AGRICULTURAL WATER MANAGEMENT PLAN

Prepared Pursuant to Water Code Section 10826
FOR THE

North Kern Water Storage District

NKWSD
33380 Cawelo Ave
Bakersfield, CA 93308-9575
(661) 393-2696

Adopted in March 2026

Completed In Accordance With the

WATER CONSERVATION BILL OF 2018
(AB 1668 and SB 606)

Plan Checklist

The following is a checklist of plan contents drawn from the *DWR Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan*. This checklist shows where required plan elements are presented in the North Kern Agricultural Water Management Plan.

AWMP Requirement Checklist

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.I – yes	1.4	AWMP Required?	10820, 10608.12
Sec.I – yes	1.4	At least 25,000 irrigated acres	10853
Sec.I – NA	1.4	10,000- 25,000 irrigated acres and funding provided.	10853
Sec.I.C.2 – yes	1.4	April 1, 2026 update.	10820(a)
Sec.I.C.1 - yes	1.4.A.2	AWMP submitted to DWR no later than 30 days after adoption; AWMP submitted electronically	10820(a)(2)(B)
Sec.I.C.1 – yes	1.4 B	5-year cycle update.	10820(a)
Sec.I – NA	1.4 B	New agricultural water supplier after December 31, 2012 – AWMP prepared and adopted within 1 year.	10820(b)
Sec.I.C.1 – NA	1.6, 5	USBR water management/conservation plan:	10828(a)
Sec.I.C.1 – NA	1.6, 5.1	Adopted and submitted to USBR within the previous four years, AND	10828(a)(1)
Sec.I.C.1 – NA	1.6, 5.1	The USBR has accepted the water management/conservation plan as adequate.	10828(a)(2)
Sec.I.A – yes	1.4 B	UWMP or participation in area wide, regional, watershed, or basin wide water management planning: does the plan meet requirements of SBx7-7 2.8 **(use checklist)**	10829
Sec.I.A	3.1 A	Description of previous water management activities.	10826(d)
Sec.I.B.1 – yes	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
Sec.1.B.1	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841

AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
App A	3.1 B.2	Publicly-owned supplier: Prior to the hearing, was the notice of the time and place of hearing published within the jurisdiction of the publicly owned agricultural water supplier in accordance with Government Code 6066?	10841
App A	3.1 B.2	14 days notification for public hearing?	GC 6066
App A	3.1 B.2	Two publications in newspaper within those 14 days?	GC 6066
App A	3.1 B.2	At least 5 days between publications? (not including publication date)	GC 6066
Sec.I.C.1 – NA	3.1 B.2	Privately-owned supplier: was equivalent notice within its service area and reasonably equivalent opportunity that would otherwise be afforded through a public hearing process provided?	10841
Sec.I.C.1 – yes	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841
Sec.I.C.2	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after the adoption?	10843(a)
Sec.I.C.3 – yes	3.1 C.2	The department.	10843(b)(1)
Sec.I.C.3 – yes	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	10843(b)(2)
Sec.I.C.3- no	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	10843(b)(3)
Sec.1.C.3	3.1 C.3	Adopted AWMP availability.	10844
S.I.C.3 – no	3.1 C.3	Was the AWMP available for public review on the agricultural water supplier's website within 30 days of adoption?	10844(a)
Sec.I.C.3 – yes	3.1 C.3	If no website, was an electronic copy of the AWMP submitted to DWR within 30 days of adoption?	10844(b)
Sec.I.D – yes	3.1 D.1	Implement the AWMP in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	10842
Sec.II	3.3	Description of the agricultural water supplier and service area including:	10826(a)
Sec.II.A.1	3.3 A.1	Size of the service area.	10826(a)(1)
Sec.II.A.2	3.3 A.2	Location of the service area and its water management facilities.	10826(a)(2)
Sec.II.A.3	3.3 A.3	Terrain and soils.	10826(a)(3)
Sec.II.A.4	3.3 A.4	Climate.	10826(a)(4)

AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.II.B.1	3.3 B.1	Operating rules and regulations.	10826(a)(5)
Sec.II.B.2	3.3 B.2	Water delivery measurements or calculations.	10826(a)(6)
Sec.II.B.3	3.3 B.3	Water rate schedules and billing.	10826(a)(7)
Sec.II.B.4	3.3 B.4	Water shortage allocation policies and detailed drought plan	10826(a)(8) 10826.2
Sec.III	3.4	Water uses within the service area, including all of the following:	10826(b)(5)
Sec.III.A	3.4 A	Agricultural.	10826(b)(5)(A)
Sec.III.B	3.4 B	Environmental.	10826(b)(5)(B)
Sec.III.C	3.4 C	Recreational.	10826(b)(5)(C)
Sec.III.D	3.4 D	Municipal and industrial.	10826(b)(5)(D)
Sec.III.E	3.4 E	Groundwater recharge, including estimated flows from deep percolation from irrigation water applied, and seepage.	10826(b)(5)(E)
Sec.IV	3.5 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)
Sec.IV.A.1	3.5 A.1	Surface water supply.	10826(b)(1)
Sec.IV.A.2	3.5 A.2	Groundwater supply.	10826(b)(2)
Sec.IV.A.3	3.5 A.3	Other water supplies, including recycled water.	10826(b)(3)
Sec.IV.B	3.5 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
Sec.IV.B.1	3.5 B.1	Surface water supply.	10826(b)(1)
Sec.IV.B.2	3.5 B.2	Groundwater supply.	10826(b)(2)
Sec.IV.B.3	3.5 B.3	Other water supplies.	10826(b)(3)
Sec.IV.C	3.5 C	Source water quality monitoring practices.	10826(b)(4)
Sec V	3.6	Annual Water budget based on the quantification of all inflow and outflow components for the service area.	10826(c)
Sec V	3.7 C	Identify water management objectives based on water budget to improve water system efficiency.	10826(f)
Sec V		Quantify the efficiency of agricultural water use	10826(h)
Sec.VI	3.9	Analysis of climate change effect on future water supplies analysis.	10826(d)
Sec.VII	4	Water use efficiency information required pursuant to Section 10608.48.	10826(h)
		Information required pursuant to Section 10608.48.	

AWMP Requirement Checklist (cont.)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
Sec.VII.A	4.1	Implement efficient water management practices (EWMPs).	10608.48(a)
Sec.VIII	4.1 A	Implement Critical EWMP: Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).	10608.48(b)
Sec.VII.A	4.1 A	Implement Critical EWMP: Adopt a pricing structure for water customers based at least in part on quantity delivered.	10608.48(b)
Sec.VII.A	4.1 B	Implement additional locally cost-effective and technically feasible EWMPs.	10608.48(c)
Sec.VII.B	4.1 C	If applicable, document (in the report) the determination that EWMPs are not locally cost-effective or technically feasible.	10608.48(d)
Sec.VII.A	4.1 C	Include a report on which EWMPs have been implemented and planned to be implemented.	10608.48(d)
Sec.VII.A	4.1 C	Include (in the report) an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future.	10608.48(d)
NA	5	USBR water management/conservation plan may meet requirements for EWMPs.	10608.48(f)
Sec.VIII.D	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(2)(A)
Sec.VIII.A	6 B	Lack of technical feasibility (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(1)(B), §597.3(b)(2)(B)
Sec.VIII.B	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point).	CCR §597.3.b(2)(C)
Sec.VIII.A	6 C	Description of water measurement BPP.	CCR §597.4(e)(2)
Sec.VIII.C	6 D	Conversion of measurement to volume.	CCR §597.4(e)(3)
Sec.VIII.F.4	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan)	CCR §597.4(e)(4)

Table of Contents

List of Figures

List of Tables

List of Appendices (included as attachments)

List of Acronyms

AF	acre-feet
AWMP	Agricultural Water Management Plan
cfs	cubic feet per second
CAWSC	California Water Science Center
CIMIS	California Irrigation Management Information System
CCTAG	Climate Change Technical Advisory Group
CVC	Cross Valley Canal
CVP	Central Valley Project
CWC	California Water Commission
DCP	Drought Contingency Plan
District	North Kern Water Storage District
DMS	Data Management System
DP	Deep Percolation
DP_{aw}	Deep Percolation of applied water
DP_{pr}	Deep Percolation of precipitation
DWR	Department of Water Resources
EC	Electrical Conductivity
ET	Evapotranspiration
ET_{aw}	Evapotranspiration of applied water
ET_c	Crop evapotranspiration
ET_o	Reference evapotranspiration
ET_{pr}	Evapotranspiration of precipitation
EWMP	Efficient Water Management Practice
Executive Order	Governor's Executive Order B-29-15
FERC	Federal Energy Regulatory Commission
FKC	Friant Kern Canal
ID	Irrigation District
IDC	IWFM Demand Calculator
ILRP	Irrigated Lands Regulatory Program
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
IWFM	Integrated Water Flow Model
GHG	Greenhouse Gas
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
ITRC	Irrigation Training & Research Center
KCWA	Kern County Water Agency
LGA	Local Groundwater Assistance
M&I	Municipal and Industrial

MCL	Maximum Contaminant Level
MUD	Municipal Utility District
N/A	Not Applicable
NKWSD	North Kern Water Storage District
North Kern	North Kern Water Storage District
North Kern WSD	North Kern Water Storage District
ppm	parts per million
RCD	Resource Conservation District
RRID	Rosedale Ranch Improvement District
Rules and Regulations	Rules and Regulations for Distribution and Use of Water
RWMG	Regional Water Management Group
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
SBx7-7	Water Conservation Act of 2009
SCADA	Supervisory Control and Data Acquisition
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
TDS	Total Dissolved Solids
WMF	Water Management Fraction
WSD	Water Storage District
WSIP	Water Storage Investment Program

AGRICULTURAL WATER MANAGEMENT PLAN

Section I. Plan Preparation and Adoption

The North Kern Water Storage District (North Kern, North Kern WSD, NKWSD, or District) Agricultural Water Management Plan (AWMP) has been prepared in accordance with the requirements of the 2018 Water Conservation Bill (AB 1668 and SB 606), which updated the previous requirements of the Water Conservation Bill of 2009 (SBx7-7, Water Code §10820) and the Governor's Executive Order B-29-15 (Executive Order) to more adequately address issues and to improve agricultural water supplies' system management and evaluation. Figure 1 is a map showing the location of the District. Because the District serves an area greater than 25,000 acres and was formed before December 31, 2012, North Kern was among the water suppliers required to prepare an AWMP on or before April 1 in years ending in six or one. Development of the original plan in 2012 was supported by a grant for $50,000 from the Department of Water Resources (DWR).

This document conforms to the framework presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan* (2025 Guidebook) that was issued by the DWR in September 2025 to aid water suppliers in preparing Agricultural Water Management Plans in accordance with the requirements of AB 1668 and SB 606, which comply with the previous requirements of SBx7-7 and the Executive Order. Although this plan was prepared in conformance with the 2025 Guidebook, some of the requirements presented in the Guidebook, such as consideration of facilitating alternative uses for lands with exceptionally high water duties or whose irrigation contributes to significant problems, are not applicable to the District's facilities or operations.

The Governor's Executive Order was issued on April 1, 2015, in response to the 2013-15 drought conditions and requires detailed drought management plans, as well as the quantification of water supplies and demands. The requirements introduced by SBx7-7 are intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, and to provide for the accurate measurement of water. As such, the AWMP process presents an opportunity for water suppliers to demonstrate existing and planned activities and programs designed to improve water use efficiency. The requirements of AB 1668 include discussion of annual water budget and identification of water use management during drought periods.

Included in Section V and VII of this plan is a description of water use management objectives and efficiency quantifications, respectively. Water management actions planned and implemented were developed to address drought conditions. The quantification of water efficiency was determined through calculations of one or more water use efficiency methods for crop water use, agronomic water use, environmental water use, and recoverable flows. Additionally, Section V includes summary tables identifying the inflow and outflow components of the District for the last five (5) calendar years from 2020 to 2024 with a summary table for water years included in the appendix.

Included in Section IX of this plan is an analysis of each of the Efficient Water Management Practices (EWMPs) presented in the 2025 Guidebook. The EWMPs are grouped into the following categories:

- Critical Efficient Water Management Practices

    1. Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of California Water Code Section 531.10 and to implement paragraph (2) of the legislation.
    2. Adopt a pricing structure for water customers based at least in part on quantity delivered.

- Conditional Efficient Water Management Practices

    1. Facilitation of alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including problem drainage.
    2. Facilitation of use of available recycled water that otherwise would not be used beneficially, meets health and safety criteria, and does not harm crops or soils. The use of recycled urban wastewater can be an important element in overall water management.
    3. Facilitate the financing of capital improvements for on-farm irrigation systems.
    4. Implement an incentive pricing structure that promotes one or more of the following goals:
        A. More efficient water use at the farm level such that it reduces waste;
        B. Conjunctive use of groundwater;
        C. Appropriate increase of groundwater recharge;
        D. Reduction in problem drainage;
        E. Improved management of environmental resources, and
        F. Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.
    5. Expand lined or piped distribution systems, construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.
    6. Increase flexibility in water ordering by, and delivered to, water customers within operational limits.
    7. Construct and operate supplier operational outflow and tailwater systems.
    8. Increase planned conjunctive use of surface water and groundwater within the supplier service area.
    9. Automate canal control devices.
    10. Facilitate or promote customer pump testing and evaluation.

11. Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.
12. Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:
    A. On-farm irrigation and drainage system evaluations;
    B. Normal year and real-time irrigation scheduling and crop evapotranspiration information;
    C. Surface water, groundwater, and drainage water quantity and quality data, and
    D. Agricultural water management educational programs and materials for irrigators.
13. Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional change to allow more flexible water deliveries and storage.
14. Evaluate and improve the efficiencies of the suppliers' pumps.

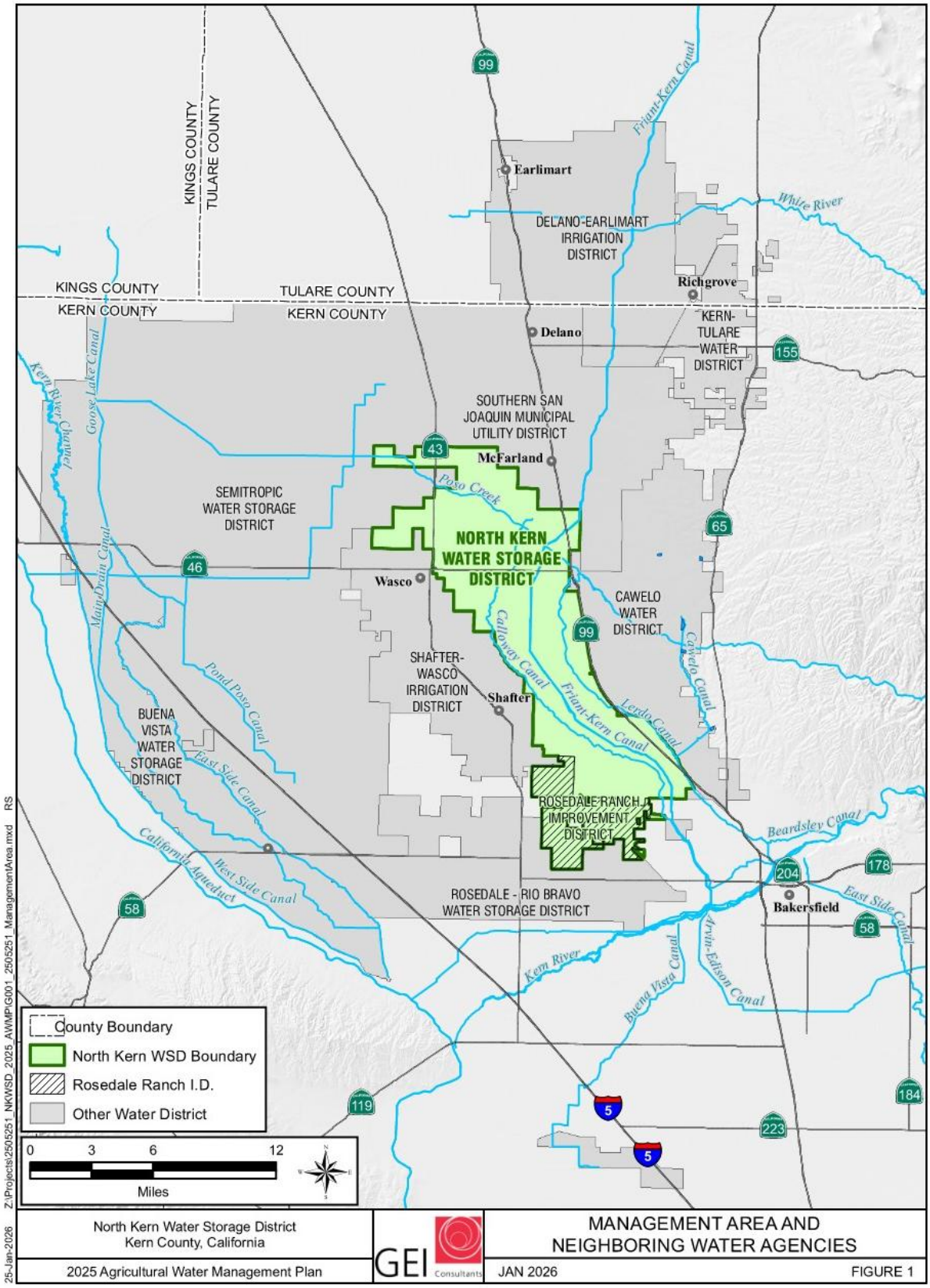


Figure 1. District Area and Neighboring Water Agencies

A. Description of Previous Water Management Activities

Water management activities previously implemented or now being implemented by the District include:

- Encourage and facilitate the construction of irrigation distribution system facilities to lands which rely exclusively on pumped groundwater for the purpose of expanding the District's capability to deliver surface water in lieu of groundwater pumping.
- Deliver surface water in lieu of groundwater pumping when practicable; use water pricing, as appropriate, to encourage such deliveries.
- Maximize use of available surface water supplies for irrigation and spreading; use water pricing, water exchanges, and water banking as appropriate.
- Enter temporary contracts for Central Valley Project (CVP) water which is available from time to time on the Friant-Kern Canal.
- Develop water exchanges and/or water banking arrangements that result in a net increase in District water supplies, when practicable.
- Encouraged U.S. Army Corps of Engineers (USACE) to expedite the "fix" for Isabella Dam deficiencies and remove the storage restriction that has been in place since 2006. The operating restriction was lifted in July 2023 after completion of major dam safety modifications.
- Maintain existing recharge capability in areas of the District that urbanize.
- Encourage and support neighboring water agencies with the importation of available surface water supplies.
- Recharge the aquifer with high quality surface water.
- Promote water use efficiency through financial support of the North West Kern Resource Conservation District (RCD)-DWR Mobile Laboratory and by encouraging landowners to take advantage of this resource by requesting field irrigation evaluations.
- Actively participate in regional water management planning through the Poso Creek Regional Water Management Group. The District also participates in local water resource management forums, including the Semitropic Water Storage District's Groundwater Monitoring Committee, the Kern River Watershed Water Quality Coalition, the Kern Fan Monitoring Committee, and the Kern Groundwater Management Committee.
- Expand the District's website to include data on groundwater levels and quality. Current well data is available on the Kern County Subbasin Data Management System (DMS) website.
- Encourage the installation of flow meters on private wells.
- Identify wells monitored by DWR or the Kern County Water Agency (KCWA) and consolidate water level readings from these wells with readings from wells measured by North Kern.
- Identify wells which are sampled for water quality by DWR or KCWA.

- Take delivery of oil-field produced water to augment irrigation supplies and for groundwater recharge.
- Implement a joint landowner and district program to expand groundwater recharge using landowner owned facilities.
- Utilize remote sensing for evapotranspiration monitoring to improve water management through improved understanding of crop water use.
- Implement water delivery improvements for District owned production wells and canal delivery points through instrumenting Supervisory Control and Data Acquisition (SCADA) automation.
- Implementation of Calloway Canal lining projects as described in Section II.A.2 including portions from Calloway to the Lerdo Intertie, Calloway to CVC Intertie to 7th Standard Road, Snow Road to 7th Standard Road, 7th Standard Road to 8-1 pump station, Fruitvale Avenue to the CVC Intertie, and Case Street to Fruitvale Avenue

As noted above, the District participates in area-wide, regional, watershed or basin-wide water management planning though the Poso Creek Regional Water Management Group.

In 2022, North Kern became a Groundwater Sustainability Agency (GSA) that is represented in the Kern County Subbasin Groundwater Sustainability Plan (GSP) 2025 Amended Final Version that was adopted in August 2025. The Kern County Subbasin GSP was collaboratively developed by 20 GSAs (including North Kern GSA) to implement project and management actions to achieve long-term groundwater sustainability in compliance with California's Sustainable Groundwater Management Act (SGMA).

B. Coordination Activities

1. Notification of AWMP *Preparation*

Water Code 10821(a), referenced in the 2025 Guidebook, does not specify how much advance time is required for notification of cities and counties of plan preparation and mentions that comments may be obtained from any city or county. In complying with these provisions, North Kern notified the entities shown in Table I-1. Appendix A presents the public notice of plan preparation.

2. *Public Participation*

Public participation activities associated with preparation of the AWMP are presented in Table I-1.

C. Plan Adoption and Submittal

The purposes of this AWMP are to assess North Kern's current and planned water management operations and to respond to the provisions of SBx7-7, the associated Agricultural Water Management Planning Act (Section 1, Part 2.8, Division 6 of the Water Code), the subsequent Agricultural Water Measurement Regulation requirements (described in Title 23 California Code of Regulations), and AB 1668 Water Management Planning. The plan describes the District's implementation of two mandatory EWMPs,

includes a discussion of the potential impacts of climate change on District operations and describes the District's program for drought response. The two mandatory EWMPs required by SBx7-7 are:

- Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.
- Adopt a pricing structure for water customers based at least in part on quantity delivered.

The plan includes an analysis confirming that the District is in compliance with the legislation's requirements, noted above, regarding 1) delivery measurement, and 2) volumetric pricing.

1. *Plan Adoption*

In preparing this plan, North Kern will present the plan at the board meeting prior to adoption of the plan at a Board of Director's meeting on March 17th, 2026. Table I-1 shows the state and local interested parties who were notified of and/or provided input to this AWMP. Appendix B of this document includes a Resolution of Plan Adoption. This plan will be updated on a 5-year cycle. North Kern is a public entity but is not a CVP contractor. Therefore, the District has not prepared either a U.S. Bureau of Reclamation (USBR) management/ conservation plan in the past.

2. *Plan Submittal*

The steps to be followed in submittal of AWMPs are described in the *Guidebook* and are outlined in Table I-1. Within 30 days of adoption, a copy of the adopted plan will be submitted electronically to DWR and the other entities shown on Table I-1 on March 17th, 2026.

3. *Plan Availability*

The requirements for availability of the District's AWMP are presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan.* The District's compliance with these requirements is shown in Table I-1.

The AWMP, as adopted by the District, will be available from the District by request.

Table I-1.Summary of Coordination, Adoption and Submittal Activities

Potential Interested Parties	Notified of Plan Preparation	Assisted in Preparation	Received Draft Plan	Notified of Public Meetings	Notified of Intention to Adopt	Sent Copy of Adopted Plan
County of Kern	X			X		X
City of Shafter	X			X		
City of Wasco	X			X		
City of Bakersfield	X			X		
DWR						X
Bakersfield Californian				March 3, 2026 March 10, 2026		
Bakersfield Public Library						X
California State Library						X
Website						March 3, 2026

D. Plan Implementation Schedule

The 2025 AWMP will be implemented after plan adoption. North Kern is currently implementing EWMPs based upon the program described in Section IX of this AWMP. These EWMPs include improvements to district operations that enhance water management and promote water conservation as well as the EWMPs mandated by SBx7-7 that promote water measurement and volumetric pricing. The drought response measures described in this plan will be implemented as required.

Section II. Description of the North Kern Water Storage District and Service Area

A. Physical Characteristics

The North Kern WSD, established in 1935, is a public agency that supplies surface water from the Kern River and groundwater to primarily agricultural customers. The District's primary objective is to support "economic pumping lifts" for landowners within the District by operating a "conjunctive use" project for the past 60 years to optimize the use of its highly variable Kern River water rights supplies. In 2024, about 47,610 acres of the 60,827 gross acres (78 percent) in the North Kern service area were irrigated agriculture. The North Kern Water Storage District GSA includes 61,741 gross acres (Kern County Subbasin, 2025, p. 5-11).

Most of the water in the Kern River comes from snowmelt, with peak runoff occurring from April through July, during which time about two-thirds of the annual flow volume occurs. Historically, the supply available to North Kern from this source has ranged from less than 10,000 AF in a "dry" year to nearly 400,000 AF in a "wet" year. Owing to the highly variable Kern River supply, North Kern supplements available surface water supplies with pumped groundwater (stored surface water) in "dry" years and recharges the underlying groundwater using spreading ponds (about 1,786 acres) in "wet" years.

1. *Size of the Service Area*

The District was organized in 1935 and adopted its "Project Report" in 1950, with implementation of improvements laid out in the report beginning shortly thereafter. Fundamentally, the Project provided for the District to purchase the right in perpetuity to all water accruing under various Kern River "pre-1914" water rights. Because the river rights purchased by North Kern were largely "junior" rights and subject to large swings in yield depending on river hydrology, the Project Report also described a series of projects focused on "re-regulating" these highly variable supplies for the purpose of "maintaining economic pumping lifts" for landowners within the District. Re-regulation was primarily to be accomplished through construction and operation of "recharge/spreading ponds" to maximize the capture of wetter year river supplies accruing to the rights and groundwater wells to "recover" previously recharged water in drier years when surface supplies accruing to the rights were limited.

To supplement its "base" Kern River supplies described above, the District entered into an additional Kern River water supply contract with the City of Bakersfield in 1976. Although the "basic term" of this contract expired at the end of 2011, the contract continues pursuant to "extension term" provisions and is expected to continue to provide water supplies to the District in the future, except during the extremely dry years. In addition to its Kern River supplies, the District uses occasional flows available from Poso Creek and takes advantage of other supplies available from the State Water Project (SWP) and the Federal CVP from time to time. These water supplies have allowed the District to maintain a positive long-term supply balance, primarily for agricultural purposes.

The District is comprised of two service areas; a surface water service area (Class 1) and a groundwater service area (Class 2), each comprising about one-half of the District's area. These service areas are

identified on Figure 2. North Kern delivers surface water and/or pumped groundwater to satisfy all the irrigation water requirements of the surface water service area. The remaining one-half of the District principally relies on groundwater pumped through the use of on-farm wells; however, to the extent that the District has water available for spreading (i.e., over and above the needs of the surface water service area) and there is an irrigation demand that can be physically reached, surface water is delivered to the Class 2 service area as well.

In addition to the 60,827-acre "old District" service area, since 1980, North Kern has also serviced approximately 9,590 acres of additional land referred to as the Rosedale Ranch Improvement District (RRID) with about 7,500acres developed for irrigated agriculture. Only a portion of RRID, 5,802 acres, is included in the North Kern GSA (Kern County Subbasin, 2025, p. 5-11). The remaining area is covered by the Kern River GSA. This area is located immediately to the south of the "old District" (near the City of Bakersfield) and has a distribution system with the capacity to meet the irrigation water requirements of all irrigated lands. The Improvement District does not benefit from the same water rights that are available to the "old District"; accordingly, groundwater remains the principal source of water within RRID, with surface water being purchased and delivered by North Kern on an "as-available" basis, which is relatively infrequent. Because RRID does not hold the same water rights as North Kern and does not have access to the same sources of water, RRID is not included in the plan's water balance or in the discussion of water management practices. The RRID service area is identified on Figure 2.

Table II-1. Water Supplier History and Size

Date of Formation	1935
Source of water	
Local surface water	X
Local groundwater	X
Gross acreage at time of formation	61,854 acres
Gross acreage - current service area (2024) – Old District	60,827 acres
Gross acreage – current service area (2024) – RRID	9,590 acres
Current irrigated acreage (2024) – Old District(1)	47,610 acres
Current irrigated acreage (2024) - RRID(1)	7,500 acres

(1) Values are based on LandIQ data

North Kern is governed by a five-member Board of Directors. Each member represents a geographical area within the District known as a division. Each board member must be a landowner (or a representative of a landowner) within the District and be elected by the landowners within their division.

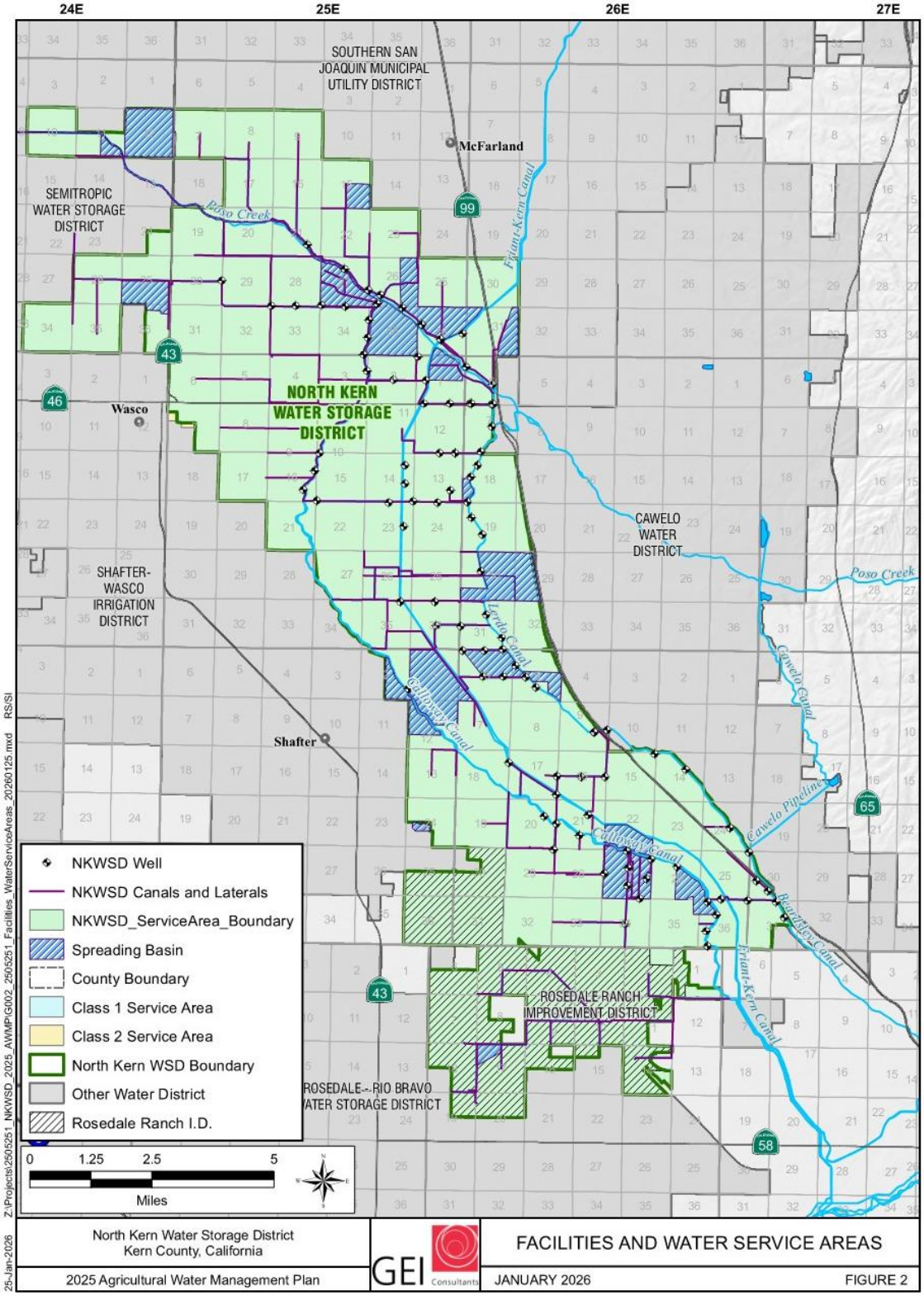


Figure 2. Facilities and Water Service Areas

Land use within North Kern is primarily agricultural. In the 1950s, at the time of North Kern's original project, the District's lands were developed almost exclusively to annual crops. In 2024, permanent crops, principally nuts and grapes, account for about 92 percent of the irrigated area in the NKWSD "Old District". Past principal annual crops included cotton, tomatoes, and wheat. While the cropping pattern has changed over time, the total farmed acreage has varied with the economics of farming. Going forward, it is reasonable to anticipate that the farmed acreage will continue to evidence modest annual fluctuations without any increasing trend (since the District is essentially fully developed) or decreasing trend.

Where farmlands in North Kern are proximate to urban areas, there has been pressure to convert these lands to urban uses. Urbanization is occurring throughout the Kern County Subbasin and other water districts are also facing this issue. To date, the Rosedale Ranch area has been the primary target for urbanization as the City of Bakersfield expands to the north. Approximately 1,000 acres have been annexed to the City of Bakersfield since formation of the Improvement District in 1980. Rosedale Ranch continues to carry on discussions with appropriate agencies to help ensure the management of the groundwater resource. In 2006, the City of Shafter annexed about 5,200 acres located within North Kern, generally in the area bounded south by Seventh Standard Road and extending north about five miles. Most of the annexed land remains in irrigated agriculture.

2. *Location of the Service Area and Water Management Facilities*

North Kern is located in Kern County, west of U.S. Highway 99, southwest of the City of McFarland, northwest of the City of Bakersfield, and east of the cities of Shafter and Wasco. As noted previously, while most of North Kern lies north of Seventh Standard Road, those lands lying south of Seventh Standard Road fall into Rosedale Ranch Improvement District. Figure 1 illustrates the District's location within Kern County. Neighboring irrigation districts are Cawelo WD to the east, Shafter-Wasco ID and Semitropic WSD to the west, and Southern San Joaquin MUD to the north. Similar to North Kern, these other water districts rely on surface water supplies for irrigation from the SWP, the CVP, and the Kern River to supplement groundwater supplies.

North Kern and neighboring districts overlie a common groundwater basin. Due to concerns regarding the future reliability of historically available surface water supplies, in 2007 North Kern and other districts and entities in the Poso Creek region prepared the Poso Creek Integrated Regional Water Management Plan (Poso Creek IRWMP) that identified potential new facilities and "non-structural" measures to improve intra- and inter-district management of water supplies.[1] The overarching goal of the Poso Creek IRWMP is to maximize the capture and use of surface water supplies available to the region and thereby reduce the impacts of existing and potential regional loss of water supply reliability.

Delivery of surface water and groundwater in North Kern is accomplished through a network of largely unlined canals; however, the system also includes some pipelines and lined canals. The District's principal supply artery, and the most upstream of its two points of diversion from the Kern River, is the Beardsley-Lerdo system. This system is entirely gravity and consists of the diversion structure, or headworks, on the Kern River and a canal which delivers water along the eastern or "high" side of the District. The lined

[1] The Poso Creek IRWMP was initially adopted in 2007; however, a 2019 Plan Update was recently prepared and adopted, which brings the Plan into compliance with "Proposition 84" standards.

portion of this canal extends from the headworks to the District's boundary and is referred to as the Beardsley Canal, while the portion within North Kern is unlined and is referred to as the Lerdo Canal. Up to 850 cfs has been conveyed through the Beardsley Canal for delivery into the District. The second point of diversion, located about 4.5 miles downstream of the first, is the Calloway Headworks which serves the relatively large, unlined section of the Calloway Canal. The District is in a multi-year effort to line the Calloway Canal with expected completion around 2030 or later. This facility is also entirely gravity and extends for 10.4 miles before entering the District at Seventh Standard Road. This "wet-year" facility has a capacity of 1,000 cfs at the headworks. Distribution laterals are generally unlined ditches and deliver water to farm turnouts by gravity from the previously-described main conveyance facilities. The main conveyance canals and distribution laterals within North Kern are shown on Figure 2.

Typically, District-owned wells are only used during "dry" years when surface water supplies are inadequate. Groundwater is delivered to customers during dry years via a network of small, lined canals running parallel to the larger, unlined canals used for conveyance of surface water. The District owns and operates about 100 wells at locations shown in Figure 2. Approximately 200 privately-owned wells in the Class 2 service area are used to meet irrigation demands in this part of the District.

Poso Creek traverses the north part of the District, however, significant flows from this creek are infrequent, and it is dry much of the time. The District holds a water rights permit for the diversion and use of Poso Creek water. An agreement with Cawelo Water District (WD) and Semitropic WSD provides for allocation of Poso Creek water among the three districts. North Kern receives flow between 135 cfs and 300 cfs (Kern County GSP, pp. 7-6). In addition, the channel of Poso Creek is periodically used for groundwater recharge with other surface water supplies available to North Kern. Water is only recharged in Poso Creek when the stream bed is dry so water introduced for recharge does not contribute to the creek's natural flow. Table II-2 provides a summary of existing irrigation facilities in North Kern.

Table II-2. Water Conveyance and Delivery System

System Used	Number of Miles
Unlined Canals	121.8
Lined Canals	26.2
Pipelines	22.5
Drains	0

North Kern relies heavily on storage and recovery of groundwater for the year-to-year regulation which is required to manage North Kern's highly variable Kern River supplies. Seasonal regulation and some year-to-year regulation are provided by the District's use of conservation storage space in Isabella Reservoir.

The USACE constructed Isabella Dam in the 1950s and is responsible for day-to-day operations. Isabella Reservoir, with a total storage capacity of 568,075 AF, is located well to the east of the District in the southern Sierra Nevada Mountains. Later, in the 1960s, the District contracted with the United States to acquire conservation storage capacity in Lake Isabella as a means to further regulate its Kern River supplies. Surface water supplies regulated in Isabella Reservoir are used conjunctively with the groundwater storage underlying the District.

Isabella Reservoir is a multiple purpose water storage facility with the primary mission being flood control. Flood control operating criteria developed by the USACE require that total reservoir storage be no more than 170,000 AF by November 1 of each year, unless otherwise approved by USACE. Historically, the maximum total reservoir storage approved by USACE has been 245,000 AF. With a minimum pool of 30,000 AF, North Kern's carryover storage ranges from about 34,000 to 48,000 AF.

In addition to flood control, the reservoir is used to store water for irrigated agriculture, release water to generate electricity, and as a recreation and water sports facility. North Kern is not responsible for maintenance of the reservoir but does pay its allocated share of maintenance costs based on a contract with the USACE.

North Kern's share of the available conservation space in the reservoir ranges from **24 to 34 percen**t. Based on the reservoir's capacity at the spillway crest, this implies a range of about **129,000 to 183,000 AF** as of July 2023. Storage restrictions reduced this range to about **79,000 to 112,000** AF in prior years. Dam safety modifications were completed in July 2023, thereby restoring the site to its full capacity.

The District has small volumes of operational storage available in mid-system reservoirs within its service area. However, since this storage is used exclusively for canal regulation, this reservoir capacity is not included in Table II-3.

Table II-3. Water Supplier Reservoirs

Reservoir	Time Period	Capacity (AF)**	North Kern's Storage Rights (AF)
Isabella Reservoir (at Spillway Crest)	Prior to 2006, 2023-present	568,075	129,000 - 183,000
Isabella Reservoir (with USACE storage restriction) (lifted in July 2023)	2006-2023	361,250	79,000 – 112,000
Isabella Reservoir (carryover storage)	Current	170,000	34,000 – 48,000
North Kern Reservoirs*	Current	N/A	N/A

*Small operation storage facilities within North Kern WSD
**Capacity is based on the USACE's website

The majority of land within the District's service area is well drained, and the need for on-farm surface drainage is minimal since the majority of farmland is irrigated with low-volume application methods. Currently, North Kern has no District-operated tailwater recovery system, while the number of on-farm operated tailwater/operational outflow recovery systems is minimal.

Following is a list of recent key improvements made to North Kern maintained canals and conveyance channels; refer to Figure 2 for specific canal names. This list supplements the description of previous water management activities presented in Section I.A and the description of specific EWMP implementation and reporting included in Section VII (Table IX-1).

- ***Calloway-to-Lerdo Intertie*:** Installed pump station and one mile of 96-inch diameter concrete pipe to convey water from the Calloway Canal to the Lerdo Canal, a 40-foot lift. This improvement increases the District's ability to take advantage of CVP supplies that become available from time to time from the Friant-Kern Canal (typically during "wet" years) by allowing such water to reach all the District's irrigation demand and spreading ponds. In

addition, it eliminated a portion of the 8-1 Canal and the associated canal seepage. This facility allows for bi-directional flow.

- ***Calloway-to-CVC Intertie:*** Installed a lined canal one mile between the Calloway Canal and the Cross Valley Canal (CVC), including a new 400 cfs capacity turnout on the CVC, all of which increases the District's ability to divert and utilize water supplies that are available in the California Aqueduct from time to time and to facilitate water management exchanges. *[]*
- Converted the 8-9 and 9-6 canals into pipeline conveyances, which eliminated potential seepage and evaporation losses.
- ***Calloway Canal and Water Delivery Improvements:*** Concrete lined the Calloway Canal from the northern terminus of the CVC (west of Coffee Road) to Calloway Canal Intertie (CVC Intertie Canal) to 7th Standard Road. The most recent completed phase of this project consists of concrete lining approximately 6,500 linear feet of previously unlined portion of the Calloway Canal between Snow Road and 7th Standard Road (at NKWSD's District Boundary) to increase surface water reliability and prevent seepage. This project also included installation of advanced metering, SCADA, and telemetry improvements for over 80 of the District's 100 production wells and 31 remote terminal units. Each flowmeter includes a totalizer capable of measuring the volume of groundwater pumped through the wells.
- Implemented SCADA monitoring to check water levels at strategic locations in the District's distribution system and prevent overflow of regulating reservoir storage.
- Lined portions of the Calloway Canal with bentonite to reduce seepage potential, specifically in areas that were known to exhibit relatively high rates of seepage.
- Continued efforts to concrete line the Calloway Canal from 7th Standard Road to 8-1 pump station, Fruitvale Avenue to CVC intertie, and Case Street to Fruitvale Avenue.
- Replaced old, worn-out propeller meters (McCrometer and Seametrics models) at turnouts with new meters.
- Implemented personal device scanning and real-time water meter reading network so water consumer usage can be uploaded to the District's server and accounting program. This has reduced human error in reporting water usage and has assisted in verifying compliance with SBx7-7 delivery volume measurements.
- Construction of a pipeline to convey oil-field produced water from the Kern Front Oil Field to the Lerdo Canal for crop to irrigation and to the Rosedale Spreading Ponds for groundwater recharge. Because conveyance to both locations is by gravity, this project protects groundwater levels by reducing the need to pump groundwater to augment surface water supplies and, at the same time, reduces energy usage and emission of greenhouse gases.
- Expanded banking and conveyance improvements through direct recharge and return capacity of recharged water. This includes improvements to the existing well network.

- Construction of a new 400 cfs turnout from the Friant-Kern Canal (FKC) to divert CVP water supplies from banking and exchange partners into 8-1 canal.

- Partnership with landowners to expand the District's recharge capacity.

3. *Terrain and Soils*

The North Kern Water Storage District is located on the valley floor of the southern portion of the San Joaquin Valley, a physiographic trough. The northwest-southeast trending valley is bounded by the Sierra Nevada Range to the east, the Tehachapi Mountains to the south and the Temblor Range and Coast Range to the west. The valley floor is characterized by low alluvial plains and fans and by overflow lands and old lakebeds.

Alluvial deposits in the Kern County sub-basin generally consist of sand, silt, and clay laid down in a complex sequence principally by the Kern River, Poso Creek, Deer Creek, the White River, small drainages along the Sierra Nevada Mountains to the east, and to a lesser extent, by streams along the Coast Range to the west. The terminus for these flows in the geologic past was Tulare Lake, located to the north of Kern County on the west side of the San Joaquin Valley. The axis of the San Joaquin Valley Basin along the west side of the valley has been subsiding over time and, as a generalization, the sediments tend to dip and thicken towards the axis of the basin and pinch out on the east and west edges. The District's service area is flat with land surface elevations ranging from over 320 feet above sea level on the east to less than 300 feet above sea level on the west.

The predominant irrigation systems in North Kern are above-ground drip systems for permanent orchard and vineyard crops. Based on 2024 crop reporting data provided by the District, annual crops are irrigated largely with fan jet, micro jet, and hand-move sprinkler systems. Over the last five years, the percentage of acreage irrigated by each of the systems noted above has remained constant.

The soil types in Kern County vary in structure, texture, and chemistry with geographical location. Valley floor soils within North Kern are derived mostly from mixed granitic and sedimentary rocks and are characterized as saline-alkaline. The generalized soils map units or soil associations underlying the area are described in the published soil survey for northwestern Kern County and are presented in Figure 3. A general soil map unit consists of one or more major soil types and some minor soils that occur together in a recognizable pattern.

Soils are described in this report in terms of associations because of the size of the District and because of their similarities to each other. Soils within the District do not have any identifiable impacts upon water operations and management in the service area.

4. *Climate*

North Kern lies at the southern end of the San Joaquin Valley, a portion of the valley that is partially surrounded by a horseshoe-shaped ring of mountains. The Sierra Nevada Mountains to the east shut out most of the cold air that flows southward over the continent in winter. It also catches and accumulates snow, which provides irrigation water for use during the dry summer months.

Summers are typically hot and dry. The average length of the growing season is 265 days, typically lasting from March to November. December and January are characterized by frequent fog or low clouds which occur mostly at night. These conditions prevail when cold, moist air is trapped in the valley by a high pressure system. In extreme cases, fogginess or cloudiness may occur continuously for two to three weeks. The depth of the fog or clouds is usually less than 3,000 feet. Under these conditions, there usually are clear skies and mild temperatures in the surrounding foothill and mountain areas. Most of the precipitation occurs in the winter with little to none occurring during the summer months of June through August. By contrast, rates for evaporation and transpiration are low in the cooler, wetter months and peak during the hot, dry summer growing season.

Table II-4 summarizes climate data from the CIMIS station at the City of Shafter. Temperatures in the summer are typically in the upper 90s and nights are fairly warm. Throughout the year, the mean temperatures vary from 34ºF in December to 96ºF in July. Annual precipitation typically ranges between four to nine inches. More detailed climatic data from the Shafter station are presented in Table II-5. Figures 4, 5 and 6 provide graphs of the mean monthly precipitation, annual precipitation, and temperature trends of the historical period 1985-2024.

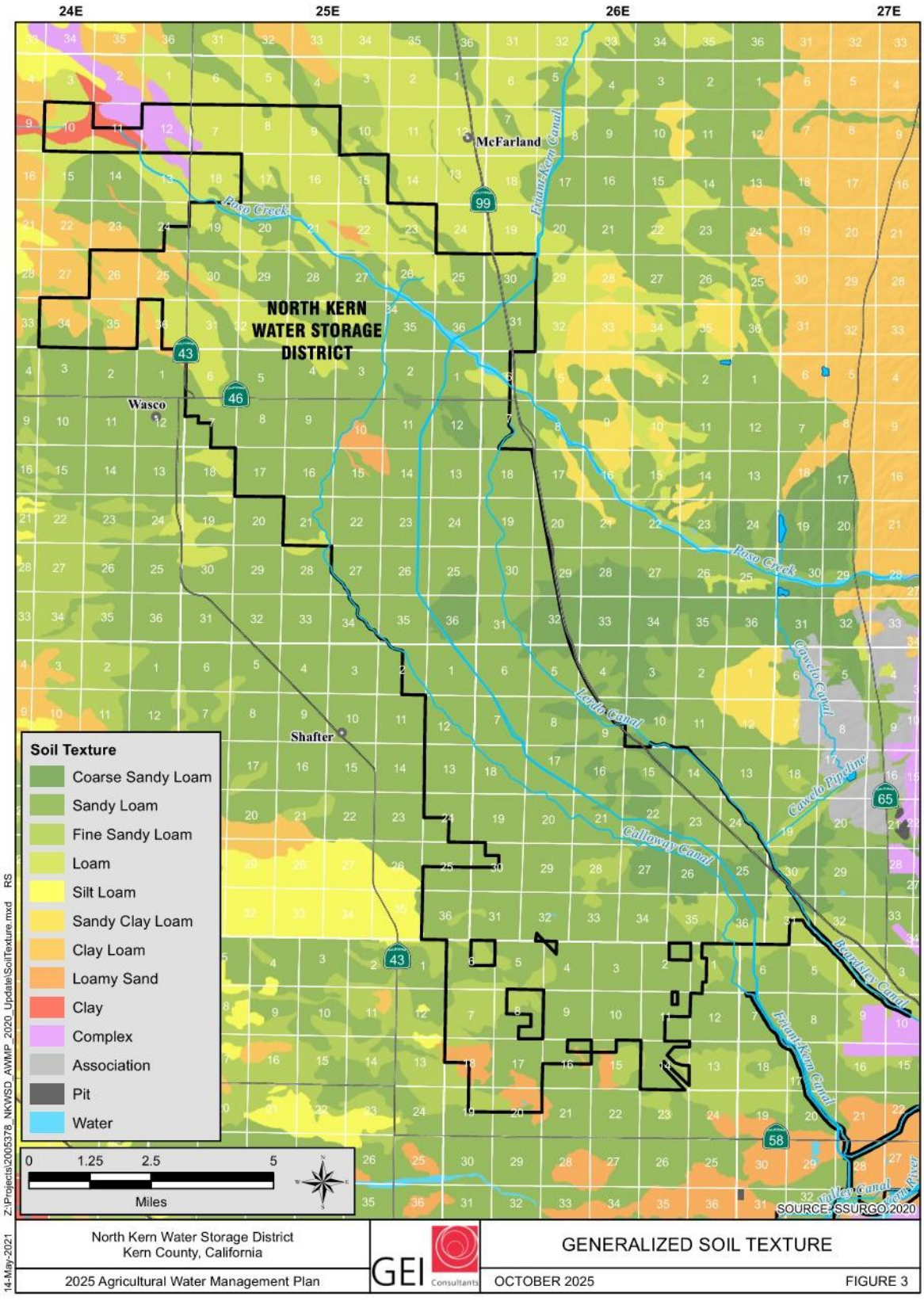


Figure 3. Generalized Soil Texture

Table II-4.Summary Climate Characteristics

Climate Characteristic	Value*
Average Annual Precipitation	6.16 Inches
Minimum Monthly Precipitation	0 Inches
Maximum Monthly Precipitation	5.97 Inches
Minimum Temperature (Avg. December Minimum)	34.7 °F
Maximum Temperature (Avg. July Maximum)	96.3 °F

*Obtained from DWR CIMIS data for Shafter/USDA Station #5 during the period 1985-2024

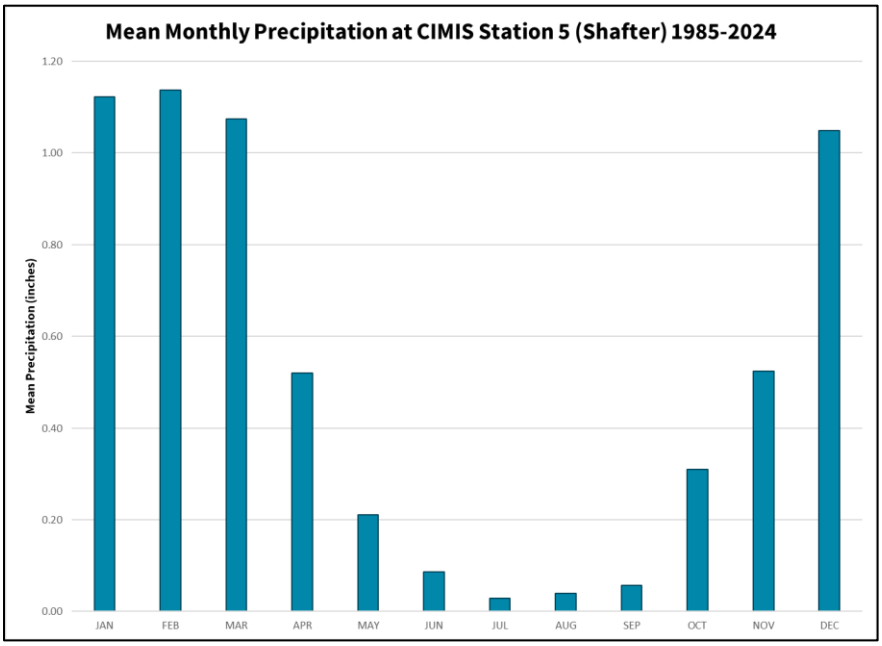


Figure 4. Mean Monthly Precipitation (1985-2024)

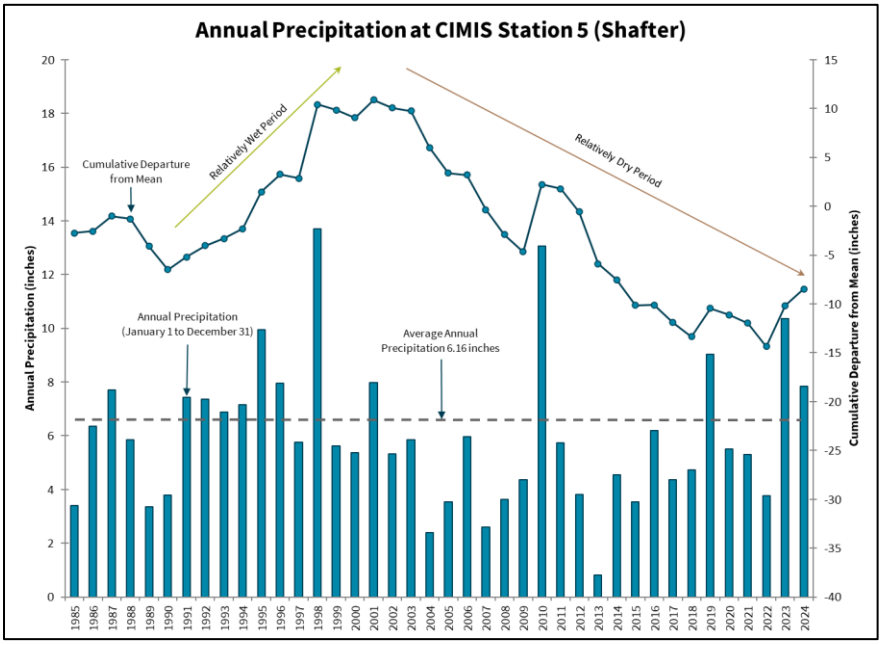


Figure 5.Annual Precipitation (1985-2024)

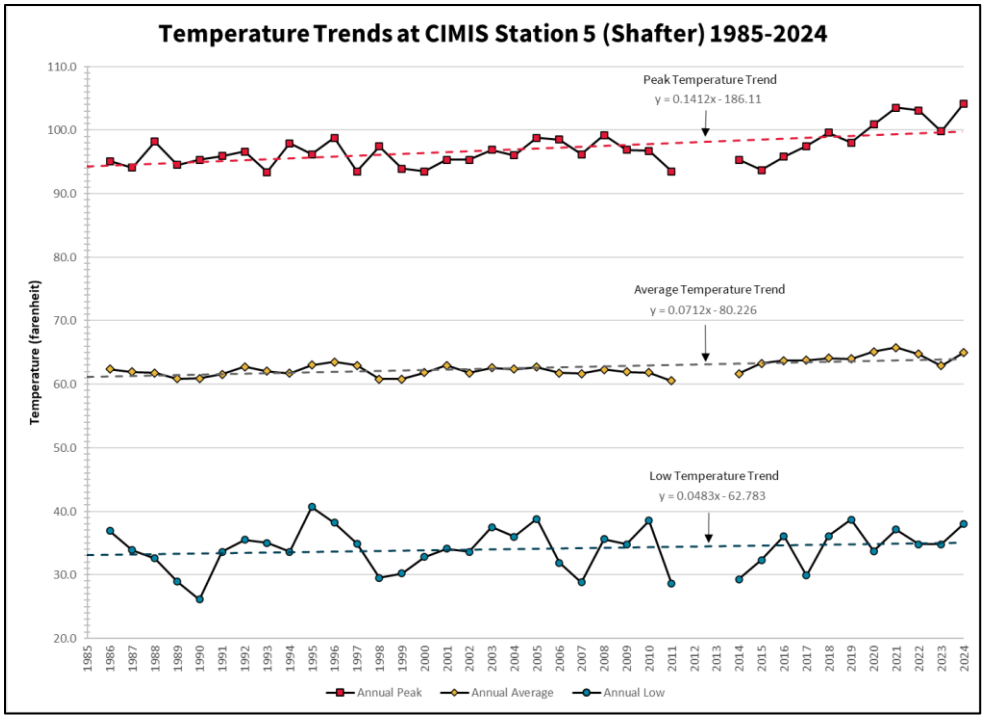


Figure 6. Temperature Trends (1985-2024)

Table II-5. Detailed Climate Characteristics

Month/Time	Average Precipitation (inches)	Average Reference ET_o (inches)*	Average Minimum Temperature, °F	Average Maximum Temperature, °F
January	1.12	1.42	37.1	58.0
February	1.14	2.31	39.5	64.3
March	1.07	3.97	43.3	69.7
April	0.52	5.66	46.8	76.2
May	0.21	7.49	52.7	83.7
June	0.09	7.97	58.4	90.9
July	0.03	8.31	63.6	96.3
August	0.04	7.56	61.8	95.2
September	0.06	5.75	56.8	90.5
October	0.31	4.00	48.2	80.9
November	0.52	2.10	39.1	67.0
December	1.05	1.32	34.7	57.3
Wet Season	4.91**	11.12**	38.7***	63.2***
Dry Season	1.25**	46.74**	55.5***	87.7***
Annual	6.16**	57.86**	48.5***	77.5***

* Obtained from DWR CIMIS data for Shafter/USDA Station #5 during the period 1985-2024. "Wet Season" constitutes average of November through March; "Dry Season" covers remaining months (April through October).

** Total seasonal and annual values

*** Average of seasonal and annual monthly values

B. Operational Characteristics

1. *Operating Rules and Regulations*

North Kern's adopted *Rules and Regulations for Distribution and Use of Water* (Rules and Regulations), amended and restated July 15, 2024, is the guideline for District operations and delivery of water (included as Appendix C**).** The *Rules and Regulations* cover the procedures which are followed to distribute irrigation water in an orderly, efficient, and equitable manner.

As presented in the *Rules and Regulations*, water orders are to be submitted a minimum of 48 hours prior to the time that service is requested, and water deliveries run continuously until the scheduled amount of water has been delivered. No "turn on" orders are accepted for less than a 24-hour period unless special arrangements have been made with the District or the District has in effect a less-than-24 hour-program where water users can place orders for periods of fewer than 24 hours. For the purpose of properly scheduling District activities and facilities, "turn off" orders are given at the same time as "turn on" orders.

Although the *Rules and Regulations* describe North Kern's obligations for water delivery, in practice, the District strives to accommodate growers' water orders, regardless of notice, so long as the orders can be delivered without disrupting other scheduled orders. Therefore, North Kern routinely operates as an arranged demand system. On the day a water order is put into effect, one of the district's system attendants

turns the delivery gate on or off, in accordance with the scheduled delivery, at the time he passes the gate on his regular run. Generally, turn-ons, turn-offs and adjustments are made in the mornings. Whenever possible, service is provided as requested; however, at times, the District may require the rescheduling of service due to capacity limitations within the District's distribution system or necessary shutdowns for emergencies beyond the District's control.

North Kern delivers nearly all the irrigation water required in the Class 1 Service Area, and deliveries to the Class 2 Service Area are made to the extent supplies are available. Table II-6 illustrates factors used to allocate water in North Kern. These factors are considered in setting the annual water allocation that is applied uniformly across the District.

Table II-6. Water Allocation Policy

Basis of Water Allocation	(Check if applicable)			Allocation	
	Flow	Volume	Seasonal Allocations	Normal Year	Percent of Water Deliveries (%)
Land within the service area		x			97
Reservoir storage					
Riparian rights					
Water year type		x			
Amount of land owned					
Predicted runoff					

Although the District makes every reasonable effort to comply with water orders, the conveyance and delivery capabilities of the District's facilities, as well as the achievement of overall economy of operational costs, make it necessary that at times, and particularly during periods of peak irrigation use, essentially 24-hour operation of facilities be maintained to assure that all water users receive adequate supplies of irrigation water.

In the event of emergencies, water users may turn off the supply of water to their turnout. In these events, water users must immediately notify the district office by telephone or in person. Water users who do not notify the District and receive authorization prior to the change may be charged a special service fee for each occurrence.

Table II-7 illustrates the lead times for requested service, as part of the arranged-demand service, as mentioned earlier.

Table II-7. Actual Lead Times

Operations	Hours/Days
Water orders	48 hours
Water shut-off	48 hours

2. *Water Delivery Measurements or Calculations*

All deliveries of surface water and groundwater by the District are measured. Meter readings at each turnout are taken every day a turnout is running and at the end of every month by District staff, using permanently stationed on-farm propeller meters (McCrometer and Seametrics models). Bar code readings are used to ensure the time and location of each measurement and to reduce transcription errors by electronically downloading data into the District's dispatch office. Most deliveries to irrigators are measured using the on-farm meters, which are periodically checked as part of the District's maintenance program. The meters provide a very accurate method of water measurement at District turnouts. Table II-8 shows levels of accuracy for typical types of measurement devices.

All propeller meters used by the District are equipped with totalizers, which accumulate the volume of flow at each turnout. According to the manual *SBx7-7 Flow Rate Measurement Compliance for Agricultural Irrigation Districts* by the Irrigation Training & Research Center of the California Polytechnic Institute, San Luis Obispo (ITRC, 2012), devices with totalizers provide measurements that are sufficiently precise to assume that the flow rate accuracy is equivalent to the calibrated volumetric accuracy. As a result, the devices used by the District to measure delivery rates provide data that enables reliable computation of volumes of water delivered from North Kern canals. Section VIII of this report discusses steps the District is taking to comply with the water measurement requirements of SBx7-7 by verifying the accuracies of metering devices.

Table II-8. Water Delivery Measurements

Type of Measurement	Frequency of Measure (Days)	Frequency of Calibration (Months)	Frequency of Maintenance (Months)	Est. Level of Accuracy (%)
Magmeters[(1)]	Instantaneously	Infrequently	As needed	± 0.1%
Weirs	Daily	Infrequently	As needed	± 10%
Pump, runtime	15 days	As needed	As needed	± 5%

(1) Currently, 100 percent of wells are Magmeters with about 80 percent connected to SCADA

3. Water Rate Schedules and Billing

The North Kern WSD Board of Directors annually establishes a base service charge which is applied on a per-acre basis to all lands and is based on budget requirements and Board policy. Water tolls are based on available water supply, estimated deliveries, and the revenue required to balance the District's budget.

Effective October 14, 2024, the water toll rate "usage-based" charge was $200.00 per acre-foot for both Class 1 water and Class 2 water for water users. In 2024, because hydrologic conditions were average and the Kern River watershed had below-normal snowpack, the water toll was increased to recover the District's pumping costs.. Table II-9 shows a summary of the water rate basis.

Table II-9. Water Rate Basis

Type of Billing	Check if Used	Percent of Water Deliveries (%)	Description
Volume of Water Delivered	X	100	All water billings are based on volume of water delivered
Area (acres)			N/A
Crop			N/A
Land Assessment			N/A

District water is priced lower in wet years when Kern River supplies are "plentiful", thereby incentivizing the use of District (surface) water over groundwater pumping. In dry years, the District pumps large volumes of groundwater and District water prices are higher, encouraging water users to conserve.

A different but uniform rate called Base Service Charge is set for each of the Class 1 and Class 2 service areas each year to balance the District's budget for that year. Table II-10 provides this information in tabular form.

Table II-10. Rate Structure

Type of Billing	Check If Used	Description
Uniform	X	Varies from year to year based on District's fixed cost for the year and planned maintenance and capital expenditure cost for the following year.

Currently North Kern bills its irrigation water users either at the end of each month, or the first day of the following month, depending on the volume and timing of water deliveries to users. The frequency of billing is shown in Table II-11.

Table II-11 Frequency of Billing

Frequency	Check If Used
Monthly	X

4. *Water Shortage Allocation Policies and Drought Plan*

Water supplies on the Kern River vary depending on watershed precipitation, snow melt runoff, and North Kern's share of the prior year's carryover storage in Isabella Reservoir. As such, water supply planning must take into consideration the amount of water that will be available during the irrigation season, the current year's water requirements, and the target carryover storage for the following season.

During years of short surface water supply, North Kern conjunctively uses groundwater, through the operation of District-owned wells, and water users in the Class 2 service area increase their use of groundwater through the operation of private wells. North Kern currently has well capacity to avoid prorating deliveries to Class 1 lands, except in extremely dry years such as 2013, which is one of the driest years in the over 100 years of flow records on the Kern River.

Table II-12 lists the measures that the North Kern Board may exercise to respond to water shortages.

Table II-12. Decreased Water Supplies Allocation

Allocation Method	Check If Used
Decrease Allocated Water	X
Shorten Irrigation Season	N/A
Restrict Water to Certain Crops	N/A

The District may refuse to deliver water to irrigators because of wasting water, either willfully, carelessly, or on account of defective ditches or pipelines. The District may also refuse to deliver water to inadequately prepared land or users who flood certain portions of the land to an unreasonable depth or amount to properly irrigate other portions. Water service may be resumed when these conditions have been remedied. Table II-13 summarizes enforcement methods available to curtail wasteful water use.

Table II-13. Enforcement Methods of Allocation Policies

Enforcement Method	Check If Used
Shut-off of Water	
Refuse service	X
Fines/Penalties	

Drought Plan

The Drought Plan section of AWMP provides some details on how the District would prepare for droughts and manage water supplies and allocations during drought conditions. This section is complimented by the recently developed Drought Contingency Plan (DCP), approved by DWR in October 2022, which addresses methods of drought management for the Poso Creek Integrated Regional Water Management (IRWM) Group that the North Kern Water Storage District is a member of. The IRWM Group includes:

- Semitropic Water Storage District,
- North Kern Water Storage District,
- Cawelo Water District,
- Shafter-Wasco Irrigation District,
- Kern-Tulare Water District,
- Delano-Earlimart Irrigation District,
- North West Kern Resource Conservation District, and
- Southern San Joaquin Municipal Utility District.

The purpose of the DCP is to identify and implement strategies that monitor short and long-term water availability, assess risks to critical resources in the case of drought, promote mitigation efforts, prioritize drought response actions, ensure administrative framework and associated responsibilities are clear and transparent, and provide for periodic evaluation and updating of the DCP. The DCP can be provided upon request.

Some components of drought planning or actions may require review of conditions, policy changes, and long-term capital improvements as they are developed in conjunction with recent GSPs. Additionally, as conditions change and new technology and knowledge becomes available, opportunities and constraints will change. The DCP discusses the following components prescribed in the Guidebook:

1) ***What hydraulic levels or conditions (reservoir levels, stream flows, groundwater, snowpack etc.) are monitored and measured to determine the water supply available and level of drought severity.***

   Hydrologic conditions in the Kern River watershed, including snowpack and precipitation, are measured by snow surveys and rain gauges. Data on precipitation, snowpack, temperature, and other parameters assist in forecasting inflow to Isabella Reservoir. Estimates of reservoir storage and projected inflow are, in turn, used to determine the volume of Kern River water available to the District. Releases from storage for delivery to North Kern are then measured, as are diversions from the river into the North Kern system. In addition to extensive measurement of surface water to enable prediction of supplies and observation of deliveries, groundwater elevations are extensively monitored in the District both for compliance with DWR's CASGEM system and for operational purposes.

   The data on snowpack, precipitation, storage in Lake Isabella and groundwater elevations are also used by the District to assess the severity of drought. The National Integrated Drought Information System also provides mapping tools with information on drought conditions within the region.

2) ***Include an analysis and identification of potential vulnerability to drought.***

   The DCP provides a vulnerability assessment for the Poso Creek Region to evaluate water supply vulnerabilities and the impacts of drought. The plan identifies the following drought vulnerabilities that affect the district: variability in Kern River supplies and Lake Isabella reservoir storage, as well as reduced groundwater availability due to SGMA sustainability goals. Lake Isabella Reservoir is the source for Kern River local supplies. Lower reservoir storage results in lower flows through Kern River, thereby increasing the use of stored groundwater supplies to meet irrigation demands. The following subsections provide details for operational adjustments and alternative water supplies for drought resilience planning.

3) ***Operational Adjustments – changes in district water management and district operations to respond to drought, including canal and reservoir operations and groundwater management.***

   There is significant year-to-year variability in the volume of Kern River runoff. Figure 7 shows the annual Kern River supply available to North Kern from 2000-2024 and illustrates the resulting wide range of fluctuations in the availability of surface water to the District. In a "dry" year, surface water supplies can be very limited (less than 50,000 AF) and pumping from District-owned-and-operated wells is significant. In a "wet" year, Kern River water supplies can be nearly 350,000 AF and are sufficient not only to satisfy irrigation water requirements (and thereby avoid the use of District-owned deep wells), but to make significant deliveries to spreading ponds for direct groundwater recharge.

During dry periods, surface water supplies available to the District are minimal and therefore measures to improve management of surface water through canal and reservoir operations have limited effectiveness due to the relatively small amounts of water being stored or conveyed by the related infrastructure. North Kern's typical response to dry conditions has been to exercise conjunctive management by increasing extraction of groundwater from District- and privately-owned pumps to compensate for reduced deliveries of surface water. Since the District's formation, North Kern's capacity to replenish groundwater through unlined canals and dedicated recharge basins has enabled the District to maintain groundwater levels.

Due to its length and severity, the recent drought compelled the District to implement drought response measures that go beyond its conjunctive management practices. Examples of these measures include: 1) prorating deliveries to Class 1 land to bring District deliveries in line with available supplies, 2) replacing non-functioning or under-producing District wells to improve capacity, and 3) development of the *Beneficial Reuse of Oilfield Produced Water Project,* which augments supplies of surface water and groundwater by introducing a new source of water supply (oil-field produced water) into the North Kern system.

The District has historically diverted all available supplies at the District's Beardsley Canal and Calloway Canal head gates on the Kern River for conveyance into North Kern for direct use for irrigation or groundwater recharge. Recharged Kern River supplies are subsequently pumped in drier years and are a key component of the Poso Creek DCP.

In addition to the drought response measures undertaken by the District, individual landowners within the North Kern service area have been actively managing water supplied to them to minimize drought-induced impacts on their farming operations. These activities are described in greater detail below.

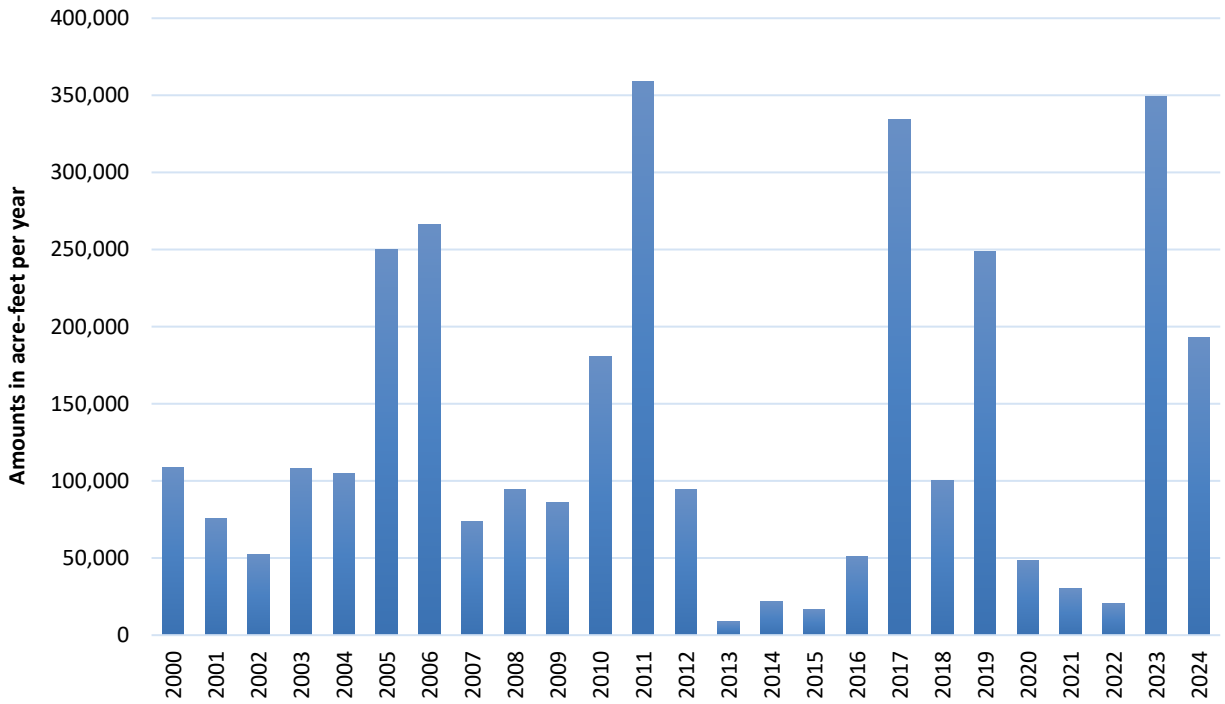


Figure 7. Annual Kern River Supply under North Kern's Diversion Rights

4) Demand Management – policies and incentives in addition to the water shortage allocation plan to lower on-farm water use.

Rather than instituting district-governed policies and incentives to lower on-farm water use, North Kern's approach to demand management is to provide the high degree of flexibility and responsiveness in deliveries necessary to enable growers to manage water efficiently under all conditions. The District also provides clear estimates of water allocations so that growers can make well-informed farming decisions. The level of operational responsiveness provided by North Kern, together with early projections of water allocations, are particularly crucial during droughts when farmers must make challenging decisions on how best to manage their farmland.

5) Alternative Water Supplies – discuss the potential if possible for the district to obtain or utilize additional water supplies. These supplies could include transfers from another water agency or district, the use of recycled water and desalination of brackish groundwater or drainage water.

North Kern's principal source of surface water is the Kern River; however, through exchanges and water purchases, the District can gain access to SWP and CVP water as well as surface water originating from other sources that has been wheeled through State and Federal facilities. Due to the duration and extent of the current drought, alternative sources of surface water have been few and the cost of transferred or exchanged water has been high. Therefore, as a conjunctively managed district, North Kern has adhered to the strategy of relying on groundwater recharged during wet years to serve as a reservoir that could be relied upon during droughts. While recharge primarily consists of Kern River water, it has also included local Poso Creek water and imported

SWP and CVP water from time to time. Here again, the severity of the current drought in Kern County in 2021 and 2022 has tested this practice as groundwater elevations have declined during the peak irrigation season by 50 to 100 feet from 2019 levels. This change is similar to the decline of 50 to 150 feet reported of the 2012-2016 drought following the wet periods in 2010 and 2011.

An additional source of water, which has been utilized within North Kern, is oil-field produced water from California Resources Company's Kern Front oilfield. Because produced water is a byproduct of oil extraction, this water source is effectively insulated from hydrologic conditions and therefore is a reliable source of water even during severe droughts. North Kern began accepting produced water into their system in August 2015 as part of the aforementioned *Beneficial Reuse of Oilfield Produced Water Project*. Under most conditions, produced water is blended with water from the Kern River and applied to irrigated lands. During periods when irrigation canals are out of service for maintenance or when sufficient water is available from the Kern River to satisfy all demands, the produced water is routed to spreading grounds for groundwater recharge. In both applications, produced water is a valuable supplement to the District's established supplies of surface water and groundwater.

Furthermore, the District is also in the process of implementing the *return capacity improvements project (NKWSD-7 per Kern County GSP, p. 14-58)* which is estimated to augment the District's groundwater supply by 4,000 AFY.

6) The district's policy and process for declaring a water shortage and implementing the water shortage allocation and drought plan.

Water supplies on the Kern River vary depending on watershed precipitation, snow melt runoff, and North Kern's prior year's carryover storage in Isabella Reservoir. The North Kern Board of Directors takes factors including the forecasted water supplies, the current year's projected water requirements and target carryover storage into account when determining the volume of water that will be available during the irrigation season.

During years when the availability of water from the Kern River is limited, North Kern pumps groundwater from District-owned wells. In addition, water users in the Class 2 service area, which is irrigated largely through pumping of private wells, increase their use of groundwater. North Kern has maintained the well capacity needed to avoid prorating deliveries to Class 1 lands, except in 2015. Due to the severe drought conditions, deliveries were previously pro-rated on July 1, 2015, and reduced to 2.4 AF per assessable acre.

As well as installing replacement wells necessary to maintain groundwater pumping capacity, the District also implemented its *Beneficial Reuse of Oilfield Produced Water Project (NKWSD-1 per 2025 Kern County GSP, p. 14-58),* which augments the District's water supply by introducing up to 9,000 AF/year of oil-field produced water. Because this water is available under all hydrologic conditions, it is particularly valuable as a drought response measure and as a tool for minimizing the need to prorate deliveries.

7) Stages of Actions – includes the stages of action and corresponding levels of drought severity that district will implement in response to the drought.

Drought response in North Kern is a responsibility shared by the District and its growers. The District's drought response policies are intended to allocate available surface water, augmented by groundwater pumped from district-owned wells, in a manner that is equitable and consistent with the District's operational policies with respect to Class 1 and Class 2 lands while maintaining the District's financial viability. An important objective of this approach is to provide growers with an accurate assessment of the volume and cost of water that will become available to them so that they can utilize this water in a manner that is best suited to the requirements of their farming operations.

Because the quantity of Kern River water available to North Kern in any given year is beyond the District's control, North Kern's drought response measures center on managing groundwater. Proration of deliveries to Class 1 lands was driven by the combination of extremely low supplies from the Kern River and other surface water sources and given the magnitude of this shortfall, the high cost of pumping a sufficient volume of groundwater to enable delivery of a full allocation. Proration of deliveries leaves growers with the responsibility of determining how best to allocate limited water supplies through deficit irrigation, fallowing of annual crops, and other water conservation measures.

As noted earlier, in addition to instituting measures to manage traditional surface water and groundwater supplies during drought, North Kern began accepting oil-field produced water into their system in August 2015 under the *Beneficial Reuse of Oilfield Produced Water Project* and is currently implementing the *return capacity improvement project*. Because the District is required by their agreement with the California Resources Company to accept produced water under all conditions, the volume of water received from this project is not modified in response to either water demands or the availability for water from other sources.

Enforcement methods of the allocation policies for drought response planning were previously described in Section II.B.4.

8) Coordination and Collaboration – include a description of how coordination and collaboration with other local districts and water agencies or regional groups will be used in drought response.

The Poso Creek Regional Water Management Group (RWMG) has proven itself to be an effective organization for operational coordination and for collaboration on development of water conveyance, groundwater recharge, and oil-field produced water projects. These projects have introduced new water into North Kern and other participating districts, improved the ability to distribute water within the region, and expanded the capability of its members to exchange and transfer water for irrigation applications and for recharge. In addition to formulating and evaluating projects, the RWMG has been successful in obtaining state and federal funding for development and implementation of numerous projects that have improved regional resiliency to drought.

It is also likely that North Kern would collaborate with some of these entities to facilitate water exchanges, transfers, and other programs that would establish an additional supply of water to be used in North Kern under drought conditions.

Implementation of the SGMA will provide yet another mechanism for regional collaboration and coordination. Regional efforts to implement this legislation will provide a firm, cooperative basis for management of groundwater during all conditions, but will be particularly important as a tool for drought response. North Kern continues to actively participate in subbasin-wide sustainable groundwater management.

9) Revenues and Expenditures – describes how the drought and lower water allocations will affect the district's revenues and expenditures.

The North Kern Board of Directors annually establishes a water toll which is applied on a per-acre-foot basis. Water tolls are based on available water supply, estimated deliveries, and the revenue required to balance the District's budget. Uniform but different tolls are set for the Class 1 and Class 2 service areas with the goal of having overall revenues from the two service classes sufficient to balance the District's budget for the year.

The North Kern Board's responsibility for adjusting water tolls each year offers a limited opportunity to reduce the financial impacts of drought by adjusting tolls to compensate for changes in the availability and demand for water. Although adjustment of tolls can buffer the financial impact of drought, the impact remains significant due to both reductions in the volumes of water delivered and increases in the costs for supplying water.

Costs for water delivery are relatively stable for surface water but can vary widely for groundwater. Because Kern River water is delivered by gravity, the cost of distributing surface water is not closely tied to annual hydrology as most of the distribution cost is attributable to the fixed costs of operating and maintaining the canal system. By contrast, the costs to the District, as well as to private well owners, of increased groundwater pumping are substantial both because of the greater volumes of groundwater pumped during droughts and because the cost of pumping each unit of water increases as groundwater elevations decline. Although rates are based on the volume of surface water projected to be available to the District during the coming irrigation season, uncertainties in these projections, as well as in the cost of groundwater pumping, can result in unexpected expenditures.

The *Beneficial Reuse of Oilfield Produced Water Project* has helped to stabilize fluctuations in the costs of supplying water as both the volume of produced water and the unit cost of delivering the water are constant and do not vary with hydrologic conditions. In addition, substitution of produced water in place of groundwater has reduced fluctuations in groundwater elevations and moderate variations in pumping costs. Similarly, the return capacity improvements project will augment the District's groundwater, which will stabilize fluctuating groundwater conditions during peak drought season.

5. *Basis for Reporting Water Quantities*

The nature of North Kern's water rights is such that there is significant year-to-year variability in the available surface water supplies. In a "dry" year, surface water supplies are very limited and pumping from District-owned-and-operated wells is significant. In a "wet" year, surface water supplies are sufficient not only to satisfy irrigation water requirements (and thereby avoid the use of District-owned deep wells), but to make significant deliveries to spreading ponds for direct groundwater recharge. Figure 7, shown previously, illustrates the variation in Kern River supply under North Kern's water rights during the period from 2000 through 2024.

In accordance with AB 1168, SB 606 and the 2025 Guidebook, the operations from the years 2020 through 2024 are reported in this plan where data was available.

Table II-14. Representative Years

	Description				
Calendar Years	2020	2021	2022	2023	2024
Water Year Type*	Dry	Critical	Critical	Wet	Above Normal

*Based on San Joaquin Valley Index retrieved at [https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST]

Section III. Description of Quantity of the Water Uses of the Agricultural Water Supplier

North Kern's principal surface water supply is the Kern River, which is diverted and delivered northward into the District through a largely open canal, gravity system. The District serves approximately 210 accounts with an average of 280 acres per account.

Owing to the highly variable Kern River supply, North Kern supplements available surface water supplies with underlying groundwater resources. During "wet" years, when irrigation water requirements are easily met, significant deliveries of surface water are also made to spreading grounds (i.e. for groundwater recharge). The District maintains approximately 100 water wells that are used to supplement surface water supplies, primarily during "dry" years.

North Kern is well positioned to participate in exchanges to supplement local water supplies, which involve SWP and CVP supplies owing to its proximity to major SWP and CVP conveyances and service areas.

A. Agricultural Water Use

The primary crops grown within North Kern are deciduous trees (mostly almonds and pistachios), grape vines, grains, and row crops. Improvements in irrigation water delivery systems and changing economic conditions have brought many changes to the crop mix within the District. Based on LandIQ data, nut trees and grapes have been among the crops with the most rapidly expanding acreages, now accounting for an average of around 90 percent of the total irrigated area for the year 2020-2024. During the last several decades, thousands of acres of annual crop land have been converted to these high value permanent crops.

The change from annual to permanent crops has led to a "hardening" of the District's total water requirements over time, especially in recent years. Table III-1 summarizes agricultural water use within the District for the representative years.

Table III-1 Agricultural Water Use (AF)

Source	2020	2021	2022	2023	2024
Agricultural Water Supplier Delivered					
Surface and groundwater[1]	154,663	143,254	151,833	392,031	229,755
Other (M&I Use)	NA	NA	NA	NA	NA
Other Water Supplies					
Surface Water	NA	NA	NA	NA	NA
Groundwater (Private Pumping)[2]	28,326	54,007	52,706	9,976	23,428
Other	NA	NA	NA	NA	NA
TOTAL	**182,990**	**197,261**	**204,539**	**402,007**	**253,183**

1. Sum of Total Surface water and Groundwater for District Deep wells. See Tables IV-1 and IV-4 for details. (Source: Kern River Annual Hydrographic Reports and District provided data)
2. Groundwater (see Table IV-4) calculated from the measured volume from Private Well Production (Source: NKWSD Summary sheet from Kern River Annual Hydrographic Reports) discharged into district facilities for conveyance and use within the District . Private pumping is calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Tables III-2a and III-2b present the total acres for each crop use. Table III-2c and III-2d present the ET in inches for specific crops grown within the North Kern service area. The efficiency of on-farm applications and crop water demands varies by crop, soil type, irrigation method and other factors. The District has installed Land IQ ET Stations and has started using data from Land IQ to calculate and report the District's ET data as of 2023. Previous years of reported ET data are based on available ITRC-Metric data for 2020 to 2022. A total weighted average was used to calculate the Total ET in inches based on the reported the irrigated and non-irrigated acres.

Table III-2a. Old District Total Area (acres) of Crops and Land Use

Crop	Total Acres, 2020	Total Acres, 2021	Total Acres, 2022	Total Acres, 2023	Total Acres, 2024	Average Acres (2020-24)
Irrigated Acres						
Almonds	24,835	25,557	27,478	32,187	29,782	27,968
Young Almonds	10,133	8,734	8,501	2,863	5,714	7,189
Pistachios	2,502	2,755	3,124	3,796	3,816	3,199
Vineyards	1,462	1,597	1,779	2,155	1,826	1,764
Young Other Deciduous	562	1,192	1,459	1,731	1,512	1,291
Young Pistachios	1,297	1,095	1,121	533	1,102	1,030
Young Vineyards	1,220	1,015	774	245	457	742
Other Truck	508	550	560	570	761	590
Grain	183	537	402	373	596	418
Double Cropped Potatoes and Carrots	294	623	584	266	228	399
Onions & Garlic	411	439	438	361	321	394
Potatoes	315	454	258	242	561	366
Alfalfa	436	326	204	279	204	290
Carrots	324	233	186	361	216	264
Unknown	249	345	321	49	0	193
Peaches	23	187	187	163	0	112
Double Cropped Corn and Wheat	59	138	169	63	0	86
Other Field	85	135	16	29	118	77
Other Deciduous	163	0	0	23	187	75
Cotton	0	12	86	19	154	54
Pasture	0	6	50	55	55	33
Corn	6	43	12	86	0	29
Cherries	3	22	0	0	0	5
Young Cherries	22	0	0	0	0	4
Subtotal Irrigated (Acres)	**45,093**	**45,996**	**47,709**	**46,450**	**47,610**	**46,572**
Non-Irrigated Acres						
Idle	8,878	7,783	5,974	7,233	6,213	7,216
Urban	2,796	2,989	3,085	3,086	3,086	3,009
Native and Riparian Vegetation	2,275	2,273	2,274	2,272	2,132	2,245
Recharge Basins	1,786	1,786	1,786	1,786	1,786	1,786
Subtotal Non-Irrigated (Acres)	**15,735**	**14,831**	**13,119**	**14,377**	**13,217**	**14,256**
Total (acres)	**60,827**	**60,827**	**60,827**	**60,827**	**60,827**	**60,827**

1. Total acres are based on ITRC-metric data from 2020-2022 and LandIQ data from 2023-2024

Table III-2b. RRID Total Area of Crops and Land Use

Crop	Total Acres, 2020	Total Acres, 2021	Total Acres, 2022	Total Acres, 2023	Total Acres, 2024	Average Acres (2020-24)
Irrigated Acres						
Almonds	1,064	2,175	2,162	2,103	2,316	1,964
Young Almonds	1,188	90	684	793	547	660
Carrots	326	382	186	16	128	208
Onions & Garlic	468	113	104	93	216	199
Double Cropped Potatoes and Carrots	75	207	274	130	235	184
Grain	288	374	48	22	175	182
Potatoes	156	93	135	336	39	152
Double Cropped Corn and Wheat	91	117	122	145	87	112
Other Truck	128	54	10	89	138	84
Young Other Deciduous	28	206	57	3	27	64
Unknown	0	5	57	150	55	53
Tomatoes	0	0	7.917925	55.42547	0	13
Alfalfa	1	1	1	2	2	1
Pistachios	0	0	0	0	0	0
Subtotal Irrigated (Acres)	**3,812**	**3,817**	**3,849**	**3,939**	**3,963**	**3,876**
Non-Irrigated Acres						
Idle	1,488	1,460	1,400	1,159	1,336	1,369
Urban	603	603	605	606	606	605
Native and Riparian	364	386	413	564	362	418
Subtotal Non-Irrigated	**2,455**	**2,450**	**2,418**	**2,328**	**2,303**	**2,391**
Total (acres)	**6,267**	**6,267**	**6,267**	**6,267**	**6,267**	**6,267**

1. Total acres are based on ITRC-metric data from 2020-2022 and LandIQ data from 2023-2024

Table III-2c. Old District Calendar ET in inches for Crops

Crop	Total ETc, 2020 (in)	Total ETc, 2021 (in)	Total ETc, 2022 (in)	Total ETc, 2023 (in)	Total ETc, 2024 (in)	Weighted Average Total ETc (in)
ET for Irrigated Acres						
Almonds	47.7	53.0	50.3	43.2	48.0	48.2
Young Almonds	17.2	19.7	21.7	19.8	18.5	19.3
Pistachios	42.2	43.7	43.0	42.0	49.3	44.3
Vineyards	40.2	42.2	42.3	40.7	43.8	41.9
Young Other Deciduous	8.7	9.2	6.7	14.6	14.1	11.2
Young Pistachios	26.2	29.9	23.8	14.3	17.6	23.4
Young Vineyards	26.5	25.3	30.5	19.5	19.8	25.7
Other Truck	28.7	31.3	33.6	32.3	26.8	30.3
Grain	20.8	29.3	27.1	22.4	17.5	23.5
Double Cropped Potatoes and Carrots	20.8	24.2	30.2	25.7	21.5	25.3
Onions & Garlic	19.5	24.1	24.6	20.0	20.2	21.9
Potatoes	20.4	23.6	22.7	17.7	19.8	21.0
Alfalfa	42.4	36.9	46.4	40.9	44.5	41.7
Carrots	21.9	30.5	24.7	23.9	29.3	25.6
Unknown	21.2	17.0	21.1	30.4	0.0	20.1
Peaches	34.1	54.1	49.4	49.9	0.0	50.5
Double Cropped Corn and Wheat	29.2	36.0	38.6	35.9	0.0	36.0
Other Field	24.6	33.1	7.8	17.1	34.3	29.3
Other Deciduous	48.7	0.0	0.0	17.7	49.1	47.0
Cotton	0.0	10.7	37.2	17.8	33.0	32.2
Pasture	27.1	13.1	36.8	24.1	15.9	24.7
Corn	10.2	39.8	3.7	33.9	0.0	32.1
Cherries	19.7	38.0	0.0	0.0	0.0	35.7
Young Cherries	18.2	0.0	0.0	0.0	0.0	18.2
Irrigated Acres Weighted Subtotal (in)	**37**	**41**	**41**	**39**	**41**	**40**
ET for Non-Irrigated Acres						
Idle	8.2	4.4	5.3	12.6	6.9	7.6
Urban	3.9	3.9	3.9	4.3	4.1	4.0
Native and Riparian	7.2	3.9	4.9	10.6	7.0	6.7
Recharge Basins	7.7	3.9	5.2	12.9	6.9	7.3
Non-Irrigated Acres Weighted Subtotal (in)	**7.3**	**4.1**	**4.9**	**10.5**	**6.2**	**6.7**
Weighted Total (inches)	**29.4**	**32.3**	**33.0**	**32.3**	**33.3**	**32.1**

Table III-2d. RRID Calendar ET in inches for Crops

Crop	Total ETc, 2020 (in)	Total ETc, 2021 (in)	Total ETc, 2022 (in)	Total ETc, 2023 (in)	Total ETc, 2024 (in)	Weighted Average Total ETc (in)
ET for Irrigated Acres						
Almonds	44.0	53.3	51.4	42.4	48.0	48.3
Young Almonds	18.0	10.8	19.7	21.9	18.5	19.2
Carrots	21.0	30.9	32.6	6.1	29.3	27.5
Onions & Garlic	21.0	24.2	24.9	17.0	20.2	21.2
Double Cropped Potatoes and Carrots	19.8	23.3	30.3	24.4	21.5	24.8
Grain	23.4	30.6	29.5	8.4	17.5	25.2
Potatoes	20.2	22.9	19.8	20.4	19.8	20.5
Double Cropped Corn and Wheat	32.9	37.3	34.8	33.9	35.6	34.9
Other Truck	29.9	34.0	16.6	31.7	26.8	29.5
Young Other Deciduous	3.3	9.5	7.9	8.2	14.1	9.0
Unknown	0.0	9.9	16.7	29.6	21.6	24.8
Tomatoes	0.0	0.0	3.8	33.2	0.0	29.5
Alfalfa	41.8	35.6	43.5	40.1	44.5	41.7
Pistachios	42.5	44.1	43.9	42.0	49.3	44.8
Irrigated Acres Weighted Subtotal (in)	**27.0**	**41.4**	**39.4**	**33.7**	**37.0**	**35.7**
ET for Non-Irrigated Acres						
Idle	6.7	2.7	4.2	10.0	6.6	5.8
Urban	10.8	10.5	10.3	10.9	11.0	10.7
Native and Riparian	6.7	3.1	3.7	7.8	5.9	5.6
Non-Irrigated Acres Weighted Subtotal (in)	**7.7**	**4.7**	**5.6**	**9.7**	**7.6**	**7.0**
Weighted Total (inches)	**19.5**	**27.0**	**26.4**	**24.8**	**26.2**	**24.8**

In 2024, the District's gross service area now encompasses approximately 60,827 acres. As shown in Table III-2a, an average of approximately 46,572 acres were irrigated from surface water and groundwater sources.

Double cropped acres included irrigated acres for double cropped potatoes and carrots as well as double cropped corn and wheat both identified in Tables II-2a, II-2b, II-2c, and II-2d. The remaining irrigated acres are cropped. For the average period of 2020 to 2024, over 90 percent of the cropped acres are planted with permanent crops with almonds being the predominant permanent crop with 27,968 acres. Inter-cropping is not a common practice in the North Kern service area so inter-cropping acres are negligible.

B. Environmental Water Use

North Kern does not make deliveries of water specifically for environmental purposes. Any environmental water uses realized from District-maintained water supplies are incidental to the District's operations. In particular, to the extent that there is water in the District's canals or the 1,786 acres of spreading ponds that are periodically flooded, it is available to local wildlife and provides incidental habitat benefits. The USACE is responsible for Isabella Reservoir operations and any environmental use of water stored in Isabella Reservoir is incidental to that operation.

These potential sources do not qualify as consumptive environmental water uses applicable to the AWMP water balance. As such, there is no water consumption assigned to environmental uses for in-stream flow releases, streams, lakes or reservoirs, or riparian vegetation.

C. Recreational Water Use

Recreational activities at Isabella Reservoir, also known as Lake Isabella, include camping, fishing, and boating. USACE is responsible for day-to-day reservoir operations, while the Kern County Parks and Recreation Department administers the recreational activities at the lake. North Kern is not responsible for any recreational activities at Lake Isabella. Recreational use of District water supplies is incidental to the District's storage of water in the reservoir, which is for the purpose of regulating the supplies. Accordingly, no consumptive use of water has been assigned North Kern's water in Isabella storage for the purpose of the water accounting in this plan.

D. Municipal and Industrial Water Use

North Kern delivers only raw (non-potable) water throughout its service area; accordingly, there are no direct deliveries for M&I purposes. All M&I water use in the North Kern service area is supplied by groundwater pumping. To date, the City of Shafter, other local communities, rural residences, and businesses have relied exclusively on groundwater pumped from the Kern County Subbasin for domestic and commercial uses. When available surface water supplies permit, the District replenishes the underlying groundwater through significant recharge operations which are conducted at multiple spreading pond locations. The spreading operations are carried out in support of the pumping required to satisfy the irrigation water requirements within the District;

however, as a practical matter, the same groundwater system supplies both agricultural uses and M&I uses.

In 1952, North Kern entered into an agreement which provides the District access to water for purposes limited to irrigation, livestock watering, and groundwater replenishment. In 2008, North Kern entered into an amendment to the 1952 agreement which provides groundwater for M&I water uses. To date, these uses have been relatively small. In particular, the City of Shafter has pumped less than 1,000 AF for such purposes. For the purpose of this report, there are no reported municipal and industrial water uses.

E. Groundwater Recharge Use

Indirect recharge occurs to the extent that the District delivers surface water in lieu of pumped groundwater to satisfy irrigation water requirements. Kern River water which is surplus to immediate irrigation requirements and cannot be regulated in the District's share of conservation storage space available in Isabella Reservoir is available for direct recharge. In this regard, North Kern makes use of over 1,786 acres of spreading ponds, the dry channel of Poso Creek, and unlined canals. The spreading ponds, as shown in Figure 2, have been in use for over 60 years and consist of relatively small ponds or cells within a given spreading site, separated by contour dikes. Since the spreading ponds were constructed in the 1950s, North Kern has spread over 3.25 million AF of water. It is noteworthy that, prior to the development of its extensive spreading grounds, North Kern initiated field experimentation and research in 1936 regarding the use of artificial recharge methods in the southern San Joaquin Valley.

During particularly "wet" years, direct recharge through the use of spreading ponds is significant in the basin. Table III-3 lists the volume of water allocated towards groundwater recharge in the years of 2020, 2021, 2022, 2023, and 2024.

Table III-3. Groundwater Recharge Water Uses (AF)[1]

Location/Groundwater Basin	Method of Recharge	2020	2021	2022	2023	2024
District Spreading Ponds	Spreading of Surface Water	7,139	11,263	12,771	215,896	56,690
District Canal Seepage		33,481	38,251	43,253	45,850	36,565
Poso Creek*	Spreading and Recharge of Surface Water	0	0	0	8,898	1,321
Deep percolation of applied water		19,535	17,687	21,698	23,689	22,211
Subtotal Groundwater Recharge from Surface Water Supply		**60,155**	**67,201**	**77,722**	**294,333**	**116,788**
Deep percolation of precipitation		6,147	3,650	4,490	11,266	5,590
Total		**66,302**	**70,851**	**82,212**	**305,599**	**122,377**

[1.] Source: Kern River Annual Hydrographic Reports for 2020-2024. Deep percolation is calculated for Agricultural lands in the NKWSD Old District with the rootzone and groundwater balance in the internal demand calculator of the IWFM Groundwater model. Canal seepage is a calculated estimate based on the total canal losses reported in the Kern River Annual Hydrographic Reports minus estimated evaporation.

[*] Values have not been reduced by potential evaporation, represent gross estimates.

F. Transfer and Exchange Use

North Kern is well-positioned to participate in exchanges which involve SWP and CVP supplies owing to its proximity to major SWP and CVP conveyances and service areas. Regarding CVP water, it is noted that the Friant-Kern Canal slices through the middle of North Kern from north to south. In addition, two of North Kern's immediate neighbors are CVP-Friant contractors; namely, the Southern San Joaquin Municipal Utility District and the Shafter-Wasco Irrigation District. Regarding SWP water, the Cross Valley Canal conveys SWP water from the California Aqueduct into the metropolitan Bakersfield area, where water is pumped into North Kern's Beardsley Canal for delivery to the Cawelo Water District. Though not a long-term CVP contractor, North Kern has purchased CVP water that has been available from time to time, typically during the peak runoff period of wet years, generally through "Section 215" contracts. In this regard it is noteworthy that the District has constructed two turnouts from the Friant-Kern Canal to facilitate such purchases, as well as having instituted water banking and exchange arrangements with neighboring districts. Table III-4 summarizes North Kern activity in water exchanges during the representative years.

Table III-4. Transfers and Exchanges Water Uses

From What Agency	To What Agency	Type of Transfer or Exchange (Ag to M&I, M&I to Ag, or Ag to Ag)	Volume (AF) 2020	2021	2022	2023	2024
Rosedale Ranch ID	North Kern WSD	Agricultural to Agricultural	0	0	0	0	0
Shafter-Wasco ID	North Kern WSD	Agricultural to Agricultural	4,520	1,021	90	24,715	14,362
Southern San Joaquin MUD	North Kern WSD	Agricultural to Agricultural	0	1,849	8,705	7,843	0
Cawelo WD	North Kern WSD	Agricultural to Agricultural	0	746	0	24,235	51
Kern Delta WD	North Kern WSD	Agricultural to Agricultural	2,500	0	1,000	25,000	7500
BVWSD	North Kern WSD	Agricultural to Agricultural	0	0	0	35,000	0
Others (STWSD, RRBWSD, SWID, KCWA, KT)	North Kern WSD	Agricultural to Agricultural	0	0	0	1,809	4
City of Bakersfield	North Kern WSD	Agricultural to Agricultural	0	0	0	5,262	0
KRC&I Co.	North Kern WSD	Agricultural to Agricultural	772	0	12	8,782	3,459
Others via CVC	North Kern WSD	Agricultural to Agricultural	4,958	0	0	8,064	0
Others via FKC	North Kern WSD	Agricultural to Agricultural	0	0	0	2,709	19,893
		Subtotal of Inflows:	**12,750**	**3,616**	**9,807**	**143,419**	**45,269**
North Kern WSD	via FKC Deliveries to CVP contractors (DEID and KTWD)	Agricultural to Agricultural	12,052	12,308	8,173	0	1,127
North Kern WSD	Cawelo WD (via Lerdo Canal)	Agricultural to Agricultural	4,454	726	0	0	0
North Kern WSD	Rosedale Ranch ID	Agricultural to Agricultural	0	0	0	15,946	4,670
North Kern WSD	Shafter-Wasco ID	Agricultural to Agricultural	1,088	4,759	1,753	290	287
North Kern WSD	Southern San Joaquin MUD	Agricultural to Agricultural	3,030	3,000	1,413	0	0
		Subtotal of Outflows:	**20,624**	**20,793**	**11,339**	**16,236**	**6,084**

Source: Kern River Annual Hydrographic Reports for 2020-2024.

In 2012 North Kern and other members of the Poso Creek RWMG completed State (California Environmental Quality Act – CEQA) and Federal (National Environmental Policy Act – NEPA) environmental documents for groundwater banking, transfer, and exchange programs among the members of the RWMG. These programs, which may involve SWP, CVP and local water supplies, envision the expansion of water management programs among the RWMG in response to reductions in historically available regional surface water supplies as documented in the Poso Creek IRWMP. Expanded water banking, transfer and exchange programs designed to improve regional water management will assist in reducing the adverse impacts on regional groundwater conditions and agricultural operations associated with regional losses of surface water supplies.

As noted elsewhere in this report and in the Poso Creek IRWMP, North Kern has substantial assets to both recharge and recover water supplies for banking, transfer, and exchange purposes. North Kern is also faced with potentially large reductions in its historically available Kern River water supplies due largely to the State Water Resources Control Board's decision in 2010 to remove the Kern River from the "fully appropriated stream" list and proposed actions of the City of Bakersfield and the Kern Delta Water District. Consequently, North Kern must optimize the use of its water and facilities assets through banking, transfer, and exchange programs within the Poso Creek region, and in other areas of Kern County, which can be facilitated because of the District's excellent proximity to the Friant-Kern Canal and CVP "Friant Division" contractors. These actions are necessary for the continuation of viable agricultural operations within the District.

G. Projected Water Use

Projections of future water use in the District are directly related to the future availability of water supplies. The GSP (2025) found that North Kern's projected water supply with the projects supporting increased groundwater banking and conjunctive use of available supply and projected demand reduction due to conversion of agricultural land to urban use and recharge basins was estimated to balance demand and water supply and achieve the Kern County subbasin's sustainability goal.

Future water use in the District will also change as some irrigated agricultural lands are converted to urban uses. Based on the GSP planning work (GSP, 2025), the total water use is estimated to decrease about two acre-feet per acre when irrigated agricultural land is converted to urban use.

Section IV. Description of Quantity and Quality of the Water Resources of the Agricultural Water Supplier

A. Water Supply Quantity

1. *Surface Water Supply*

With regard to surface features, the Calloway and Lerdo canals run south-north, and the Friant Kern Canal runs north-south through the District; Poso Creek runs northwest through the northern part of the District; and the Kern River is south of the District. North Kern's principal surface water supply is the Kern River, diverted and delivered by gravity to water users through the Lerdo and Calloway canals. Poso Creek is a relatively small, intermittent source of local surface water. Table IV-1 shows North Kern's diversions from the Kern River for the years 2020-2024 in AF per year (amounts are measured at Seventh Standard Road, the District's south boundary).

Surface water is retained and regulated in the District's conservation storage space in Isabella Reservoir, as noted in Table II-3. The USACE constructed Isabella Dam in the 1950s and is responsible for day-to-day reservoir operations. Isabella "surface storage" is used by the District to supplement groundwater storage associated with the District's recharge and recovery activities. Table IV-2 lists restrictions or imposed limitations on sources of North Kern's water supply, particularly the storage of water in Isabella Reservoir.

Table IV-1. Surface Water Supplies (AF)

Source	Diversion Restriction	2020	2021	2022	2023	2024
Total Supply	Water year type and priority rights	45,485	21,579	26,283	392,031	220,448

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes District Supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland (See Table V-1 for details).

Table IV-2 Restrictions on Water Sources

Source	Restrictions or Imposed Limitations	Name of Agency Imposing Restrictions	Operational Constraints
Kern River	Storage	USACE	Dam-safety considerations caused USACE to impose a maximum storage restriction of about 360,000 AF, which is about 200,000 AF less than the reservoir's capacity at spillway crest. After competion of modifications the restriction was lifted in July 2023.

2. *Groundwater Supply*

In years of deficient surface water supply, continuity of delivery to the surface water service area is maintained by the operation of approximately 100 wells which are owned and operated by the District, while on-farm wells are used to meet irrigation demands in the remainder of North Kern.

Long-term water-level data in selected wells representing the unconfined to semi-confined aquifers are used to evaluate groundwater movement, storage conditions, and pumping costs. Historically, water levels in supply wells have been measured twice a year, in both the "spring" and "fall", with the timing of these measurements intended to coincide with the annual water level high and low, respectively. Measurement of water levels will continue to be performed in both spring and fall to show seasonal variations in water levels throughout the District, and groundwater levels at select wells will be monitored on a monthly basis. These data have been made available to the KCWA and the DWR for the District-owned wells.

The average depth to groundwater in the District has been around 200 feet at the end of a "wet" period (1986) and around 270 feet at the end of a "dry" period (1993). Over the last 20 years, the annual (average) spring water levels have fluctuated within a band of about 50 feet to 100 feet. Seasonal fluctuations can be significant and are a function of the amount of groundwater pumping in a given year and the location within the District. In general, seasonal fluctuations are greatest in the northern portion of the District and are less pronounced in the south.

The San Joaquin Valley portion of Kern County is referred to as the Kern County Subbasin, the north boundary of which is coincident with the north county line. North Kern WSD is within the Kern County Subbasin, designated as DWR Groundwater Basin Number 5-22.14, and the District is shown in relation to the groundwater basin boundary in Figure 8.

The Kern County Subbasin is well-studied, with major investigations having been conducted by both state and federal agencies. Project reports and environmental documents prepared by local water districts are a source of more site-specific data. Table IV-3 summarizes information on the size and capacity of the Kern County Subbasin. Importantly, the "safe yield" of the basin - the amount of water that can be withdrawn based on "natural" basin replenishment (i.e., excluding conjunctive use/banking programs) - has not been determined but is clearly a relatively small fraction of groundwater production from the Subbasin in dry years. The collectively prepared 2025 Kern County Subbasin GSP, which included NKWSD as a groundwater sustainability agencies, is available upon request.

Table IV-3. Groundwater Basins

Basin Name	Size (Sq. Mi.)*	Estimated Capacity (AF)**	Sustainable Yield (MAFY)*
Kern County Groundwater Subbasin	3,040	40,000,000	1.31 MAFY

*Source: 2025 Kern County Subbasin GSP

**The estimated capacity is based on DWR San Joaquin District Kern County Groundwater Basin Information: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/5_022_14_KernCountySubbasin.pdf

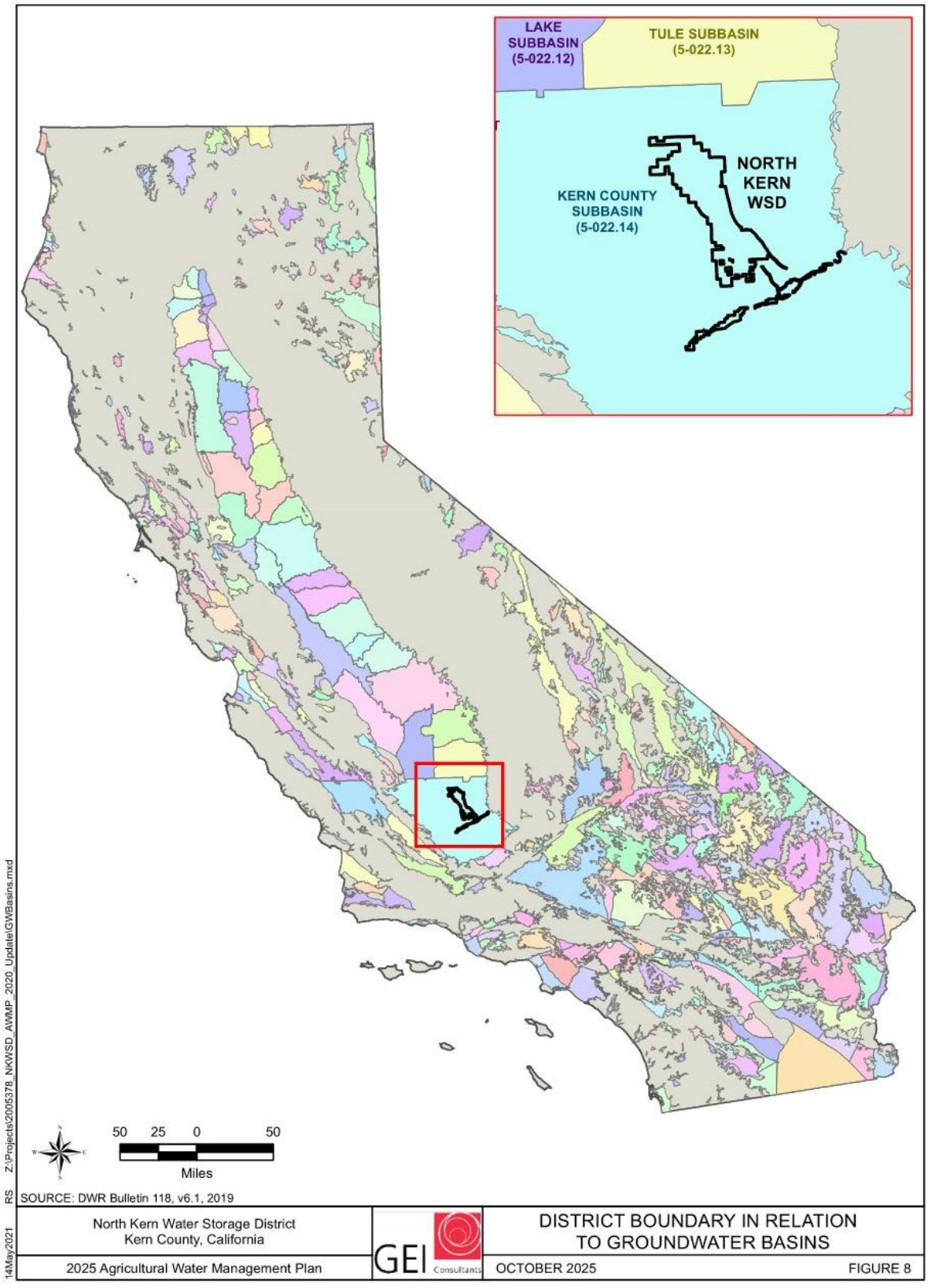


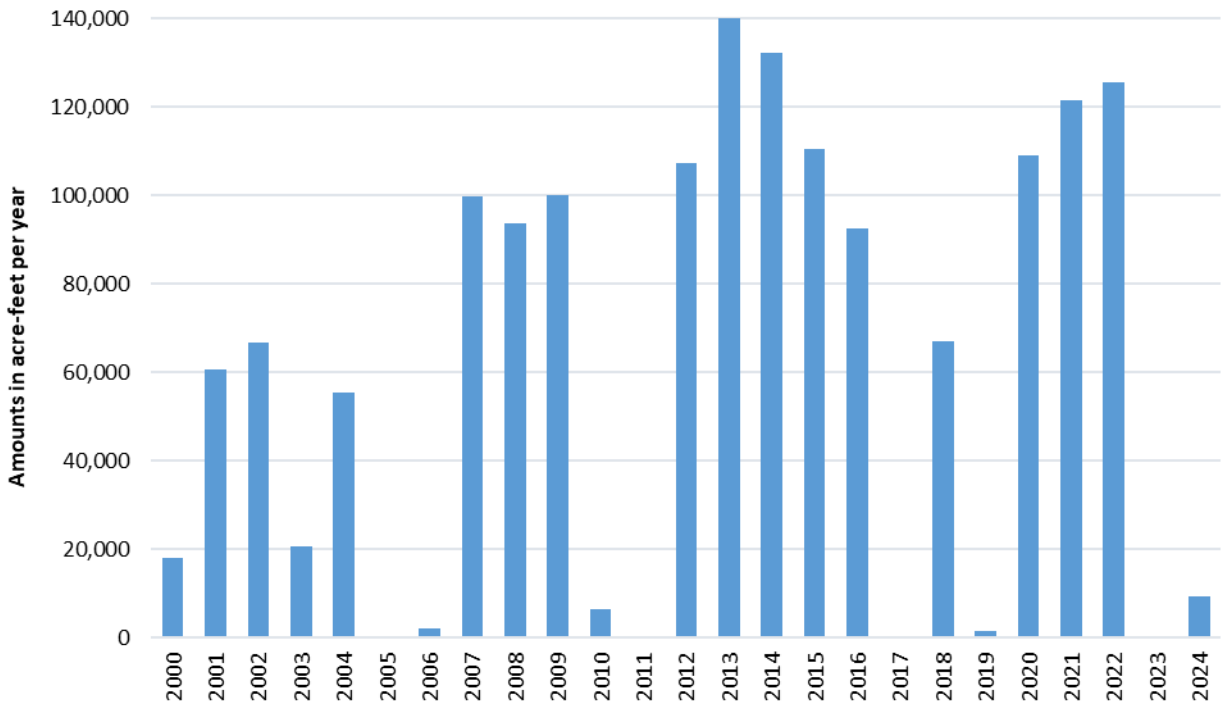
Figure 8. District Boundary in Relation to Groundwater Basins

Irrigation Wells

Groundwater pumping by the District is used to offset deficiencies in available surface water supplies. About one-half of the District's approximately 100 wells, originally were constructed in the 1950s, are about 800 feet in depth, while wells constructed since that time are typically drilled to a depth of about 1,000 feet, with the top of the screened interval located from 400 to 500 feet below ground surface and extending 500 to 600 feet.

Pumping lifts vary with hydrology and with location; however, they are estimated to have ranged from 350 to 400 feet over recent years. The at-well pumping drawdowns during the irrigation season can exceed 100 feet but are typically about 50 to 75 feet. Based on a 2008 field survey, privately-owned on-farm wells totaled over 200, about 70 percent of which were in ready-to-operate condition.

During the drier years, the District's well field is principally operated during the nine-month period extending from February through October and is operated at or near capacity from May into August. Annual pumpage from District wells has ranged up to 140,000 AF. Conversely, there are years where available surface water supplies are adequate and the well field is not used at alle years, as illustrated in Figure 9.



Source: North Kern WSD Kern River Annual Hydrographic Reports.

Figure 9. Groundwater Pumping from District-Owned Deep Wells.

District water is priced lower in wet years when Kern River supplies are "plentiful", thereby incentivizing the use of District (surface) water over groundwater pumping. In dry years, the District pumps large volumes of groundwater and District water prices are higher, encouraging water users to conserve.

The volume of measured groundwater pumped within the boundaries of North Kern in 2020, 2021, 2022, 2023, and 2024 for discharge into the North Kern distribution system is shown in Table IV-4. Non-district (or privately-owned) wells that are pumped within the District for direct application onto farmland without conveyance through North Kern facilities are also included.

Table IV-4 Groundwater Supplies*

Groundwater Basin	Total (AF)				
	2020	2021	2022	2023	2024
District Deep Wells[1]	109,178	121,675	125,550	0	9,307
Non-District Deep Wells[1, 2]	28,326	54,007	52,706	9,976	23,428
Total	**137,504**	**175,682**	**178,256**	**9,976**	**32,735**

Source: North Kern WSD Kern River Annual Hydrographic Reports.

1. Measured volume discharged into district facilities for conveyance and use within the District
2. Non-District Deep Wells includes Private Well Production (Source: NKWSD Summary sheet from Kern River Annual Hydrographic Reports) as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

3.*Other Water Supplies*

In general, North Kern does not have uncontrolled inflows to the District. The exception to this is Poso Creek, which is frequently dry but which, at times, is a source of unregulated inflow. Flows from Poso Creek are measured at weirs which enable the District to estimate inflows except during storms when accurate measurement by the weirs is not possible.

The City of McFarland provides a permitted discharge of 1.1 to 1.5 million gallons per day of recycled water supplies for irrigation of 270 acres of alfalfa crop land in the North Kern GSA (Kern County Subbasin GSP, 2025, p. 5-36). The volume of recycled water delivered within the boundaries of North Kern in 2020, 2021, 2022, 2023, and 2024 is shown in Table IV-5.

Table IV-5 Recycled Water Supplies

Source	Total (AF)				
	2020	2021	2022	2023	2024
City of McFarland	841	578	1,215	186	807
Total	**841**	**578**	**1,215**	**186**	**807**

Source: Kern County Subbasin DMS values provided by City of McFarland. No data was provided in 2024. As such, 2024 was estimated as the average annual volume of 2014-2023 data.

B. Water Supply Quality

North Kern's groundwater and surface water quality is generally good to excellent. Surface water diverted from the Kern River originates from snowpack in the Sierra Nevada Mountains, in particular the Kings-Kern Divide. The Kern River watershed covers approximately 2,400 square miles of the western slopes of the Sierras towards the southern end of the Central Valley (2025 Kern County GSP, p. 7-6). Kern River water contains low amounts of total dissolved solids (TDS) and minimal or negligible amounts of other water quality constituents that impact agricultural and/or domestic water use. The quality of the underlying groundwater is much more variable.

The District is a member of the Kern River Watershed Coalition Authority which, among other things, implements the Central Valley Regional Water Quality Control Board Irrigated Lands Regulatory Program (ILRP). North Kern also performs water quality monitoring consistent with the ILRP including water quality analyses at the canal inlets for the main supply arteries. Water quality sensors collect data for temperature, conductivity and pH which are later analyzed by the District.

1. *Surface Water Supply – Kern River (Head of the Beardsley Canal)*

Water is diverted from the Kern River at two points. The principal supply artery, and most upstream diversion, is the Beardsley-Lerdo canal system. Surface water quality monitoring is generally performed at this station, indicative of the water from the Kern River that is diverted into North Kern canals. The diverted water at this location has a TDS of approximately 134 milligrams per liter (mg/l) with low concentrations of other constituents, as seen in Table IV-6. The quality of the river water is fairly consistent from year to year.

Note that Table IV-6 presents data general representative water quality data from the Kern River based on the 5-year water quality average (2020 through 2024) for the Kern River NE Treatment Plant Influent (1510003-252). This monitoring point is prior to first use in the Poso Creek region; therefore, water quality at this point is representative of water entering the region. This presents a more current depiction of the quality of water diverted from the Kern River.

Table IV-6 Surface Water Supply Quality

Parameter	Units	Values
Ca	mg/l	17.8
Mg	mg/l	3.3
Na	mg/l	16.9
Alkalinity	mg/L (as $CaCO_3$)	65.8
K	mg/l	2.2
Cl	mg/l	5.7
SO_4	mg/l	14.4
NO_3	mg/l	0.33
TDS	mg/l	134
Hardness	mg/L (as $CaCO_3$)	58
Electrical Conductivity	µS/cm	204

Source: SDWIS Kern River NE Treatment Plant Influent (1510003-252) for 2020-2024

2.*Groundwater Supply*

Groundwater in the eastern part of the subbasin is typically sodium bicarbonate type water, while groundwater to the west is characterized by calcium sulfate type water. Water quality sustainable management criteria described in the 2025 Kern County Subbasin GSP set water quality objectives for constituents of concern based on the existing water quality of representative monitoring wells in the region. Most of the historical water quality sampling in the District has been done for agricultural purposes. The water quality objective for TDS in the 2025 Kern County GSP is 500 ppm - 1000 ppm (Kern County Subbasin GSP, p. 8-111). Based on this sampling, groundwater underlying the district generally meets the criteria with median TDS concentrations from 2010-2023 being < 1000 ppm; however, there are exceptions. The most notable is an area of high salinity extends south from the Shafter Airport to near Seventh Standard Road and Highway 99. Outside of this area, TDS concentrations in the District groundwater typically range from 250 to 500 ppm which is good from an irrigation water perspective.

Of the constituents typically included in an irrigation water quality analysis, nitrate nitrogen (NO_3) is one constituent with concentrations that have, in some cases, exceeded the corresponding primary drinking water maximum contaminant level (MCL) of 10 mg/L, which is defined as the water quality objective in the 2025 Kern County GSP (Kern County GSP, p. 8-90). In particular, there are three principal areas where this has occurred:

1) Between Highway 46 and Kimberlina Road.
2) South of Kimberlina Road and east of the Friant-Kern Canal.
3) South of Dresser Avenue, primarily northeast of or near the Friant-Kern Canal.

Full drinking water quality analyses are much more limited in North Kern. With the recently lowered primary drinking water MCL for arsenic of 10 ppb (set as the water quality objective in the 2025 Kern County GSP (Kern County GSP, p. 8-64)), meeting these standards may be problematic for many public supply wells in the San Joaquin Valley; however, testing to date

suggests that median arsenic concentrations from 2010-2023 in groundwater underlying North Kern is typically below the MCL.

3. *Other Water Supplies*

There are no additional water supplies other than those described in this plan, so the characteristics of the District's water supply are captured through monitoring of surface water and groundwater.

C. Water Quality Monitoring Practices

1. Source Water

North Kern regularly monitors the quality of surface water diverted from the Kern River to confirm the suitability of this water for agricultural use. The majority of monitoring locations are at main supply diversions from the Kern River. Groundwater is occasionally monitored at district deep well locations, typically in years of heavy use due to low surface water supply. Table IV-7 provides general information on monitoring of source water quality in the District.

Table IV-7 Water Quality Monitoring Practices

Water Source	Monitoring Location	Monitoring Practice	Frequency of Analysis
Kern River	Head of the Beardsley	Agricultural Suitability	Monthly
Kern River, Groundwater*	7th Standard, Zachary, Kimberlina, Stiff House	Agricultural Suitability	Monthly

* During wet years all flow at this location may be surface water. During dry years, groundwater is also conveyed past this location with the volume of groundwater inversely proportional to the availability of surface water.

2. Drainage Water

Drainage water is essentially non-existent in the district due to extent of permanent crops. As noted in Table IV-8, North Kern will conduct monitoring of surface drainage and groundwater as needed to confirm the suitability of this water for reuse.

Table IV-8 Water Quality Monitoring Programs for Surface/Sub-Surface Drainage

Monitoring Program	Analyses Performed	Frequency of Analysis
Surface and Groundwater	EC and NO_3	As needed

In addition, the District does not provide any drainage facilities, nor does it control or monitor any on-farm subsurface drainage systems. Therefore, limitations to drainage reuse is not of concern to the District. As such, there are no applicable drainage reuse limitations related to increased leaching, blending supplies, restricted area of use, restricted crops, or other reasons. As noted above, the District does participate in and help facilitate the ILRP administered by the KCWA and the Kern River Watershed Coalition Authority, and regulates discharges from irrigated lands and focuses on priority water quality issues, such as pesticides and toxicity, nutrients, and sediments. Other programs focused on protecting groundwater quality include the Central Valley-Salinity Alternatives for Long-Term Sustainability (CV-SALTS) is a stakeholder-led initiative established to address nitrate and salt accumulation in the Central Valley's groundwater supplies. The Nitrate

and Salt Control Programs are being implemented on parallel paths. The overarching goals of these programs are to:

- Identify short- and -long-term solutions to ensure safe drinking water in communities where groundwater is high in nitrate.
- Reduce impacts from nitrate and salts to the groundwater.
- Where reasonable and feasible, restore groundwater quality.

On-farm tailwater drainage within the District's service area is minimal due to the prevalence of low-volume and level-basin irrigation systems. In cases where on-farm tailwater is generated, the water users typically contain it within their property.

Section V. Water Accounting and Water Supply Reliability

A. Quantifying the Water Supplier's Water Supplies

1. *Agricultural Water Supplier Water Quantities*

Diversions of surface water from the Kern River vary from year to year depending on the weather, the amount of runoff, and operational considerations. The years of 2020 and 2021 represent extreme drought conditions. Tables V-1 a, b, c, d, and e summarize monthly diversions from the Kern River to North Kern delivery canals. Note that these values represent the monthly amount of water arriving within District boundaries after consideration of operational losses which occur outside of the District's service area (which include canal seepage and evaporative losses).

Table V-1a. Surface and other Water Supplies for 2020 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Kern River	2,581	654	0	-2,442	5,639	9,488	11,538	7,055	4,026	613	593	3,935	43,680
Poso Creek inflows	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers & Exchanges inflows	1,464	6,814	13	2,694	640	27	848	226	16	5	3	0	12,750
Transfers & Exchanges outflows	-242	-733	-1,598	-1,851	-2,121	-2,149	-3,141	-3,633	-2,523	-2,100	-503	-30	-20,624
Recycled Water	0	0	113	106	112	112	112	113	87	86	0	0	841
Oilfield Produced Water	782	748	827	780	811	728	728	772	700	653	648	661	8,838
Total	**4,585**	**7,483**	**-645**	**-713**	**5,081**	**8,206**	**10,085**	**4,533**	**2,306**	**-743**	**741**	**4,566**	**45,485**

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes the District supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland.

Table V-1b. Surface and other Water Supplies for 2021 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Kern River	2,392	0	0	440	413	5,133	5,821	1,655	1,263	228	4,200	7,256	28,801
Poso Creek inflows	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers & Exchanges inflows	0	0	6	15	0	15	789	43	38	2	0	2708	3,616
Transfers & Exchanges outflows	0	-530	-1,619	-2,791	-2,272	-2,130	-2,017	-2,140	-2,377	-2,347	-2,273	-297	-20,793
Recycled Water	89	87	98	0	0	0	0	0	0	103	100	101	578
Oilfield Produced Water	740	679	718	737	782	750	802	837	849	839	831	813	9,377
Total	**3,221**	**236**	**-797**	**-1,599**	**-1,077**	**3,768**	**5,395**	**395**	**-227**	**-1,175**	**2,858**	**10,581**	**21,579**

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes District supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland.

Table V-1c. Surface and other Water Supplies for 2022 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Kern River	480	0	0	0	-736	4,593	7,196	1,079	0	0	2,810	3,889	19,311
Poso Creek inflows	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers & Exchanges inflows	8,705	0	8	0	1,000	28	54	0	0	0	0	12	9,807
Transfers & Exchanges outflows	0	-49	-1,554	-1,423	-1,552	-1,477	-1,384	-1,476	-1,360	-810	-254	0	-11,339
Recycled Water	99	90	100	97	104	100	115	104	100	102	100	104	1,215
Oilfield Produced Water	12	764	833	813	843	807	846	901	851	595	12	12	7,289
Total	**9,296**	**805**	**-613**	**-513**	**-341**	**4,051**	**6,827**	**608**	**-409**	**-113**	**2,668**	**4,017**	**26,283**

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes District supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland.

Table V-1d. Surface and other Water Supplies for 2023 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Kern River	-1,348	4,549	10,612	33,316	-100	45,201	30,756	18,007	34,116	40,695	23,971	8,844	248,619
Poso Creek inflows	1,219	0	78,508	4,867	5,240	0	0	0	0	0	0	0	89,834
Poso Creek outflows	0	0	-77,215	-2,932	-3,100	0	0	0	0	0	0	0	-83,247
Transfers & Exchanges inflows	4,339	10,246	18,658	15,106	59,461	5,188	9,210	12,584	478	78	1,871	6,200	143,419
Transfers & Exchanges outflows	0	0	-774	-2,257	-3,463	-3,235	-2,166	-1,641	-1,105	-1,022	-573	0	-16,236
Recycled Water	103	84	0	0	0	0	0	0	0	0	0	0	186
Oilfield Produced Water	787	717	779	827	856	786	764	823	782	828	698	809	9,456
Total	**5,100**	**15,596**	**30,568**	**48,927**	**58,894**	**47,940**	**38,564**	**29,773**	**34,271**	**40,579**	**25,967**	**15,853**	**392,031**

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes District supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland.

Table V-1e. Surface and other Water Supplies for 2024 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Kern River	1,652	2,449	7,767	5,095	24,399	27,661	29,859	20,493	19,150	9,556	5,738	15,418	169,237
Poso Creek inflows	38	557	535	191	0	0	0	0	0	0	0	0	1,321
Poso Creek outflows	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers & Exchanges inflows	10,588	13,078	5,769	8,826	3,885	2,868	50	30	12	8	151	4	45,269
Transfers & Exchanges outflows	0	0	-63	-10	-2,183	-1,918	-1,330	-561	-18	-1	0	0	-6,084
Recycled Water	67	67	67	68	67	67	67	68	67	67	67	68	807
Oilfield Produced Water	741	716	770	746	865	828	896	887	825	893	820	911	9,898
Total	**13,086**	**16,867**	**14,845**	**14,916**	**27,033**	**29,506**	**29,542**	**20,917**	**20,036**	**10,523**	**6,776**	**16,401**	**220,448**

Source: North Kern WSD Kern River Annual Hydrographic Reports. Includes District supply for Kern River, Poso Creek Flows, Transfers between neighboring districts and deliveries to RRID, and Oilfield Produced Water. Recycled water included data from the City of McFarland was estimated as the average annual volume of 2014-2023 data and uniform monthly use.

Along with water diverted from the Kern River, North Kern and local communities and irrigators pump groundwater from the Kern County Subbasin. North Kern reporting of groundwater pumping includes district-owned wells, about 100 at different locations across the District, and estimates of pumping from privately-owned wells that discharge into District-owned facilities for distribution within the District boundaries. All groundwater pumped by North Kern, and water received through exchanges with neighboring districts, is used to supplement the available surface water supply when it is less than the demand.

Table V-2 summarizes the quantity of groundwater pumped by North Kern. This includes the District-owned deep wells, as well as those private wells which are pumped into the District's system for conveyance and delivery. This also includes private groundwater pumping not conveyed through district facilities.

Table V-2a. Groundwater Supplies Summary for 2020 (AF)

Month	District Deep Wells[1]	Non-District Deep Wells[1, 2]	Total
January	0	0	0
February	2,787	0	2,787
March	7,995	0	7,995
April	9,086	0	9,086
May	15,136	5,231	20,367
June	14,900	4,755	19,655
July	15,834	3,663	19,497
August	14,339	4,977	19,316
September	13,075	5,015	18,090
October	11,010	4,686	15,696
November	4,088	0	4,088
December	928	0	928
Total	**109,178**	**28,326**	**137,504**

[1] Pumped into North Kern distribution system for irrigation use within the District.

[2] Includes private groundwater pumping not conveyed through district facilities. Non-District Deep Wells includes Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Table V-2b Groundwater Supplies Summary for 2021 (AF)

Month	District Deep Wells[1]	Non-District Deep Wells[1, 2]	Total
January	42	0	42
February	6,234	0	6,234
March	11,762	0	11,762
April	16,344	3,537	19,881
May	16,467	8,833	25,300
June	14,715	8,839	23,554
July	15,059	11,213	26,272
August	14,134	14,648	28,782
September	12,513	4,566	17,079
October	11,587	0	11,587
November	2,166	2,371	4,537
December	652	0	652
Total	**121,675**	**74,517**	**196,192**

[1] Pumped into North Kern distribution system for irrigation use within the District

[2] Includes private groundwater pumping not conveyed through district facilities. Non-District Deep Wells includes Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Table V-2c Groundwater Supplies Summary for 2022 (AF)

Month	District Deep Wells[1]	Non-District Deep Wells[1, 2]	Total
January	1,017	0	1,017
February	8,735	0	8,735
March	11,802	0	11,802
April	15,195	3,298	18,493
May	17,169	10,258	27,427
June	15,608	5,824	21,432
July	15,955	11,291	27,246
August	14,019	15,127	29,146
September	12,250	5,586	17,836
October	12,049	1,322	13,371
November	1,751	0	1,751
December	0	0	0
Total	**125,550**	**52,706**	**178,256**

[1] Pumped into North Kern distribution system for irrigation use within the District

[2] Includes private groundwater pumping not conveyed through district facilities. Non-District Deep Wells includes Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Table V-2d Groundwater Supplies Summary for 2023 (AF)

Month	District Deep Wells[1]	Non-District Deep Wells[1, 2]	Total
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	3,336	3,336
August	0	2,425	2,425
September	0	3,409	3,409
October	0	0	0
November	0	806	806
December	0	0	0
Total	**0**	**9,976**	**9,976**

[1] Pumped into North Kern distribution system for irrigation use within the District

[2] Includes private groundwater pumping not conveyed through district facilities. Non-District Deep Wells includes Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Table V-2e Groundwater Supplies Summary for 2024 (AF)

Month	District Deep Wells[1]	Non-District Deep Wells[1, 2]	Total
January	0	0	0
February	0	0	0
March	74	262	336
April	0	7,217	7,217
May	615	5,017	5,632
June	512	2,932	3,444
July	0	3,128	3,128
August	0	3,064	3,064
September	0	1,264	1,264
October	6,843	0	6,843
November	1,263	545	1,808
December	0	0	0
Total	**9,307**	**23,428**	**32,735**

[1] Pumped into North Kern distribution system for irrigation use within the District

[2] Includes private groundwater pumping not conveyed through district facilities. Non-District Deep Wells includes Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

2. *Other Water Sources Quantities*

Surface water diverted from the Kern River and groundwater are the two sources of water actively managed by North Kern. Effective precipitation constitutes an uncontrolled source of supply which reduces the applied irrigation water requirement. A daily root zone water budget model was used to support effective precipitation estimates for North Kern. A daily root zone water budget is a generally accepted and widely used method to accurately and consistently calculate crop evapotranspiration (ETc), effective precipitation, crop consumptive use of applied irrigation water, and other water budget flow paths in the root zone (ASCE, 2016 and ASABE, 2007).

Flows through the root zone and plant surfaces were modeled using the Integrated Water Flow Model (IWFM) Demand Calculator, referred to as IDC. The IDC root zone water budget calculates a daily balance of inflows and outflows to and from the root zone and crop surfaces. Key inputs required by IDC include weather and climate data, soil characteristics, and crop characteristics. IDC uses these inputs to accurately calculate the balance of inflows and outflows, and to parse ETc into the fractions of crop consumptive use met by precipitation (effective precipitation, or ET of precipitation) and by applied irrigation water (ET of applied water).
The IDC root zone water budget model was used to develop time series estimates for the following flow paths:

- Evapotranspiration of applied water, or ETaw (also referred to as crop consumptive use of applied irrigation water)
- Evapotranspiration of precipitation, or ETpr (also referred to as effective precipitation)

- Deep percolation of precipitation, or DPpr
- Deep percolation of applied water, or DPaw

Effective Precipitation is included as shown in Table V-3 for the years 2020, 2021, 2022, 2023, and 2024.

Table V-3. Effective Precipitation Summary (AF)

	2020	2021	2022	2023	2024
Total Annual Effective Precipitation*	24,912	13,724	16,005	32,442	25,771

*Effective Precipitation was calculated with the root zone water balance in the IDC of the IWFM Groundwater model for the Old District. The effective precipitation is equal to the calculated ET of precipitation.

B. Quantification of Water Uses

Table V-4 shows the volume of water delivered through District facilities to North Kern irrigation customers. The volume of water delivered is based on flow measurements at the farm turnouts.

Table V-4. Applied Water

	Volume (AF)				
	2020	2021	2022	2023	2024
District Deliveries to Farm Turnouts*	112,837	112,007	120,770	119,547	132,859

*Values are based on the summation of Class 1 and Class 2 irrigation deliveries (Source: NKWSD summary sheet of the Kern Annual Hydrographic Reports).

Table V-5 summarizes water uses within the North Kern service area for 2020 through 2024. The calculated crop ETc was used in developing the District's water balance (Table V-5). The estimate of losses from the canal system is based on balancing measured system inflows and outflows and is recorded in Table V-5 as two items "conveyance seepage" and "conveyance evaporation" (items 4a and 4b). Conveyance operational outflows through Poso Creek are included in surface water supplies in Table V-6.

Table V-5. Quantify Water Use (AF)

Estimated Water Use	2020	2021	2022	2023	2024
Crop Water Use					
1 Crop Water Requirement (ETc only due to drought conditions) (Table III-2c)	139,721	158,459	161,804	151,077	161,788
2 Leaching (included in item 1) [a]	0	0	0	0	0
3 Cultural practices [a]	0	0	0	0	0
Conveyance and Storage System					
4a Conveyance seepage (Table III-3)	33,481	38,251	43,253	45,850	36,565
4b Conveyance evaporation [d]	1,472	1,665	1,679	1,660	1,556
5 Conveyance operational outflows [b]	NA	NA	NA	NA	NA
6 Reservoir evaporation [c]	0	0	0	0	0
7 Reservoir seepage [c]	0	0	0	0	0
8a Deep percolation of applied water and precipitation	25,682	21,337	26,188	34,955	27,801
8b. District spreading pond recharge(e)	7,139	11,263	12,771	224,794	58,011
Environmental Use					
8 Environmental use – wetlands	0	0	0	0	0
9 Environmental use – other	0	0	0	0	0
10 Riparian vegetation	0	0	0	0	0
11 Recreational use	NA	NA	NA	NA	NA
Municipal and Industrial					
12 Municipal	0	0	0	0	0
13 Industrial	0	0	0	0	0
Subtotal	**207,495**	**230,975**	**245,695**	**458,336**	**285,721**

[a] No extra water supply is applied for leaching or cultural practices. These items are included in item 1, see Table III-2c and preceding text.
[b] Operational outflows are directed into the channel of Poso Creek for groundwater recharge and occasion inflows and outflows are accounted for in Table IV-1.
[c] Included in item 4a and 4b.
[d] Conveyance evaporation is estimated as the total surface area for canal conveyance multiplied by a spatial CIMIS Area and an evaporation scaler.
[e] This includes groundwater recharge through the channel of Poso Creek

As discussed earlier, drainage wells and surface drainage systems are not employed by the District. In very wet years with water conveyance through Poso Creek, there is surface water leaving the District. In the reporting period 2020 to 2024, there were no monitored on-farm surface or subsurface drainage water leaving the District service area. There were no reported irrecoverable losses from the District for drainage water flows to a saline sink or perched water table.

C. Overall Water Budget

Table V-6 summarizes the total water supplies available to the North Kern service area. Surface water is the volume of water diverted from the Kern River to the North Kern water system (canals).

The groundwater volume includes both North Kern pumping from deep wells and private pumping that is discharged for conveyance into district facilities and includes private pumping not conveyed through the North Kern distribution system.

Table V-6. Quantify Water Supplies (AF)

Water Supplies	2020	2021	2022	2023	2024
1 Surface Water (summary total from Table IV-1)	45,485	21,579	26,283	392,031	220,448
2 Groundwater (summary total from Table IV-4)	137,504	175,682	178,256	9,976	32,735
3 Total Precipitation	21,322	23,702	17,072	41,322	27,371
4 Water purchases [(a)]	0	0	0	0	0
5 Transfers or exchanges into District [(b)]	0	0	0	0	0
Subtotal	**204,311**	**220,964**	**221,610**	**443,329**	**280,555**

[(a)] Water purchases are included in item 1.
[(b)] Transfers and Exchanges are included in item 1

Table V-7 summarizes the water budget for the service area. Because of the uncertainty regarding the lack of accounting for the extent of rootzone storage in the North Kern water budget, the closure term of the budget represents an approximation of the change in storage within the rootzone that occurred in 2020 through 2024.

Table V-7. Budget Summary (AF)

Water Accounting	2020	2021	2022	2023	2024
1 Subtotal of Water Supplies (Table V-6)	204,311	220,964	221,610	443,329	280,555
2 Subtotal of Water Uses (Table V-5)	207,495	230,975	245,695	458,336	285,721
Closure term attributed to rootzone change in storage within North Kern	-3,184	-10,011	-24,085	-15,007	-5,166

When compared to the values presented in the 2020 AWMP, the subtotal of water uses has increased and is indicative of the severity of the ongoing drought and of the dependence placed on groundwater well when North Kern is compelled to pro-rate allocations. However, during wet years (for example 2023), the District recharges excess water, and pumps the water in drier years thereby successfully operating a conjunctive-use project.

D. DWR Annual Water Budget

1. Inflows

The District's water budget components have been described in previous sections of this plan. Inflow elements of the water budget include the surface water elements described in Section IV.A.1 and the groundwater elements described in Section IV.A.2. Transfers and exchanges, as described in Section III.F, were also included as part of water supplier surface water diversions. The District's water budget inflow components are provided in Table V-8 for the period 2020 to 2024.

Table V-8. Water Budget Inflow Components – North Kern Water Storage District

Inflow Component	AWMP Location for Supporting Calculations	Uncertainty	How Quantified?	Calendar Year 2020	Calendar Year 2021	Calendar Year 2022	Calendar Year 2023	Calendar Year 2024
Units	Page number or Section	Percent		Acre-feet per year	Acre-feet per year	Acre-feet per year	Acre-feet per year	Acre-feet per year
Effective Precipitation	Table V-3, Section IV.A.2	15	Calculated	24,912	13,724	16,005	32,442	25,771
Water Supplier surface water diversions	Table IV-1, Section IV.A.1	5	Measured	45,485	21,579	26,283	392,031	220,448
Water Supplier groundwater pumping	Table IV-4, Section IV.A.2	3	Measured	109,178	121,675	125,550	0	9,307
Private groundwater pumping	Table IV-4, Section IV.A.2	15	Measured	28,326	54,007	52,706	9,976	23,428
Total				207,902	210,985	220,544	**434,449**	**278,954**

User Notes & Explanations:
All data provided on a calendar year basis, consistent with District and landowner water budget accounting. Transfer and Exchanges are included as part of Surface Water diversions

2. Outflows

The District's water budget components have been described in previous sections of this plan. Outflow elements of the water budget include the crop consumptive use in Section III.A and deep percolation, conveyance seepage described in Section III.E. Conveyance evaporation is described in Table V-5 in Section V.B. The District's water budget outflow components are provided in Table V-9 for the period 2020 to 2024.

Table V-9 Water Budget Outflow Components – North Kern Water Storage District

Outflow Component	AWMP Location for Supporting Calculations	Uncertainty	How Quantified?	Calendar Year 2020	Calendar Year 2021	Calendar Year 2022	Calendar Year 2023	Calendar Year 2024
	Page number or Section	Percent		Acre-feet per year	Acre-feet per year	Acre-feet per year	Acre-feet per year	Acre-feet per year
ET_c (Crop Consumptive use)	Table III-2c, Section III.A	15	Calculated	139,721	158,459	161,804	151,077	161,788
Surface Outflows	N/A	N/A	N/A	0	0	0	0	0
Deep Percolation	Table III-3, Section III.E	15	Modeled	25,682	21,337	26,188	34,955	27,801
Conveyance seepage	Table III-3, Section III.E	15	Calculated	33,481	38,251	43,253	45,850	36,565
Conveyance evaporation	Table V-5 in Section V.B	15	Calculated	1,472	1,665	1,679	1,660	1,556
Total				**200,356**	**219,712**	**232,924**	**233,542**	**227,710**

User Notes & Explanations:
All data provided on a calendar year basis, consistent with District and landowner water budget accounting. Operational outflows are directed into the channel of Poso Creek for groundwater recharge and occasion inflows and outflows are accounted for in Table IV-1. Deep percolation, including deep percolation of applied water and deep percolation of precipitation, is calculated for agricultural lands in the NKWSD Old District with the rootzone and groundwater balance in the IDC of the IWFM Groundwater model. Conveyance seepage and evaporation include losses from regulating reservoirs.

E. Water Supply Reliability

The Kern River is North Kern's principal source of surface water supply and the amount available to the District in any given year is highly variable, ranging from less than 10,000 AF in a "dry" year to nearly 400,000 AF in a "wet" year. Therefore, efficient water management practices and conjunctive management (i.e. the coordinated use of surface water and groundwater sources) are critical. During "dry" years with reduced availability of surface water supplies, the District relies on carryover storage in Isabella Reservoir to the extent available but also relies heavily on pumped groundwater (derived primarily from previously recharged surface water).

The Poso Creek IRWMP identified water supply reliability as the region's principal water resources concern going forward and identified and prioritized a number of projects to mitigate the anticipated reduction in water supply reliability. Several of these projects have been constructed, are under construction, or will be under construction in the near term. Some examples of improvements to District facilities are described in Section II.

Because North Kern shares a common groundwater basin with other districts in the Poso Creek region, the future reliability of water supplies available to support agriculture in North Kern is closely tied to regional water supply reliability.

Despite the significant success of North Kern's conjunctive use program, as well as water management programs conducted by other districts in the Poso Creek region, significant concerns regarding future regional groundwater conditions persist. These concerns have been addressed through the Kern County GSP (2025) projects and demand management actions. Surface water supply reductions result in increased levels of groundwater pumping with adverse impacts on groundwater levels and conditions.

F. Future Water Supply

North Kern derives nearly all its surface water from diversions from the Kern River; therefore, future changes in the North Kern water supply will be driven by changes in Kern River hydrology and particularly by the volume, nature and timing of precipitation in the watershed. The discussion presented in Section VII of this plan describes how climate change may affect the hydrology of the Kern River watershed. As described in the Kern County GSP (2025) North Kern's future conjunctive management of surface water and groundwater is projected to remain in balance.

While changes in watershed hydrology may reduce the reliability of surface water from the Kern River watershed in ways the District cannot control, the District will adapt its water management practices to respond to these changes with increased conjunctive management as describe in the Kern County GSP (2025). This may involve adaptive management strategies for water consumers or the expansion of water banking transfers and exchanges, which are addressed in the discussion that follows.

1. Expansion of Water Banking, Transfers, and Exchanges

In response to potential losses of historical Kern River supplies and resulting adverse impacts to groundwater, North Kern, through the Poso Creek IRWMP, has identified and constructed several major capital improvements that enhance the District's capabilities to conjunctively use its Kern River supplies, other surface supplies available to the District, and, through water banking, transfer, and exchange agreements, surface supplies available to other agencies in the Poso Creek region, Kern County, and along the Friant-Kern Canal.

The District's primary objective in developing additional banking, transfer and exchange programs is to maximize deliveries of surface water supplies into the District to offset potential losses in historical supplies which support groundwater levels underlying the District and thereby sustain future agricultural operations. To accomplish this objective, it is in the District's interest to consider diverse water banking, transfer, and exchange programs with Poso Creek RWMG agencies, other agencies in Kern County, and agencies within the Friant-Kern Canal service area.

Existing Water Banking and Exchange Programs

North Kern has implemented water banking and exchange programs to optimize management of water supplies, increase the total volume of water brought into the District, and develop facilities to improve future water management. These programs include numerous "bucket-for-bucket" exchanges, one-time "low priority/mutually agreeable" banking programs, and several longer-term higher priority programs. All of the District banking programs include provisions whereby a minimum of10 percent of the water banked is "left behind" (not recovered) to support groundwater levels in the District. Furthermore, development of the higher priority programs included construction of facilities (e.g., wells, turnouts, etc.) that benefit both the banker and the District.

Expansion of Water Banking and Exchange Programs

As discussed previously, through the Poso Creek IRWMP, North Kern identified several capital projects to improve the District's water management capabilities in order to partially compensate for losses in water supply reliability. More specifically, the District identified projects focused on significant conveyance improvements that allow North Kern to more fully utilize its existing water management assets, particularly its facilities to recharge water in wetter years.

Many of "North Kern's" projects identified in the Poso Creek IRWMP have been completed or are in the process of being completed, and the District has effectively established additional water banking and exchange "capacity" particularly regarding water supplies available from the CVP Friant Division and the SWP. For the reasons previously described, North Kern intends to develop additional banking and exchange programs to more fully utilize its recharge capabilities to support the viability of continued agricultural operations in the District. These programs have been initiated and will increase the District's overall water supplies since a minimum of 10 percent (and as much as 50 percent or more) of additional water recharged in

the District will not be recovered by bankers and will thereby support groundwater conditions underlying the District.

District Water Banking and Exchange Capacity

As noted previously, the District has substantial recharge and recovery assets/capabilities. The use of most of these assets is prioritized to manage the District's highly variable surface water supplies for the direct benefit of District landowners (primarily agricultural operators). However, during certain periods, substantial portions of these assets are available to support banking and exchange programs with third parties.

- Recharge Capacity

  In addition to substantial capacity to recharge water "in-lieu" of groundwater pumping by the District and District landowners, North Kern operates about 1,786 acres of recharge ponds with a capacity to recharge up to 25,000 AF of water per month and with a maximum annual recharge capacity of 300,000 AF. The District directly recharges significant quantities of water in about three of ten years, with an average of 150,000 AF recharged in its spreading ponds in these years. Although the District has an additional 150,000 AF of physical recharge capacity available in these wetter years, based on the typical timing for the availability of wet year supplies from the Friant and SWP systems, it is not reasonable to assume additional water would be available for recharge during the entire year. However, through expanded water banking programs, additional recharge on the order of 75,000 AF is possible in wet years, with lesser quantities recharged in moderately wet years. These additional recharge volumes would increase the District's water supplies by up to 15,000 AF per year on average based on a "2 for 1" type unbalanced banking program (i.e., 50 percent of water recharged is left behind). Finally, should the District lose a portion of its historical supplies, additional recharge capacity would become available for third-party banking and exchange programs.

- Recovery Capacity and Timing

  A portion of additional water recharged through expanded banking programs (typically 50 percent to 90 percent) must be recovered for the banking entity. North Kern operates a system of 100 wells with an approximate instantaneous capacity of 350 cfs. This capacity is approximately equal to peak irrigation season demands for Class 1 lands.[2] Unused District well capacity is available for use by Class 2 lands in the District and to return water to District banking and exchange partners.

  If the District's wells were operated continuously over a 10-month period, total production could be on the order of 200,000 AF. Since the maximum District Class 1 and 2 demands met from District wells is approximately 150,000 AF, about 50,000 AF per year of well

[2] The District supplies nearly all of the water required to meet the irrigation water requirements of the Class 1 service area.

capacity would be available to return previously banked water to banking partners. Approximately 15,000 AF per year of this capacity is committed to the District's existing banking programs.

As noted above, the District's instantaneous well recovery capacity roughly matches its peak irrigation season obligation to Class 1 lands. Consequently, under very dry conditions when the District has limited surface water storage available in Lake Isabella, little well capacity is available to return water to banking partners during the peak irrigation months (approximately May through August). To the extent North Kern's banking partners require recovery of previously banked water during this period, additional wells would be necessary. Importantly, these additional "peaking" wells will not increase the total volume of previously banked water recovered from the District but will simply allow the timing of water recovery to match the banking partners' needs.

2.Effects of Expanded Water Banking and Exchange Programs

As previously discussed, in 2012 North Kern and other members of the Poso Creek RWMG completed CEQA and NEPA environmental documentation for groundwater banking, transfer, and exchange programs among the RWMG. These programs envision the expansion of water management programs among the RWMG to assist in reducing the adverse impacts on regional groundwater conditions (and agricultural operations) associated with losses of surface water supplies. Since these programs are intended to reduce the adverse impacts of regional water supply losses by bringing additional wetter year supplies into the region, analyses concluded that the programs would be environmentally beneficial compared with the "no project" alternative.

To support the continued viability of agricultural operations in the District, through this AWMP North Kern is proposing to broaden water banking and exchange programs previously reviewed in the Poso Creek environmental documents to include other agencies in Kern County with State and Federal water supply contracts as well as CVP "Friant Division" contractors located outside of Kern County. Broadening these programs outside the Poso Creek RWMG would provide the District with additional opportunities to supplement water supplies available for agricultural operations in the District. Since these programs would increase District surface water supplies they would be expected to incrementally improve groundwater conditions.

The secondary source of water supply for the District is groundwater. Although not immediately affected by changes in surface water hydrology, local groundwater is derived from surface water in that groundwater recharge is driven primarily by excess surface water (i.e. beyond irrigation requirements) during wet years and percolation of applied irrigation water.

Section VI.Water Management Objectives

The North Kern website declares the District's mission to be:

> "North Kern was formed in 1935 pursuant to the State "Water Storage District Act" principally to address lowering groundwater levels associated with the expanding use of deep well turbine pumps in the District and adjacent areas. The District's primary objective was (and is) to support "economic pumping lifts" for landowners within the District through the importation of surface water supplies (principally from the Kern River)."

Project and management actions identified in the 2025 Kern County Subbasin's GSP serve as water management objectives for this AWMP to promote water use efficiency improvements in the District and contribute to sustainable management of surface water and groundwater resources. A list of these project and management actions listed in order of priority are provided in combination with the EWMPs in Section IX.

Section VII.Water Use Efficiency Quantification

Four types of water use serve as the basis for water use efficiency calculations: crop water use, agronomic water use, environmental water use, and recoverable flows. These water use efficiency components are described in the sections below and quantified in Table VII-1**.**

A. Crop Water Use

Crop water use, or crop consumptive use, in North Kern represents the portion of total applied water withdrawn by crops that is evaporated, transpired, incorporated into products or crops, or otherwise removed from the immediate water environment for consumptive use (ASCE, 2016).

In the water budget presented in this AWMP, crop water use of applied water is referred to as ET_{aw}. ET_{aw} is quantified as an outflow of the IDC root zone water budget described earlier. Table VII-1 summarizes the ET_{aw} in North Kern in 2020 through 2024.

B. Agronomic Water Use

Agronomic water use in North Kern represents the portion of total applied water that is directly used for crop cultivation practices, but that is not consumed by crops (i.e., excluding ET_{aw}). Sample agronomic water uses include soil leaching, seedbed preparation, and climate control. In North Kern, agronomic water uses mainly include small water volumes used for salt leaching and frost protection. Surface water Kern River is of very high quality, with low salinity and low TDS, resulting in generally low leaching requirements for the crops grown in the District**.**

Table VII-1. Water Use Efficiency Components

Water Use Efficiency Component	Year (Year Type[1], Available Water[2])					
	2020	2021	2022	2023	2024	Average
	(D)	(C)	(C	(W)	(AN)	
Crop Consumptive Use (ET_{aw})	115,026	143,692	144,746	118,521	136,017	**131,600**
Agronomic Use	0	0	0	0	0	**0**
Environmental Use	0	0	0	0	0	**0**
Recoverable Flows of Water Supply Diversions						
Recoverable Flows to Groundwater (Seepage)	33,481	38,251	43,253	45,850	36,565	**39,480**
Recoverable Surface Flows (Recharge from Spreading Grounds)	7,139	11,263	12,771	224,794	58,011	**62,796**
Total Recoverable Flows of Water Supply Diversions	**40,620**	**49,514**	**56,024**	**270,644**	**94,576**	**102,276**
Recoverable Flows to Groundwater (DP_{aw})	19,535	17,687	21,698	23,689	22,211	**62,796**
Total Recoverable Flows of Applied Water	**60,155**	**67,201**	**77,722**	**294,333**	**116,788**	**165,071**

[1] Year types, as determined by the Kern River.
[2] Assuming negligible environmental use within North Kern Class 1 and 2 service area (Kern River instream flow requirements are met before irrigation diversions and are outside the North Kern service area).

C. Environmental Use

As described earlier, there are no natural environmental resource delineations within the irrigation

service area that are supported by North Kern water.

D. Recoverable Flows

Recoverable flows in North Kern encompass the portion of total applied water, or total water supply, that are neither consumed by crops nor evaporated from the distribution system, but that are recoverable for other beneficial uses within North Kern, downstream of North Kern, or in other areas overlying the Kern County Subbasin. Recoverable flows of applied water are represented in this water budget by DP_{aw}. As described previously, DP_{aw} is quantified by the IDC root zone water balance model.

Of the total water supplies available to North Kern, recoverable surface flows include water recharged from North Kern's 1,786 acres of spreading grounds. Recoverable flows to groundwater include seepage from the unlined portions of the conveyance system.

Table VII-1 summarizes the combined recoverable flows from North Kern in 2020 through 2024.

E. Method 4: Water Management Fraction

The water use efficiency fraction most applicable to North Kern, a conjunctive management district, is the water management fraction (WMF). Conjunctive management through recharge from the 1,786 acres of spreading grounds in North Kern provides facilities for the sustainable recharge of groundwater in wetter years and recovery in drier years. Some reuse also occurs directly by water users at the farm level, while other users outside of North Kern are also able to recover groundwater made available from seepage and recharge of North Kern water supplies. These methods of water recovery, recharge, and reuse result in higher levels of system performance and water use efficiency than would occur otherwise.

The WMF can be calculated in two ways: (1) by comparing consumptive use of applied water (ET_{aw}) and the recoverable flows of applied water to the total applied water in North Kern, and (2) by comparing consumptive use of applied water and all recoverable flows in the North Kern distribution system and irrigated lands to the total water supplies available within North Kern. The WMF is calculated on an annual basis at the water supplier scale, Total Water Supply Basis, according to the following:

Equation 5-5:

$$WMF = (ET_{aw} + DP_{aw} + Seepage + Spreading\ Ground\ Recharge) / (Total\ Water\ Supply^{3}) \quad [5\text{-}5]$$

Over the 2020 to 2024 calendar years, the WMF varied from 95 to 99 percent (*see* Table VII-2). This high WMF indicates that essentially all of North Kern's water supply is used to meet irrigation demands or is recoverable for beneficial use at a future time by North Kern and down gradient surface water and groundwater users. The only water budget flow path that is not recoverable or consumed by crops in North Kern is evaporation from the North Kern distribution system.

[3] Total water supply includes Irrigation Diversions into the Beardsley-Lerdo Canal and into the Calloway Canal and deliveries and exchanges for water banking.

Table VII-2. Water Use Efficiency Fraction (Total Water Supply Basis), Acre-Feet.

Year[1]	Evapotranspiration of Applied Water	Recoverable Flows of Total Water Supply[2]	Total Water Supply[3]	Water Management Fraction
2020	115,026	60,155	183,255	0.96
2021	143,692	67,201	217,193	0.97
2022	144,746	77,722	231,179	0.96
2023	118,521	294,333	417,953	0.99
2024	136,017	116,788	257,853	0.98
Total 2020-2024	**658,002**	**616,199**	**1,306,196**	0.98

[1] Reported for calendar year.
[2] Recoverable flows of total water supply include DP_{aw}, Seepage, and recharge from North Kern's 1,786 acres of spreading grounds.
[3] Total water supply includes Irrigation Diversions into the Beardsley-Lerdo Canal and into the Calloway Canal and deliveries and exchanges for water banking plus calculated private pumping including Private Well Production from the Kern River AHR as part of private pumping calculated for Agricultural lands in the NKWSD Old District with the rootzone balance in the internal demand calculator of the IWFM Groundwater model (developed by Todd GW).

Section VIII. Analysis of Effect of Climate Change

A. Effects of Climate Change on Water Demand

In 2016, the California Water Commission (CWC) published a climate change analysis for the Water Storage Investment Program (WSIP). The analysis derived datasets from 20 global climate projections recommended by the Climate Change Technical Advisory Group (CCTAG). The results were provided by DWR in the Guidance for Climate Change Data Use During GSP development (DWR, 2018b). The WSIP analysis provided climate projections for the following scenarios: 2030 central tendency, 2070 central tendency, 2070 dry with extreme warming, and 2070 wet with moderate warming. Projections represent the historical period from January 1915 to December 2011. The hydrological variability was preserved while the magnitude of conditions was adjusted for each scenario based on changes in precipitation and air temperature derived from general circulation models.

Several investigations of the possible effects of climate change to surface and groundwater sources in the Central Valley have been conducted by the U.S. Geological Survey (USGS) California Water Science Center (CAWSC). Two of these studies (USGS, 2009; Water Resources Research, 2012) report the results of modeling efforts to quantify the hydrological effects of warming climate scenarios, including a model of runoff and recharge from the watersheds of the Sierra Nevada Mountains and a model of agricultural water-deliveries and use in the Central Valley. The warming scenarios were based on a commonly accepted projection of 21st century climate from the GFDL CM2.1 (Geophysical Fluid Dynamics Lab Climate Model 2.1) global climate model, responding to assumptions of rapidly increasing greenhouse-gas emissions (GHGs). The scenarios predict California's climate will become warmer (+2 to +4° C) and drier (10-15 percent) relative to historical conditions. In 2018, the California Energy Commission's Cal-Adapt Web site predicted temperature differences in the North Kern service area (Kern County) from a baseline historical average (1961 to 1990) to a projected average (2070 to 2090). The projection shows an increase in annual average temperature of about 5.1°F to 8.5°F under medium carbon and high carbon emission scenarios, respectively (San Joaquin Valley Regional Report, 2022). Based on these projections, climate change could result in the following types of water resources impacts:

- Due to more rainfall and less snow, shift in streamflow timing with more flow during the late winter and spring and less flow into the summertime.
- Wetter wet years and drier dry years.
- Increased demands for irrigation water, which would be met through increased conjunctive management, increased recharge with surface water when available supporting future extractions of stored surface water.

As described in greater detail in the Kern County GSP (2025), these combined effects are projected to be met through increasing conjunctive management. When available surface water will be stored in the aquifer and this surface water will be extracted when needed in the dry years. Climate change is expected to increase both daytime and nighttime temperatures in the Central Valley resulting in lengthening of the growing season. In 2018, Cal-Adapt predicted that the number of

days exceeding the "extreme heat threshold" of 101.6°F for the North Kern service area (Kern County) will increase from a historical baseline average of 4 extreme heat days (1961-1990) to a projected average of 55 extreme heat days (2070-2090). Using the same baseline and projection years, the number of nights exceeding the "warm night threshold" of 73°F is expected to increase from 3 nights to about 48 nights (San Joaquin Valley Regional Report, 2022). This general increase in temperatures coupled with greater variability and unpredictability in precipitation (depicted in decadal average projections by Cal-Adapt) is expected to lead to increases in evapotranspiration resulting from warmer seasons, thereby creating an increase in demand for irrigation water and an increase in the year-to-year variability of demand.

Temperate fruit and nut trees such as almonds, pistachios, and apples require adequate winter chill to produce economically viable yields. As explained above, the number of warm nights will increase, and therefore the number of winter chill hours will decrease, causing adverse effects on the yield of these orchard crops which currently account for an average of 85 percent of total crops in North Kern from the period of 2020 to 2024 based on LandIQ data. The number of hours of winter chill in the San Joaquin Valley has shrunk from about 1,500 a few decades ago, to approximately 1,000 to 1,200 hours (PLoS ONE, 2009). By the end of the century, the adequate winter chill needed for almonds, pistachios and apples is predicted to disappear.

B. Effects of Climate Change on Agriculture's Water Supply

The future of North Kern's water supply will be driven largely by changes in hydrology and particularly by changes in the volume, nature, and timing of precipitation in the Sierra Nevada Mountains, which affects the Kern River watershed, the District's main source of surface water supply.

For all scenarios produced for the 2025 Kern County Subbasin GSP, which consider the impacts of climate change, the reliability, and thus volume of water delivered by the SWP and CVP water supply systems is expected to be reduced. This considers the potential Delta salinity intrusion due to sea level rise that is estimated by the National Research Council as 15 centimeters by 2030 and 45 centimeters by 2070, respectively (DWR, 2018a) According to the 2023 SWP Delivery Capability Report (DWR, 2024), future average SWP deliveries are projected to decrease by 10 percent by 2043, with SWP deliveries in dry/critical water years decreasing by 20 percent by 2043. Current long-term reliability predictions of SWP Table A deliveries, modeled under historic (1922-2021) precipitation and runoff patterns and accounting for future conditions such as land use and climate change. Climate change has yielded a two percent decrease from the long-term average or 3.5 percent by volume[4].

This assumption of reduced reliability can be extended to Kern River water supplies (the primary source of surface water for the District) as the reliability of the Kern River will be principally affected by the amount and timing of precipitation and snowfall. DWR climate change scenarios

[4] Source: 2024 Annual Review of the Operation and Construction of the State Water Project (https://cwc.ca.gov/-/media/CWC-Website/Files/Documents/2025/01_January/2024_SWP_Annual_Review_Final_Draft.pdf)

considered variations of average air temperature and precipitation in 2030 and 2070 for the nine hydrologic regions of California compared to the baseline historical conditions in 1995. On average, statewide precipitation is projected to increase by 2.9 percent at year 2030 and by 5.3 percent at year 2070. Temperature is predicted to increase by 2.4°F on average statewide at year 2030 and increase by 5.4°F at 2070. Snowpack in the Sierra Nevada Mountains, which serve as the source of runoff to the Kern River, is projected to decrease because of temperature increases, as predicted by CWC. This results from a shift toward more rain and less snow, causing snow to melt earlier in the year which reduces the availability of water during the summer.

Local communities, rural residences, and businesses rely on groundwater from the Kern County Subbasin as their main supply. North Kern only pumps groundwater when surface supplies are inadequate to satisfy demand (e.g. during dry years). Currently, North Kern recharges groundwater during wet years in spreading ponds and unlined canals across the District. The combination of groundwater use in dry years and recharge in wet years has provided a balance in water supply. Should climate change result in a reduction in water available from the Kern River, this may prompt North Kern to increase the frequency of groundwater pumping which would lead to a decrease in groundwater storage without the necessary means of replenishing the depleted storage, impacting all groundwater users.

C. Regional Vulnerability Assessment

The Modified IRWMP Climate Change Vulnerability Assessments Matrix below provides an assessment of the regional vulnerability to the potential climate change impacts, using the 'Vulnerability Assessment Checklist' found in the 'Climate Change Handbook for Regional Water Planning' (CDM, 2011). As previously mentioned, North Kern WSD is a member of the Poso Creek RWMG. This checklist is a modified version of the checklist provided in the 2014 Poso Creek IRWM Plan Update, tailoring information more specifically to North Kern. The checklist provides a further evaluation of the effects of climate change on regional water demands and supplies, as well as water quality, flooding events, environmental and ecosystems, and hydropower systems.

Vulnerability ratings, identified in the matrix, are based on presumed level of impact to regional conditions based on climate change considerations given in the checklist. For this assessment, the following rating system was used:

- "High" rating: expected impacts of climate change on listed item pose a severe risk to regional or District operations in the future, including, impacts that greatly inhibit the ability to deliver water supplies to users within the region or District.
- "Medium" rating: expected impacts of climate change on listed item pose a moderate risk to regional or District operations in the future, including, impacts that require management and planning changes in order to mitigate adverse effects.
- "Low" rating: expected impacts of climate change on listed item pose a low risk to regional or District operations in the future, including, impacts that may be mitigated through

relatively simple planning or management changes but are not critical to regional or District operations.

- "Not Applicable" (N/A) to the region or District, or impacts that will not affect regional operations.

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.[1]	Checklist Item	Regional Conditions	Vul. Rating
I. Water Demand Assessment			
I.A	Are there major industries that require cooling/process water in your planning region?	Currently, requirements for cooling/process water are insignificant in North Kern.	Low
I.B	Does water use vary by more than 50% seasonally in parts of your region?	Yes. Irrigated agriculture is the predominant use of water for the District. While annual water demands are fairly consistent from year to year, there is considerable seasonal variation, with the highest demands occurring in the summer and lowest demands in the winter.	Medium
I.C	Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as long heat lingers before night-time cooling, be prohibitive for some crops?	All crops grown in North Kern are climate sensitive to some extent. Modest shifts in heating and cooling patterns are likely to affect crop yield; however, significant shifts could affect the viability of continuing to grow certain crops. As explained previously, the number of extreme heat days and warm nights are expected to increase in the area, which is likely to affect the quality and yield of crops.	Medium
I.D	Do groundwater supplies in your region lack resiliency after drought years?	Groundwater levels will decline with a period of dry years. The resiliency of the District's groundwater resource is directly related to the reliability of surface water supplies, primarily the availability of water from the Kern River since groundwater is used to meet demands that are not fulfilled by surface water supplies. To this extent, "resiliency" has been reduced.	High
I.E	Are water use curtailment measures effective in your region?	There has been a trend in North Kern toward permanent crops which limits the ability to curtail water use in any given year by fallowing. Although North Kern has not initiated permanent demand reduction by purchasing and retiring land, some neighboring districts have instituted this practice.	Medium
I.F	Are some in-stream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	There are no in-stream flow requirements within the North Kern service area. However, the surface water supplies available to the District may be affected by such requirements, particularly on the Kern River downstream of Isabella Reservoir.	Low

[1] Numbers based on checklist shown in Section 4.3 of the 'Climate Change Handbook for Regional Water Planning' (CDM, 2011).

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
II. Water Supply Assessment			
II.A	Does a portion of the water supply in your region come from snowmelt?	Yes. All surface water inflows are primarily a function of snowmelt runoff; however, the snowmelt does not occur within the IRWM Region[2].	High
II.B	Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Yes. The District's primary source of supply is the Kern River. The Kern River has its watershed in the Sierra Nevada Mountains, which have been identified as climate-sensitive. North Kern also has to capability to participate in exchanges for water diverted from the Delta through the SWP and for water from the Friant Unit of the CVP.	High
II.C	Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	No.	N/A
II.D	Would your region have difficulty in storing carryover surpluses from year to year?	Carryover of Kern River water in Isabella Reservoir is limited by the Reservoir's flood control purpose. There is limited carryover available for SWP water in San Luis Reservoir, and carryover of CVP water in Millerton Reservoir is essentially non-existent. The most effective means of local regulation is through the use of banking activities. The District has been actively working to optimize the use of its water to both recharge and recover water supplies through its banking program within the Region and other areas of Kern County.	High
II.E	Has your region faced a drought in the past during which it failed to meet local water demands?	In 2020, 2021 and 2022, the drought resulted in an insufficient availability of District water supplies to meet local water demands. The District therefore pro-rated deliveries to Class 1 farmers and was not able to deliver any water to Class 2 farmers. The farmers, however, were able to meet their necessary demands via their privately-owned wells.	High
II.F	Does your region have invasive species management issues at your facilities, along conveyance structure, or in habitat areas?	Invasive species issues are minimal in North Kern, primarily consisting of algae growth in canals during times of low conveyance with low velocities or ponded water conditions.	Low

[2] For the entirety of this checklist, "Region" refers to the Poso Creek IRWM Region.

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
III. Water Quality Assessment			
III.A	Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?	Wildfires are not a threat within North Kern; however, wildfires are a threat in the Kern River watershed. Wildfires and subsequent erosion upstream of Isabella Reservoir would likely be mitigated by detention in the reservoir. Wildfires and subsequent erosion downstream of the reservoir would have greater potential to affect the irrigation operations in the Region, particularly those relying on micro-irrigation methods. Depending on timing, direct recharge of groundwater in spreading ponds could also be adversely impacted. There would be no threat to M&I uses within North Kern since all such uses are met with groundwater.	Low
III.B	Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	Some local and regional canals seasonally have algae blooms that require maintenance, including minimal treatment or cleanup efforts. Algae blooms may become more frequent with climate change as a result of increased temperatures in North Kern and less water moving through the canals.	Low
III.C	Are seasonal flows decreasing for some water-bodies in your region? If so, are the reduced low flows limiting the water-bodies' assimilative capacity?	Poso Creek is the only "water body" in the Region with seasonal flows; however, whether seasonal flows are decreasing is unknown.	N/A
III.D	Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	No.	N/A
III.E	Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	No. M&I uses in the District are supplied by groundwater pumping and surface water supplies are not treated for irrigation use.	N/A

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
IV. Sea Level Rise Assessment			
IV.A	Has coastal erosion already been observed in your region?	The North Kern Water Storage District is located in the Southern San Joaquin Valley, and the concerns regarding coastal regions are not applicable.	N/A
IV.B	Are there coastal structures, such as levees or breakwaters, in your region?		N/A
IV.C	Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation at less than six feet above mean sea level in your region?		N/A
IV.D	Are there climate-sensitive low-lying coastal habitats in your region?		N/A
IV.E	Are there areas in your region that currently flood during high tides or storm surges?		N/A
IV.F	Do tidal gauges along the coastal parts of your region show an increase over the past several decades?		N/A
V. Flooding Assessment			
V.A	Does critical infrastructure in your region lie within the 200-year floodplain?	Although flows in Poso Creek are infrequent, flooding of adjacent lands has occurred from time to time. The Poso Creek floodplain traverses the northern portion of the Region from east to west. Most of the area within the floodplain consists of irrigated agriculture; however, a reach of State Highway 99 and a portion of the City of McFarland are also included. Highway 99 is a major north-south transportation corridor, the disruption of which would have public safety, as well as economic, implications.	Medium
V.B	Does part of your region lie within the Sacramento-San Joaquin Drainage District?	No.	N/A

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
V. Flooding Assessment (cont.)			
V.C	Does aging critical flood protection infrastructure exist in your region?	No. Storage restrictions that have been in place on Isabella Reservoir since 2006 were removed in 2023 as dam safety concerns were adequately addressed. While Isabella Reservoir does not present a flood control issue for the Region, it is a water supply issue, inasmuch as it regulates the delivery of Kern River water to the Region.	Medium
V.D	Have flood control facilities (such as impoundment structures) been insufficient in the past?	While there are not any flood control impoundment structures in North Kern, investigations have been conducted in the past with regard to the feasibility of constructing a dam on Poso Creek (which has yet to pass the benefit-cost test).	Low
V.E	Are wildfires a concern in parts of your region?	As noted in III.A (above), wildfires are not a concern in North Kern; however, wildfires are a concern in the watersheds that provide the District with its surface water supplies.	Low
VI. Ecosystem and Habitat Vulnerability Assessment			
VI.A	Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	Coastal aquatic habitats are not applicable to North Kern. The potential for erosion or sedimentation exists along the channel of Poso Creek. Significant flow in Poso Creek is very infrequent.	Low
VI.B	Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?	No.	Low
VI.C	Do climate-sensitive fauna or flora populations live in your region?	No.	Low
VI.D	Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	Yes. They consist of San Joaquin Kit Fox, Tipton Kangaroo Rat, and San Joaquin Wooly Threads. Whether or not changes in species distribution have occurred is unknown. The District supports the management efforts for endangered and threatened species led by the Tulare Basin Wildlife Partners, who actively monitor species distribution and habitat changes in the Region.	Medium

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
VI. Ecosystem and Habitat Vulnerability Assessment (cont.)			
VI.E	Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	Recreational water use in the Region is limited to duck clubs which rely on seasonal flooding of ponds which have been developed for that purpose.	Low
VI.F	Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	No.	N/A
VI.G	Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?	No.	N/A
VI.H	Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?	No. The Central Valley of California, where the District is located, is not listed as one of the 'Top 10' habitats vulnerable to Climate Change according to the 'It's Getting Hot Out There: Top 10 Places to Save for Endangered Species in a Warming World' Report (Endangered Species Coalition, 2010).	Low
VI.I	Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Is there infrastructure projects planned that might preclude species movement?	The Region includes the channel of Poso Creek. Poso Creek traverses the Region from east to west and connects with the Refuge. The channel of Poso Creek provides an east-west movement corridor for wildlife, which extends from the foothills in the east to the trough of the San Joaquin Valley in the west. Flow in this reach of Poso Creek is infrequent. While infrastructure projects are planned which involve Poso Creek, they would not adversely affect the use of Poso Creek as a wildlife movement corridor. In particular, maintenance of the channel's flow carrying capacity is compatible with its use as a movement corridor. The RWMG has planned some projects and programs to improve existing facilities while not changing the movement corridors.	Low

Table VIII-1. Modified IRWMP Climate Change Vulnerability Assessments Matrix

List No.	Checklist Item	Regional Conditions	Vul. Rating
VII. Hydropower Assessment			
VII.A	Is hydropower a source of electricity in your region?	PG&E and SCE provide electrical service to North Kern, and their sources of electricity are many and varied. As of 2012, SCE's electrical generation portfolio contained less than 10% hydropower (which includes the 12-MW Borel Powerhouse at Lake Isabella), while PG&E's was a little more than 10%. In both cases, the hydrogenation takes place outside of the Region. Hydropower generation within the Region is very minor and is incidental to the operation of irrigation conveyance and distribution facilities.	Low
VII.B	Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?	It is reasonable to expect that energy needs for the District will increase in the future as a result of several factors. These include changes in land use from agricultural to urban uses; increases in groundwater pumping resulting from reductions in historically available surface water supplies that are anticipated as a result of climate-induced changes in hydrology and increases in groundwater pumping to satisfy higher ET requirements for irrigated agriculture. A feasibility study was developed by USACE, SCE and the Federal Energy Regulatory Commission for decommissioning the Borel Powerhouse in response to safety changes at the Isabella Dam. SCE submitted an application for Surrender of License for the Borel Hydroelectric Project on May 1, 2023. As of July 29, 2024, the Federal Energy Regulatory Commission (FERC) issued an Environmental Assessment of project features and surrender of Project License, and the application is currently under review by FERC. Shutting down the plant, instead of re-aligning the Borel Canal conduit, may reduce construction costs as well as environmental impacts from constructing a new canal. If the new canal is constructed, the Borel Powerhouse will remain reliant on the availability of water in the Lake Isabella dam from which SCE receives the water for Borel. Other future plans for hydropower generation facilities in the Region are unknown; however any such plans would be limited to small hydropower facilities which would be incidental to the operation of irrigation conveyance and distribution systems. In this regard, based on currently available technology, solar generation is more likely than small hydropower.	Low

The score sheet below summarizes the results of the vulnerability assessment presented in the matrix. The seven sections of the assessment are listed in order of vulnerability, from highest to lowest.

Table VIII-2. IRWMP Climate Change Vulnerability Assessment Score-Sheet

Section No. [1]	Section Title	Vulnerability Rating			
		High	Medium	Low	N/A
II	Water Supply Assessment	4	0	1	1
I	Water Demand Assessment	1	3	2	0
V	Flooding Assessment	0	2	2	1
VI	Ecosystem and Habitat Vulnerability Assessment	0	1	4	2
III	Water Quality Assessment	0	0	2	3
VII	Hydropower Reliance Assessment	0	0	3	1
IV	Sea Level Rise Assessment	0	0	0	6
Total Climate Change Assessment Score		**5**	**6**	**14**	**14**

[1] Numbers based on checklist shown in Section 4.3 of the 'Climate Change Handbook for Regional Water Planning' (CDM, 2011).

Based on the vulnerability assessment summarized in the score sheet, "Water Supply" and "Water Demand" appear to have the highest level of vulnerability to potential Climate Change impacts to the District. This confirms the projected outlook for the District presented in Sections A and B, respectively. The remaining sections assessed in the matrix, while important, do not pose as much of a projected risk to regional water resources operations or management efforts.

D. Response to Effects of Climate Change

North Kern is committed to monitoring key indicators of climate change that affect the hydrology of the Kern River watershed and growing conditions in the District's service area. The goal of the District is to utilize the available surface water and groundwater resources as effectively as possible in meeting the requirements of the District's water users. The following sections describe ways in which the District, as well as the RWMG, are responding to the above mentioned effects of climate change.

Water Supply

As previously noted, any reduction in surface water supplies can be expected to increase the use of energy in North Kern due to increased groundwater pumping, which would result in an assumed increase in GHG emissions at the source of the increased generation of electrical energy. The District is aware of the reduced reliability of its surface water supply and the increased energy associated with groundwater pumping. Replacement of pre-1950 wells to return to pre-2010 capacity and improve energy efficiency.

Water supply reliability was further enhanced by the *Beneficial Reuse of Oilfield Produced Water* Project which involved the construction of a 14,900 linear-foot pipeline connecting the North Kern service area to an existing California Resources Corporation pipeline. The pipeline conveys up to 9,000 AF/year of oil-field produced water from the Kern Front oil field to the North Kern service area. Additionally, as indicated before, the District is currently in the process of implementing the return capacity improvements project which will augment their groundwater supply by an additional 4,000 AFY. These annual deliveries have provided a new water supply for agricultural irrigation, with the added benefit of reducing energy consumption and GHG emissions as a result of the produced water being gravity fed to the Lerdo Canal, ultimately reducing groundwater extractions.

Water Demand

Farmers are already seeing the effects of climate change on the crops and are altering their practices to accommodate effects like increased water demands and reduced winter chill. Some farmers are beginning to overcome decreasing winter chill by planting trees closer together and using new varieties. Another recent practice adapted by farmers in the area involves reducing the volume of irrigation water applied to pistachios to instead have sufficient water for almonds. While this practice will sacrifice production of pistachios over the short term, pistachios have the ability to recover from drought stress, while almonds, once stressed, may not rebound to their previous levels of production, and therefore require more fundamental maintenance.

Studies are now underway to prepare farmers for the likely impacts of climate change. Such efforts include breeding varieties of fruit trees which can withstand the decreased water chill hours, developing tools to aid crops in coping with insufficient chill, and researching the temperature responses of particular orchard crops to better understand potential long-term effects. However, some solutions such as replanting orchards with altered crop varieties or the installation of aiding tools may not be feasible for many irrigators.

Poso Creek RWMG

The 2019 Poso Creek IRWMP Update provided the following strategies which were deemed the most practical and effective for climate change preparation in the Region, while also providing measurable benefits to current water management practices:

- Expand in-lieu service areas in the Region, by expanding water conveyance to lands which are currently dependent solely on groundwater supplies (i.e., reduce dependency on groundwater basin during “wetter” periods).
- Improve agricultural and urban water use efficiency.
- Expand groundwater recharge and banking efforts through expansion of spreading pond acreage to capture surplus wet-period water supplies and thereby help to maintain groundwater levels.
- Encourage changes in regional crop varieties that are more resistant to climate change.

The RWMG emphasizes these strategies not only in response to climate change, but also to cope with significant surface water supply deficiencies that already face the Region. Because North Kern is primarily reliant on the Kern River, the impacts of climate change on the hydrology of the Kern River will have an immediate impact on North Kern, whereas the implications of climate change and regulatory restrictions on Delta water supplies will be felt more acutely by many of North Kern's neighboring districts. In all instances, the major tool North Kern and other members of the RMWG have to respond to increasingly tenuous supplies of surface water has been and will continue to be conjunctive management of both surface water and groundwater resources. Management practices will therefore have to be adaptive in nature.

Local and Regional Resources

- San Joaquin Valley Summary Report, Preview. California's Fourth Climate Change Assessment. 2022. Available at: https://climateassessment.ca.gov/regions/.
- Poso Creek Integrated Regional Water Management (IRWM) Group. 2019. "IRWM Plan Update (Poso Creek IRWMP, 2019)."
- Kern County Subbasin. 2025. Groundwater Sustainability Plan (GSP) 2025. Amended Final Version. Adopted August 2025. https://kerngsp.com/wp-content/uploads/2025/09/Kern-County-Subbasin-Groundwater-Sustainability-Plan-2025-Clean.pdf. (Kern County Subbasin GSP, 2025)
- Luedeling, E; Zhang, M; Girvetz, E.H., July 2009. "Climatic Changes Lead to Declining Winter Chill for Fruit and Nut Trees in California during 1950-2099". PLoS ONE 4(7). (PLoS ONE, 2009)
- Water Resources Research, Vol. 48, 2012. "A Method for Physically Based Model Analysis of Conjunctive Use in Response to Potential Climate Change".

Table VIII-3. District Strategies to Mitigate Climate Change Impacts.

Source	Strategy	Status
California Water Plan (DWR 2010a, 2013, 2018c, and 2023)	Reduce water demand	The District is implementing all technically feasible and locally cost-effective EWMPs identified by SBx7-7 to improve water use efficiency in District operations and to encourage on-farm improvements. Conversion of agricultural land to urban use is projected to reduce water demand (GSP, 2025). Additional actions to reduce water demand are considered on an ongoing basis as part of North Kern's water management activities.
	Improve operational efficiency and transfers	As described above and elsewhere in this AWMP, the District has and continues to implement improvements to increase operational efficiency.
	Increase water supply, including through, increased storage, recharge and sustainable groundwater management	The District has increased its available water supply through conjunctive management of available groundwater supplies, through reuse of recycled water from the City of McFarland, Oilfield Produced Water, and through other innovative technologies. North Kern participated in a cloud seeding program to maximize surface water supplies available from Kern River. This included improved return capacity for groundwater recharge. In the future, the District will seek additional opportunities to increase available water supply, including increased conjunctive management through consideration of opportunities to increase groundwater recharge to increase available groundwater supply to compensate for reduced April through July runoff. North Kern is also actively engaged in SGMA efforts and supported the development of the approved 2025 GSP for the Kern County Subbasin. Implementation of the GSP includes expanding managed aquifer recharge as part of North Kern's conjunctive management program to sustainably manage groundwater in the Kern County Subbasin.
	Improve water quality	The District will continue to monitor surface water and groundwater quality as part of its active water quality monitoring program, and the coordination with monitoring programs conducted by others.
	Practice resource stewardship	The District intrinsically supports the stewardship of agricultural lands within and surrounding its service area through its irrigation operations and resulting groundwater recharge. The District participates in studies of aquatic life and habitat to better understand potential impacts of climate change. North Kern also supports stewardship of surface water and groundwater supplies, as evidenced through its comprehensive conjunctive management program, watershed monitoring programs, and active engagement in GSP implementation for the Kern County Subbasin, among other efforts.
	Improve flood management	No adopted plan for flood management, but preventative and mitigation measures are done to manage flood flows from Poso Creek.
	Engage people in water management	North Kern offers affordable surface water in all years and also offers a variety of agricultural water management educational programs and materials for farmers, staff, and the public.
	Support Long-Term and Regional Water Management Planning	The District collects, manages, and reports a wide array of data related to the District's operations and water management efforts. The District is also actively involved in regional surface water and groundwater management planning.
	Improve Forecasting, Data, and Management	Not Applicable.
	Other strategies	Other strategies include crop idling, irrigated land retirement, and rainfed agriculture. Under severely reduced water supplies, growers could consider these strategies; however, it is anticipated that climate change impacts will be mitigated through the other strategies described.
USA California Climate Adaptation Strategy (CNRA	Aggressively increase water use efficiency	Described above under "Reduced water demand" and "Improve operational efficiency and transfers."
	Practice and promote integrated flood management	Described above under "Improve flood management."

Source	Strategy	Status
2009 and 2021)	Enhance and sustain ecosystems	Described above under “Practice resource stewardship."
	Expand water storage and conjunctive management	Described above under "Increase water supply."
	Fix Delta water supply	Not applicable to the District.
	Preserve, upgrade, and increase monitoring, data analysis, and management	The amount of information and analysis available to support the District's water management is extensive and continues to increase substantially. For example, North Kern maintains records of its monitoring network for representative monitoring wells and has access to annual Kern River Hydrographic Reports.
	Plan for and adapt to sea level rise	Projections indicate that sea levels could rise by 2 to 5 feet by 2100. Direct impacts on the District are not anticipated.
Sacramento and San Joaquin Basins Study (USBR, 2016b)	Reduce water demand	Described above under “Reduce water demand”
	Increase water supply	Described above under “Increase water supply, including through recharge and sustainable groundwater management”
	Improve operational efficiency	Described above under “Improve operational efficiency and transfers.” The District has and continues to implement improvements to increase operational efficiency through SCADA monitoring and automation, canal lining and improvements, conjunctive use management, and the many other efforts described as EWMPs in **Section IX**.
	Improve resource stewardship	Described above under “Practice resource stewardship.”
	Improve institutional flexibility	North Kern cooperates with neighboring districts and works with agencies that affect the flexibility with which North Kern can store and deliver water, including the USACE.
	Improve data and management	Described above under “Preserve, upgrade, and increase monitoring, data analysis, and management.”

State Resources

- California Water Commission, 2016. Water Storage Investment Program Technical Reference. Sacramento, CA: Technical Memorandum. Climate Change Projections for Water Storage Investment Program (WSIP) - Technical Reference - California Natural Resources Agency Open Data. (CWC, 2016)
- Central Valley Flood Protection Plan (CVFPP) 2022 Update, Technical Analyses Summary Report, November 2022, Available at https://cvfpb.ca.gov/cvfpp/
- Progress on Incorporating Climate Change into Planning and Management of California’s Water Resources. California Department of Water Resources. July 2006. Available at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/comments102612/desjardins/progress_on_incorporating_climate_chg.pdf. (DWR 2006)
- 2009 California Climate Change Adaptation Strategy. California Natural Resources Agency. December 2009. (CNRA, 2009)
- 2021 California Climate Change Adaptation Strategy. California Natural Resources Agency. 2021. (CNRA, 2021)
- Managing An Uncertain Future: Climate Change Adaptation Strategies for California’s Water. California Department of Water Resources. October 2008. (DWR, 2008)

- Managing an Uncertain Future. California Water Plan Update 2009. Volume 1, Chapter 5. March 2010. (DWR, 2010a)
- Climate Change Characterization and Analysis in California Water Resources Planning Studies. California Department of Water Resources. December 2010. (DWR, 2010b)
- Climate Change Handbook for Regional Water Planning. Prepared for U.S. Environmental Protection Agency and California Department of Water Resources by CDM. November 2011. (CDM, 2011)
- Climate Change and Integrated Regional Water Management in California: A Preliminary Assessment of Regional Perspectives. Department of Environmental Science, Policy and Management. University of California at Berkeley. June 2012. (UCB, 2012)
- California Adaptation Planning Guide: Planning for Adaptive Communities. California Emergency Management Agency and California Natural Resources Agency. July 2012. (Cal EMA and CNRA, 2012)
- Managing an Uncertain Future. California Water Plan Update 2013. Volume 1, Chapter 5. 2013. (DWR, 2013)
- Perspectives and Guidance for Climate Change Analysis. California Department of Water Resources Climate Change Technical Advisory Group. August 2015. (DWR-CCTAG, 2015)
- California Department of Water Resources, 2018a. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development. Sacramento, CA: Technical Memorandum. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/GroundwaterManagement/Sustainable-Groundwater-Management/Best-ManagementPractices-and-Guidance-Documents/Files/Climate-ChangeGuidance_Final_ay_19.pdf (DWR, 2018a)
- DWR, 2018b. Resource Guide, DWR-Provided Climate Change Data and Guidance for Use During Groundwater Sustainability Plan Development. Sacramento, CA: Technical Memorandum. https://water.ca.gov/-/media/dwr-website/webpages/programs/groundwater-management/sustainable-groundwatermanagement/best-management-practices-and-guidancedocuments/files/resource-guide-climate-change-guidance_v8_ay_19.pdf (DWR, 2018b)
- Actions for Sustainability. California Water Plan Update 2018. Chapter 3. 2018. (DWR, 2018c)
- California Water Plan Update 2023. (DWR, 2023)
- Safeguarding California Plan: 2018 Update, California's Climate Adaptation Strategy. California Natural Resources Agency. January 2018. (CNRA, 2018)
- Indicators of Climate Change in California. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2018. (Cal EPA, 2018)
- Climate Action Plan—Phase 1: Greenhouse Gas Emissions Reduction Plan. California Department of Water Resources. July 2020. (DWR, 2020)
- Climate Action Plan—Phase 2: Climate Change Analysis Guidance. California Department of Water Resources. September 2018. (DWR, 2018b)
- Climate Action Plan—Phase 3: Climate Change Vulnerability Assessment. California Department of Water Resources. February 2019. (DWR, 2019)

- Cal-Adapt website tools, data, and resources for exploring California's climate change research and developing adaption plans. Available at https://cal-adapt.org/
- California's Water Supply Strategy, Adapting to a Hotter, Drier Future (August 2022)

Other Resources

- Climate Change and Water. Intergovernmental Panel on Climate Change. June 2008. (IPCC, 2008)
- Climate Change and Water Resources Management: A Federal Perspective. U.S. Geological Survey. Circular 1331. 2009. (USGS, 2009)
- West-Wide Climate Risk Assessments: Irrigation Demand and Reservoir Evaporation Projections. Technical Memorandum No. 86-68210-2014-01. U.S. Bureau of Reclamation. 2015. Available at https://www.usbr.gov/watersmart/baseline/docs/irrigationdemand/irrigationdemands.pdf (USBR, 2015)
- SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water 2016. March 2016. (USBR, 2016a).
- Sacramento and San Joaquin Rivers Basin Study. March 2016. (USBR, 2016b)

Section IX.Water Use Efficiency Information

A. EWMP Implementation and Reporting

The California Water Code sets forth specific EWMPs for agriculture; two of which are identified as "critical" and 14 of which are to be implemented if they are "locally cost effective and technically feasible" (total 16). The latter are referred to as "conditionally required" in DWR's *2025 Guidebook*. Each of the 16 EWMPs is listed in the *2025 Guidebook* and in Section I of this plan. Table IX-1 summarizes the status of implementation of EWMPs at North Kern. The two "critical" EWMPs are listed first and are followed by the 14 "conditionally required" EWMPs.

As described throughout this report, North Kern takes a programmatic approach to water management and has implemented several initiatives to conserve water, protect water quality and maintain groundwater elevations throughout its service area that combine features of individual EWMPs.

Table IX-2 provides an estimate of the improvements in efficiency that have been achieved in North Kern since the issuance of the District's last AWMP. Table IX-3 describes EWMPs that are not planned for implementation because they are either technically infeasible or not locally cost effective.

The description of implemented EWMPs presented here includes projects described in Section I.A. of this plan. It should be noted that North Kern has chosen to implement some EWMPs that, when viewed in isolation, are not locally cost-effective water conservation measures but that contribute to the District's overall water management strategy.

Table IX-1. Report of EWMPs

Water Code Reference	EWMP	Current Status	Status of EWMP
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.	Implementing	North Kern currently measures, monitors, and controls flows throughout its water delivery system. The District also measures deliveries in order to bill water users accurately for the volume of water used. The District is committed to comply with the requirements of SBx7-7 by verifying the accuracy of measurement of irrigation water deliveries using the methodology described in Supporting Documentation F of this report.
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Implementing	North Kern charges water users based on the volume of water delivered.
10608.48.c(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	There are no high water-duty or problem drainage conditions in the North Kern service area.
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Implementing	The District considers requests for use of recycled water. The District is using recycled water from the City of McFarland averaging to 466 AF/year from 2020 to 2024. In 2015, the District brought online the Beneficial Reuse of Oilfield Produced Water Project which annually brings about 9,000 AF/year of produced water from the Kern Front Oil Field for application to irrigated lands and for recharge in the District's Rosedale spreading pond.
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems.	Implementing	The District does not provide direct financial support for capital improvements to on-farm systems. However, North Kern does assist in implementation of on-farm improvements by agreeing to provide a fixed level of financial support to irrigators and then reducing water charges according to a schedule that will satisfy the commitment of support.
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) more efficient water use at the farm level; (B) conjunctive use of groundwater; (C) appropriate increase of groundwater recharge; (D) reduction in problem drainage; (E) improve management of environmental resources; (F) effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Implementing	North Kern's Board of Directors annually establishes a water rate that is the basis for volumetric pricing of delivered water. Water is priced higher in dry years when the District incurs significant pumping costs and lower in wet years with little or no district pumping. Wet-year pricing is set at levels below the costs for landowners to pump their private wells, thereby encouraging the conjunctive use of available surface water *in lieu* of groundwater pumping.
10608.48.c(5)	Expand line or pipe distribution system, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage.	Implementing	North Kern has two main conveyance canals which are capable of diverting water from the Kern River and delivering it within the service area. One of these canals is lined between the river and North Kern and is the principal conveyance facility. Within North Kern, seepage from canals and regulatory reservoirs is recoverable as pumped groundwater. North Kern has 26 miles of lined canal within the District which were constructed specifically for dry-year operations in order to reduce canal seepage. Some of the unlined distribution canals have been replaced with buried pipelines. The District has lined portions of the Calloway Canal with bentonite to reduce seepage potential, specifically in areas that were known to exhibit relatively high rates of seepage. The preponderance of the District's distribution system, however, remains unlined, adding to the District's recharge capability during wet years.
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	Implementing	To the extent that deliveries are being made from storage in Isabella Reservoir the District's ability to be flexible in water order times is limited. The District, however, does strive to add flexibility to water ordering and delivery wherever possible. This includes the use of in-system regulatory reservoirs to help regulate mismatches between water supply and demand. In addition, District policy allows water transfers between water users within the boundaries of the District. The policy allows water users to transfer water to parcels owned or rented by the water user.

Table IX-1. Report of EWMPs continued

Water Code Reference	EWMP	Current Status	Status of EWMP
10608.48.c(7)	Construct and operate supplier operational outflows and tailwater recovery systems.	Not Applicable	With 1,786 acres of spreading grounds, North Kern is able to direct potential operational outflows to recharge areas. Additionally, due to the nature of the on-farm irrigation practices utilized in North Kern, spillage, and tailwater rarely occur. Recovery systems are not utilized as they would have little effect on water use efficiency.
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area.	Implementing	The District has been operating a very significant and successful conjunctive use project for over 60 years. Kern River and other surface water available to North Kern is used in preference to groundwater to the extent available. In “wet” years, available supplies which are in excess of irrigation demand are used to recharge the underlying groundwater (primarily through 1,786 acres of dedicated spreading ponds). In “dry” years, groundwater is pumped to offset the deficit in available surface water supplies. Through the Poso Creek IRWMP, North Kern identified and has constructed several major capital improvements that enhance the District’s capabilities to conjunctively use its Kern River supplies, other surface water supplies available to the District and through water banking, transfer, and exchange agreements, surface water supplies available to others in the Poso Creek region, Kern County, and on the Friant-Kern Canal. District operations in critically dry years have demonstrated the value of the District’s commitment to conjunctive management and have led to additional investments in facilities both to increase groundwater recharge and to maintain the District’s capacity to extract stored groundwater.
10608.48.c(9)	Automate canal control structures.	Implementing	North Kern has automated approximately 21 water level and flow monitoring stations at water diversion points and has installed monitoring stations along some reaches of its canals. The District has identified another 2 locations that could be automated for greater water management flexibility. The District has added, and will continue to add, canal automation to its in-house SCADA system to enhance water delivery flexibility to water users. The District has installed meters on all wells. As with other district initiatives, North Kern has proceeded with implementation of this EWMP as a vehicle to improve customer service. Improved control of deliveries has benefited North Kern growers during the drought by enabling them to make effective use of pro-rated allocations.
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation.	Implementing	The District mandates that private landowners measure and test the efficiency of pumped water discharged into the canal.
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.	Implementing	The North Kern Board of Directors has a designated Water Conservation Coordinator.
10608.48.c(12)	Provide for the availability of water management services to water users.	Implementing	North Kern (1) measures all deliveries to water users and provides each user with the volume of water delivered during each billing cycle; (2) financially supports the mobile irrigation lab which is operated by the North West Kern RCD (which provides free irrigation system performance testing to District growers); and (3) publishes a periodic newsletter for the dissemination of information from UC Cooperative Extension and other sources.
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Implementing	The District’s surface water supply originates from the Kern River, which is regulated by Isabella Reservoir (a USACE-operated facility). Repairs to resolve dam-safety concerns were completed by USACE in 2023. North Kern and the other River interests are working closely with USACE to update the Water Control Manual to allow for more flexible water deliveries and storage while protecting property from flowing. restriction.
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier’s pumps.	Implementing	The District has a program for regular inspection and maintenance of pumps and motors to keep them in good working order. Pumping plant efficiencies are periodically determined and, if less than a given threshold value, the pump and motor are pulled for inspection and rehabilitation.

The 2026 North Kern Water Operations budget for capital improvement and work orders contains funding for operation and continued implementation of the EWMPs described in Table IX-1.

Table IX-2 presents an estimate of the water savings or improvements in water management anticipated to occur over the next five and ten years as a result of programs now being implemented or being planned by the District.

Table IX-2 Evaluation of relative Magnitude of Past and Future WUE Improvements by EWMPs

Water Code Reference No.	EWMP	Implementation Status	Marginal WUE Improvements[1,2]			
			Past		Future	
			Relative to No Historical Implementation[3]	Since Last AWMP	5 Years in Future	10 Years in Future
10608.48.b (1)	Measure the volume of water delivered to customers with sufficient accuracy	Being Implemented	No Direct WUE Improvements			
10608.48.b (2)	Adopt a pricing structure based at least in part on quantity delivered	Being Implemented	None	Limited	Limited	
10608.48.c (1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Not Applicable to NKWSD			
10608.48.c (2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Being Implemented	Modest (approx. 9,466 AF total annually)	None	None to Limited, Depending on Future Opportunities (Timing and Availability)	
10608.48.c (3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented	Substantial (for indirect support)	Modest	None to Limited, Depending on Future Needs	
10608.48.c (4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented	Substantial	None	Limited, Depending on Change In Pricing Structure	

10608.48.c (5)	Expand lined or piped portions of the distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	Substantial (Limited Reduction in Irrecoverable Losses)	Modest	Limited
10608.48.c (6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	Limited	Limited	Limited
10608.48.c (7)	Construct and operate supplier spill and tailwater recovery systems	Not Technically Feasible	None	None	None
10608.48.c (8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	Substantial	Substantial	Modest to Substantial
10608.48.c (9)	Automate canal control structures	Being Implemented	Modest	Modest to Substantial	Limited
10608.48.c (10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	Modest	None (Limited Energy Conservation)	None (Limited Energy Conservation)
10608.48.c (11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	The activities of the Water Conservation Coordinator and other North Kern staff to achieve WUE improvements through implementation of the EWMPs are described individually by EWMP.		
10608.48.c (12)	Provide for the availability of water management services to water users.	Being Implemented	Substantial	Limited	None to Limited
10608.48.c (13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented	Substantial	Modest	Modest
10608.48.c (14)	Evaluate and improve the efficiency of the supplier's pumps.	Being Implemented	Substantial	None (Limited Energy Conservation)	None (Limited Energy Conservation)

[1] As noted herein and throughout this analysis, reductions in losses that result in WUE improvements at the farm or district scale do not result in WUE improvements at the basin scale, except in the case of evaporation reduction. All losses to seepage, spillage, tailwater, and deep percolation are recoverable within North Kern or by downgradient water users within the basin.

[2] In most cases, quantitative estimates of improvements are not available. Rather, qualitative estimates are provided as follows, in increasing relative magnitude: None, Limited, Modest, and Substantial.

[3] WUE Improvements occurred in recent years relative to if they were not being implemented.

B. Documentation for Non-Implemented EWMPs

North Kern has implemented, or is in the process of implementing, each of the recommended EWMPs other than those categorized in Table IX-1 as being Not Technically Feasible or Not Applicable. Although certain of these measures are not locally cost-effective as individual water conservation measures, the District is implementing them as elements of a broad program that enables North Kern to provide a high level of service to its agricultural customers and to responsibly manage surface water and groundwater resources in the District's service area. This position is summarized below in Table IX-3.

Table IX-3 Non-Implemented EWMP Documentation

EWMP #	Description	(check one of both)		Justification/Documentation
		Technically Infeasible	Not Locally Cost-Effective	
10608.48.c(1)	Facilitate alternative land uses	X		There are no high water-duty or problem drainage conditions in the North Kern service area. The types of crops grown in the service area are not excessively irrigated and are not high water-use crops as evidenced by the irrigation methods used and typical delivery volumes. The District is in compliance with the ILRP indicating that no problem drainage areas exist.
10608.48.c(7)	Tailwater recovery systems	X		On-farm practices at North Kern generate little tailwater because of the on-farm application methods used by the District's growers. Spillage (operational discharge) is now recovered and is an element of the District's groundwater recharge program. Therefore, because little tailwater is generated within the District, implementation of tailwater recovery measures is not technically feasible.

C. Project and Management Actions for NKWSD

In the development of the 2025 Kern County Subbasin's GSP, the District identified projects and management actions that are designed to improve management of the District's water resources by directly improving water use efficiency, through facility improvement projects, and by incentivizing more efficient water use by District landowners, through management actions such as establishing water budgets and pricing structures.

Table IX-4 provides the list of projects and management actions developed in the 2025 Kern County Subbasin GSP and adopted here as water management objectives. The projects and management actions are listed in order of priority.

Table IX-4. SGMA Projects and Management Actions for the North Kern Water Storage District

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					
NKWSD-1	Beneficial Reuse of Oilfield Produced Water	Oilfield produced water of sufficient quality for beneficial reuse used as source water for groundwater recharge. 9,000 AFY expected annually, 6,500 of which will be transferred to RRID.	✓		✓	New Local Supply	Already being implemented	NKWSD, Board Meetings & Website	Waste Discharge Requirement Permit	Ongoing	2014	2016	2014-	2,500	0			✓			Oilfield Produced Water	District / SGMA authorities	$300,000	$1,000,000	Water Tolls/ District
NKWSD-2	Allocation of Available NKWSD Supplies to RRID	Transfer a portion of groundwater banked oilfield produced water from NKWSD to RRID benefit.	✓			New Local Supply	Already being implemented	NKWSD, Board Meetings & Website	None	Ongoing	2020	2023	2023-	6,500	0			✓			Oilfield Produced Water	District / SGMA authorities	$0	$650,000	RRID/Landowners
NKWSD-3	Landowner Subsurface/Surface Recharge Program	Implementation of joint Landowner and District program to expand District groundwater recharge using landowner owned facilities.	✓	✓		Supplemental Water Recharge	Already being implemented	NKWSD, Board Meetings & Website	CEQA	Ongoing	2020	2024	2024-	1,000	320	✓		✓			Utilize Existing Water Right/ Landowner Acquisition	District / SGMA authorities	$1,400,000	$90,000	District/Landowners
NKWSD-4	SCADA Automation and Evapotranspiration Measurement Improvements	Develop automation and remote sensing for ET monitoring and improved management of surface water conveyance.	✓			Water Conservation-Efficiency	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Ongoing	2020	2024	2021-	0	3,400			✓		✓	Demand Reduction	District / SGMA authorities	$160,432	$10,000	Grant/ District assessments and/or water tolls
NKWSD-5	Calloway Canal Improvements: Lining Snow Rd. to 7th Standard Rd.	Concrete lining of canal to increase surface water reliability and prevent loss from seepage.	✓	✓	✓	Water Conservation-Efficiency	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Ongoing	2019	2024	2025-	0	0	✓		✓			Utilize Existing Water Right	District / SGMA authorities	$6,506,700	$5,000	Grant/ District assessments and/or water tolls
NKWSD-6	Calloway Canal Improvements: lining 7th Standard Rd. to 8-1 Pump Station	Concrete lining of canal to increase surface water reliability and prevent loss from seepage.	✓	✓	✓	Water Conservation-Efficiency	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Initiated	2020	2026	2026-	0	0	✓		✓			Utilize Existing Water Right	District / SGMA authorities	$10,061,000	$5,000	Grant/ District assessments and/or water tolls
NKWSD-7	Groundwater Banking Conveyance Improvements to NKWSD Recharge and Recovery	Improvements to existing well network for return capacity of recharged water to District's banking partners.	✓	✓	✓	Third Party Banking	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Initiated	2019	2026	2025-	4,000	0	✓	✓	✓			Third Party Banking Partner Sources	District / SGMA authorities	$15,330,000	$930,000	Grant/ District assessments and/or water tolls
NKWSD-8	Calloway Canal Improvements: lining Fruitvale Ave. to CVC Intertie	Concrete lining of canal to increase surface water reliability and prevent loss from seepage.	✓	✓	✓	Water Conservation-Efficiency	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Initiated	2022	2028	2027-	0	0	✓		✓			Utilize Existing Water Right	District / SGMA authorities	$6,509,000	$5,000	Grant/ District assessments and/or water tolls
NKWSD-9	Calloway Canal Improvements: lining Case St. to Fruitvale Ave.	Concrete lining of canal to increase surface water reliability and prevent loss from seepage.	✓	✓	✓	Water Conservation-Efficiency	Already being implemented	NKWSD, Board Meetings & Website	CEQA, NEPA	Initiated	2022	2029	2028-	0	0	✓		✓			Utilize Existing Water Right	District / SGMA authorities	$8,404,360	$5,000	Grant/ District assessments and/or water tolls
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	Feasibility Study	NA	2030	2030-	0	0			✓	✓	✓	NA	None	Unknown	Unknown	District assessments and/or water tolls

NKWSD-10	RRID Groundwater Recharge Project	Construction and implementation of water recharge basins for the RRID management area. Approximately 450 acres of crops will be removed and replace by recharge facilities.	✓	✓		Demand Reduction, Supplemental Water Recharge	Already being implemented	NKWSD, Board Meetings & Website	CEQA	Initiated	2023	2036	2025-	7,200	1,300	✓	✓	✓			Utilize Existing Contracts, Agreements, and Surplus Acquisition	District / SGMA authorities	$18,000,000	$400,000	Grant/RRID
NKWSD-11	Expanded Water Banking Program	Use of available capacity in existing facilities and development of additional recharge and recovery facilities	✓	✓	✓	Third Party Banking	Already being implemented	NKWSD, Board Meetings & Website	CEQA	Initiated	2020	TBD	2025-	5,000	0	✓	✓	✓			Third Party Banking Partner Sources	District / SGMA authorities	TBD	TBD	Grant/ District assessments and/or water tolls
NKWSD-12	Poso Creek Weir	Installation of a concrete weir on Poso Creek to replace the earthen structure.	✓		✓	Water Conservation-Efficiency	Upon adoption of this project	NKWSD, Board Meetings & Website	CEQA, CDFW	Conceptual	2025	TBD	2026-	TBD	0		✓	✓		✓	Poso Creek	District / SGMA authorities	TBD	TBD	Grant/ District assessments and/or water tolls

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)
Management Actions		Implemented / Functional / In-Process	As-Needed										Implemented		Functional	In-Process				As-Needed					
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, Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS), as well as local Groundwater Banking MOUs.	✓	✓			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	Grant/ District assessments and/or water tolls
KSB-3	Exceedance Policy	Subbasin-wide policy to outline what measures are taken if an MT is exceeded (levels, quality, or subsidence). This policy involves the implementation of action plans and notifications to beneficial users.	✓	✓	✓		When an MT exceedance occurs for any sustainability indicator.	NA	NA	Implemented	NA	2024	2024-	0	0				✓	✓	NA		$0	$25,000	District assessments and/or water tolls
KSB-5	Well Mitigation Program	Implementation of a well mitigation program to address water level and quality impacts on drinking water. The program provides emergency bottled water, well assessments, hauled water, and well improvements or replacements.	✓				When groundwater management activities impact domestic wells.	Refer to Subbasin Outreach and Engagement Plan	NA	With the adoption of the GSP in December, the Well Mitigation Plan will be adopted and implemented beginning on January 1, 2025.	NA	2025	2025-	0	0				✓		NA	NA	$0	$45,000	Grant/ District assessments and/or water tolls
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	Grant/ District assessments and/or water tolls
KSB-6	White Land Demand Management	Development of governance structure and demand reduction action for Subbasin white lands (lands not within a district or management area). Correct the water supply imbalance by setting water budgets and a linear reduction of 10% per year over the planning period of 2030-2040.	✓	✓	✓	Demand Reduction	Subbasin-wide overdraft correction.	Stakeholder Meetings Board Meetings Hearings Public Outreach & Engagement	NA	Initiating Development	NA	2030	2030-	0	20,410	✓				✓	NA	None	$0	$10,000	District assessments and/or water tolls
KSB-7	Well Registry	An ongoing effort to update and maintain the Subbasin well inventory and translate it into a well registry. Information will be updated and housed within the Subbasin data management system.	✓	✓	✓			Refer to Subbasin Outreach and Engagement Plan	NA	Ongoing	NA	2024-	2024-	0	0				✓	✓	NA	NA	$0	$25,000	District assessments and/or water tolls
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 assessments and/or water tolls

KSB-9	California Aqueduct Subsidence Action Plan	Subbasin has developed an Action Plan for Subsidence Interim Milestone (IM) & Minimum Threshold (MT) Exceedances which requires GSAs to evaluate and initiate targeted P/MAs to reduce GSA-related subsidence. As part of this P/MA, GSAs located within or proximate to the CASP 3-mile wide Monitoring Corridor to the California Aqueduct may initiate targeted P/MAs should future observed subsidence rates exceed IMs and MTs.	✓		✓		When an subsidence IM/ MT exceedance occurs.	NA	NA	Ongoing	In-process	Ongoing												
KSB-10	RMW Data Gaps	An assessment of level and quality data gaps identified RMN data gaps for water levels and quality. Identified data gaps will be evaluated and addressed by the end of 2026 as specified in Section 15.	✓	✓	✓	NA	NA	NA	Permitting will be required if new wells need to be drilled	Ongoing	NA	2026	2026-	0	0					✓	NA	NA	Unknown at this time	Unknown at this time	Unknown at this time
NKWSD-13	Ongoing Evaluation of Groundwater Levels and Water Quality Trends	Monitor WQ to determine if a correlation for degradation develops as a result of declining water levels.	✓	✓			Already being implemented	NKWSD, Board Meetings & Website	None	Ongoing	2015	TBD	Ongoing	0	0	✓				✓	Monitoring	District / SGMA authorities	$0	$75,000	District assessments and/or water tolls
NKWSD-14	Refinement of Water Budget Components	Improvement of monitoring and measurements to refine the accuracy of measurement or calculation of inflow and outflow components of district-level water budget. Will also refine Subbasin Model and water budget.	✓	✓	✓		Already being implemented	NKWSD, Board/GSA Meetings & Website	None	Initiated	2020	TBD	2030-	0	0			✓		✓	Data Improvement	District / SGMA authorities	$0	$15,000	Grant/ District assessments and/or water tolls
NKWSD-15	Conversion of Agricultural Land to Urban Use in RRID	Conversion of agricultural land to urban use within the limits of each city to reduce groundwater use due to the decreased demand.	✓	✓		Demand Reduction	Already being implemented	Land Use & Planning	District, City & County	Initiated	2015	TBD	2030-	0	9,600			✓			Demand Reduction	District / SGMA authorities	$0	$22,500	Landowners, Cities & Private
NKWSD-16	Urban Water Conservation Program	Implementation of urban indoor and outdoor usage cappage as required by SB 606 and AB 1668.	✓			Demand Reduction	Already being implemented	Urban Water Supplier & District	State Regulations, Local Ordinance	Ongoing	2020	TBD	2030-	0	TBD	✓		✓			Demand Reduction	Cities	$0	$10,000	Grants/City/District
NKWSD-17	In-District Allocation Structure	Implementation of an groundwater credit allocation structure that would allow for the transfer of groundwater pumping credits within the district's jurisdiction.	✓	✓		Water Use Efficiency	As Needed	NKWSD, Board Meetings & Website	None	Conceptual	TBD	TBD	TBD	TBD	0			✓			Utilize Existing Water Storage	District / SGMA authorities	TBD	TBD	Grant/ District assessments and/or water tolls
NKWSD-18	Voluntary Land Fallowing	Development and implementation of a voluntary land fallowing program to reduce water demand.	✓	✓	✓	Demand Reduction	As Needed	NKWSD, Board Meetings & Website	None	Conceptual	TBD	TBD	TBD	0	TBD			✓			Demand Reduction	District / SGMA authorities	TBD	TBD	Grant/ District assessments and/or water tolls
NKWSD-19	Pumping Restrictions	Implement groundwater pumping allocations or limits.	✓	✓	✓	Demand Reduction	As Needed	NKWSD & GSA Board Meetings, Website, Direct Notices	Local Ordinance	Conceptual	TBD	TBD	TBD	0	TBD			✓	✓		Demand Reduction	District / SGMA authorities	TBD	TBD	District assessments and/or water tolls
NKWSD-20	In-Lieu Recharge Program	Implementation of fees for groundwater use when surface water is available.	✓	✓	✓	Water Conservation-Efficiency	As Needed	NKWSD, Board Meetings & Website	Prop 218	Conceptual	TBD	TBD	2035-	0	TBD	✓	✓	✓			Demand Reduction	District / SGMA authorities	None	None	None
NKWSD-21	On-Farm Efficiency/Deficit Irrigation Practices Incentive Program	Improvements to individual farming operations that address water use efficiency and/or groundwater protection through incentive programs.	✓	✓	✓	Water Conservation-Efficiency	As Needed	NKWSD, Board Meetings & Website	None	Conceptual	TBD	TBD	2035-	TBD	TBD	✓		✓			Demand Reduction - Water Use Efficiency	District / SGMA authorities	TBD	TBD	Grant/ District assessments and/or water tolls

Supporting Documentation: Agricultural Water Measurement Regulation Documentation

A. Description of Water Measurement Best Professional Practices

Section 10608.48(b) of the California Water Code requires that agricultural water suppliers governed by this section of the code, "Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10" of the legislation. Further, Section 531.10(a) requires that, "An agricultural water supplier shall submit an annual report to the department (DWR) that summarizes aggregated farm-gate delivery data, on a monthly or bi-monthly basis, using best professional practices."

North Kern's ability to comply with these requirements rests on the fact that all irrigation deliveries in the District are measured to support the District's volumetric water pricing to its customers. All deliveries are made through piped turnouts, with the diameters of the pipes ranging between 8 and 12 inches. Deliveries at most farm turnouts are measured with propeller flowmeters manufactured by McCrometer and Seametrics although a few turnouts still use Armco (Waterman) gates where flows are calculated based on the gate opening. The propeller meters are mounted within the turnout piping following accepted engineering practices and measure flow rates and also record the total volume of water delivered. Figure 10 is a photograph of a typical farm turnout from a District canal.

Figure 10. Typical North Kern Irrigation Turnout.

Data on volumes of delivered water recorded by the District are updated on a daily basis. Ditch-tenders enter water delivery readings into the District's water management software by first scanning the code for the turnout into their cell phone and then entering the reading from the

water meter. This information is emailed from the field, uploaded into the District's water management software and reviewed by a supervisor as a quality control procedure. Irrigated acreage is determined based upon a cropping forecast that is prepared each winter for the upcoming season. These crop reports include information obtained directly from water users that identify the crop type, irrigation method and acreage. The irrigated acreage values are verified by checking the acreage identified in the Kern County Assessor's Parcel Number database and are further field confirmed by North Kern field staff. As all turnouts at North Kern deliver water to single fields, there is a direct correspondence between the turnout identification number and the area served by that turnout.

Water delivery data are made available to water users whenever it is requested throughout the season, which enables irrigators to monitor their water usage. The District's billing system uses the pricing structure adopted by North Kern's Board of Directors and the flowmeter readings at a given farm turnout to determine the water bill associated with District deliveries through that turnout.

B. Engineer Certification and Apportionment

The methodology used to determine the individual device accuracy values found in Section 597.3(a) will be verified by a Professional Engineer using industry accepted standards. These methods will take into account the differential in water levels and/or fluctuations in the flow rate or velocity during the delivery event and the type, size and characteristics of the measuring device being verified.

Flowmeters at each farm turnout measure District deliveries to each irrigator's place of use. The flowmeter indicates the instantaneous flow rate and the cumulative total of water delivered, with the latter function referred to as a "totalizer".

Previously, meters were only repaired or replaced when a meter was observed to be malfunctioning or when a water user questioned the accuracy. However, in 2012 the District checked the accuracy of over 15 percent of the district's meters to provide documentation for this plan. The methodology used to determine whether the accuracy of a representative sample of the flow-measurement devices complies with the requirements of Section 597.3(a) is described later in this section. North Kern plans to adopt this methodology for field testing of existing flow metering devices and to present a report approved by a California-registered Professional Engineer as the basis for ongoing compliance with SBx7-7.

C. Water Measurement Conversion to Volume

SBx7-7 requires an annual volumetric accuracy of within ±12 percent on existing devices. Since North Kern's flow-measurement devices include totalizers (which directly record cumulative flow volume), the devices' accuracy in measuring flow rates is representative of their ability to measure volumes of water delivered. Therefore, the discussion presented later

in this section that relates to testing the accuracy of measurement of flow rates applies equally to determination of the accuracy of measurement of volumes of delivered water.

D. Legal Certification and Apportionment – Legal Access to the Farm-gate

North Kern staff has legal access to install, measure, maintain, operate, and monitor flow-measurement devices at all farm turnouts from the District's irrigation distribution system. In addition, with few exceptions turnouts deliver water to single fields. Therefore, there are no institutional or legal impediments that restrict access to turnouts or measurement of water and, for the purposes of satisfying SBx7-7, there is no need to measure water upstream of points of delivery to individual customers.

E. Device Corrective Action Plan

As noted above, in the past North Kern has repaired or replaced flow meters only when there was some obvious deficiency in their performance or when a water user questioned the accuracy of a meter. In 2012 North Kern verified the accuracy of measurement at over 15 percent of its turnouts to document measurement accuracy for this plan.

Devices identified during the 2012 program to have measurement accuracies that departed by more than ±12 percent from flows measured by a calibrated device were sent to the district shop for repair. Devices that were not rectified in the shop were replaced. After installation in the field, the accuracy of repaired meters was verified using a calibrated device, and an affidavit was submitted by a California-registered Professional Engineer certifying the accuracy of each repaired meter to be within ±10 percent by volume. Moving forward, new replacement meters will be laboratory certified by their manufacturer prior to installation to have an accuracy of measurement within ±6 percent by volume. Repair or replacement of these flow meters will be completed within three years of approval of this testing program by DWR.

F. Farm Gate Measurement and Device Accuracy Compliance

SBx7-7 requires that agricultural water suppliers measure the volume of water delivered to customers with sufficient accuracy to comply with standards described in the legislation. These standards are presented below.

1. *Measurement Options at the Delivery Point or Farm-gate of a Single Customer*

   An agricultural water supplier shall measure the volume of water delivered at the delivery point or farm-gate of a single customer. If a device measures a value other than volume, for example, flow rate, velocity or water elevation, the accuracy certification must incorporate the measurements or calculations required to convert the measured value to volume. An existing measurement device shall be certified to be accurate to within ±12 percent by volume.

2. *Initial Certification of Device Accuracy*

   For existing measurement devices, the device accuracy shall be initially certified and documented by either:

   - *Field-testing that is completed on a random and statistically representative sample of the existing measurement devices. Field-testing shall be performed by individuals trained in the use of field-testing equipment and documented in a report approved by an engineer.*

   - *Field-inspections and analysis completed for every existing measurement device. Field-inspections and analysis shall be performed by trained individuals in the use of field inspection and analysis, and documented in a report approved by an engineer.*

3. *Protocols for Field Testing*

   Field-testing shall be performed for a sample of existing measurement devices according to manufacturer's recommendations or design specifications and following best professional practices. It is recommended that the sample size be no less than 10 percent of existing devices, with a minimum of 5, and not to exceed 100 individual devices for any particular device type. Alternatively, the supplier may develop its own sampling plan using an accepted statistical methodology.

   If during the field-testing of existing measurement devices, more than one quarter of the samples for any particular device type do not meet the relevant accuracy criteria, the agricultural water supplier shall provide in its Agricultural Water Management Plan a plan to test an additional 10 percent of its existing devices, with a minimum of 5, but not to exceed an additional 100 individual devices for the particular device type. This second round of field-testing and corrective actions shall be completed within three years of the initial field-testing.

   Field-inspections and analysis protocols shall be performed and the results shall be approved by an engineer for every existing measurement device to demonstrate that the design and installation standards used for the installation of existing measurement devices meet the relevant accuracy standards and that operation and maintenance protocols meet best professional practices.

4. *North Kern WSD Program for Compliance with Water Measurement Requirements*

   In 2012 North Kern followed the guidelines described above by identifying 33 randomly-selected turnouts to serve as a representative sample for verification of flow measurement. This sample population represents 16.7 percent of the District's 198 turnouts. These turnouts deliver water to 10 percent of the District's irrigated area. Flows measured at each of the turnouts within the sample population were compared with measurements recorded

by a calibrated ultrasonic flowmeter to determine the accuracy of measurement. The sample population is shown in Appendix D.

Because the propeller meters used by the District are equipped with totalizers, errors detected in the measurement of flow rates correspond with errors in measurement of delivered water volumes, with measurement error being defined as the percentage departure between the propeller flowmeter reading and the corresponding reading taken with the calibrated ultrasonic meter. This formula for computing error conforms with the following language from Section 572.2 of the legislation.

> *"Accuracy" means the measured volume relative to the actual volume, expressed as a percent. The percent shall be calculated as 100 x (measured value – actual value) / actual value, where the "measured value" is the value indicated by the device or determined through calculation using a measured value by the device, such as flow rate, combined with a duration of flow, and "actual value" is the value as determined through laboratory, design or field testing protocols using best professional practices.*

A histogram of the error of measurement values is shown below in Figure 11. Note that all readings were taken for a period of 10 minutes at each turnout.

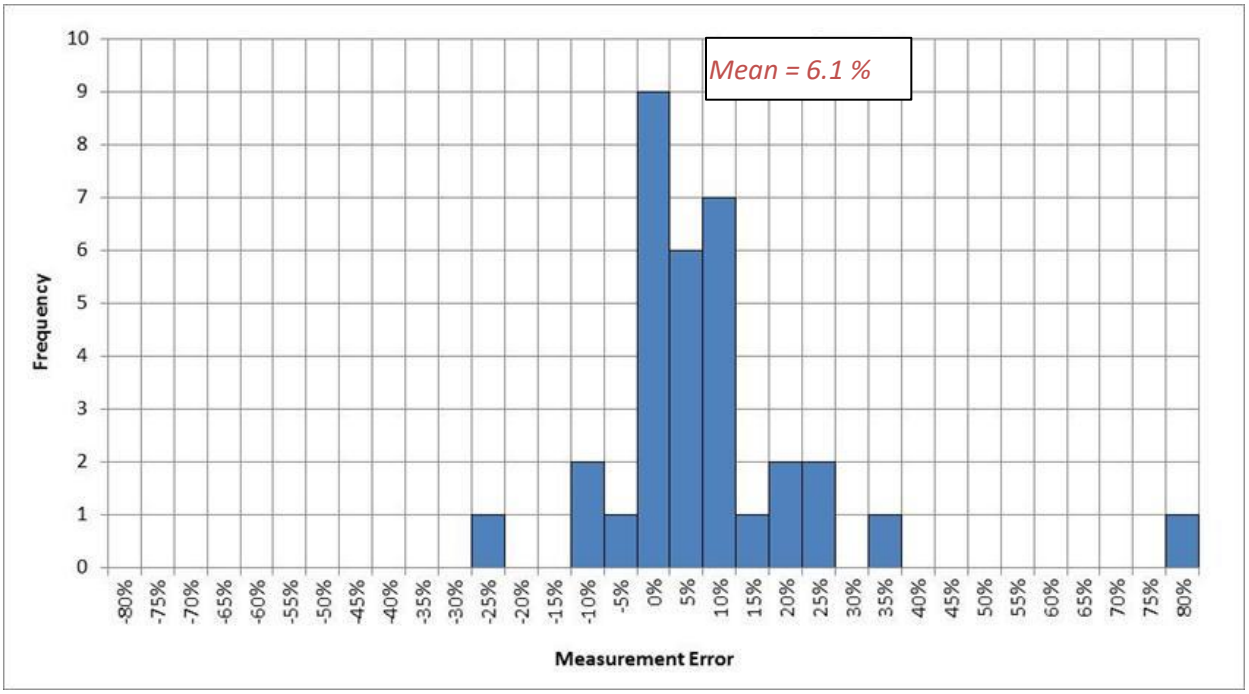


Figure 11. Histogram of percent measurement error at individual turnouts

As illustrated in the histogram, although the sample population includes a maximum value of 79 percent, the mean sample error was 6.1 percent, with a standard deviation of 16.8 percent and with approximately 58 percent of the individual error values falling within ±6 percent of the calibrated values and 76 percent falling within ±12 percent. This analysis

indicates that flow measurement at a majority of turnouts meets the ±12 percent volumetric measurement accuracy required by SBx7-7 for existing measurement devices, with the accuracy of about 24 percent of the sampled devices falling outside of the acceptable accuracy limits. As described earlier, those devices falling outside of the acceptable accuracy limits were repaired or replaced.

The next analysis was performed using sampling errors that had been weighted so that the error of measurement is proportional to the volume of water delivered at the turnout. Weighting was accomplished by multiplying the error of measurement computed at each turnout by the flow meter reading. This weighted data yielded a 10.6 percent error of measurement for the total sample population. However, as illustrated in Figure 11, much of the total sample error is the result of errors associated with a small number of turnouts. For example, if the turnouts with the four highest weighted measurement errors (Turnouts 8-00-60-A, 8-00-78B, 8-03-25A, and 8-17-6B) were removed from the remaining population, the error of the sample population would be reduced to 5.9 percent. This value indicates that, with few exceptions, the volume of water delivered by the turnouts included in the sample population is measured at an accuracy that conforms with the standards presented in SBx7-7.

Section X. References

1. ASCE. 2016. Evaporation, Evapotranspiration, and Irrigation Water Requirements. ASCE Manuals and Reports on Engineering Practice No. 70 (or MOP 70), 2nd ed. (or subsequent edition), American Society of Civil Engineers, New York, N.Y.
2. California Code of Regulations; Title 23; Water; Division 2, DWR. Chapter 5.1 Water Conservation Act of 2009. Article 2. Ag Water Measurement
3. CDM. 2011. "Climate Change Handbook for Regional Water Planning." Prepared for U.S. Environmental Protection Agency and California Department of Water Resources by CDM.
4. California Department of Water Resources. 2012. "A Proposed Methodology for Quantifying the Efficiency of Agricultural Water Use."
5. California Department of Water Resources, 2018a. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development. Sacramento, CA: Technical Memorandum. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/GroundwaterManagement/Sustainable-Groundwater-Management/Best-ManagementPractices-and-Guidance-Documents/Files/Climate-ChangeGuidance_Final_ay_19.pdf
6. DWR, 2018b. Resource Guide, DWR-Provided Climate Change Data and Guidance for Use During Groundwater Sustainability Plan Development. Sacramento, CA: Technical Memorandum. https://water.ca.gov/-/media/dwr-website/webpages/programs/groundwater-management/sustainable-groundwatermanagement/best-management-practices-and-guidancedocuments/files/resource-guide-climate-change-guidance_v8_ay_19.pdf
7. California Department of Water Resources. 2024. "The State Water Project Final Delivery Capability Report 2023." July.
8. California Department of Water Resources. 2025. "A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan." September.
9. California Water Code Section 20500. 1887. California Irrigation Districts Act.
10. California Water Commission, 2016. Water Storage Investment Program Technical Reference. Sacramento, CA: Technical Memorandum. Climate Change Projections for Water Storage Investment Program (WSIP) - Technical Reference - California Natural Resources Agency Open Data.
11. Irrigation Training and Research Center. 2012. "SBx7 Compliance for Agricultural Districts", draft.
12. Kern County Subbasin. 2025. Groundwater Sustainability Plan (GSP) 2025. Amended Final Version. Adopted August 2025. https://kerngsp.com/wp-content/uploads/2025/09/Kern-County-Subbasin-Groundwater-Sustainability-Plan-2025-Clean.pdf.

13. Kern County Water Agency. 2013. “Consolidated Contract through Amendment No. 36”, Dept. of Water Resources website. SWP A0 – Water Supply Contracts.

14. Kern River Watershed Coalition Authority. 2013. Memorandum for comments on Kern River Watershed Coalition Authority re-draft of “Waste Discharge Requirements General Order for Discharges from Irrigated Lands within the Central Valley Region for Dischargers not Participating in a Third-Party Group.” (November 2012 Draft).

15. Luedeling, E; Zhang, M; Girvetz, E.H., July 2009. “Climatic Changes Lead to Declining Winter Chill for Fruit and Nut Trees in California during 1950-2099”. PLoS ONE 4(7).

16. Poso Creek Integrated Regional Water Management (IRWM) Group. 2019. “IRWM Plan Update (Poso Creek IRWMP).”

17. Poso Creek IRWM Group. 2022. “Drought Contingency Plan Poso Creek IRWM Region.” Adopted October 2022.

18. San Joaquin Valley Summary Report, Preview. California’s Fourth Climate Change Assessment. 2022. Available at: https://climateassessment.ca.gov/regions/.

19. United States Geological Survey. Fact Sheet 2009-3074. September 2009. “Effects of Climate Variability and Change on Groundwater Resources in the United States”.

20. Water Resources Research, Vol. 48, 2012. “A Method for Physically Based Model Analysis of Conjunctive Use in Response to Potential Climate Change”.

21. Wright, J. L., and R. G. Allen. 2007. Chapter 8. Water Requirements. In Design and Operation of Farm Irrigation Systems, 2nd ed., R. G. Allen, J. L. Wright, and W. R. Walker, eds., 181-218. St. Joseph, Mich.: ASABE.

Appendix A – Public Hearing Notice

PUBLIC HEARING

North Kern Water Storage District (NKWSD)
will hold a public hearing on:
March 17, 2026, at 7:30 A.M.

Regarding:

2025 Agricultural Water Management Plan Update

The Water Conservation Act of 2009 requires certain agricultural water suppliers in California to prepare Agricultural Water Management Plans (AWMP). To meet the requirements of this legislation, NKWSD is updating their AWMP. The AWMP includes a discussion of NKWSD and its water facilities, water supply and demand, and various programs, policies and efficient water management practices being implemented now or planned in the coming years. The NKWSD Board of Directors will hold a hearing to consider public comments on the proposed 2025 AWMP.

A copy of the 2025 AWMP may be reviewed at the NKWSD office (33380 Cawelo Extended Ave, Bakersfield, CA 93308) or on the District's website (www.northkernwsd.org).

Written comments, submitted prior to the hearing should be directed to:

David Hampton
North Kern Water Storage District
33380 Cawelo Extended Ave, Bakersfield, CA 93308

Comments may also be provided at the hearing.

If you have questions regarding the AWMP, please contact David Hampton at (661) 393-2696.

Appendix B – Board Resolution

DRAFT RESOLUTION NO. _____
ADOPTING NORTH KERN WATER STORAGE DISTRICT'S
AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, with the passage of the 2018 Water Conservation Bill, an update to the 2009 Water Conservation Act and SBx7-7 and the issuance of the Governor's Executive Order B-29-15, preparation of a 2025 Agricultural Water Management Plan became mandatory and the requirements introduced were intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, to require accurate measurement of water, and to prepare drought response plans; and

WHEREAS, the District has prepared a 2025 Agricultural Water Management Plan pursuant to the guidelines that were issued by the California Department of Water Resources in September 2025 to aid water suppliers in preparing Agricultural Water Management Plans in accordance with the requirements of AB 1668 and SB 606, which comply with the previous requirements of SBx7-7 and E.O. B-29-15.

WHEREAS, the District posted the Plan for a two-week review period and subsequently held a hearing on March 17, 2026 to hear and consider comments from the public on the Plan; and

WHEREAS, at the public hearing, there were no verbal objections to the Plan.

NOW, therefore, BE IT RESOLVED, that the Board of Directors of the North Kern Water Storage District does hereby approve and adopt the District's 2025 Agricultural Water Management Plan as presented and prepared in accordance with SBx7-7, California's 2018 Water Conservation Bill, California's 2009 Water Conservation Act regarding Efficient Water Management Practices and with E.O. B-29-15.

Moved by Director ____, seconded by Director _____, that the foregoing resolution be adopted.

The following vote was had:
Ayes: Directors _____
Noes: Directors _____
Absent: Directors _____
The President declared the resolution adopted.

o0o

I, _____, Secretary of the Board of Directors of the NORTH KERN WATER STORAGE DISTRICT, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at a meeting of said Board of Directors held the 17th day of March 2026.

Secretary of the Board of Directors
of the North Kern Water Storage District

Appendix C – Rules and Regulations for Distribution of Water

The North Kern Rules and Regulations for Distribution of Water can be found on the District website here: [https://www.northkernwsd.com/rules-and-regulations/]

Appendix D – Water Meter Accuracy Verification Form

North Kern Water Storage District - Water Meter Accuracy Verification Form

Date	Turnout No	Meter Name and Model	Year Installed	Pipe Size (in)	Flowmeter Reading (gpm) A	Ultrasonic meter Reading (gpm) B	Elapsed Time	Difference (A-B) C	Percent Error (C/B)*100	Test Person Initial
10/3/2012	8-00-29	McCrometer 03-05307-10	2003	10"	950gpm	935gpm	10Min	15gpm	1.6%	SM
10/3/2012	8-00-34	McCrometer 02-03-145-10	2002	10"	1450gpm	1504gpm	10Min	54gpm	3.5%	SM
10/3/2012	8-00-40	McCrometer		10"	1400gpm	1401gpm	10Min	1gpm	0.7%	SM
10/3/2012	8-00-63B	McCrometer 03-02610-10	2003	10"	1000gpm	1132gpm	10Min	132gpm	11.6%	SM
10/3/2012	8-00-63A	McCrometer 03-02609-10	2003	10'	1100gpm	1115gpm	10Min	15gpm	1.3%	SM
10/4/2012	8-00-60A	McCrometer 97-8729-10	1997	10"	1290gpm	1059gpm	10Min	231gpm	21.8%	SM
10/4/2012	8-00-60B	McCrometer 97-8727-10	1997	10"	500gpm	482gpm	10Min	18gpm	3.7%	SM
10/4/2012	8-00-66	McCrometer 06-66620-12	2006	12"	700gpm	946gpm	10Min	246gpm	26.0%	SM
10/4/2012	8-00-78B	Seametrics 05119468		10"	2155gpm	1739gpm	10Min	416gpm	23.0%	SM
10/4/2012	8-00-78a	Seametrics 05119483		10"	1963gpm	1844gpm	10Min	119gpm	6.4%	SM
10/4/2012	8-17-24b	McCrometer 97-05601-12	1997	12"	2100gpm	1960gpm	10Min	139gpm	7.1%	SM
10/8/2012	8-00-43	McCrometer		6"	400gpm	400gpm	10Min	0gpm	0.0%	SM
10/8/2012	8-00-24	McCrometer 97-5186-10	1997	10"	1400gpm	1414gpm	10Min	14gpm	1.0%	SM
10/8/2012	8-0-25	McCrometer 94-8453-10	1994	10"	1350gpm	1323gpm	10Min	26gpm	2.0%	SM
10/9/2012	8-03-5C	McCrometer 08-04650-08	2008	8"	500gpm	520gpm	10Min	30gpm	5.7%	SM
10/9/2012	8-03-25A	McCrometer 08-04939-08	2008	8"	1500gpm	838gpm	10Min	662gpm	78.0%	SM
10/11/2012	8-03-43A	McCrometer 97-05602-10	1997	10"	1900gpm	1740gpm	10Min	160gpm	9.1%	SM
10/11/2012	8-03-43B	McCrometer 99-02340-10	1999	10"	1350gpm	1280gpm	10Min	70gpm	5.4%	SM
10/11/2012	9-07-12B	McCrometer 98-7259-12	1998	12"	2280gpm	2340gpm	10Min	60gpm	2.5%	SM
10/11/2012	9-07-12A	McCrometer 91-12-742	1991	12"	2700gpm	2563gpm	10Min	137gpm	5.3%	SM
10/11/2012	9-00-27	McCrometer 07-12100-08	2007	8"	800gpm	758gpm	10Min	42gpm	5.5%	SM
10/11/2012	9-00-24	McCrometer 08-11724-10	2005	10"	850gpm	857gpm	10Min	7gpm	0.8%	SM
10/11/2012	8-11-8B	McCrometer 97-8730-10	1997	10"	1200gpm	1034gpm	10Min	166gpm	16.0%	SM
10/11/2012	8-11-8A	McCrometer 97-8726-10	1997	10"	1100gpm	1248gpm	10Min	148gpm	11.8%	SM
10/14/2012	8-17-6A	McCrometer 03-06877-10	2003	10"	1000gpm	976gpm	10Min	24gpm	2.4%	SM
10/14/2012	8-17-6C	McCrometer 08-07592-10	2008	10'	1300gpm	1300gpm	10Min	0gpm	0.0%	SM
10/14/2012	8-00-87D	McCrometer 03-06880-10	2003	10"	1200gpm	1184gpm	10min	16gpm	1.3%	SM
10/14/2012	8-00-87C	McCrometer 06-03483-10	2006	10"	1400gpm	1237gpm	10Min	163gpm	13.1%	SM
10/14/2012	8-00-87B	McCrometer 99-2717-10	1999	10"	1385gpm	1286gpm	10Min	99gpm	7.6%	SM
10/14/2012	8-00-87A	McCrometer 97-08275-10	1997	10"	1800gpm	1556gpm	10Min	244gpm	15.6%	SM
10/14/2012	8-21-3A	McCrometer 06-03362-10	2006	10"	1050gpm	1032gpm	10Min	18gpm	1.7%	SM
10/14/2012	8-17-6B	McCrometer 97-08277-10	1997	10"	1500gpm	1139gpm	10Min	361gpm	31.0%	SM
10/14/2012	8-17-6D	McCrometer 03-06880-10	2003	10"	1200gpm	1184gpm	10Min	16gpm	1.3%	SM