

Table SMC-1. Summary of Undesirable Results and Minimum Threshold Definitions, Criteria, and Justification

Sustainability Indicator	Undesirable Result (UR) Causes	Potential Effects on Beneficial Users	UR Definition	Minimum Threshold (MT) Definition	MT Justification	UR Criteria	UR Justification
Chronic Lowering of Groundwater Levels	<p><b>Increased pumping</b> due to (a) increase in water use per acre on irrigated land, (b) new land put into agricultural production, and/or (c) additional urban demand met by groundwater.</p> <p><b>Reduced recharge</b> due to (a) increased agricultural irrigation efficiency, (b) climate change resulting in decreased precipitation, (c) decreased surface water inflows from contributing watersheds, (d) reduced cross-boundary inflows and/or increased cross-boundary outflows, and/or (e) increased ET.</p>	<p><b>Groundwater well dewatering</b> and associated effects (e.g., increased maintenance costs, possible well deepening/replacement, and reduced well lifespan).</p> <p><b>Increased pumping lift</b> and associated effects (i.e., greater energy use, higher pumping costs, increased wear and tear on well pump motors, reduced well efficiency, and lower well yield).</p> <p><b>Effects on correlated sustainability indicators</b> (i.e., groundwater storage, subsidence, and depletion of interconnected surface waters).</p> <p><b>Reduced surface water flows and associated ecosystem health</b> for confirmed GDEs.</p>	<p>Undesirable Results would be experienced if and when a chronic decline in groundwater levels in the Principal Aquifer negatively affects the long-term viable access to groundwater for urban, domestic, agricultural, industrial, and environmental beneficial users and uses within the Basin.</p> <p>Domestic wells are greatest in number and generally shallowest in depth. Hence, <b>Significant and Unreasonable effects</b> associated with Undesirable Results occur when the number of completely dewatered domestic wells exceeds the assumed 40-year well replacement rate projected to occur over the 20-year planning and implementation horizon (dewatering of more than 26% of existing domestic wells).</p>	<p>MTs are set at 20 RMW-WLs, which exceeds basic guidelines for monitoring network well density based on Basin area (13 wells).</p> <p>For RMW-WLs with historical groundwater levels showing long-term negative trends:</p> <ul style="list-style-type: none"> <li>- MT set at projected future water level based on a 20-year extension of the historical trend.</li> </ul> <p>For all other RMW-WLs:</p> <ul style="list-style-type: none"> <li>- MT set at the historical low groundwater level.</li> </ul>	<p>RMW-WLs are representative of groundwater levels in their vicinity, based on representativeness analysis, and the network is designed to ensure that it reflects groundwater conditions in the vicinity of beneficial uses and users.</p> <p>MTs are set at levels indicating a depletion of supply that may lead to Undesirable Results, based on the most sensitive beneficial users (domestic wells).</p> <p>MTs consider historical groundwater level trends.</p> <p><b>A 20-year trend extension</b> for RMW-WLs with declining trends allows the GSAs reasonable and sufficient time to implement P/MAs to halt trends, and is consistent with the period in which the Basin is required to achieve its Sustainability Goal.</p> <p><b>Historical low groundwater levels</b> are not known to have caused significant and unreasonable impacts to beneficial uses and users of groundwater, based on the best available information.</p> <p><b>Domestic well impact analysis</b> shows that 9% of domestic wells (202 wells) could be partially dewatered and 4% (89 wells) could be completely dewatered if MTs were reached at all RMW-WLs.</p> <p>MTs are set to not negatively affect adjacent subbasins.</p>	<p>Undesirable Results are defined to occur when Fall MTs are exceeded in 25% or more of the RMW-WLs (5 out of 20) for two (2) consecutive non-drought years, as determined by the San Joaquin Valley DWR Water Year Hydrologic Classification Index.</p>	<p>Exceeding MTs at 25% or more of RMW-WLs could result in partial dewatering of approximately 2% of domestic wells and complete dewatering of approximately 1% of domestic wells, based on the domestic well impact analysis and assuming proportional impacts on domestic wells from each MT exceedance at an RMW-WL. Thus, the Undesirable Result definition is protective of the most sensitive beneficial users while ensuring the effects are representative of basin-scale and not localized conditions.</p> <p>Requiring two years of consecutive non-drought years of MT exceedances provides <b>confirmation that the chronic lowering of groundwater levels is not drought related</b>, consistent with the definition of undesirable results for this indicator in CWC 10721(x)(1).</p> <p>The Basin GSAs will strive through the use of PMAs to maintain water levels at or above the Measurable Objectives, which are in all cases above the MTs.</p>
Reduction of Groundwater Storage	Same causes as the Chronic Lowering of Groundwater Levels sustainability indicator	<b>Reduced groundwater supply reliability</b> due to reduced quantity of water available.	Undesirable Results would be experienced if and when a reduction in storage in the Principal Aquifer negatively affects the long-term viable access to groundwater for the urban, domestic, agricultural, industrial, and	<p>MTs for Chronic Lowering of Groundwater Levels are used as a proxy:</p> <p>For RMW-WLs with historical groundwater levels showing long-term</p>	MTs for Reduction in Groundwater Storage may be set by using MTs for Chronic Decline in Groundwater Levels as a proxy if it is demonstrated that a correlation exists between the two metrics. The following calculation demonstrates this correlation:	Undesirable Results are defined to occur when Fall MTs are exceeded in 25% or more of the RMW-WLs (5 out of 20) for two (2) consecutive non-drought years as determined by the San Joaquin Valley DWR Water Year Hydrologic Classification Index.	The use of MTs for the Chronic Lowering of Groundwater Levels as a proxy for Reduction of Groundwater Storage has been demonstrated to be appropriate and protective. The amount by which groundwater storage would be reduced if <u>all</u> RMW-WLs declined to their respective MTs represents only 4% of

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			<p>environmental beneficial users and uses within the Basin.</p> <p><b>Significant and unreasonable effects</b> associated with Undesirable Results would include:</p> <ul style="list-style-type: none"> <li>- Reduction in usable groundwater storage of more than 10% over the 20-year planning and implementation horizon, based on Fall 2015 groundwater storage volume.</li> </ul>	<p>negative trends:</p> <ul style="list-style-type: none"> <li>- MT set at projected future water level based on a 20-year extension of the historical trend.</li> </ul> <p>For all other RMW-WLs:</p> <ul style="list-style-type: none"> <li>- MT set at the historical low groundwater level</li> </ul>	<p>The volume of “usable storage” theoretically accessible to existing wells was conservatively estimated using the CoSANA model as the storage above the 400-foot depth interval, as 50% of wells are 400 feet deep or less. The usable storage volume is about 11.7 million acre-feet (MAF).</p> <p>The volume of groundwater above the Chronic Lowering of Groundwater Levels MTs and the 2018 groundwater elevations is estimated at almost 400,000 AF, which is less than 4% of the estimated volume of usable storage. Because estimated usable storage is much greater than the volume of water above the MTs, the MTs for Chronic Lowering of Groundwater Levels are considered protective for the Reduction of Groundwater Storage Sustainability Indicator.</p>		<p>total usable groundwater storage. Given that the Undesirable Results definition is based on only 25% of RMW-WLs exceeding their MTs, the definition avoids significant and unreasonable effects for the Reduction of Groundwater Storage sustainability indicator.</p> <p>The Basin GSAs will strive through the use of PMAs to maintain water levels at or above the Measurable Objectives, which are in all cases above the MTs.</p>
Seawater Intrusion	Groundwater conditions in the Basin show that Seawater Intrusion is not present within the Basin, and is not anticipated to be present in the future, and therefore the Sustainability Indicator is <b>not applicable to the Basin.</b>						
Degraded Water Quality	<p>Causes related to <b>hydraulic conditions potentially influenced by groundwater level management:</b></p> <ul style="list-style-type: none"> <li>- <b>Lateral migration from adjacent areas</b> with poorer quality groundwater</li> <li>- <b>Leaching from internal sources</b> such as fine-grained, clay-rich interbeds.</li> <li>- <b>Upwards vertical flow</b> from deeper zones below the bottom of the Basin.</li> <li>- <b>Recharge from managed recharge projects.</b></li> </ul>	<p><b>Increased costs to treat groundwater</b> to drinking water standards if it is to be used as a potable supply source.</p> <p><b>Increased costs to blend</b> relatively poor-quality groundwater with higher quality sources for drinking water users.</p> <p><b>Increased well construction costs</b> to deepen wells in search of higher quality water, or complete well rehabilitation to seal off poor water quality zones.</p> <p><b>Reduced crop yields</b> because of higher irrigation water salinity and/or element concentrations that exceed plant sensitivity and toxicity levels.</p> <p><b>Potential reduction in “usable storage” volume of groundwater</b> in the Basin if large areas are impaired to the point that they cannot be used</p>	<p>Undesirable Results for Degraded Water Quality would be experienced in the Basin if and when water quality conditions of the Principal Aquifer are degraded as a result of SGMA-related groundwater management activities such that they negatively impact the long-term viability of the groundwater resource for beneficial users and uses.</p> <p><b>Significant and unreasonable effects</b> associated with Undesirable Results would include:</p> <ul style="list-style-type: none"> <li>- Increase in concentrations of identified constituents of concern above levels or state and federal</li> </ul>	<p>MTs are set at 13 RMW-WQs, which [meets/exceeds] basic guidelines based on Basin area (13 wells).</p> <p>MTs are set for the following three identified constituents of concern <b>based on regulatory thresholds for drinking water beneficial use set by US EPA and State of CA</b>, as follows:</p> <p>Arsenic: 10 ug/L (primary MCL)</p> <p>Nitrate: 10 mg/L (primary MCL)</p> <p>TDS: 1,000 mg/L (secondary MCL upper limit)</p>	<p>MTs were set for arsenic, nitrate, and TDS because these constituents are (a) the ones most likely to affect the beneficial uses and users of groundwater throughout the Basin, and (b) potentially influenced by groundwater level management actions under the purview of GSAs (see Causes of Undesirable Results).</p> <p>The State of CA and US EPA have set primary maximum contaminant levels (MCLs) for water quality constituents that may cause harm to human health, and secondary MCLs for constituents based on consumer acceptance (aesthetic) considerations.</p> <p>MTs were set based on their respective MCLs, as MCLs are the water quality standards for the most sensitive beneficial use (i.e., drinking water).</p>	<p>Undesirable Results are defined to occur when MTs are exceeded for any of the three identified constituents of concern in 25% or more of the RMW-WQ (3 out of 12) for two (2) consecutive non-drought years, as determined by the San Joaquin Valley DWR Water Year Hydrologic Classification Index, because of SGMA-related groundwater management activities.</p>	<p>Groundwater management decisions can influence local well water quality while having little to no influence on overall basin water quality conditions and sustainability. The criteria of 25% or more of RMW-WQs exceeding their MTs is justified because it addresses the potential cumulative effects from management decisions on basin-scale water quality conditions, while conservatively <b>identifying a potential basin-scale rather than well-specific water quality issue.</b></p> <p>Requiring two consecutive non-drought years of MT exceedances provides <b>confirmation that the degraded water quality is not drought related.</b></p>

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		to support beneficial uses and users.	regulatory thresholds, as a result of SGMA-related groundwater management activities, on a regional rather than well-specific basis.		<p>It should be noted that the MOs for Degraded Water Quality are set at levels below the applicable MCLs.</p> <p>It should be noted that other State, federal, and local entities have greater authority to enforce water quality standards, especially for anthropogenic-derived pollutant constituents, and regulation of those constituents is not under the purview of GSAs.</p>		
Land Subsidence	<p><b>Depressurization of aquifers and aquitards due to lowering of groundwater levels</b>, which can lead to compaction of compressible strata and lowering of the ground surface. Therefore, the causes of Undesirable Results due to Land Subsidence are the same as the potential causes listed above for Undesirable Results due to Chronic Lowering of Groundwater Levels.</p>	<p><b>Damage to critical infrastructure</b>, including gravity-driven water conveyance infrastructure (e.g., Folsom South Canal [FSC]), municipal water lines, canals, etc. that results in a loss of function or capacity of the infrastructure.</p> <p><b>Damage to non-critical infrastructure</b> such as individual groundwater well heads, discharge lines, and casings.</p>	<p>Undesirable Results would be experienced if and when land subsidence due to groundwater level declines negatively affects the ability to use existing critical infrastructure within the Basin.</p> <p><b>Significant and unreasonable effects</b> associated with Undesirable Results would include:</p> <ul style="list-style-type: none"> <li>- Subsidence-related damage to critical water conveyance infrastructure, as defined and listed in Section 9.5 <i>Land Subsidence</i>, resulting in a loss of functional capacity of the infrastructure that prevents conveyance of available volumes of water that could otherwise be conveyed if the subsidence had not occurred.</li> </ul>	<p>Groundwater levels are used as a proxy for monitoring potential land subsidence.</p> <p><b>No specific MTs are established for Land Subsidence.</b> Rather, the MTs established for Chronic Lowering of Groundwater Levels are deemed to be protective against Undesirable Results for Land Subsidence.</p>	<p>The MTs for Chronic Lowering of Groundwater Levels (discussed above) are set with consideration of beneficial uses and users, historical low groundwater levels, and an adequate timeframe for implementation of necessary P/MAs to halt downward trends, if any.</p> <p>Based on the best available information, <b>significant subsidence has not occurred within the Basin</b> (see Section 9.5 <i>Land Subsidence</i>). Extrapolation of the measured historical subsidence rate at the one continuous GPS monitoring location 20-years into the future (i.e., the maximum time required to reach the established Groundwater Level MTs in the absence of any future management actions) is only 1.7 inches, which is unlikely to negatively affect the effectiveness of existing critical infrastructure within the Basin.</p>	<p><b>No specific Undesirable Results criteria are set for Land Subsidence.</b> Rather, the criteria established for Chronic Lowering of Groundwater Levels are deemed to be protective against Undesirable Results for Land Subsidence.</p>	<p>Given that there is no evidence that significant and unreasonable land subsidence has occurred in the Basin in the past, and that potential future subsidence under current/historical rates during the 20-year planning and implementation horizon are also not significant and unreasonable, <b>definition of specific UR criteria for Land Subsidence is not applicable or necessary.</b></p> <p><b>Ongoing monitoring</b> of groundwater levels in the RMW-WL monitoring network, supplemented by available regional-scale subsidence monitoring data (i.e., DWR's InSAR datasets), will allow the GSA to monitor for and track potential subsidence, and to modify SMCs in the future, as necessary.</p>
Depletion of Interconnected Surface Water	Causes include <b>the same causes that contribute to Undesirable Results due to Chronic Lowering of Groundwater Levels</b> (i.e., increased groundwater pumping and reduced recharge; see above).	<p><b>Impacts to beneficial uses and users of surface water</b>, including:</p> <ul style="list-style-type: none"> <li>- <b>Impacts on permitted diversions</b> from the Cosumnes River and Dry Creek due to reduced surface water flows.</li> <li>- <b>Impacts to environmental uses and</b></li> </ul>	Undesirable Results would be experienced in the Basin when surface water depletions occur because of SGMA-related groundwater management activities such that they negatively impact the beneficial users and uses of surface water.	<p>MTs are set at six (6) RMW-ISWs. Two (2) wells are in the approximately 11-mile reach of the Cosumnes River that is assumed interconnected.</p> <p>Groundwater levels are used as a proxy for</p>	The Cosumnes River includes disconnected and interconnected reaches. The timing and spatial extent of interconnected reach is considered a data gap, and the assumed interconnected reach was identified using various information, including comparing groundwater level elevations in shallow wells to the	Undesirable Results are defined to occur when Fall MTs are exceeded in one or more RMW-ISW (1 of 6) for two (2) consecutive non-drought years, as determined by the San Joaquin Valley DWR Water Year Hydrologic Classification Index.	<p>The Undesirable Result definition is set to be consistent with and protective against the significant and unreasonable effects.</p> <p>Requiring two consecutive non-drought years of Fall MT exceedances provides confirmation that the depletion of interconnected surface water is not</p>

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	<p><b>Additional causes directly related to surface water bodies</b> include:</p> <ul style="list-style-type: none"> <li>- hydrology (e.g., climate change)</li> <li>- increased diversions</li> <li>- reduced return flows</li> <li>- water consumption by riparian vegetation</li> </ul>	<p><b>users of surface water</b>, including GDEs and surface flows required for fish migration.</p>	<p><b>Significant and unreasonable effects</b> associated with Undesirable Results would include:</p> <ul style="list-style-type: none"> <li>- Depletion of surface water at a rate greater than the maximum pre-2015 historical rate of depletion during below-average rainfall years.</li> </ul>	<p>depletions of interconnected surface water.</p> <p>For the two RMW-ISWs along assumed interconnected reaches:</p> <ul style="list-style-type: none"> <li>- MT set at the highest seasonal low elevation during below-average rainfall years from the start of monitoring through 2015.</li> </ul> <p>For the four RMW-ISWs on disconnected reaches (majority): Same Approach for MTs for Chronic Lowering of Groundwater Levels</p>	<p>elevation of the bottom of the streambed (where data was available), model results, and satellite imagery.</p> <p>MTs for RMW-ISWs along the assumed interconnected reach are established by using seasonal-low groundwater elevations over the period of record through 2015 to prevent depletions that are greater than the maximum that occurred prior to 2015. These water levels also support GDEs equivalent to conditions prior to 2015.</p> <p>MTs for RMW-ISWs along disconnected reaches employ the same justification as MTs for Chronic Lowering of Groundwater Levels, which considers <b>historical lows and a 20-year trend extension</b> for RMW-ISWs with declining trends. A 20-year trend extension allows the GSAs reasonable and sufficient time to implement P/MAs to halt trends and is consistent with the period in which the Basin is required to achieve its Sustainability Goal.</p>		<p>drought related, as <b>GSAs are not required to ensure that drought-related impacts do not occur.</b></p>

**Abbreviations:**

- DWR = Department of Water Resources
- GSA = Groundwater Sustainability Agency
- GWL = Groundwater level
- ISW = Interconnected surface water
- MCL = Maximum Contaminant Level
- mg/L = milligrams per liter
- MT = Minimum threshold
- RMW = Representative Monitoring Well
- SGMA = Sustainable Groundwater Management Act
- SMC = Sustainable Management Criteria
- ug/L = micrograms per liter
- UR = Undesirable or Results
- US EPA = United States Environmental Protection Agency
- WQ = Water Quality