Final Draft for Public Review

Semitropic Water Storage District Groundwater Sustainability Agency 2024 Groundwater Sustainability Plan

Kern County, CA

Semitropic Water Storage District
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Table 1-1. Subbasin Plan GSPs

GSP Name	Area (acres)	Percentage of Subbasin Area	GSA	GSP Content
Kern Subbasin GSP	1,205,482	67.6%	Arvin GSA Cawelo Water District GSA Kern Groundwater Authority GSA Kern River GSA Kern Water Bank GSA Greenfield County Water Districts GSA North Kern WSD GSA Pioneer GSA Rosedale-Rio Bravo WSD GSA Shafter-Wasco ID GSA Southern San Joaquin MUD GSA Tejon-Castac Water District GSA West Kern Water District GSA Wheeler Ridge-Maricopa GSA	Kern Subbasin GSP
Buena Vista WSD GSA GSP	51,070	2.9%	Buena Vista WSD GSA	Kern Subbasin GSP Supplemental GSA information on blue pages identified in Executive Summary
Henry Miller GSA GSP	26,063	1.5%	Henry Miller GSA	
Kern-Tulare Water District GSA GSP	11,344	0.6%	Kern-Tulare Water District GSA	
Olcese Water District GSA GSP	3,199	0.2%	Olcese Water District GSA	
Semitropic Water Storage District GSA GSP	224,350	12.6%	Semitropic Water Storage District GSA	
Westside District Water Authority GSA GSP	260,812	14.6%	Westside District Water Authority GSA	

Semitropic Water Storage District
Groundwater Sustainability Agency
2024 Groundwater Sustainability Plan

Executive Summary
Supplemental Blue Pages

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1101 Central Avenue
Wasco, CA 93280

May 2024

SEMITROPIC WATER STORAGE DISTRICT GSA GSP EXECUTIVE SUMMARY

ES.1. Introduction

The Semitropic Water Storage District Groundwater Sustainability Agency (SWSD GSA) (**Figure BP-ES-1**) has worked closely with the Kern Subbasin to develop a single Groundwater Sustainable Plan (GSP) which reflects common methodologies, goals, and objectives for achieving groundwater sustainability over the entire Kern Subbasin by 2040. The Kern Subbasin GSP has been developed with the full cooperation of all of the GSAs in the Subbasin, representing a tremendous amount of coordination and effort to develop a plan that meets the legislative requirements of the Sustainable Groundwater Management Act (SGMA).

The SWSD GSA fully adopts the Kern Subbasin GSP, included here in its entirety, without changes. However, the SWSD GSA is submitting this SWSD GSA GSP to highlight the actions taken by the SWSD GSA to implement demand management actions that will ensure that the SWSD GSA reaches sustainability at or before 2040. These demand management actions target the elimination of the SWSD GSA's portion of the projected Kern Subbasin 2030 climate change scenario groundwater deficit of 136,040 acre-feet per year (AFY) before 2040. The SWSD GSA is also providing additional information on its Semitropic Groundwater Banking Project operations, which supports local and state-wide water supply resiliency objectives and the use of remote sensing to estimate evapotranspiration as a significant tool for managing demand management**. Table BP-ES-1** provides a cross walk of supplementation information provided in the SWSD GSA GSP.

Table BP-ES-1. SWSD GSA GSP Blue Page Crosswalk Index

Section and Blue Page (BP) Numbers	Section Title	Description
Executive Summary BP-ES-1 to BP-ES-8	Executive Summary	Explanation of separate GSP submittal and overview of supplemental information provided.
Section 5 BP-5-1 to BP-5-13	Description of Plan Area	Description of benefits, operations, monitoring and mitigation of the Semitropic Groundwater Banking Project and also the use of remote sensed evapotranspiration as a reliable tool to inform demand management actions.
Section 14 BP-14-1 to BP-14-23	Project and Management Actions	Expanded description of projects and management actions adopted by SWSD to coordinate and maintain sustainability objectives through the SGMA planning and implementation horizon.

ES.2. Project and Management Actions Overview

SWSD GSA's demand management program was developed and adopted in its 2020 GSP submittal, which was then part of the Kern Groundwater Authority GSP. The demand management programs were developed with extensive input from local stakeholders and landowners with the objective of managing local groundwater conditions at or above established Measurable Objectives. To ensure management at or above Measurable Objectives, the SWSD GSA's demand management program manages all lands within the GSA to specific Landowner Water Budgets (Management Action SWSD-16) that include the following water supply categories:

- Contract Water: State Water Project (SWP) supplies (yield from SWP Table A entitlement).
- Supplemental SWSD Supplies: includes leave behind from third party banking, Article 21 from the SWP, Section 215 from the Central Valley Project, dry year transfers and other water purchase.
- Native Supply: includes Native Groundwater Yield of the Kern Subbasin (estimated at 0.15 acre-feet per acre) and precipitation.
- Temporary Consumptive Use Allowance (TCA): The TCA is an allocation of permissible overdraft that will be driven to 0 by 2040 and was set so all irrigated lands would have an adequate supply in 2020; however, the overdraft that is represented by TCA would be reduced annually such that over time the demand would be driven down to the sustainable supply.

Irrigated acreage and associated consumptive demand have steadily decreased since 2015 as shown in **Figure BP-ES-2** and **Figure BP-ES-3**, respectively. The decrease in irrigated acres and associated demands have been driven in part by several management actions implemented by SWSD since 2016. These management actions are summarized below and described in greater detail in Section BP 14. These early management actions have reduced SWSD GSA's demand from 411,900 AF in 2015 to 369,500 AF in 2023, a reduction of approximately 42,400 AF of demand. As of 2024, irrigated acres in the GSA reduced to 120,400 acres from 135,400 acres in 2015 for a total of reduction of approximately 15,000 acres. Demand reduction is the result of direct fallowing of irrigated acres and increasing efficiency or changed cropping patterns on remaining irrigated lands.

As of 2024, the total service area of SWSD is approximately 222,600 acres with approximately 120,400 acres of irrigated lands (including 6,900 acres of managed wetlands). The remaining 102,200 acres are undeveloped lands that include 8,960 acres associated with the Kern National Wildlife Refuge.

SWSD GSA's early management actions include:

- Assembly Bill 453 (2016): This special legislation provided SWSD the authority to collect groundwater extraction information, required the reporting of groundwater information, and authorized SWSD to impose fees on the extraction of groundwater from the subbasin.
- New Lands Surcharge Program: Any new land developed after July 1, 2017 is charged $500/AF of consumptive use greater than the allocated native groundwater yield. This interim program was replaced with the Landowner Water Budgets in 2022.
- SGMA Basin Sustainability Charges/Credits: A program whereby SWSD utilizes remote sensing data to determine the consumptive use (as evapotranspiration (ET)) for each parcel and the aggregate by Landowner of Record in the SWSD. The consumptive use for an irrigated parcel is compared to the average consumptive use of all irrigated fields. If the consumptive use for a single parcel is in excess of the average, then the parcel is levied a charge (the basin sustainability charge). If the consumptive use of a parcel is less than the average, then the parcel is due a credit (the basin sustainability credit). This interim program was replaced with the Landowner Water Budgets in 2022.
- Landowner Water Budgets (Management Action SWSD-16): Beginning in 2022, SWSD allocated the total water supply of SWSD to each landowner based on the landowner class. The water budgets developed for each landowner define the required reduction in consumptive water demand and associated groundwater extractions necessary to balance the SWSD's total water budget and eliminate local overdraft within the boundaries of the SWSD GSA. Landowner Water Budgets were delivered to all landowners (farmers) in 2021 and became effective in calendar year 2022.
- Tiered Pricing for Groundwater Pumping (Management Action SWSD-17): As of May 2022, the SWSD GSA is developing the tier pricing structure that will enforce the adherence to Landowner Water Budgets (Management Action SWSD-16) and provide funding for other projects and management actions, including the Domestic Well Mitigation Program (Management Action KSB-5). The tiered pricing structure, subject to a successful proposition 218 process, is expected to be implemented in 2025.

Additionally, the SWSD GSA has implemented a number of projects and management actions aimed at reducing the overall demand on local groundwater resources. Recent projects include:

- Land fallowing,
- Increase emphasis on acquisition of supplemental water supplies for the benefit of the SWSD,
- Acquisition and banking water on behalf of the SWSD,
- Cap on third party banking obligations, and;
- Expansion of SWSD recharge capabilities to enhance conjunctive use capabilities which are not associated with third party banking obligations.

Through a cooperative Kern Subbasin effort, the average annual groundwater deficit under 2030 climate change conditions has been projected at 372,120 AF, as shown in **Section 14.1.3**. The SWSD GSA allocation of that deficit is 136,040 AF. Within the SWSD GSA, this represents the potential fallowing of between 35,800 to 48,600 acres of irrigated lands by 2040 assuming no additional water supplies can be developed to augment the SWSD GSA's existing surface water supplies to offset this deficit. The range of potentially fallowed lands is based on a range of per acre consumptive use (measured as crop ET) of 3.8 to 2.8 acre-feet per acre. The deficit reduction and acreage fallowing began in 2016 and will be continued primarily through the implementation of Management Action SWSD-16 Landowner Water Budgets and Management Action SWSD-17 Tiered Pricing for Groundwater Pumping.

Many of the remaining projects and management actions are designed to increase the GSA's supplemental water supplies to support the economic viability of agriculture and sustainability of water supplies for non-agricultural beneficial users, primarily domestic users. To the extent that the SWSD GSA successfully augments its supplemental water supply, the Landowner Water Budgets (Management Action SWSD-16) will be adjusted accordingly.

SWSD GSA Section BP 14 provides additional information on SWSD's project management and actions to meet the sustainability goal by 2040.

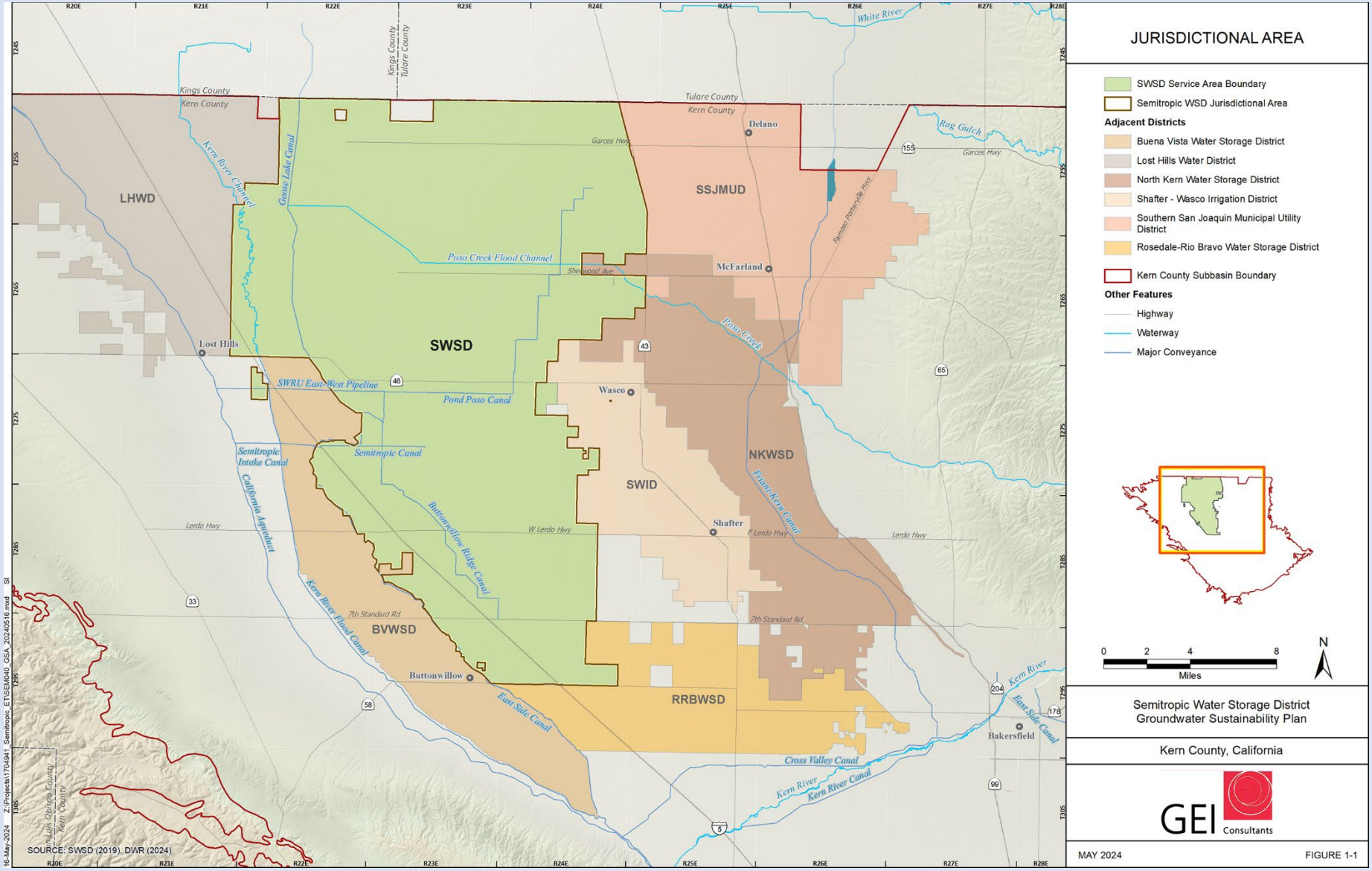


Figure BP-ES 1. SWSD GSA Jurisdictional Area

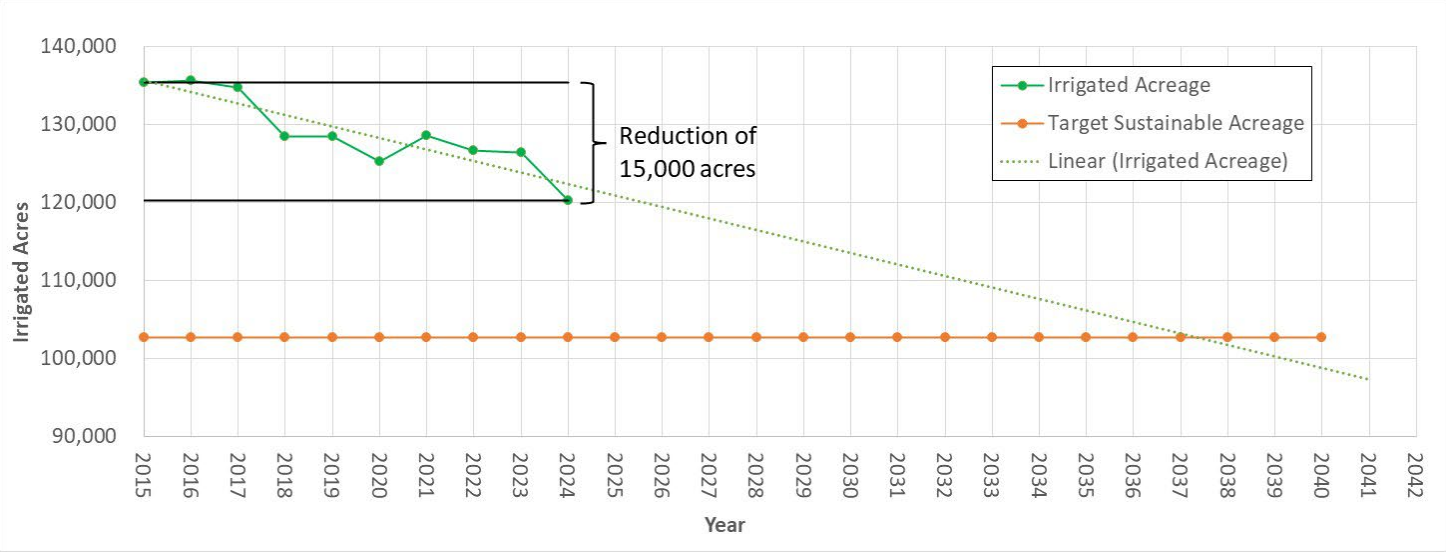


Figure BP-ES-2. Irrigated Acres in SWSD GSA from 2015 to 2024

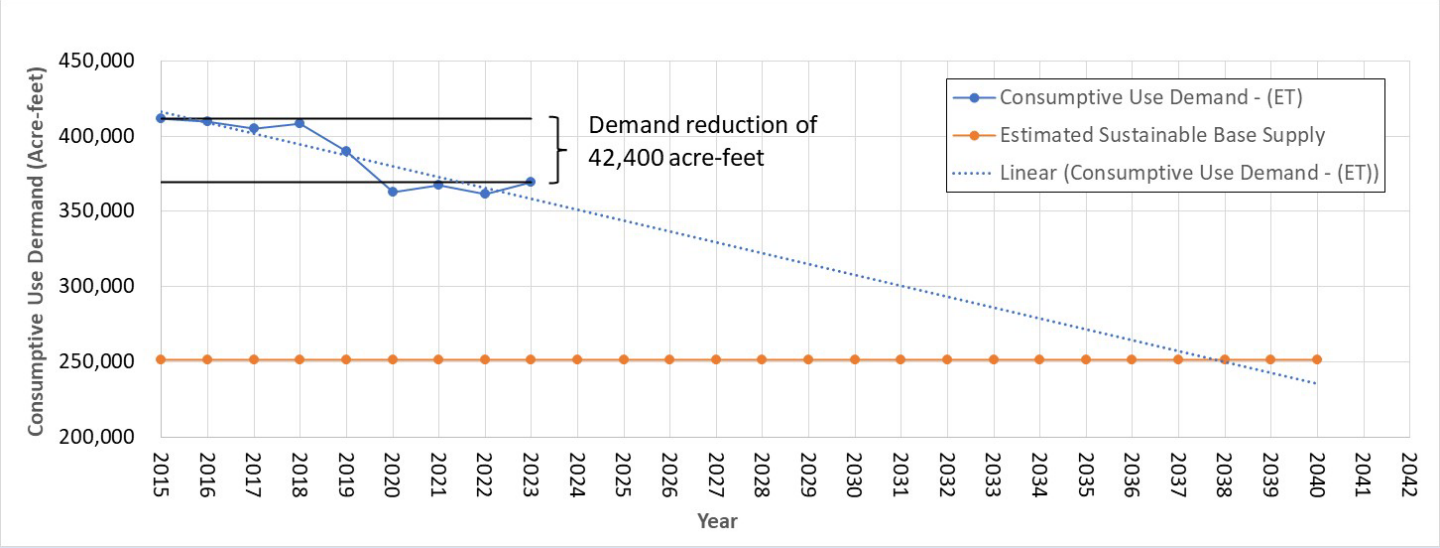


Figure BP-ES-3. Consumptive Use Demand in SWSD GSA from 2015 to 2023

ES.3. Groundwater Banking Overview

The Semitropic Groundwater Banking Program (Semitropic Groundwater Bank) incorporates both in-lieu (indirect) and direct recharge allowing for the storage of surface water in the groundwater basin. The Semitropic Groundwater Bank began operation in the early 1990's and is one of the largest groundwater banks in operation, with an approved storage capacity of approximately 1.65 million AF. Semitropic Groundwater Bank banking partners include: Metropolitan Water District of Southern

California, Santa Clara Valley Water District, Zone 7 Water Agency, Alameda County Water District, Newhall Land and Farming Company, San Diego County Water Authority, the City of Tracy, Santa Clarita Valley Water Agency (formerly Castaic Lake Water Agency), Homer, LLC, Poso Creek Water Company, LLC, Montecito Water District, and Harris Ranch.

The goal of the Semitropic Groundwater Bank is to provide long-term underground storage of surplus SWP water and other supplies, providing supply reliability to banking partners. While the storage of banking partner supplies provides a groundwater level benefit to SWSD landowners, this benefit is transient as stored water is obligated for future recovery. However, the benefits to SWSD and its landowners also includes the addition of banking facilities which the SWSD can utilize to acquire water, primarily in wet years, to enhance its conjunctive use operations.

Water is traditionally stored in the Semitropic Groundwater Bank when the banking partners make their allocated SWP supplies or other surplus water supplies available to SWSD for banking. These surface water supplies are delivered to landowners in SWSD's service area in-lieu of their groundwater pumping (in-lieu recharge) or directly spread in groundwater recharge facilities (direct recharge). There are two mechanisms available to return water to banking partners during recovery years. The first is through SWP entitlement water exchanges (entitlement exchange), where SWSD recovers stored surface water for delivery to landowners in exchange for their respective share of surface water available from the California Aqueduct. This allows for the surface water in the California Aqueduct that would have been delivered to SWSD to be re-directed to Semitropic Banking Partners. The second method occurs in particularly dry years when not enough SWP supplies are allocated to SWSD to meet SWSD's contractual commitment to return water to the banking partners. Under this condition, SWSD extracts stored surface water and physically delivers it through pump-back facilities to the California Aqueduct for delivery to Banking Partners.

The Aggregate of Third Party Banking Contracts provides for the following:

- Total aggregate firm recharge rights of 140,050 AF per year (AFY) with potential to recharge more if conditions are appropriate.
- Total firm return capability of 140,050 AFY by pump-back to the California Aqueduct and potential for return up to 133,000 AFY by SWP supply entitlement exchange assuming a Banking Partner requests the return of stored water when the SWP Allocation is 100%.
- Maximum storage per the project's Certified Environmental Impact Report: 1.65 million AF.

Existing infrastructure associated with the Semitropic Groundwater Bank includes dedicated SWSD owned recovery wells, access to landowner wells for the recovery of

previously stored water, conveyance pipelines, regulating basins and pump stations, and other ancillary facilities. All of these existing facilities are within the SWSD service area. SWSD certified a Final Environmental Impact Report (EIR) covering the Semitropic Groundwater Bank Project in 1994 and Final Supplemental EIR for the Stored Water Recovery Unit in 2000.

The SWSD GSA does not account for the water recharged on behalf of a banking partner as a SWSD supply which can be used to augment the surface water supplies of the SWSD. It should also be noted that banking water is only provided to those landowners within SWSD that have demonstrated that their lands have been developed with a reliance upon groundwater for at least 5 years and SWSD confirms that the water quality from the landowner's well is acceptable for return to the California Aqueduct. This is required before SWSD invests in the capital facilities necessary to connect the landowner to SWSD's In-Lieu Banking Program which includes a meter on the service connection for the delivery of surface water to the landowner and a meter on the SWSD connections to the landowners well.

SWSD GSA Section BP 5 provides additional information on Semitropic Groundwater Bank operations, accounting, and approval processes.

ES.4. Remote Sensing for Monitoring Water Demand for SGMA Compliance

SWSD GSA has contracted with LandIQ to provide ET data to the SWSD GSA on a monthly basis to support the SWSD-16 Landowner Water Budgets program and for the evaluation of the demand management performance. This ET data is then incorporated into the SWSD GIS database to allow the SWSD GSA to analyze the ET data relative to the Kern County Assessor's information for each parcel within the SWSD boundary. The SWSD GSA also conducts crop surveys annually whereby the ET data are analyzed by field or crop. Lastly, ET data are provided to each SWSD GSA landowner such that the landowner can assess their annual ET in relation to their Landowner Water Budget as described in the SWSD-16 Landowner Water Budgets.

The use of remote sensed ET is a method that has been used by SWSD since 2017. The evaluation of SWSD-wide ET, both on developed and undeveloped lands, provides the SWSD GSA with a robust tool that has proven to be reliable and more effective than metering all groundwater wells. The use of remote sensed ET data throughout the entire Subbasin also provides a consistent and common methodology for estimating consumptive use subbasin-wide. SWSD GSA Section BP 5 provides additional information on the use of remote sensed ET data in the SWSD GSA and in the Kern Subbasin.



Semitropic Water Storage District Groundwater Sustainability Agency 2024 Groundwater Sustainability Plan

Section 5. Description of the Plan Area Supplemental Blue Pages

Semitropic Water Storage District
1101 Central Avenue
Wasco, CA 93280

May 2024

SEMITROPIC WATER STORAGE DISTRICT GSA GSP SECTION 5. DESCRIPTION OF THE PLAN AREA

5.1. Introduction

SWSD GSA is providing supplemental information to **Section 5.5.2** Water Banking and **Section 5.7.4** Land Use and Cropping. The supplemental information for **Section 5.5.2** Water Banking further elaborates upon the importance of water banking operations within the SWSD GSA and to its banking partners. This supplemental information also provides greater clarity on banking operations and accounting process practiced that ensure that the banked water is accurately tracked and accounted for. The supplemental information for **Section 5.7.4** Land Use and Cropping expands upon the discussion relative to the application of Remote Sensing of consumptive use (as ET) for SGMA compliance and provides further discussion as to how the decision was made to adopt remote sensing.

5.2. Semitropic Groundwater Banking Program

The Semitropic Groundwater Banking Program (Semitropic Groundwater Bank) incorporates both in-lieu (indirect) and direct recharge allowing for the storage of surface water in the groundwater basin. The Semitropic Groundwater Bank began operation in the early 1990's and is one of the largest groundwater banks in operation, with an approved storage capacity of approximately 1.65 million AF. The goal of the bank has been to provide long-term underground storage of surplus SWP water and other supplies to stabilize declining groundwater levels and to improve water supply resiliency for SWSD's landowners and banking partners. Semitropic Groundwater Bank banking partners include: Metropolitan Water District of Southern California, Santa Clara Valley Water District, Zone 7 Water Agency, Alameda County Water District, Newhall Land and Farming Company, San Diego County Water Authority, the City of Tracy, Santa Clarita Valley Water Agency (formerly Castaic Lake Water Agency), Homer, LLC, Poso Creek Water Company, LLC, Montecito Water District, and Harris Ranch. **Figure BP-5-1** shows the general location of Banking Partners and their interrelationships.

Water is traditionally stored in the Semitropic Groundwater Bank when the banking partners make their allocated SWP supplies, or other surplus water supplies available to Semitropic for banking. These surface supplies are delivered to landowners (farmers) in SWSD's service area in-lieu of their groundwater pumping (in lieu recharge) or directly spread in groundwater recharge facilities (direct recharge). There are two mechanisms available to return water to banking partners during recovery years. The first is through SWP entitlement water exchanges (entitlement exchange), where SWSD recovers

stored surface water for delivery to landowners in exchange for their respective share of surface water available from the California Aqueduct. This allows for the surface water in the California Aqueduct that would have been delivered to SWSD to be re-directed to Semitropic Banking Partners. The second method occurs in particularly dry years when not enough SWP supplies are allocated to SWSD to meet SWSD's contractual commitment to return water to the banking partners. Under this condition, SWSD extracts stored surface water and physically delivers it through pump-back facilities to the California Aqueduct (pump-back) for delivery to Banking Partners.

The Aggregate of Third Party Banking Contracts provides for the following:

- Total aggregate firm recharge rights of 140,050 AFY with potential to recharge more if conditions are appropriate.
- Total firm return capability of 140,050 AFY by pump-back to the California Aqueduct and potential for return up to 133,000 AFY by SWP supply entitlement exchange assuming a Banking Partner requests the return of stored water when the SWP Allocation is 100%
- Maximum storage per the project's Certified Environmental Impact Report: 1.65 million AF

Existing infrastructure associated with the Semitropic Groundwater Bank includes dedicated SWSD owned recovery wells, access to landowner wells for the recovery of previously stored water, conveyance pipelines, regulating basins and pump stations, and other ancillary facilities. All of these existing facilities are within the SWSD service area.

With regard to SGMA planning, the SWSD GSA does not account for the water recharged on behalf of a Banking Partner as a district supply which can be used to augment the surface water supplies of SWSD. It should also be noted that banking water is only provided to those landowners within SWSD that have demonstrated that their lands have been developed with a reliance upon groundwater for at least 5yrs and SWSD confirms that the water quality from the landowner's well is acceptable for return to the California Aqueduct. This is required before SWSD invests in the capital facilities necessary to connect the landowner to SWSD's In-Lieu Banking Program, which includes meters on the service connections between the landowner and SWSD facilities to meter all flows related to banking operations.



Figure BP-5-1. Semitropic Groundwater Banking Program Partner

Banking Program Operations

Water supplies provided by Banking Partners are delivered through the California Aqueduct, facilitated by the California Department of Water Resources (DWR). All water deliveries are metered and verified by DWR through the California Aqueduct and at the delivery point to SWSD. Ninety percent of the water delivered by a Banking Partner is held in storage for future recovery and the remaining 10-percent is retained by SWSD for local groundwater benefits.

The in-lieu banking program relies upon a contractual agreement between the SWSD and participating landowners located within the SWSD. The landowner agreement includes the following general concepts:

- To be eligible to participate the participating landowner must demonstrate to SWSD that the landowner has an established farming operation in SWSD and irrigates the associated crops with a well on the subject farm

as the sole source of water and the farm has been in existence for more than 5 years.

- The landowner agrees to irrigate with surface water when available from a SWSD Banking Partner and agrees to not irrigate with the well or wells associated with the agreement.
- The surface water that is used in-lieu of groundwater creates the banked water account on behalf of the Banking Partner that supplied the surface water. This banked water is held in trust by the Semitropic Water Bank for the Banking Partner.
- The landowner also agrees to operate the wells associated with the agreement for the recovery of banked water when SWSD needs to return banked water.
- Once the agreement is executed, SWSD invests in the infrastructure to connect the landowner's farming operation to the SWSD system which includes the installation of a metered turnout for the delivery of water to the farming operation and the installation of a metered connection on each associated well used for the return of banked water.

- Process for Banking Water Recharge Operations:
  - A Banking Partner submits a request to SWSD to recharge water noting the desired volume and timing of delivery.
  - SWSD aggregates the recharge requests and coordinates with the Kern County Water Agency (KCWA) and DWR to obtain the approvals for the banking operation. If a Banking Partner is requesting to recharge water from the Central Valley Project then the United States Bureau of Reclamation (USBR) is also included in the approval process.
  - Once approvals are received, the SWSD prepares a recharge schedule noting the monthly estimated recharge volume by Banking Partner, this schedule is coordinated with the KCWA and DWR.
  - SWSD then coordinates with the participating SWSD landowners and the KCWA and DWR for the daily delivery of water from the California Aqueduct to the landowners farming operations to effectuate the in-lieu banking operation. The banking water delivered from the California Aqueduct to SWSD is metered by DWR and SWSD meters all water deliveries to participating landowners within SWSD.
  - Each meter is read by SWSD staff each time a water delivery is started and stopped, and all meters are read on a monthly basis. Meter readings are uploaded via tablet to a SWSD water accounting database. Banking Partners are charged a volumetric rate on a month basis water recharged.

- Process for Banking Water Recovery Operations:
    - A Banking Partner submits a request to SWSD to recover banked water noting the desired volume to be recovered and timing of delivery.
    - SWSD aggregates the recovery requests and coordinates with the KCWA and DWR to obtain the approvals for the banking operation. If a Banking Partner is requesting the delivery of recovered banked water to the Central Valley Project then the USBR is also included in the approval process.
    - Once approvals are received the SWSD prepares a recovery schedule noting the monthly estimated recovery volume by Banking Partner, this schedule is coordinated with the KCWA and DWR.
    - SWSD then coordinates with the participating SWSD landowners and the KCWA and DWR for the daily delivery of water from the SWSD Banking Program to the California Aqueduct. Each well being utilized for the recovery of banked water is metered by SWSD. SWSD then aggregates the recovered bank water such that it can be pumped back to the California Aqueduct via metered connections. DWR also meters the water delivered from SWSD to the California Aqueduct.
    - Each meter is read by SWSD staff each time a water delivery is started and stopped, and all meters are read on a monthly basis. Meter readings are uploaded via tablet to a SWSD water accounting database. Banking Partners are charged a volumetric rate on a month basis water recovered.
- District metered delivery records are aggregated and compared to DWR meter readings.
- All deliveries to and from the California Aqueduct are reconciled with DWR, KCWA and Banking Partners.
- All water accounts are audited by SWSD's independent auditor, Banking Partners also audit water banking transactions.

Banking Monitoring and Mitigation

The Semitropic Groundwater Bank monitors groundwater conditions and operates its recharge and recovery programs to avoid unreasonable impacts to local landowners. The monitoring program is coordinated with all neighboring water district through the Semitropic Monitoring Committee, established through a Memorandum of Understanding (MOU). The MOU provides for the following:

- Established a Groundwater Monitoring Committee
- Funds independent hydrogeologist
- Holds Quarterly Groundwater Monitoring Committee Meeting

- Prepares bi-annual monitoring report

To support the Groundwater Monitoring Committee activities and for its own monitoring efforts, the SWSD also collects water quality samples from 1/3 of the recovery wells each year such that all wells connected to the banking program are sampled every 3 years. Additionally, water quality samples are taken at the California Aqueduct at the point of delivery on a daily basis to confirm compliance with DWR Pump-in Criteria when banked water is being physically returned to the California Aqueduct. During recovery operations water quality samples are also collected on a weekly basis up-stream and down-stream of the of the SWSD's turnouts at the California Aqueduct to confirm water quality upstream and downstream of the SWSD's pump-in.

Groundwater levels are collected each spring and fall in more than 100 wells across SWSD's service area, including the SGMA Representative Monitoring Wells reported to DWR for SGMA compliance. This data is used to analyze and report groundwater level conditions annually and to support the evaluation of the 3-year / 15-foot rule, which ensures that banking operations do not impact the groundwater levels that would have occurred absent the banking operations, protecting SWSD landowners and the adjacent water districts. The 3-year / 15-foot rule evaluates groundwater levels over a 3-year period via a groundwater model to assess that the groundwater levels are no more than 15-feet deeper than the groundwater condition that would have been in the absence of the banking project.

5.3. Use of Remote Sensing for SGMA Compliance

The SWSD GSA, and the entire Kern Subbasin, relies upon remote sensing to estimate crop consumptive use to quantify the volume of water consumed by agricultural lands and to support SGMA compliance. The SWSD GSA has contracted with LandIQ to provide consumptive use data as ET to the SWSD GSA on a monthly basis. This data is then incorporated into SWSD's GIS database and the SWSD GSA can analyze the ET data relative to the Kern County Assessor's Information for each parcel within the SWSD GSA boundary. SWSD also conducts crop surveys annually allowing the ET data to be analyzed by field or crop. Lastly, ET data is provided to each SWSD GSA Landowner such that the Landowner can assess their annual ET in relation to their Landowner Water Budget as discussed in P/MA SWSD-16. **Figure BP-5-2** provides an illustrative example of how the SWSD GSA utilizes County Assessors data, crop surveys, and ET data to analyze the consumptive use in the SWSD GSA. This analysis provides parcel level ET data by Landowner, by crop type, and by season (on a monthly basis). Remote sensed data also identifies consumptive use variations by parcel and within the same crop types. Finally, the data provides consumptive use information on non-developed lands within the GSA. **Table BP-5-1** is a summary of the SWSD GSA consumptive use analysis by year since 2015.

The evaluation of SWSD GSA wide ET, both on developed and undeveloped lands, provides the SWSD GSA with a robust tool that has proven to be reliable and more effective than metering all groundwater wells when assessing water demands of the agricultural lands. The use of remote sensed ET data throughout the entire Kern Subbasin also provides a consistent and common methodology for estimating consumptive use as ET.

A wide range of agricultural crops are grown in the Kern Subbasin. While the water use of these crops can be estimated via empirical methods (e.g. Kc approaches), these estimates are not unique to individual fields, irrigation management, soil type, changing environmental conditions, etc. The Land IQ approach to estimating field-by-field ET incorporates heavy ground truthing (eddy covariance and surface renewal climatic stations located throughout the Kern Subbasin) to calibrate and validate the data-driven models. ET is the greatest "outflow" of water from the SWSD GSA and Kern Subbasin water balance and needs to be estimated as accurately as possible. Incorporation of ground truthing significantly aids in reducing the variability of field-by-field ET estimates. Also, field-by-field crop type, precipitation, and permanent crop age are also provided. The accuracy of these four products is expected to be:

- Field-by-field ET (+/- 5-7%)
- Field-by-field precipitation (+/- 5-10 mm)
- Field-by-field crop mapping (97.5% prediction accuracy and +/- 6 feet spatial boundary accuracy)
- Field-by-field permanent crop age (+/- 1-2 years)

All of these spatial results significantly enhance the ability to better understand the overall water balance within the SWSD GSA and the Kern Subbasin and comply with SGMA regulatory requirements.

Calculation of ET can be performed accurately using weighing lysimeters and eddy correlation monitoring techniques. These methods are limited, however, because they provide point values of ET for a specific location and fail to provide the ET on a regional scale. This limitation has motivated the development of using remotely sensed (RS) data from satellites to evaluate ET over large areas. Satellite data are well suited for deriving spatially continuous ET surfaces that can be pared down to the field scale because of their temporal and spatial characteristics.

Table BP-5-2 provides a qualitative analysis comparing at well meter measurements and remote sensing and is the basis for supporting the SWSD GSA's use of remote sensed data for developing ET estimates. This process has also been adopted by the entire Kern Subbasin.

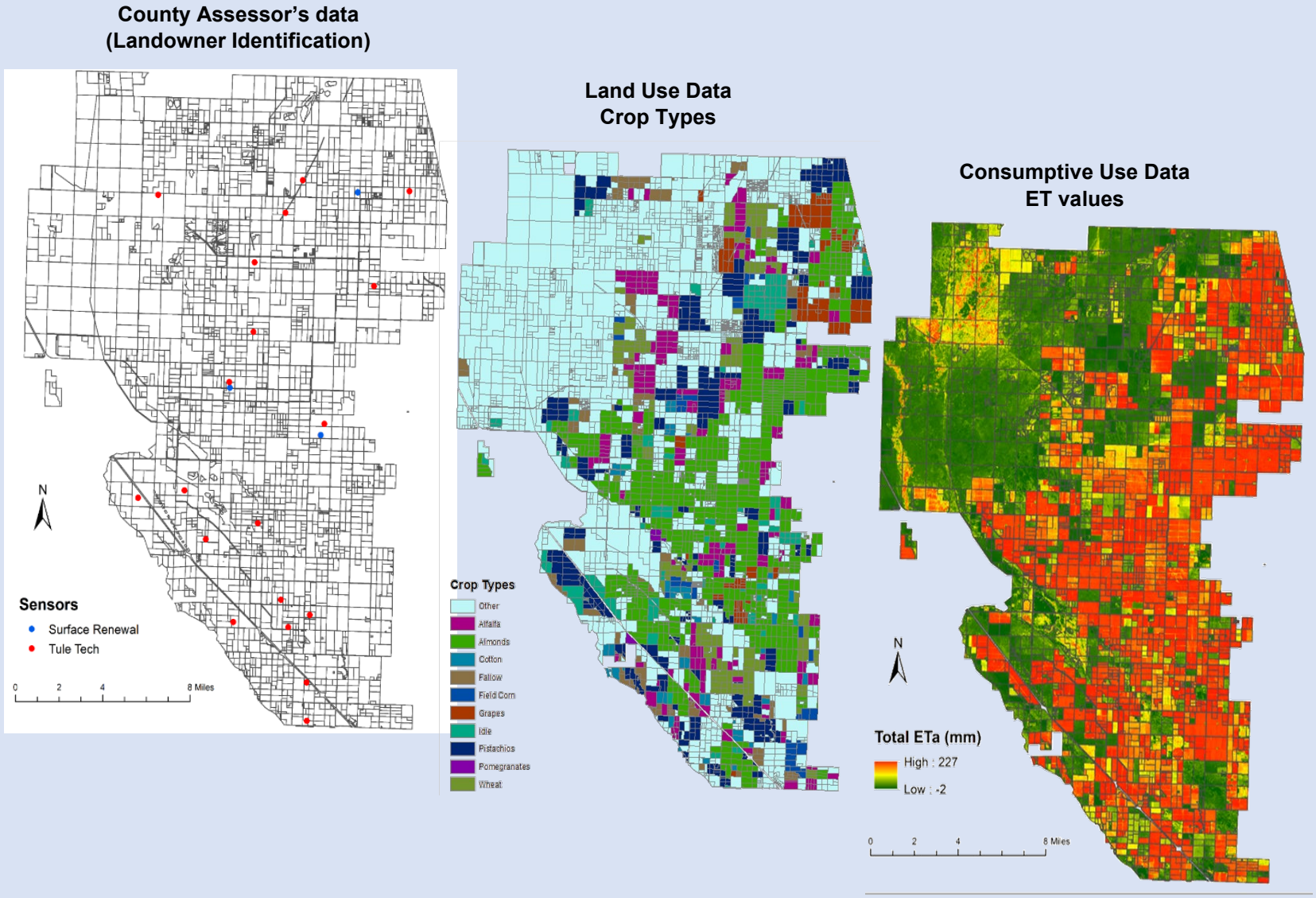


Figure BP-5-2. Illustrative Example of Remote Sensed ET Data Development

Table BP-5-1. SWSD GSA Land Use and Consumptive Use Data

	Calendar Year									
IRRIGATED LANDS (Acre)	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Annual Crops	43,670	39,470	36,410	32,010	30,470	26,810	28,870	27,630	28,330	26,120
Permanent Crops	81,400	85,490	87,670	89,020	91,180	91,590	92,780	92,190	91,200	87,360
Managed Wetlands (Duck Ponds)	10,330	10,740	10,670	7,420	6,880	6,930	6,930	6,920	6,870	6,870
Total Irrigated Lands (Acre)	**135,400**	**135,690**	**134,750**	**128,460**	**128,530**	**125,340**	**128,570**	**126,750**	**126,400**	**120,340**
Total Non-Irrigated Lands (Acre)	86,020	85,730	87,940	94,100	94,080	97,230	94,000	95,830	96,170	102,230
Total SWSD GSA Acres	**221,420**	**221,420**	**222,700**	**222,560**	**222,610**	**222,570**	**222,570**	**222,580**	**222,570**	**222,570**
CONSUMPTIVE USE , ET (Acre-Feet)	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Annual Crops	135,760	122,810	111,990	104,900	89,320	76,030	81,930	73,410	74,790	TBD
Permanent Crops	258,210	268,090	274,870	290,550	288,630	276,090	278,180	282,090	282,870	TBD
Managed Wetlands (Duck Ponds)	17,870	18,570	18,460	12,930	11,800	10,710	7,410	5,940	11,850	TBD
Total Consumptive Use, ET - Irrigated Lands (Acre-Feet)	**411,840**	**409,470**	**405,320**	**408,380**	**389,750**	**362,830**	**367,520**	**361,440**	**369,510**	TBD
Total Consumptive Use, ET - Non-Irrigated Lands (Acre-Feet)	116,340	116,210	118,950	139,310	128,020	122,030	75,610	62,790	140,190	TBD
Total SWSD GSA CONSUMPTIVE USE, ET (Acre-Feet)	**528,180**	**525,680**	**524,270**	**547,690**	**517,770**	**484,860**	**443,130**	**424,230**	**509,700**	**TBD**

Table BP-5-2. Analysis Relative to the Use of Meters vs Remote Sensing (Evapotranspiration) for SGMA Compliance

Item	Meters	Evapotranspiration	Explanation
Water "use" measurement	Applied water	Consumed water - crop ET	The actual water "use" is that water than leaves the system via evapotranspiration. The portion of pumped water that is not evaportranspired by the crop **remains in the system** for recharge or consumption in the future. If not accessible for future consumption within the root zone, excess applied water recharges groundwater. This is no different than how a recharge basin works. It's just a smaller amount (depth) but spread over a much larger area.
Accuracy	More variable	Less variable	If installed correctly, frequently calibrated, and maintained, meters can provide accurate estimates of pumped groundwater. In reality, it should be expected that correct installation, calibration, and maintenance will not always occur. It should be the goal to be accurate across an entire subbasin. Accurate landscape-wide ET accomplishes this. In some cases, meter variability can range widely >30%. ET variability has been measured up to +/-10-15%.
Equitability	No	Yes	The only equitable monitoring program is one that samples the entire population. This isn't about the volume of water extracted, rather the number of acres and the crops grown that a single pump supplies. A subset leaves smaller pumpers the freedom to extract groundwater without repercussions. ET treats all growers the same regardless of field size or land base owned.
Field data collection	Required	Not Required	Every meter results need to be collected on a continuous basis. It is unlikely this will happen and people will "estimate" their pumping records. One key advantage of remotely sensed approaches is the ability to cover large landscapes without field measurements and establish relative comparisons from one field/block to another.
Coverage	Only applicable to where there are wells	Full coverage, regardless of where wells exist and water supply source	Remotely sensed ET provides a 100% coverage of every field. Some fields will be missed with meters. Growers may not report a well or a well inventory will not record all wells.
Feasibility to cover entire landscape	Incomplete Measurement: Not feasible if only requiring larger pumpers (>500 acre-feet/year) to meter	Comprehensive Measurement; Proven as feasible	In some agricultural landscapes (especially those along the eastern side of the valley), there are hundreds if not thousands of wells. The ability to instrument and measure every well accurately is arguably not possible. This means there will be an incomplete assessment of applied water. It is not accurate, scientifically appropriate, nor equitable.
Well inventory	Required	Unnecessary	A well inventory is likely to be incomplete. Previously unused/abandoned wells can be put back into use and not included in an inventory. Diesel and solar powered wells may never be found.

Table BP-5-2. Analysis Relative to the Use of Meters vs Remote Sensing (Evapotranspiration) for SGMA Compliance

Item	Meters	Evapotranspiration	Explanation
Permitting/Ordinances	Required	Unnecessary	Permitting or ordinances may be required, thus delaying even further the measurements necessary to manage the system. Some growers will refuse access to their land or will refuse reporting their applied water. Legal ramifications are likely. Remotely sensed ET does not require a permit, ordinance, or grower approval and treats all growers the same.
Meter calibration	Required	Unnecessary	Rules will likely need to be established to require calibration on a set schedule. Unnecessary with remotely sensed ET.
Meter failure	Probable	Not possible	Some meters will fail during the irrigation season and a portion of pumped volumes will be unknown. Remotely sensed ET is determined on a continuous basis.
Policing	Required	Unnecessary	As part of any responsible metering program, an enforcement component will likely be necessary. This is not necessary with remotely sensed ET.
Grower manipulation	Probable	Not possible	Unfortunately, there will undoubtedly be fraudulent reporting, manipulation of meters, and "carry over" into the next year or "accumulation" in the current one to avoid violations, reduce fees, and/or support a future year. A grower could over-irrigate a crop one year, knowing he will grow a crop the next year that doesn't use as much water. Orchard removal is an example. Some growers have already said they will build a replacement "sleeve" the same length as the in-line meter and put in the place of the meter for certain periods of time. Others may divert water upstream of the meter
Cost	$10s to $100s per acre/year depending on the year	approximately $1 per acre/year	Meter costs include: new or replacement meters, labor, annual or biannual calibrations, maintenance, parts, record keeping/database management, training, staff/consultant fees, reporting, field inspections etc. Increased costs further disadvantage small farmers. Also, given the uncertainties relative to the economics of each farming operation the current definitions of “Small farmers” need to be better defined and can be a farmer pumping more than 500 acre-feet/year.
Meter equipment consistency	Not all meters are the same	Consistent analysis across landscape	It is well known that some meter types and manufacturers are better than others. This creates greater variability and inequities between fields and growers. Remotely sensed ET analysis is consistent (and at a minimum, relative) across a landscape.
Relative water use	Potential for more variability in meters	Remotely sensed ET is at least relative between fields	One meter can be +/- 1-3% high or low and the next meter +/- 10-30% high or low. Remotely sensed ET is at least relative between fields because one model is used across the landscape, as compared to hundreds or thousands of independent meters. Relative comparisons between fields are equitable, at a minimum. When ET

Table BP-5-2. Analysis Relative to the Use of Meters vs Remote Sensing (Evapotranspiration) for SGMA Compliance

Item	Meters	Evapotranspiration	Explanation
			estimates are accurate, the entire landscape beginning at the field level, can be quantified as to water lost to the environment.
Longevity	Meters wear out	Growing in accuracy with more and more satellites	Meters wear out and will need to be replaced periodically. More advanced satellites are being put into orbit more and more frequently.
Historical data	None for most fields	ET can be retrospective	If no well previously, no way to know historical pumping to compare to future pumping for validation and policing. Remotely sense ET estimates can be retrospectively developed for every field for a decade or more.
Crop type impact	Not accounted for	Relationships exist	DWR crop mapping can be correlated to consumption on a field-by-field basis, independent of water source. General trends in consumption by crop type, by regional area, and by age for permanent crops now exist. Variability in consumption does occur mostly depending on grower decisions related to irrigation management.
Time to comprehensive/representative water "use" measurements	Unknown, but will take at least 2-4 years	Accomplished and ongoing	timing for comprehensive measurements of water "use" is imperative. Without it, the window shortens significantly to implement project and management actions, assess the impact, and adjust as necessary.
Staff requirements	Will require multiple staff or consultant teams	Achieved by single entity	Staff requirements for a comprehensive metering program is very large and possibly not achievable in a reasonable and necessary timeline. Remotely sensed ET is already up and running for entire subbasins and has been for years.
500 acre-foot pumping limit	Arbitrary value	Not applicable	Water cannot be effectively managed if it is not fully measured. Establishing a pumping threshold will not represent the entire landscape, will create a system in which growers will try to evade, and will not be equitable for all. Remotely sensed ET covers the entire landscape and every field and holds all irrigators accountable. Achieving sustainability with an incomplete landscape assessment of applied water will offer more chance for failure. If setting the pumping amount at 500 ac-ft is an attempt to protect small farmers, there are many situations where that will not be the case.
Thresholds	Currently SWRCB is exempting wells pumping less than 500 acre-feet	ET provided for fields as small as 2 acres, independent of pumped water	SGMA provides crop mapping for every field in California, 2-acres and greater. The average field/block size in California is 31 acres. Field sizes are generally smaller on the east side of the San Joaquin Valley. If a grower applies 3-3.5 feet of water, it will require 140-170 acres to exceed 500 acre-feet. There are numerous wells that serve less than this acreage due to small field/block size and individual small farmer holdings.

Table BP-5-2. Analysis Relative to the Use of Meters vs Remote Sensing (Evapotranspiration) for SGMA Compliance

Item	Meters	Evapotranspiration	Explanation
Small (<500 ac-ft/ac) versus Large (>500 ac-ft/ac) pumpers/farmers	Does not account for small pumpers/farmers	Accounts for all regardless of pumping volume	Generally speaking, larger growers have more resources to help them track applied and consumed water. This allows them the ability to optimize their irrigation practices and management. Smaller growers may not have these resources and may actually be pumping more groundwater per acre than larger growers, just to make sure they irrigated enough without technology helping them optimize their systems.
Installation requirements	Improper installation occurs	Not applicable	The correct upstream and downstream pipe distance, alignment, and diameter are required for accurate meter readings. It is fairly common to see installed meters violating these requirements and thus the results are suspect.
Environmental conditions	Not measured	Measured by ground truthing stations (e.g. CIMIS, Land IQ stations, other)	Environmental conditions affect consumed water, which affects pumping. Impacts of climate change need to be monitored to estimate the actual water consumption that leaves the system. The 2022, very dry water year as compared to the 2023, very wet water year is a good example.
Irrigation method/site conditions	some irrigation methods are less efficient when meeting crop water demand	Consumption not influenced by soil type, rather presence or absence of plant available soil moisture	surface irrigation methods generally are less efficient in meeting the demand of the crop. Long "runs" of surface water will require more applied water to "get to the other end of the field." This is further exacerbated with coarse textured soils. Excess applied water, as long as runoff is contained or recycled, stays within the system to be used in the future.
Dual water sources (groundwater and surface water)	May or may not measure surface water sources	Measures consumption of all water sources (surface, ground, and precipitation)	For dual water source systems (groundwater and surface water) contributions of each vary from year to year, thus a measurement of applied water from surface water sources may be necessary. Growers may creatively manage surface water to spread it around to fields to keep a series of wells under pumping cap.
Precipitation contributions	not measured with meters	Measured. All consumed water is estimated (both applied and precipitation)	Ground truthing stations have precipitation gauges. As such, a spatial precipitation map is created to estimate contributions of precipitation to ET. In a wet year, more growers may fall under a pumping limit, when on average, they would not have.
Movement of water	Controlled by growers	Not an influence on consumption	If a grower has 2 pumps and one is running up against a potential acre-foot limit or pumping cap and another one nearby has pumped less, a grower can easily string temporary pipe from one field to another to avoid pumping beyond per well pumping cap. The grower is in compliance, but this doesn't address excess groundwater pumping.



Semitropic Water Storage District
Groundwater Sustainability Agency
2024 Groundwater Sustainability Plan

Section 14. Projects and Management Actions
Supplemental Blue Pages

Semitropic Water Storage District
1101 Central Avenue
Wasco, CA 93280

May 2024

SEMITROPIC WATER STORAGE DISTRICT GSA GSP SECTION 14. PROJECTS AND MANAGEMENT ACTIONS

As stated above, the goals and objectives of the P/MAs presented herein are to address any existing or potential Undesirable Results by the GSP implementation deadline for Kern County (i.e., by January 2040). As such, P/MAs will be implemented incrementally to achieve this goal. While the exact schedule and timetable for implementation of all individual P/MAs is not exactly known at this time, general implementation schedules, also known as a "Glide Path," have been developed as summarized for SWSD GSA in **Table BP-14-1** below and illustrated on

Figure **BP-14-1**. This "Glide Path" is aimed to address 25 percent (34,010 AFY) of the projected deficit of 136,040 AFY during each five-year Milestone through 2040, which in turn will affect conditions of the relevant Sustainability Indicators based on the assumption that those conditions are directly related to the balance of supplies and demands within the GSP Area. The anticipated P/MA implementation schedule is forecasted to exceed the target deficit reduction before 2040.

Table BP-14-1. Glide Path – Target Deficit Reduction

Project and Management Action Implementation Schedule (AFY)						
SWSD GSA Projected-Future Scenerio Deficit Reduction "Glide Path" 354.44 (b)(2)		**2020**	**2025**	**2030**	**2035**	**2040**
Projected Deficit			-136,040			
Target Deficit Reduction (%)		0	25%	50%	75%	100%
Target Deficit Reduction		**0**	**-34,010**	**-68,020**	**-102,030**	**-136,040**
Deficit Reduction "Glide Path" Milestones		**-136,040**	**-102,030**	**-68,020**	**-34,010**	**0**
Project and Management Action, by Type (AFY)						
Planned Demand Reduction	Land Retirement	0	0	0	0	0
	Demand Reduction	0	40,668	81,337	122,005	162,673
	Ag to Urban Conversion	0	0	0	0	0
	Water Conservation-Efficiency	0	0	0	0	0
	Subtotal	**0**	**40,668**	**81,337**	**122,005**	**162,673**
Planned Water Supply Augmentation	Supplemental Water Recharge	0	0	0	0	0
	Supplemental Water Use	19,000	19,000	19,000	19,000	20,800
	Third-Party Banking	0	0	0	0	0
	New Local Supply	0	0	0	35,000	35,000
	Exercise of Rights	2,800	2,800	2,800	2,800	2,800
	Subtotal	**21,800**	**21,800**	**21,800**	**56,800**	**58,600**
P/MA Implementation Schedule*		**21,800**	**62,468**	**103,137**	**178,805**	**221,273**
Total As-Needed P/MA Deficit Benefits		*0*	*0*	*0*	*0*	*0*
Planned P/MA Deficit Reduction Schedule*		**-114,240**	**-73,572**	**-32,903**	**42,765**	**85,233**

* Implementation Date includes estimated time to start accruing benefits

Target = 0

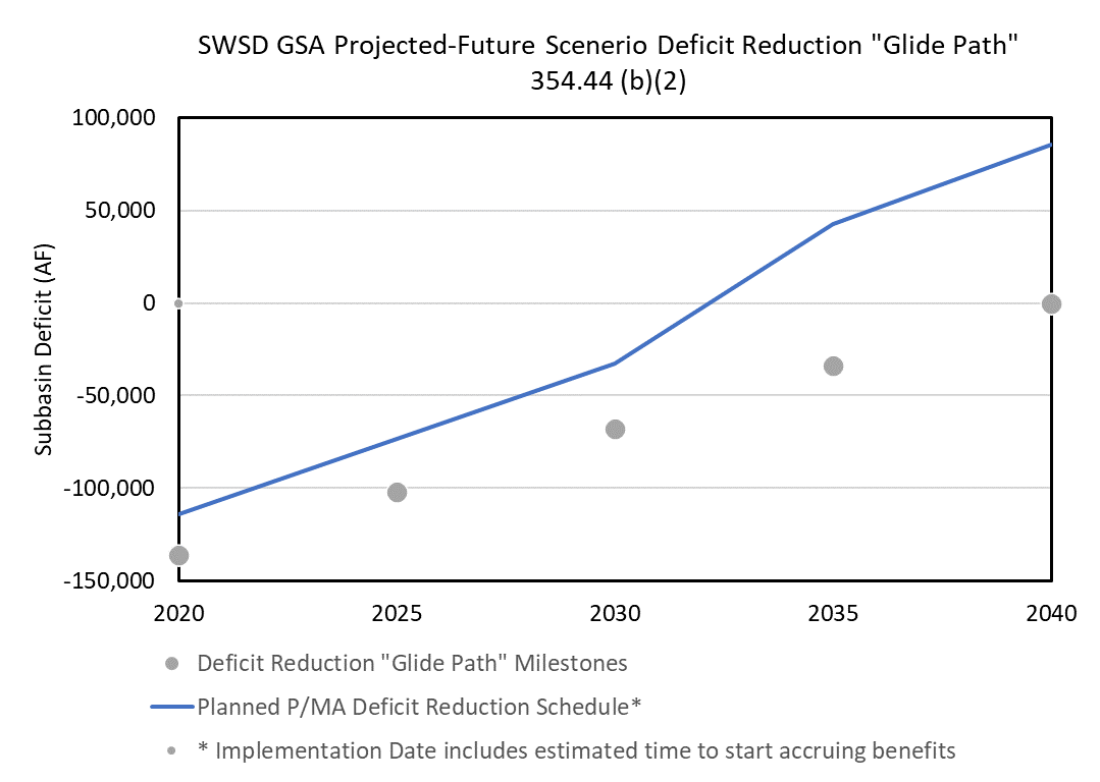


Figure BP-14-1. Glide Path – P/MA Planned Deficit Reduction vs. Milestones

P/MAs are numbered with the acronym of the GSA (example SWSD-1) if the P/MA is specific to the individual GSA. P/MAs are numbered with "KSB-#" if the P/MA is considered to be Subbasin wide in nature. Note that "KSB" P/MAs have either full Subbasin participation or nearly all GSAs participating. The SWSD GSA's projects and management actions are described **Table BP-14-2.**

Table BP-14-2 SWSD GSA Projects and Management Actions

P/MA Number	P/MA Name	Summary Description	Relevant Sustainability Indicators Affected			Overdraft Correction Description Category	Circumstances for Implementation	Public Noticing Process	Permitting and Regulatory Process Requirements	Status	Timetable / Circumstances for Initiation	Timetable for Completion	Timetable for Accrual of Expected Benefits	Expected Benefits							Source(s) of Water, if applicable	Legal Authority Required	Estimated Costs		
														Primary (AFY)		Secondary									
			Groundwater Levels & Storage	Groundwater Quality	Land Subsidence									Water Supply Augmentation	Demand Reduction	Water Quality Improvement	Flood Control	Water Management Flexibility / Efficiency	Mitigation Programs	Data Gap Filling/ Monitoring			One-time Costs	Ongoing Costs (per year)	Potential Funding Source(s)
Projects		Implemented / Functional / In-Process	As-Needed							Implemented	Functional	In-Process	As-Needed												
SWSD-1	Monitoring Network Improvement Plan	Assess and identify monitoring network requirements for full compliance with SGMA and development of an implementation plan for achieving full compliance. Additional wells leverage existing network of monitoring wells.	✓	✓	✓		Upon approval by SWSD BOD	Semitropic GSA Board Meetings & Website	Site specific (CEQA)	**Implemented**	Complete	Complete	2023-	**0**	**0**					✓		District authorities	$10,000	$0	District
SWSD-2	Leonard Avenue System	Conveyance capacity to support delivery of surface water for groundwater recharge. Interconnection with Shafter-Wasco Irrigation District.	✓		✓		Complete	Semitropic GSA Board Meetings & Website	CEQA	**Implemented**	Complete	Complete	2023-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$16,100,000	$0	District
SWSD-3	Diltz Intertie	Conveyance capacity to support delivery of surface water for groundwater recharge. Interconnection with Shafter-Wasco Irrigation District.	✓		✓		Complete	Semitropic GSA Board Meetings & Website	CEQA	**Implemented**	Complete	Complete	2020-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$3,200,000	$0	District
SWSD-4	Cox Canal Pump Station	Conveyance capacity to support delivery of surface water for groundwater recharge. Interconnection with Buena Vista Water Storage District.	✓		✓		Complete	Semitropic GSA Board Meetings & Website	CEQA	**Implemented**	Complete	Complete	2022-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$3,600,000	$0	District
SWSD-5	Water Market Acquisitions	Increased participation in state-wide water markets for spot market and long-term water transfers. And maximize acquisition of wet year water supplies for recharge.	✓		✓	Supplemental Water Supplies	Upon approval by SWSD BOD	Semitropic GSA Board Meetings & Website	CEQA / DWR	**Implemented/ Ongoing**	NA	On-going	2020-	**19,000**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$0	$9,500,000	District
SWSD-6	Stored Water Recovey Unit-XYZ	Development of water storage to expand in-lieu service areas.	✓		✓	Exercise of Rights	Upon approval by SWSD BOD and identification of funding	Semitropic GSA Board Meetings & Website	None	**Completed**	Current	2018	2022-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$17,000,000	$0	District
SWSD-7	Pond-Poso Spreading Grounds, Phase II	Development of spreading facililiteis to increase groundwater recharge capacity.	✓		✓	Supplemental Water Recharge	Upon approval by SWSD BOD and identification of funding	Semitropic GSA Board Meetings & Website	CEQA	**Construction**	Current	2025	2025-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$32,000,000	$0	District
SWSD-8	Schuster Spreading Grounds	Development of spreading facililiteis to increase groundwater recharge capacity.	✓		✓	Supplemental Water Recharge	Upon approval by SWSD BOD and identification of funding	Semitropic GSA Board Meetings & Website	CEQA	**Design**	Current	2026	2026-	**0**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	$1,200,000	$0	District
SWSD-9	Poso Creek MAR	Development of floodwater capture and recharge program from Poso Creek flood flows.	✓		✓	Supplemental Water Recharge	Upon completion of feasibility and permitting requirements	Semitropic GSA Board Meetings & Website	CEQA	**Feasibility**	Current	2028	2028-	**2800**	**0**		✓	✓			Poso Creek & Friant-215	District authorities	$17,700,000	$0	District
SWSD-10	Pond-Poso Entrance Ponds	Development of spreading facilities to increase groundwater recharge capacity.	✓		✓	Supplemental Water Recharge	Upon approval by SWSD BOD and identification of funding	Semitropic GSA Board Meetings & Website	CEQA	**Design**	Current	2028	2028	**0**	**0**	✓	✓	✓			Poso Creek & Friant-215	District authorities	$8,000,000	$0	District

Table BP-14-2. SWSD GSA Projects and Management Actions (continued)

P/MA Number	P/MA Name	Summary Description	Relevant Sustainability Indicators Affected			Overdraft Correction Description Category	Circumstances for Implementation	Public Noticing Process	Permitting and Regulatory Process Requirements	Status	Timetable / Circumstances for Initiation	Timetable for Completion	Timetable for Accrual of Expected Benefits	Expected Benefits								Source(s) of Water, if applicable	Legal Authority Required	Estimated Costs		
														Primary (AFY)		Secondary										
			Groundwater Levels & Storage	Groundwater Quality	Land Subsidence									Water Supply Augmentation	Demand Reduction	Water Quality Improvement	Flood Control	Water Management Flexibility / Efficiency	Mitigation Programs	Data Gap Filling/ Monitoring				One-time Costs	Ongoing Costs (per year)	Potential Funding Source(s)
Projects		**Implemented** **Functional** **In-Process**	**As-Needed**											**Implemented**		**Functional**		**In-Process**			**As-Needed**					
KSB-1	**Friant-Kern Canal Capacity Mitigation**	1) Collaborate with FWA to develop costs estimates for the Lower Reach Capacity Correction, 2) develop an attribution analysis of post-2020 subsidence impacts, 3) participate in developing a value of water analysis in cooperation with FWA and 4) develop and implement a funding mechanism to pay for post-2020 conveyance impacts on the FKC attributable to subsidence.	✓		✓		Completion of Design and Impact Analysis	Stakeholder Meetings Board Meetings	NA	**Feasiblity Study**	NA	2030	2030-	**0**	**0**			✓	✓	✓	NA	None	Unknown	Unknown	District
SWSD-11	**Tulare Lake Project**	Development of conveyance facilities to divert Kings River flood flows for direct use and recharge in the SWSD.	✓	✓	✓	Supplemental Water Recharge	Upon compeltion of water rights determination	Semitropic GSA Board Meetings & Website	CEQA / State Board / Regulatory	**Feasibility/ Water Rights**	Current	2035	2035-	**35000**	**0**	✓	✓	✓			Kings River flood flows	District authorities	$270,000,000	$1,000,000	District
SWSD-12	**Enhanced Groundwater Recharge**	Development of surface and subsurface recharge projects underlying developed agricultural lands to increase groundwater recharge capacity.	✓			Exercise of Rights/ Supplemental Water Recharge	Upon approval by SWSD BOD and identification of funding	Semitropic GSA Board Meetings & Website	Site Specific (CEQA)	**In-Process**	Current	2040	2020-	**0**	**0**	✓		✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District authorities	TBD	$25,000	District
SWSD-13	**Evaluation and Assessment of GDEs within the Semitropic Area**	Conduct additonal analysis to verify the presence and extend fo GDE's in the Semitropic and, if present, develop appropriate monitoring protocols.	✓				As needed	Semitropic GSA Board Meetings & Website	TBD	**As needed**	Current	2030	2030-	**0**	**0**					✓		District authorities	$50,000	bank	District
SWSD-14	**Brackish Water Desalination**	Development of a brackish water treatment facility to treat locally sourced brackish water for District use.	✓			New Local Supply	Upon completion of environmental and regulatory requirements As needed	Semitropic GSA Board Meetings & Website	CEQA	**As needed**	Current	2040	2040-	**1,800**	**0**	✓		✓			Local brackish water	District authorities	$0	$900,000	District
SWSD-15	**In-District Water Markets and Transfers**	District will allow for the development of market for in-district transfers.	✓			Exercise of Rights Supplemental Water Use	As needed	Semitropic GSA Board Meetings & Website	TBD	**As needed**	As needed	2040	2040-	**TBD**	**0**			✓			SWP, Friant, Kern River, CVP and other imported and local sources.	District / SGMA authorities	TBD	$25,000	District
SWSD-16	**Landowner Water Budgets**	Establish individual water budgets for landowners by landowner classes. Implemented to reduce District's demand to	✓	✓	✓	Demand Reduction	Establish water budgets by landowner	Semitropic GSA Board Meetings & Website	CEQA	**Implemented**	Complete	Complete	2017	**0**	**132,000**			✓	✓		NA	District / SGMA authorities	$0	$250,000	District
KSB-2	**Coordination with Groundwater Regulatory Programs**	Coordination with various water quality regulatory programs by local, state, and federal agencies. Some of these programs include the Irrigated Lands Regulatory Program, SAFER projects, Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS), as well as local Groundwater Banking MOU's.	✓	✓			When domestic or small community wells require assistance maintaining access to safe and reliable water supplies.	Refer to Subbasin Outreach and Engagement Plan	NA	**Implemented**	NA	2020	2020-	**0**	**0**	✓				✓	NA	NA	$0	$25,000	District
KSB-3	**Exceedance Policy**	Subbasin wide policy to provide protocols for groundwater GSAs to investigate exceedances. This policy is developed in conjunction with the Subbasin Well Mitigation Program which identifies mitigation strategies for vulnerable communities.	✓	✓	✓		When an MT exceedance occurs for any sustainability indicator.	NA	NA	**Implemented**	NA	2024	2024-	**0**	**0**				✓	✓	NA		$0	$25,000	District

Table BP-14-2. SWSD GSA Projects and Management Actions (continued)

P/MA Number	P/MA Name	Summary Description	Relevant Sustainability Indicators Affected			Overdraft Correction Description Category	Circumstances for Implementation	Public Noticing Process	Permitting and Regulatory Process Requirements	Status	Timetable / Circumstances for Initiation	Timetable for Completion	Timetable for Accrual of Expected Benefits	Expected Benefits							Source(s) of Water, if applicable	Legal Authority Required	Estimated Costs		
														Primary (AFY)		Secondary									
			Groundwater Levels & Storage	Groundwater Quality	Land Subsidence									Water Supply Augmentation	Demand Reduction	Water Quality Improvement	Flood Control	Water Management Flexibility / Efficiency	Mitigation Programs	Data Gap Filling/ Monitoring			One-time Costs	Ongoing Costs (per year)	Potential Funding Source(s)
Projects		Implemented / Functional / In-Process	As-Needed										Implemented	Functional		In-Process				As-Needed				
KSB-4	**Coordination with Basin Study**	Coordination with local GSA's to gain a better understanding of the Kern Subbasin and how best to manage for sustainability, native yield, subsurface flow, and evapotranspiration. The further development of the data management system to improve data access and transparency.	✓	✓	✓		Supporting data collection, reviewing and validating results with GSA-specific data.	NA	NA	**Ongoing**	NA	2025	2025-	**0**	**0**					✓	NA	NA	$25,000	$0	District
SWSD-17	**Tiered Pricing for Groundwater Pumping**	Develop pricing structure to incentivize groundwater users to manage groundwater extractions to SWSD-16 landowner budgets.	✓	✓	✓	Demand Reduction	Implementation of SWSD-16	Semitropic GSA Board Meetings & Website	218 Process	**Ongoing**	Current	2025	2025-	**0**	**33,000**			✓	✓		NA	District / SGMA authorities	$100,000	$25,000	District
KSB-5	**Domestic Well Mitigation**	Development of a subbasin domestic and small community well mitigation program to assist with financial aspects of emergency water supplies and well improvement and replacment due to lowering of groundwater levels.	✓	✓			When declining groundwater levels impact domestic or small community wells.	Refer to Subbasin Outreach and Engagement Plan	NA	**Initiating Development**	NA	2025	2025-	**0**	**0**				✓		NA	NA	$0	$45,000	District
KSB-7	**Well Registry**	Maintain and improve 2024 Subbasin well inventory in the DMS platform with added data from field surveys, current beneficial use determinations, and coordination with Kern County Environmental Health and DWR to track new wells, etc.	✓	✓	✓			Refer to Subbasin Outreach and Engagement Plan	NA	**Ongoing**	NA	2024-	2024-	**0**	**0**				✓	✓	NA	NA	$0	$25,000	District
KSB-8	**Consumptive-Use Study**	Maintain and improve existing Subbasin consumptive-use study (ITRC Metric/LandIQ) for accurate estimates of water use by parcel within GSA's.	✓	✓	✓			Refer to Subbasin Outreach and Engagement Plan	NA	**Ongoing**	NA	2020-	2020-	**0**	**0**				✓	✓	NA	NA	$0	$25,000	District
SWSD-18	**District Fallowing Program**	Support land fallowing as a District action and by individual landowners or groups of landowners.	✓	✓	✓	Demand Reduction	Implementation of SWSD-16	Semitropic GSA and District Board CEQA compliant process	CEQA	**As needed**	Current	2040	2040-	**0**	**TBD**			✓	✓			District authorities	TDB	$0	District

Demand Reduction P/MAs are the primary means for achieving the sustainability goals as represented by the "Glide Path" for the SWSD GSA that will result in closing the currently identified "projected deficit" of 136,040 AFY under the 2030 Climate Change Scenario by the January 2040 GSP implementation deadline.

Many of the remaining projects and management actions identified in **Table BP-14-2** are designed to increase the GSA's supplemental water supplies to support the economic viability of agriculture and to maintain the sustainability of water supplies for non-agricultural beneficial users, primarily domestic users. To the extent that the SWSD GSA successfully augments its supplemental water supply, the Landowner Water Budgets (Management Action SWSD-16) will be adjusted accordingly.

P/MAs either being Implemented, In-Process or As-Needed that contribute to water demand reduction are described in this section.

Demand Reduction P/MAs Implemented After Passage of SGMA and Prior to Adoption of GSP

The SWSD GSA has already implemented programs to limit/discourage continued development of additional irrigated lands dependent on groundwater. The intent of these programs is to limit additional dependence on groundwater resources. With the passage of Assembly Bill 453 in 2016, the SWSD GSA enacted two early implementation programs for the purpose of achieving sustainability as mandated by SGMA, the New Lands Surcharge Program and the SGMA Basin Sustainability Charges/Credits Program. These two programs were implemented in 2017 and continued through 2021, after which they were replaced with Management Action SWSD-16 The Landowner Water Budgets Program. The New Lands Surcharge and the SGMA Basin Sustainability Charges/Credits programs are briefly described below.

- New Lands Surcharge Program: Any new land developed after July 1, 2017 would be charged $500/AF of consumptive use greater than the allocated native groundwater yield associated with the property. The purpose of the new land surcharge is to collect funds such that the SWSD GSA may purchase water to offset the consumptive use associated with the new development which exceeds the native groundwater yield and to avoid adding to the collective overdraft condition of the Subbasin in accordance with the provisions of the SGMA.
- SGMA Basin Sustainability Charges/Credits: A program whereby the SWSD utilizes remote sensed data to determine the consumptive use (as ET) for each parcel and the aggregate consumptive use by Landowner of Record in the SWSD GSA. The consumptive use for an irrigated parcel is compared to the average consumptive use of all irrigated fields in the SWSD GSA. If the consumptive use for a single parcel is more than the average, then the parcel is levied a charge (the basin sustainability charge). If the consumptive use of a

parcel is less than the average, then the parcel is due a credit (the basin sustainability credit). The basin sustainability charges and credits were calculated as follows:

- Basin Sustainability Charge = (General Project Service Charge) ÷ (Average consumptive use (ET) as AF/ac) x 1.5
- Basin Sustainability Credit = (General Project Service Charge) ÷ (Average consumptive use (ET) as AF/ac) x 1.0
- The General Project Service Charge (GPSC) is an assessment levied by the SWSD on all lands developed with a reliance upon groundwater, the current GPSC as of 2023 is $137.90 per parcel acre.

From 2015 to 2024 there has been a reduction of approximately 15,000 irrigated acres in the SWSD GSA and continued changes in crop selection. The reduction of irrigated acreage and the change of crop selection have resulted in an overall water demand reduction of approximately 42,400 acre-feet (2015 to 2023) thereby reducing the collective reliance upon groundwater pumping.

The implementation of Management Action SWSD-16 (Landowner Water Budgets) replaced this program in 2022.

Additionally, the SWSD GSA has implemented a number of projects and management actions aimed at increasing conjunctive use within the SWSD GSA and reducing the overall demand on local groundwater resources. These projects include:

- Land fallowing
- Banking water on behalf of the SWSD
- Cap on third party banking obligations
- Expansion of SWSD recharge facilities
- Expansion of SWSD in-lieu distribution – not associated with third party banking obligations

Demand Reduction P/MA's Implemented After Adoption of GSP (2020)

SWSD-16 Landowner Water Budgets – An important aspect of managing the SWSD GSA's local groundwater resources is understanding the quantities of surface water and groundwater available to individual landowners in the SWSD GSA and how managing those resources over time will lead to sustainable groundwater management. The SWSD GSA adopted SWSD-16 – Landowner Water Budgets as the principal Management Action to achieve sustainability.

The Program consists of allocating the surface water and groundwater supplies of the SWSD to each unique parcel according to their Land Class and level of contractual

participation in the SWP and/or the SWSD's Project as funded by the General Project Service Charge (GPSC)[1] and Special GPSC. The Program includes a Temporary Consumptive-Use Allowance (TCA) for each parcel consisting of a temporary water supply allocation to meet 100% of the consumptive use of irrigated crops or managed habitats for year 2020. The TCA will be incrementally reduced each year until 2040, when the TCA will be zero for all parcels such that the aggregate consumptive use of the remaining irrigated crops and management habitat will equal the sustainable water supply of the SWSD.

Landowner Water Budgets
Landowner Water Budgets are defined as the aggregated water budget for each parcel under common ownership considering the land classes and associated water supplies.

Land Classes
All parcels or portions of parcels within the SWSD GSA can be categorized into four categories depending on their level of contractual participation in SWSD water supply programs and land use practices. The amount of surface water available to each parcel is established by the landowner's contractual agreement with the SWSD.

The broad categories of Land Classes are:

- **Contract Lands and GPSC**: Lands which have an existing contract with SWSD to receive SWP contract supplies (Table A or Contract Water supplies) and are paying GPSC assessments.
- **Groundwater Service Area GPSC:** Lands paying GPSC and not receiving SWP contract supplies (Table A).
- **Special GPSC (Duck Clubs):** Lands paying a reduced GPSC, typically Duck Clubs.
- **District "White Lands":** Lands within the boundaries of the SWSD GSA which do not pay the GPSC or Special GPSC. Parcels or portions of parcels designated as White Lands have no access to SWSD water supplies and are only allocated Native Yield and precipitation.

In practice, landowners will likely have parcels that fall into multiple categories relative to the classification of each parcel owned by each landowner within SWSD GSA.

[1] The General Project Service Charge and Special General Project Service Charge is a property tax levied on all lands within the Semitropic Water Storage District which have been developed utilizing groundwater. The SWSD Project is the importation of surface water to reduce reliance upon the groundwater basin and includes the development of the groundwater banking program and construction of the surface water distribution system.

Water Supply Categories

Contract Water: Through the KCWA, the SWSD and its Buttonwillow Improvement District and Pond-Poso Improvement District have contracts for SWP Table A supplies delivered by the DWR. Those contracts collectively are for 155,000 AFY of Table A entitlement or Table A amount. This supply is distributed to SWSD GSA landowners with existing contracts with the SWSD for SWP Table A water and is referred to herein as "Contract Water." The quantity of Contract Water allocated to each parcel is determined in the contracts for agricultural water service between the SWSD's improvement districts and the landowner.

The stated average long-term reliability of the SWP is 56% (DWR, Delivery Capacity Report and Studies, 2021); therefore, the SWSD can expect to receive an average annual delivery of SWP Table A water of 86,800 AF. SWSD will distribute this average supply of Contract Water to contract landowners, according to their Contract Water allocation, each year relative to their annual consumptive use regardless of whether SWP deliveries are higher or lower than the long-term average. SWSD will be responsible for managing the overall Contract Water supply. The average long-term reliability of the SWP is subject to periodic update by the DWR. As this estimate is updated, the SWSD GSA will adjust Landowner Water Budgets accordingly.

Supplemental SWSD Supplies: This category is comprised of all water supplies acquired by the SWSD on behalf of all landowners paying the GPSC or the Special GPSC. These supplies will be allocated to each landowner proportional to what they pay in assessments as either the GPSC, Special GPSC or combination of GPSC and Special GPSC. This supply includes:

- Leave behind from third-party banked supplies,
- Article 21,
- Section 215,
- Dry year purchases, and
- Other water purchases.

As of 2023 the SWSD GSA has estimated the average annual supplemental water acquisitions to be 71,550 AFY. Based on this estimate and the assumption that SWSD will be able to make a similar level of supplemental water acquisitions in the future, each landowner's water budget includes a proportionate share of this supplemental water estimate. The SWSD will distribute this average supplemental water supply each year regardless of actual supplemental water acquisitions. In years where SWSD is able to acquire greater amounts of supplemental water, SWSD will conjunctively manage the amount of acquired supplemental supplies above the average for use in drier years. In years with below average supplemental water acquisitions, SWSD will provide the average delivery from previously recharged supplies. SWSD will be responsible for

managing the delivery of the estimated average annual supplemental supply. The Supplemental SWSD Supply will be reviewed and updated on an annual basis.

Native Groundwater Yield: This is the estimated amount of water available to each parcel of land from the Native Groundwater Yield of the Kern Subbasin and precipitation available to meet consumptive use. The Native Groundwater Yield of the Kern Subbasin is estimated to be 0.15 acre-feet per acre per year and is applied to the shape acres associated with each parcel. The Native Groundwater Yield of the Kern Subbasin has been estimated based on current available data and in coordination with all GSAs in the Kern Subbasin and is subject to future revision. The Native Groundwater Yield is subject to periodic review and update.

Precipitation: Precipitation is estimated to be 0.46 acre-feet per acre based on a 10-year average using the CDEC WSC Gauge (2014-2023) and five (5) SWSD gauges (2023). It is applied to only the parcel or portion of a parcel paying either the GPSC, the Special GPSC, or in a few instances the aggregate of both the GPSC and Special GPSC. For a parcel however, it is identified as a supply component to offset the consumptive use (ET) of the parcel. Precipitation is not allocated to District White Lands as an identified supply as it is inferred that for white lands the precipitation is offset by the consumptive use (ET) of the property. Estimated precipitation will be reviewed and updated annually.

Temporary Consumptive Use Allowance (TCA): The TCA has been established by the SWSD GSA such that on average no individual parcel will be short of a water supply necessary to meet their consumptive use demand at the initiation of the SGMA implementation period, 2020. The TCA is available for the consumptive use on the parcel for which it has been allocated for a given year or any other parcel under common ownership by a landowner. Any unused TCA is not transferable between unique landowners and may not be accrued or carried over as a supply for future use. Furthermore, it is not the intent of the SWSD GSA for the TCA to be a landowner asset, but rather to be used as a tool of the GSA to gradually reduce groundwater overdraft over the 20-year SGMA implementation period with the TCA being reduced to 0 by 2040 and will be 0 from 2040 forward on all lands within the SWSD GSA.

The initial TCA will be allocated to each parcel such that the total water supply available to the parcel at the beginning of the implementation period is equivalent to 4.2 acre-feet per acre for lands paying the GPSC and the Special GPSC. District White Lands or currently undeveloped/ unirrigated lands that are not paying either the GPSC or the Special GPSC will not receive a TCA.

Example Water Budgets
All landowners in the SWSD GSA will receive a water budget based on their individual contractual agreement with SWSD for either SWP supplies or the GPSC to meet the consumptive use or crop evapotranspiration (ET) of their properties.

The following tables and figures provide example Landowner Water Budgets for the following land classes: Contract Lands with GSPC (**Figure BP-14-2** and **Table BP-14-3**), Groundwater Service Area with GPSC (**Figure BP-14-3** and **Table BP-14-4**), and Special GPSC (Duck Clubs) (**Figure BP-14-4** and **Table BP-14-5**). Lands classified as "District White Lands" will also receive a Landowner Water Budget; however, the only water supply available to these properties is the Native Groundwater Yield which is currently assumed to be 0.15 acre-feet per acre and precipitation.

Enforcement of Water Budgets
The SWSD GSA will impose the following penalty structure to enforce adherence to Landowner Water Budgets, until which time Management Action SWSD-17 Tiered Pricing Structure is adopted. Management Action SWSD-17 Tiered Pricing Structure is anticipated to be adopted through a Proposition 218 process in 2025.

SGMA provided GSAs with two types of SGMA penalties to enforce compliance with the GSA's GSP. These two penalties are:

- Section 10732, Subdivision (a)(1): "A person who extracts groundwater in excess of the amount that person is authorized to extract under a rule, regulation, ordinance, or resolution adopted [by the GSA], shall be subject to a civil penalty not to exceed five hundred dollars ($500) per acre-foot extracted in excess of the amount that person is authorized to extract."
- Section 10732, Subdivision (b)(1): "A person who violates any rule, regulation, ordinance, or resolution adopted [by the GSA] shall be liable for a civil penalty not to exceed one thousand dollars ($1,000) plus one hundred dollars ($100) for each additional day on which the violation continues if the person fails to comply within 30 days after the local agency has notified the person of the violation."

Therefore, any landowner who at the end of the calendar year has an aggregated consumptive use which exceeds the landowners aggregated annual consumptive use water budget will be charged $500 per acre-foot for each acre-foot or portion of an acre-foot of consumptive use in excess of the annual Total Consumptive Use Budget, as provided in their Landowner Water Budget Statement. Such charge will be invoiced by the SWSD GSA, and the landowner will be afforded 45-days to pay the charge.

If after 45-days the landowner has not paid the $500 per acre-foot charge, then the landowner will also incur an additional penalty of $1,000 plus $100 dollars for each additional day the invoice for the $500 per acre-foot charge remains unpaid.

The funds collected will be used for acquiring a water supply to mitigate the landowner's exceedance.

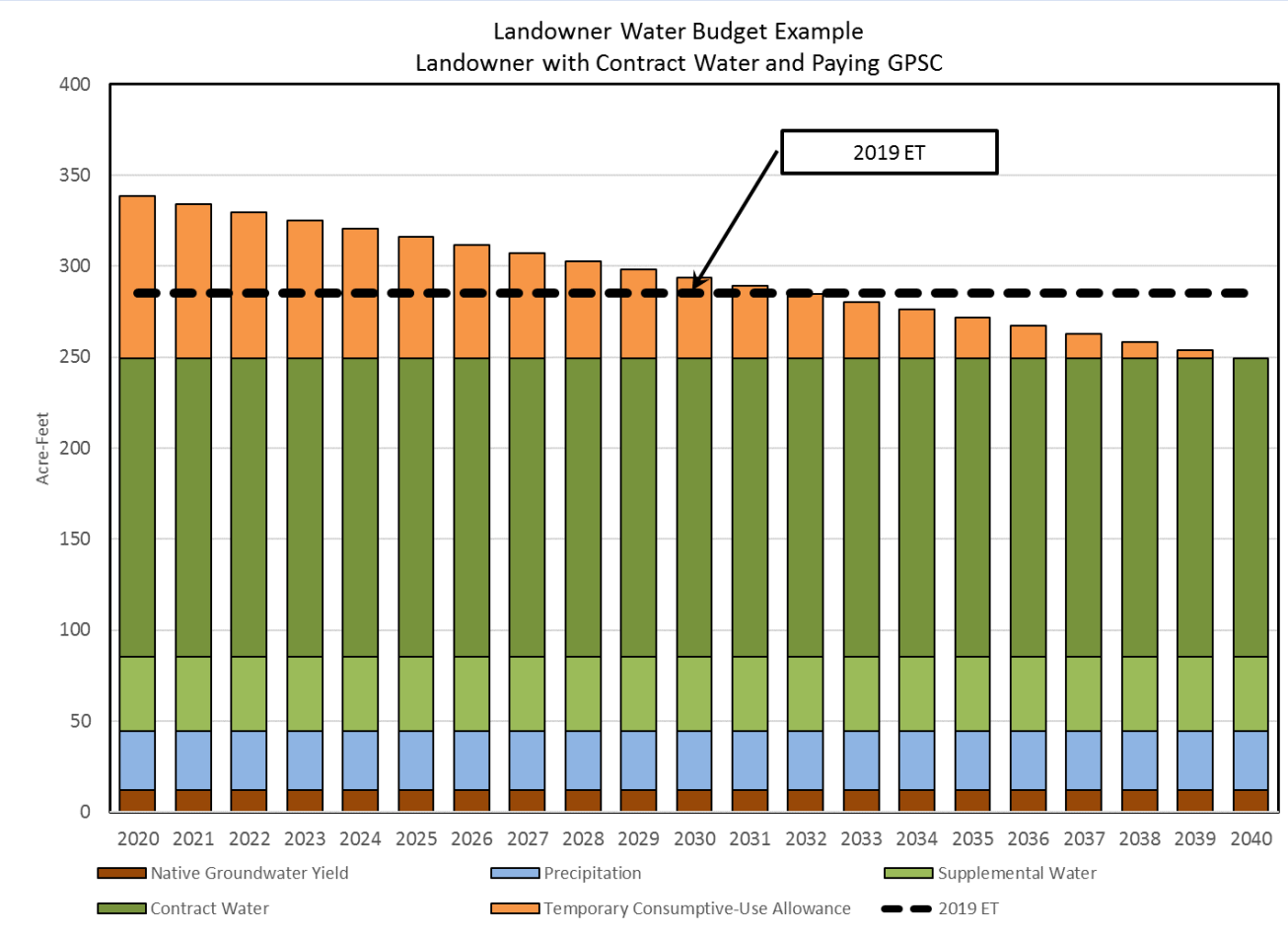


Figure BP-14-2. Example Water Budget for Landowner with SWP Contract Lands and Paying GPSC

Table BP-14-3. Example Water Budget for Landowner with SWP Contract Lands and Paying GPSC

2020 LANDOWNER WATER BUDGET

Prepared August 2021

Landowner:	Landowner -Contract and GPSC		**Contract Water**	
Shape GIS Acres:	81.50		Contract Entitlement:	282.28
Parcel Acres:	80.65		Est LT Reliability:	58%
Developed Acres:	80.65			163.72

	AF	AF/Parcel Ac
2020 Et (All Lands):	285.06	
2020 Et (Developed Lands):	285.06	3.53

			Native Supply					
Calendar Year	Contract Water (AF)	Supplemental Water (AF)	Native Groundwater Yield (AF)	Precipitation (AF)	Base Supply (AF)	Temporary Consumptive-Use Allowance (AF)	Total Consmptive Use Budget (AF)	Total Consmptive Use Budget (AF/Ac)
2020	163.72	41.19	12.23	31.99	249.13	89.60	338.73	4.20
2021	163.72	41.19	12.23	31.99	249.13	85.12	334.25	4.14
2022	163.72	41.19	12.23	31.99	249.13	80.64	329.77	4.09
2023	163.72	41.19	12.23	31.99	249.13	76.16	325.29	4.03
2024	163.72	41.19	12.23	31.99	249.13	71.68	320.81	3.98
2025	163.72	41.19	12.23	31.99	249.13	67.20	316.33	3.92
2026	163.72	41.19	12.23	31.99	249.13	62.72	311.85	3.87
2027	163.72	41.19	12.23	31.99	249.13	58.24	307.37	3.81
2028	163.72	41.19	12.23	31.99	249.13	53.76	302.89	3.76
2029	163.72	41.19	12.23	31.99	249.13	49.28	298.41	3.70
2030	163.72	41.19	12.23	31.99	249.13	44.80	293.93	3.64
2031	163.72	41.19	12.23	31.99	249.13	40.32	289.45	3.59
2032	163.72	41.19	12.23	31.99	249.13	35.84	284.97	3.53
2033	163.72	41.19	12.23	31.99	249.13	31.36	280.49	3.48
2034	163.72	41.19	12.23	31.99	249.13	26.88	276.01	3.42
2035	163.72	41.19	12.23	31.99	249.13	22.40	271.53	3.37
2036	163.72	41.19	12.23	31.99	249.13	17.92	267.05	3.31
2037	163.72	41.19	12.23	31.99	249.13	13.44	262.57	3.26
2038	163.72	41.19	12.23	31.99	249.13	8.96	258.09	3.20
2039	163.72	41.19	12.23	31.99	249.13	4.48	253.61	3.14
2040	163.72	41.19	12.23	31.99	249.13	0.00	249.13	3.09

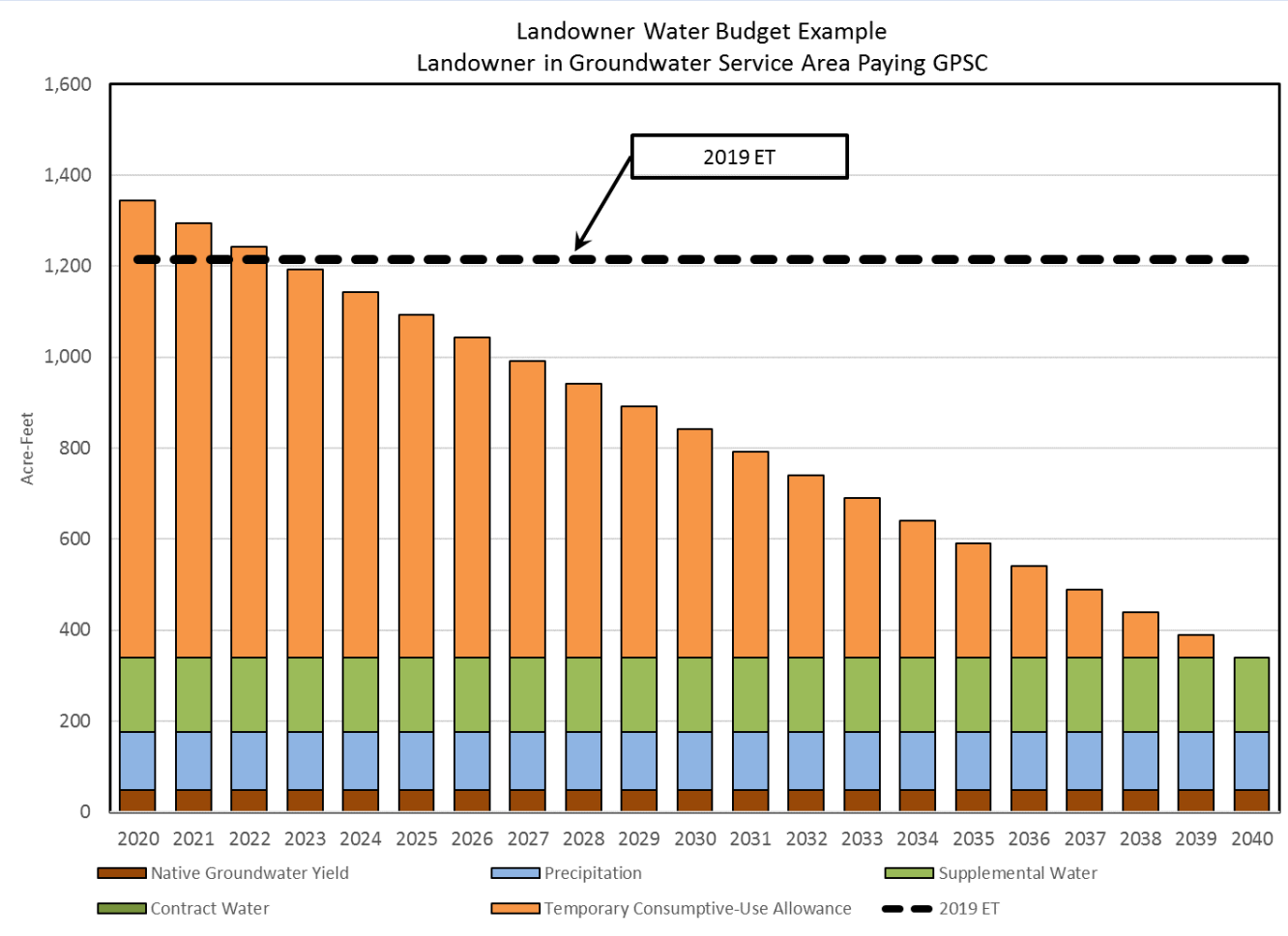


Figure BP-14-3. Example Water Budget for Landowner in Groundwater Service Area and Paying the GPSC

Table BP-14-4. Example Water Budget for Landowner in Groundwater Service Area and Paying the GPSC

2020 LANDOWNER WATER BUDGET

Prepared August 2021

Landowner: Landowner GRD WTR + GPSC
Shape GIS Acres: 322.09
Parcel Acres: 320.00
Developed Acres: 320.00

Contract Water
Contract Entitlement: -
Est LT Reliability: 58%
-

	AF	AF/Parcel Ac
2020 Et (All Lands):	1,215.15	
2020 Et (Developed Lands):	1,215.15	3.80

			Native Supply					
Calendar Year	Contract Water (AF)	Supplemental Water (AF)	Native Groundwater Yield (AF)	Precipitation (AF)	Base Supply (AF)	Temporary Consumptive-Use Allowance (AF)	Total Consmptive Use Budget (AF)	Total Consmptive Use Budget (AF/Ac)
2020	-	163.43	48.31	126.94	338.69	1,005.31	1,344.00	4.20
2021	-	163.43	48.31	126.94	338.69	955.05	1,293.73	4.04
2022	-	163.43	48.31	126.94	338.69	904.78	1,243.47	3.89
2023	-	163.43	48.31	126.94	338.69	854.52	1,193.20	3.73
2024	-	163.43	48.31	126.94	338.69	804.25	1,142.94	3.57
2025	-	163.43	48.31	126.94	338.69	753.98	1,092.67	3.41
2026	-	163.43	48.31	126.94	338.69	703.72	1,042.41	3.26
2027	-	163.43	48.31	126.94	338.69	653.45	992.14	3.10
2028	-	163.43	48.31	126.94	338.69	603.19	941.87	2.94
2029	-	163.43	48.31	126.94	338.69	552.92	891.61	2.79
2030	-	163.43	48.31	126.94	338.69	502.66	841.34	2.63
2031	-	163.43	48.31	126.94	338.69	452.39	791.08	2.47
2032	-	163.43	48.31	126.94	338.69	402.13	740.81	2.32
2033	-	163.43	48.31	126.94	338.69	351.86	690.55	2.16
2034	-	163.43	48.31	126.94	338.69	301.59	640.28	2.00
2035	-	163.43	48.31	126.94	338.69	251.33	590.02	1.84
2036	-	163.43	48.31	126.94	338.69	201.06	539.75	1.69
2037	-	163.43	48.31	126.94	338.69	150.80	489.48	1.53
2038	-	163.43	48.31	126.94	338.69	100.53	439.22	1.37
2039	-	163.43	48.31	126.94	338.69	50.27	388.95	1.22
2040	-	163.43	48.31	126.94	338.69	(0.00)	338.69	1.06

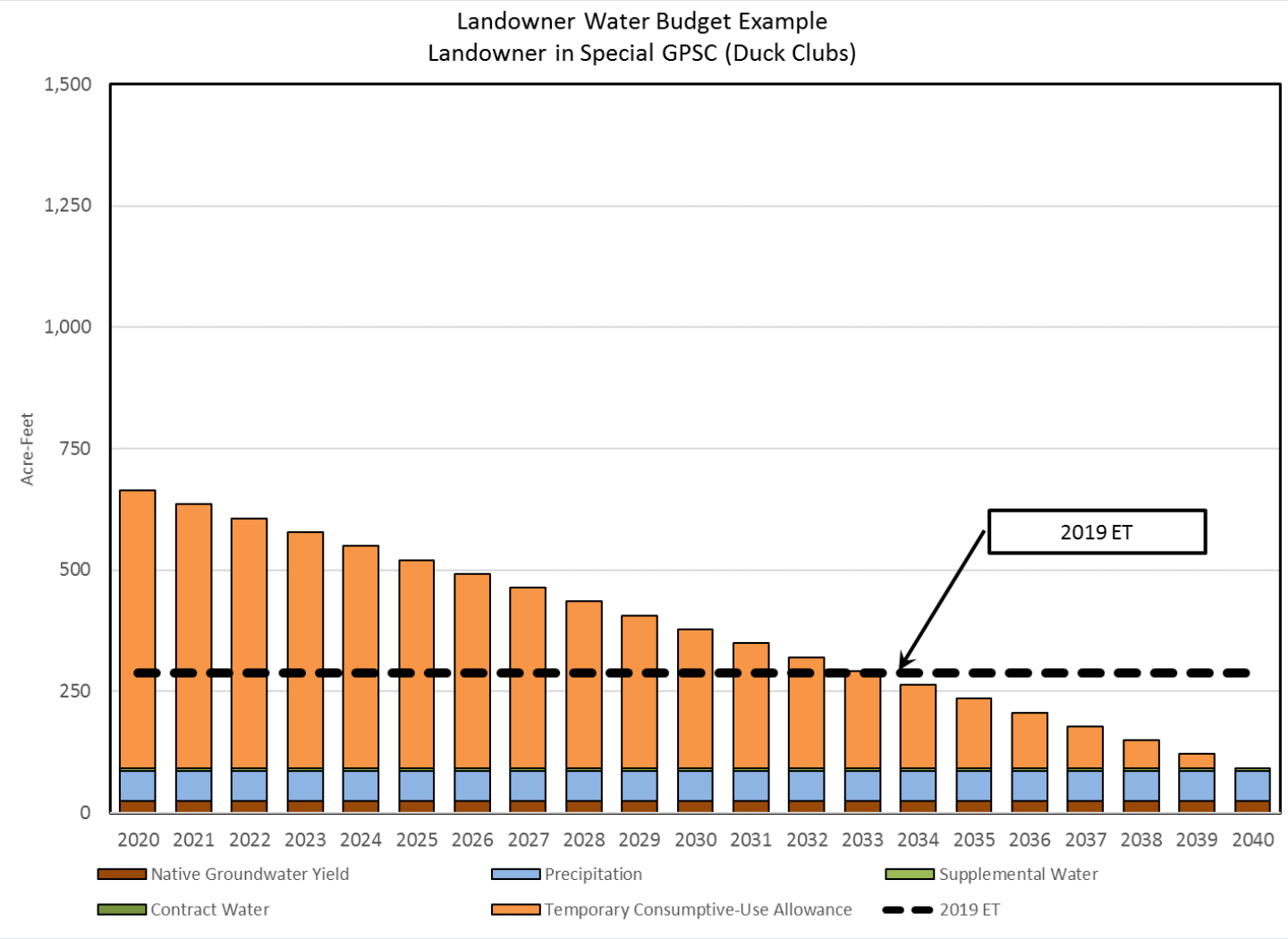


Figure BP-14-4. Example Water Budget for Landowner Paying Special GPSC (Duck Clubs)

Table BP-14-5. Example Water Budget for Landowner Paying Special GPSC (Duck Clubs).

2020 LANDOWNER WATER BUDGET

Prepared August 2021

Landowner:	Landowner - Special GSPC		Contract Water	
Shape GIS Acres:	161.14		Contract Entitlement:	-
Parcel Acres:	157.99		Est LT Reliability:	58%
Developed Acres:	157.99			-
	AF	AF/Parcel Ac		
2020 Et (All Lands):	287.88			
2020 Et (Developed Lands):	-	-		

			Native Supply					
Calendar Year	Contract Water (AF)	Supplemental Water (AF)	Native Groundwater Yield (AF)	Precipitation (AF)	Base Supply (AF)	Temporary Consumptive-Use Allowance (AF)	Total Consmptive Use Budget (AF)	Total Consmptive Use Budget (AF/Ac)
2020	-	5.50	24.17	62.67	92.35	571.21	663.56	4.20
2021	-	5.50	24.17	62.67	92.35	542.65	635.00	4.02
2022	-	5.50	24.17	62.67	92.35	514.09	606.44	3.84
2023	-	5.50	24.17	62.67	92.35	485.53	577.88	3.66
2024	-	5.50	24.17	62.67	92.35	456.97	549.32	3.48
2025	-	5.50	24.17	62.67	92.35	428.41	520.75	3.30
2026	-	5.50	24.17	62.67	92.35	399.85	492.19	3.12
2027	-	5.50	24.17	62.67	92.35	371.29	463.63	2.93
2028	-	5.50	24.17	62.67	92.35	342.73	435.07	2.75
2029	-	5.50	24.17	62.67	92.35	314.17	406.51	2.57
2030	-	5.50	24.17	62.67	92.35	285.61	377.95	2.39
2031	-	5.50	24.17	62.67	92.35	257.05	349.39	2.21
2032	-	5.50	24.17	62.67	92.35	228.48	320.83	2.03
2033	-	5.50	24.17	62.67	92.35	199.92	292.27	1.85
2034	-	5.50	24.17	62.67	92.35	171.36	263.71	1.67
2035	-	5.50	24.17	62.67	92.35	142.80	235.15	1.49
2036	-	5.50	24.17	62.67	92.35	114.24	206.59	1.31
2037	-	5.50	24.17	62.67	92.35	85.68	178.03	1.13
2038	-	5.50	24.17	62.67	92.35	57.12	149.47	0.95
2039	-	5.50	24.17	62.67	92.35	28.56	120.91	0.77
2040	-	5.50	24.17	62.67	92.35	(0.00)	92.35	0.58

SWSD-17 Tiered Pricing for Groundwater Pumping – After adoption of the 2020 GSP, the SWSD GSA initiated development of the tier pricing structure identified as Management Action SWSD-17 Tiered Pricing for Groundwater Pumping. SWSD-17 is structured to further reinforce the Landowner Water Budgets SWSD-16. The tiered pricing structure creates a rate structure such that if a landowner's consumptive use (ET) includes the use of their TCA or exceeds their annual Total Consumptive Use Water Budget, as provided in the Landowner Water Budgets, then fees would be charged to incentivize adherence to the water budgets and such fees would be used by the SWSD GSA to mitigate potential impacts to domestic wells in the GSA and to fund projects and management actions including the acquisition of supplemental water supplies.

This tiered water rate structure has been developed in coordination with the Tiered Water Rate Structure technical memorandum developed by GEI Consultants (April 2022) with the support of M.Cubed, an economic consultant retained to develop recommendations for proposed tiered rates. This tiered structure allocates the tiered rates developed by M.Cubed to the usage of TCA or Total Consumptive Use in relation to a landowners Total Consumptive Use Budget, as shown in **Figure BP-14-5** and described below.

Tier 0
Tier 0 will apply to all landowners who utilize any portion of their allocated TCA to meet the consumptive use demand on their properties. The charges in Tier 0 will support the mitigation of potential impacts to domestic users within the SWSD GSA and neighboring management areas if the actions of SWSD GSA are found to contribute to an exceedance or exceedances. The charge at Tier 0 will be carried forward into all subsequent tiers to support potential mitigation needs.

The charge for Tier 0 is a charge of $5.00 per acre-foot for any usage of a landowner's allocated TCA.

Tier 1
Tier 1 conditions will apply when a landowner is utilizing any portion of their TCA and the SWSD Improvement District[2] in which the landowner is located is below the Measurable Objective established in the SWSD GSA Improvement District Plan. The threshold for determining if groundwater levels within the SWSD Improvement District are below the Measurable Objective is when 40% or more of the Representative Monitoring Wells over four consecutive bi-annual SGMA required monitoring periods within the SWSD Improvement District are below the established Measurable Objective value.

[2] SWSD has two improvement districts, the Shafter Wasco Improvement District and the Buttonwillow Improvement District.

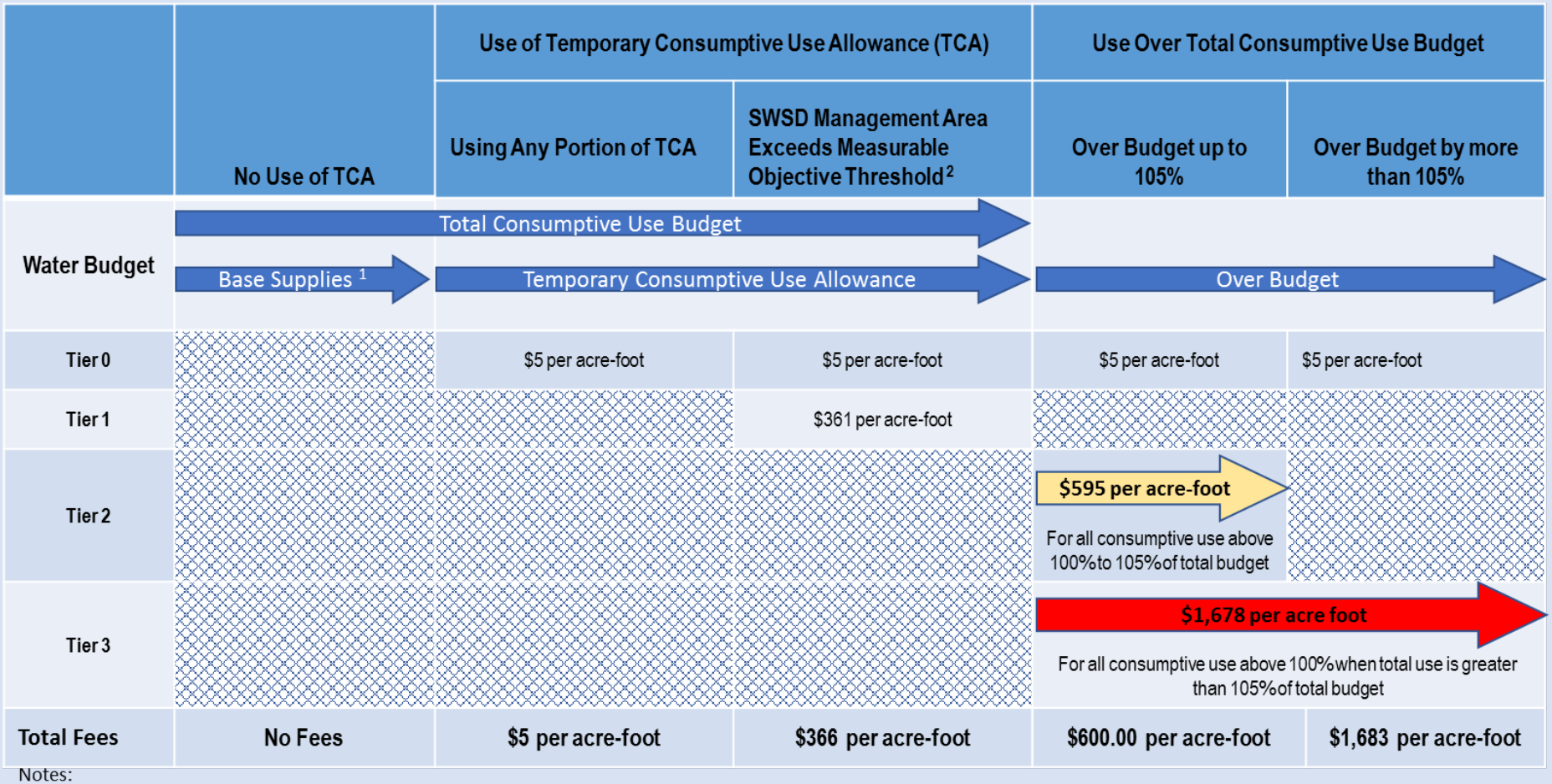
The charge for Tier 1 is up to $321.00 per acre-foot for any usage of the landowners TCA when Tier 1 conditions exist, plus the $5 per acre-foot charge for Tier 0.

Tier 2
Tier 2 conditions apply when a landowner's total consumptive use exceeds their Total Consumptive Use Budget, as established by the SWSD GSA, by up to 5.0%, or up to 105% of the Total Consumptive Use Budget. When Tier 2 conditions apply, the landowner is only responsible for charges in Tier 2 and Tier 0. The Tier 2 charge applies to the quantity of water consumed above a landowner's respective water budget, up to 105% of that respective budget.

The charge for Tier 2 is up to $595.00 per acre-foot for any consumptive use above the landowner's Total Consumptive Use Budget up to 105% over that respective budget plus the $5 per acre-foot charge for Tier 0.

Tier 3
Tier 3 conditions apply when a landowner's total consumptive use exceeds their Total Consumptive Use Budget, as established by the SWSD GSA, by more than 5.0%, or more than 105% of the Consumptive Use Budget. When Tier 3 conditions apply, the landowner is only responsible for charges in Tier 3 and Tier 0. The Tier 3 charge applies to the quantity of water consumed above 105% of a landowner's respective water budget.

The charge for Tier 3 is up to $1,678.00 per acre-foot and applies to all consumptive use above the landowner's Total Consumptive Use Budget when the landowners total consumptive use is greater than 100% of its budget, plus the $5 per acre-foot charge for Tier 0.



Notes:

1 – Base supplies include SWP contract allocations, supplemental water supplies, native groundwater yield and precipitation as specified in each landowner water budget statement

2 – Exceedance of the SWSD Measurable Objective Threshold is equal to the exceedance of measurable objective values in 40% of representative monitoring wells in a single SWSD management area for 4 consecutive monitoring periods.

Figure BP-14-5. Tiered Pricing Structure Diagram

SWSD-18 District Fallowing Program – The intent of SWSD-18 District Fallowing Program is to support the fallowing of up to 39,000 acres over the 20-year SGMA implementation period. The SWSD GSA land fallowing program supports land fallowing as an SWSD GSA action, and action by an individual landowner, groups of landowners, or a combination thereof. An objective of the program is a reduction in consumptive use required to reduce or eliminate SWSD GSA's estimated water budget deficit of approximately 136,040 AFY. If achieved through land fallowing alone, this would result in the fallowing of between 32,650 and 44,250 acres of irrigated lands, if no additional water supplies can be developed to offset this deficit. The range of potentially fallowed lands is based on a range of per acre consumptive use (measured as crop evapotranspiration (Et)) of 3.8 to 2.8 acre-feet per acre of currently irrigated lands. As of 2024, the SWSD has worked with landowners to fallow approximately 15,000 acres of irrigated land (**Figure BP-14-6**).

However, it is the intent of the SWSD GSA to work with its landowners to continue to develop new and enhanced supplemental water supply projects, and to the extent possible, maintain as many irrigated acres within the SWSD GSA as economically viable while also meeting the sustainability goal of the Kern Subbasin. As needed, the SWSD GSA will initiate environmental and regulatory compliance efforts for other projects and management actions that enhance SWSD's supplemental water supplies.

The implementation of SWSD 16,17, and 18, the primary management actions undertaken by the SWSD GSA to achieve sustainability, has resulted in a decrease in both irrigated acres and consumptive use demand. Demand management actions began in 2015, when the SWSD GSA imposed a New Lands Surcharge Fee, for all newly developed agricultural lands. This program, coupled with the above identified Management Actions, have established a downward trend in both irrigated acres and total consumptive use demand in the GSA. **Figure BP-14-6** shows the declining trend of irrigated acres in the SWSD GSA since 2015. As this figure shows landowners have been actively reducing irrigated acres in response to the SWSD GSA's demand management actions, primarily the establishment of landowner water budgets. **Figure BP-14-7** shows the corresponding reduction of total consumptive use demand in the GSA, resulting from a reduction of irrigated acres. The SWSD GSA estimates that it can support a consumptive use demand of 251,500 AFY, based on available surface water supplies and the sustainable yield of groundwater in the Subbasin, this estimate is updated annually. This volume can support approximately 102,750 acres of irrigated lands. Based on the trends shown in **Figure BP-14-6** and **Figure BP-14-7**, the SWSD GSA will achieve sustainability before 2040.

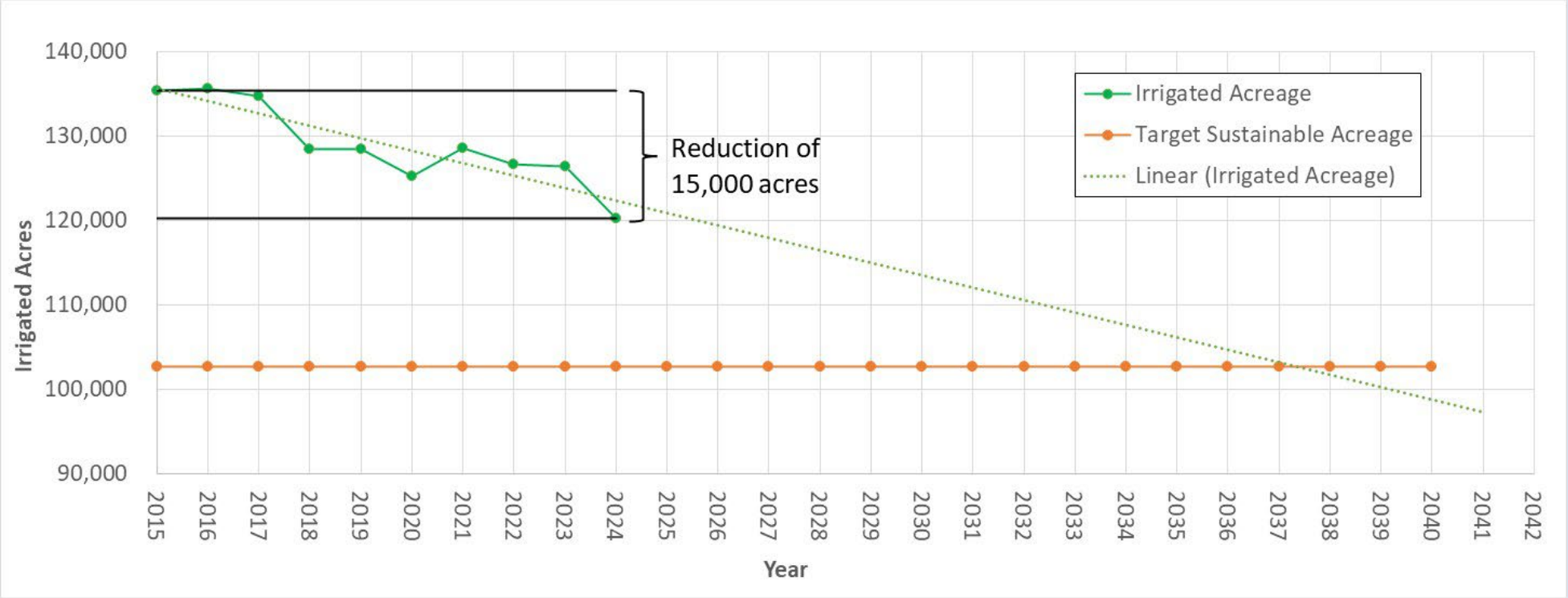


Figure BP-14-6. SWSD GSA Irrigated Acreage with Trend and Target Sustainability

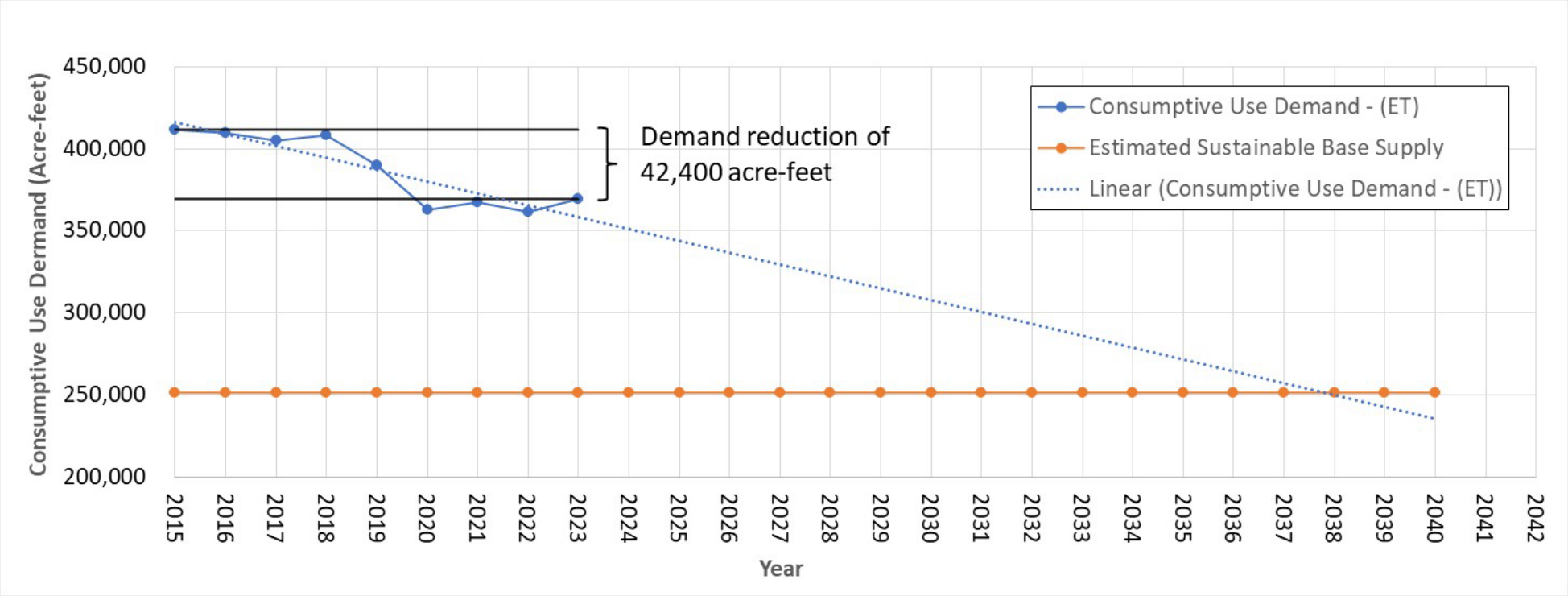


Figure BP-14-7. SWSD GSA Consumptive Use Demands with Trend and Target Sustainability