recycled water during winter months only (November through March), the 2,250 AF/yr. would be delivered to the 180/400-Foot Aquifer Sub-Basin through a 16" diameter, 6-mile long pipeline. Water would be injected through four new injection wells west of the City of Salinas; two back-up injection wells would also be installed. Associated injection well facilities would include backwash well pumps, backwash percolation basins, electrical power supply, and motor controls.

##### *9.4.4.3.1 Relevant Measurable Objectives*

Relevant measurable objectives benefiting from this project include:

- Groundwater elevation measurable objective
- Groundwater storage measurable objective
- Seawater intrusion measurable objectives
- Land subsidence measurable objectives

##### 9.4.4.3.2 Expected Benefits and Evaluation of Benefits

The AWPF may provide up to approximately 2,200 AF of water for direct recharge to the Subbasin. This project could benefit other subbasins, such as the Monterey and Eastside subbasins by potentially providing water to these subbasins for direct recharge.

Changes in groundwater elevation will be measured with the groundwater level monitoring program detailed in Chapter 7. Subsidence will be measured using the DWR provided subsidence maps detailed in Chapter 7. Seawater intrusion will be measured using MCWRA's existing seawater intrusion mapping approach. A direct correlation between providing winter advanced treated water to the Subbasin and changes in groundwater elevations, subsidence, or seawater intrusion is likely not possible because this is only one among many management actions and projects that will be implemented in the Subbasin.

##### 9.4.4.3.3 Circumstances for Implementation

The recharge of winter AWPF water project is one of four alternative projects that may provide additional water to the Subbasin. The project will only be implemented after all four alternative projects have been refined. If needed, the most cost-effective project of the four will be selected to supply additional water to the Subbasin.

This project can only be implemented after the AWPF is expanded, and only if Cal-Am is not injecting the water into the Seaside Basin. This project will not proceed until all of these circumstances have been met.

##### 9.4.4.3.4 Legal Authority

The SVBGSA can acquire water for recharge under California Water Code section 10726.2 (b) which give the SVBGSA authority to "Appropriate and acquire surface water or groundwater …" as well as "the spreading, storing, retaining, or percolating into the soil of the waters for subsequent use" (CWC, 2014). All AWPF recharge will be done in accordance with the Division of Drinking Water's recycled water regulations.

##### 9.4.4.3.5 Implementation Schedule

The implementation schedule is presented on Figure 9-30. It is anticipated to take between three and four years to implement.