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Turlock Irrigation District
Lateral 5.5 Regulating Reservoir Project

WaterSMART: Drought Response Program: Drought Resiliency Projects for FY 2025
No. R25AS00013

Prepared For:
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Executive Summary

Date: October 7, 2024	**Applicant Name:** Turlock Irrigation District
Applicant Category: A	**Funding Group:** II
City: Turlock	**Project Length of Time:** 28 months
County, State: Stanislaus County, CA	**Estimated Completion Date:** Jan. 2028
Task: Task A	**Located on a Federal Facility:** No

The Turlock Irrigation District (TID) is a major agricultural water provider in California's Central Valley that owns and maintains more than 250 miles of gravity-fed canals and laterals, providing irrigation water to more than 4,700 agricultural customers and servicing approximately 148,000 acres within the Central Valley. Fruit, nut, and table food crop production within the Central Valley contributes to 40% of the United States' fruits, nuts, and table foods. TID relies on a combination of surface water diverted from the Tuolumne River under TID's water rights and groundwater pumped from the overstrained high-priority San Joaquin Valley Basin-Turlock Subbasin. The average volume of surface water supplied to TID's growers is 520,000 acre-feet per year (AFY) in an unconstrained year, with an average of 468,750 AFY of surface water supplied annually over the last 10 years. TID's existing canals and laterals were constructed more than 100 years ago, prior to expansion of agricultural lands. The long travel distance from source to agricultural customers, and existing capacity limitations constrain TID's ability to supply all customers with the same levels of high-quality, timely irrigation deliveries that they require for their crop. As a result, TID and its customers rely on groundwater wells to compensate for capacity constraints, prevent crop damage and meet irrigation demands, driving high volumes of groundwater pumping even during wet and above normal years. These challenges are most acute along the Lateral 5.5 canal, which has served a growing number of irrigators since the San Joaquin River flood control levees were constructed and land was reclaimed for agricultural production. **Capacity constraints along Lateral 5.5 are typically the most severe in TID, resulting in longer than average delivery wait times and requiring the highest volumes of groundwater pumping from an over-drawn basin to prevent crop damage, as compared to other canals in TID. Lateral 5.5 provides water to 10,119.91 acres of agricultural land.**

TID proposes to construct the Lateral 5.5 Regulating Reservoir Project (the Project) on a 40-acre TID owned property strategically located midway along Lateral 5.5, directly benefitting sustainable water management and drought resilience at the epicenter of these challenges. Overall, the Project is expected to provide **6,000 AFY of benefits in the Lateral 5.5 region** through improved management of water supplies, allowing TID to reduce supplemental groundwater pumping and surface water diversions for Lateral 5.5. The Project will allow direct capture of water that would have otherwise been lost to spillage (4,000 AFY), conserving that water for deliveries to TID's customers and preserving groundwater storage and surface water in Don Pedro Reservoir for when it is needed most. In addition, the location was selected to allow the City of Turlock to transfer 2,000 AFY of recycled water from an adjacent pipeline for agricultural irrigation, providing TID access to a new water supply source to further enhance drought resilience in the region. In terms of groundwater pumping along Lateral 5.5, the Project benefits (6,000 AFY) exceed TID's 20-year average groundwater pumping on Lateral 5.5 (4,300 AFY). In terms of total water deliveries on Lateral 5.5, the Project benefits (6,000 AFY) represent 15% of TID's 20-year average deliveries on Lateral 5.5 (26,800 AFY).

TID's service area is in a hot-summer Mediterranean climate whose rain deficits have led to alarming droughts. Stanislaus County has endured several intense droughts in terms of frequency and duration since the early 2000's. The latest drought of 2021-early 2023 influenced Governor Gavin Newsom to issue a proclamation of a state of emergency that included Stanislaus County. Although heavy snow and rainfall of late 2022 and early 2023 significantly improved drought conditions for the State, in the beginning of the 2023 Water Year (September 2022), 63.45% of Stanislaus County (TID location) was experiencing Category D-4 Extreme Drought, as it has endured for most of the past nine years. However, increasing temperatures and reduced precipitation due to climate change have added a new challenge for water demands during drought event for the agricultural customers and their crops. Given the vulnerability to drought and the nationwide reliance on crop production from this region, enhancing drought resilience through projects such as the proposed, is vital.

The Project is consistent with TID's 2020 Agricultural Water Management Plan (AWMP), and Drought Management Plan (DMP) all of which recognize the construction of regulating reservoirs as opportunities to provide regional benefits that support drought resilience. Furthermore, the Project is consistent with the Sustainability Goal for the Turlock Subbasin in the Groundwater Sustainability Plan (GSP) (Appendix E) and satisfies Goal No.5 of the sixteen critical Efficient Water Management Practices (EWMPs) in the California Water Code (CWC). The proposed Project is expected to provide significant quantifiable benefits to water users served by the Lateral 5.5 canal by enhancing surface water availability downstream of the most severely capacity constrained area in the TID service area:

- Improved operational flexibility during drought events.
- Conservation of water otherwise spilled that is most needed during drought events.
- Reduced groundwater pumping in an overdrafted groundwater basin assisting in compliance with SGMA.
- Improved customer service through more reliable and stable flow rates and faster operational response time when irrigation is most vital for crop.
- Increased water supply for agricultural production during drought.
- Support direct and in-lieu groundwater recharge into an overstrained basin.
- Reduced energy consumption and greenhouse gas (GHG) emissions associated with less frequent pumping.
- Quantifiable Cost Savings through reduced groundwater pumping and surface water diversions.
- Facilitates the use of recycled water, a new water source from the City of Turlock.

The Project is shovel ready and will utilize primarily in-house construction and maintenance forces. Construction can begin immediately upon Notice of Award (beginning as early as September 1, 2025) and will conclude in 28 months.

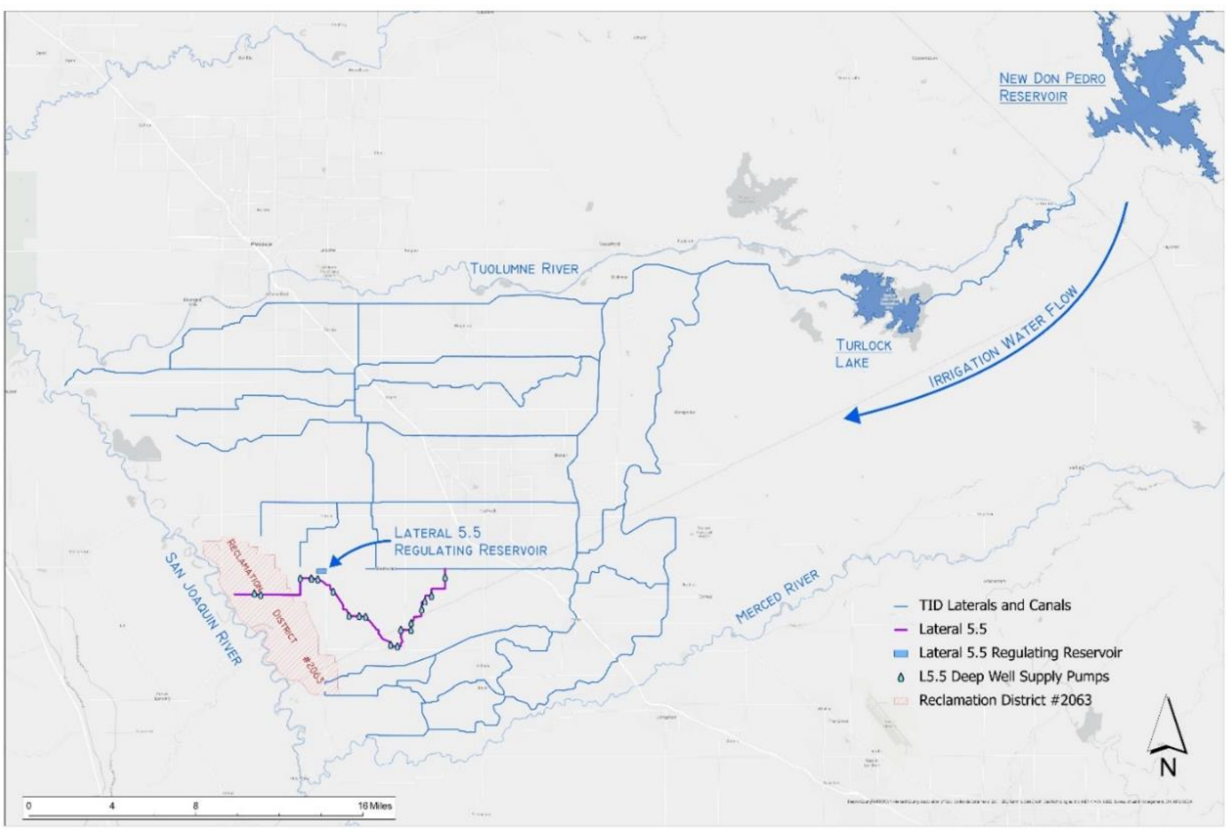
Table 1. 10-Year Average Water Supply

Year	Surface Water Total (Acre-feet)	Agency Groundwater (Acre-feet)	Other (Acre-feet)	Total (Acre-feet)
2015	281,500	35,600	24,300	341,400
2016	382,900	52,200	23,800	458,900
2017	473,200	6,800	20,100	500,100
2018	510,800	8,600	28,200	547,600
2019	469,300	6,200	27,900	503,400
2020	435,800	34,100	34,700	504,600
2021	363,500	59,600	29,200	452,300
2022	336,400	44,200	21,400	402,000
2023	524,400	9,500	21,100	555,000
2024	396,800	5,900	19,500	422,200
			TOTAL	**468,750**

Project Location

The Project site is a 40-acre parcel (APN 058-027-020) owned by TID located south of and adjacent to the Harding Drain between Central Avenue and Blaker Road, immediately southwest of Turlock, California, in unincorporated Stanislaus County (Figure 1). The approximate centroid of the Project site is located at 37°27’45” N, 120°57’46” W.

Figure 1. Project Location



Project Description

TID is a major agricultural water provider within Stanislaus County in California's Central Valley serving more than 4,700 irrigation customers through 250 miles of gravity-fed canals and laterals. TID's water supplies have been constrained due to past extreme drought conditions over the years which have led to decreased water allocations for irrigation as a conservation measure. TID has been prioritizing water management projects that will enhance conjunctive management of TID's surface water and groundwater supplies to ensure adequate water service and drought resilience.

TID's drought risks and water management challenges are most acute along the Lateral 5.5 canal (Figure 1). The Lateral 5.5 canal draws water from the Lateral 5 Canal at the intersection of Harding and Kilroy roads near Turlock, California. Water is then transported westerly to irrigated land south of Harding Road. When the San Joaquin River flood control levees were built in the 1960s, additional irrigable land was reclaimed. Lateral 5.5, segments of which were built prior to the levees, were undersized to serve this enlarged area with surface water alone, an issue that has become exacerbated over time through changes in land use. These constraints coupled with drought conditions have led to substantial volumes of groundwater pumping to overcome capacity constraints to prevent crop damage even during wet and above normal years. Lateral 5.5's upper spillway is connected to the Harding Drain, which is a deeply cut field drain that conveys water outflows from several TID canals and field runoff to the San Joaquin River. TID has planned the Project at a strategic location along Lateral 5.5 that will allow TID to capture and conserve water from Harding Drain and to receive recycled water from the City of Turlock. Currently, the agricultural producers (growers) are turning to groundwater to water their crops because surface water is unable to be provided in a timely manner to maintain crop health. This Project will allow water from the Lateral 5.5 to be provided on a required schedule basis which will allow growers to reduce reliance on groundwater pumping from the overdrafted Turlock groundwater basin, a high priority basin as detailed by the California Sustainable Groundwater Management Act (SGMA) prioritization tool.

The Project will construct a regulating storage reservoir on a 40-acre parcel owned by TID that will capture overflow water that would otherwise spill to the San Joaquin River. Figure 2 shows how spillage from the surrounding canals will be conveyed from an existing turnout in the Harding Drain to the regulating reservoir where it will be temporarily stored and later pumped into Lateral 5.5 for use by downstream agricultural producers. Specifically, regulating reservoir operations will involve remotely monitoring water levels in the Harding Drain as water passes over an existing weir at Morgan Road. When water begins to pass over this weir a control system will turn on the reservoir intake pumps, which will draw water through an existing turnout in the Harding Drain and convey it to the regulating reservoir. Once the water collected in the regulating reservoir reaches certain levels, TID staff will schedule irrigations from the reservoir utilizing the outlet pumps, which will convey the stored water to Lateral 5.5 for use by downstream growers. As water is delivered from the regulating reservoir, more spilled water will be collected from the Harding Drain. Thus, the regulating reservoir will be in a constant state of filling and draining, allowing it to collect most of the spill water passing through the Harding Drain. Also, recycled water from the City of Turlock will be conveyed into the regulating reservoir through separate system and will be managed in a similar way that spill water is managed.

Regarding construction of the Project, a buried concrete irrigation pipeline with ten concrete irrigation valve structures located along the pipeline currently runs south to north through the approximate center of the identified property. There are irrigation valve structures that lead to pipelines through the Harding Drain embankment at the northeast and northwest corners of the property and are used to carry irrigation tail water from the parcel to the Harding Drain. The Project would first involve removing and capping the existing concrete pipeline near the southern edge of the property, removing the pipe and irrigation valve boxes running through the center of the property, and removing the top foot of native soil to stockpile at the site's northwest corner, resulting in approximately 120,000 cubic yards (CY) of cut. The unsuitable cut material (approximately 54,000 CY) will be hauled to TID's Shelansky's Yard north of the township of Delhi. The project site would then be graded and compacted earthen fill embankments would be constructed using approximately 60,000 CY of the stockpiled native material. The remaining 6,000 CY of clean native material would be stockpiled in the 3.5-acre northwestern portion of the property not being utilized by the reservoir, to serve as a staging and material storage yard for future TID projects. The interior banks and floor of the reservoir would be lined with 3-inch-thick fiber reinforced concrete.

A 19-foot by 35-foot reinforced concrete pump station (the "Harding Drain Pump Station") with a 10-foot by 13-foot sump structure would be constructed on the northwest corner of the property and connected by two 36-inch diameter C905 plastic pipelines to an existing intake structure on the Harding Drain, west of Blaker Road. Two 6,800 gallons per minute (gpm) electric powered vertical lift pumps would be placed over the sump structure to convey water east from the sump through two 24-inch diameter C905 plastic pipelines approximately 600 feet, to a reinforced concrete structure inside the proposed regulating reservoir. A 21-foot by 35-foot reinforced concrete pump station (the "Reservoir Pump Station") would be constructed on the southern embankment of the Lateral 5.5 Regulating Reservoir, adjacent to and partially over an approximately 3,900 square foot depressed sump area inside the reservoir. Two 9,000 gpm electric powered vertical lift pumps will carry water over a concrete spillway and discharge it to a 48-inch diameter C905 plastic pipeline running south approximately 1,650 feet to an existing concrete outfall structure on the Lateral 5.5 canal.

Another reinforced concrete structure or a reinforced section of reservoir lining would be built inside the Lateral 5.5 Regulating Reservoir and connected to a 12-inch steel pipeline through the embankment, for a connection to Turlock's recycled water conveyance pipeline estimated to commence by September 2025 once permitting is complete. Both pump stations will be outfitted with programmable logic controllers and radio telemetry for remote control and monitoring through TID's existing supervisory control and data acquisition (SCADA) network. Approximately 6,800 feet of permanent security fencing will also be constructed to prevent access from unauthorized personnel.

Figure 2. Project Site

Applicant Category and Eligibility of Applicant

The Turlock Irrigation District (Applicant) is a Category A applicant as defined by the NOFO. TID is an irrigation district located in Stanislaus County, CA and provides water to gross acreage of 197,261 acres.

Evaluation Criteria

Evaluation Criterion A-Severity of Drought or Water Scarcity and Impacts (15 points)

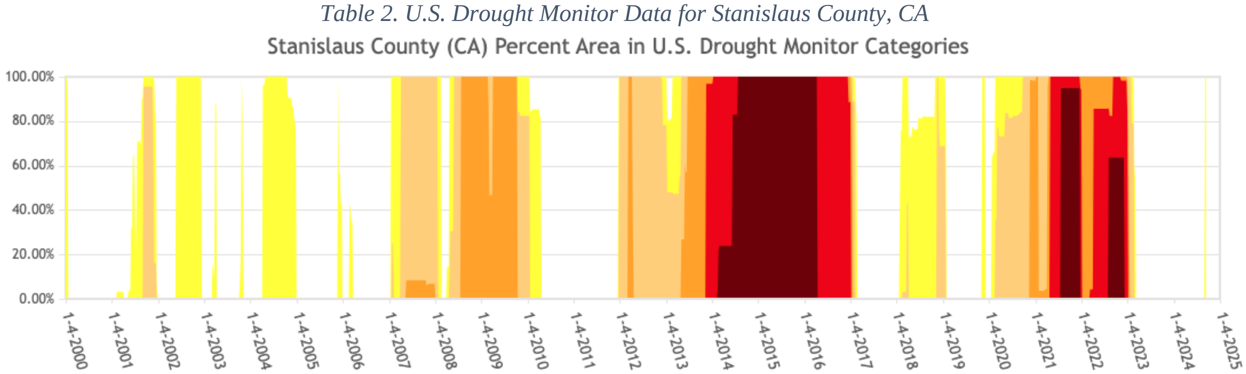
Describe the severity of the impacts that will be addressed by the project:

- *Describe recent, existing, or potential drought of water scarcity conditions in the project area.*
  - *Is the project in an area that is currently suffering from drought or water scarcity, or which has recently suffered from drought or water scarcity? Please describe existing conditions, including when and the period of time that the area has experienced drought or water scarcity conditions. Include information to describe the frequency, duration, and severity of current or recent*

conditions. You may also provide information relating to historical conditions. Please provide supporting documentation (e.g., Drought Monitor, droughtmonitor.unl.edu).

According to the article published by American Society of Civil Engineers (ASCE) in 2018, California experienced one of its deepest, longest, and warmest historical droughts between 2012-2016 (ASCE, 2018). Scientists have discovered that the pace of groundwater depletion in California's Central Valley has accelerated dramatically during the drought as heavy agricultural pumping has drawn down aquifer levels to new lows and now threatens to devastate the underground water reserves. "We have a full-on crisis," said Jay Famiglietti, a hydrology professor and executive director of the University of Saskatchewan's Global Institute for Water Security. "California's groundwater, and groundwater across the southwestern U.S., is disappearing much faster than most people realize." In December 2022, this institute published **"Groundwater depletion in California's Central Valley accelerates during megadrought"** in the journal Nature Communications, that since 2019, the rate of groundwater depletion has been 31% greater than during the last two droughts. Other publications mention *"Broiling heat in the middle of the worst drought in 1,200 years has strained the state's underground water supply, pitting the Central Valley's $20 billion agriculture industry against many of its own workers."* This statement was reported by Forbes magazine in September 2022. According to **Inside Climate News**, the Central Valley is experiencing its driest year in four decades, and farmers are struggling to compensate for the lack of water. As noted in Section 6 of the AWMP and shown in Table 2, TID (Stanislaus County) has experienced record-breaking droughts in terms of frequency, intensity, and duration since the early 2000's, with the most intense drought (large portion of the region being in Category D3-Extreme Drought and Category D4-Exceptional Drought) being in early 2014 spanning until 2017. The latest drought had a smaller duration but similar intensity which spanned from mid-2021 to early 2023. On May 10, 2021, Governor Gavin Newsom issued an executive order that extended the state of emergency due to severe drought conditions to Stanislaus County. The Governor found that these conditions "caused by the drought, by reason of their magnitude, are or are likely to be beyond the control of the services, personnel, equipment, and facilities of any single local government and require the combined forces of a mutual aid region or regions to appropriately respond." TID is in a hot-summer Mediterranean climate whose rain deficits coupled with climate change have led to prolonged and more frequent droughts. Although heavy snow and rainfall in the winters of 22/23 and 23/24 significantly improved drought conditions for the State, 100% of Stanislaus County (TID location) is currently experiencing Category D-1 Abnormally Dry conditions. Most recently, the National Weather Service issued several excessive heat advisories for the Central Valley for record high temperatures reaching 110 degrees in summer 2024.

Table 2. U.S. Drought Monitor Data for Stanislaus County, CA



Additionally, in September of 2014, the State of California voted to implement the SGMA in response to groundwater depletion and the destruction of aquifers influenced by over-pumping. SGMA requires that local Groundwater Sustainability Agencies (GSAs) be developed in High- and Medium-Priority subbasins to draft, adopt, and enact Groundwater Sustainability Plans (GSP) which will serve as the guiding planning documents for all groundwater sustainability project planning through 2042. These conditions coupled with more stringent legislation (SGMA, 2014) have constrained available water supplies and impacted conjunctive management efforts throughout the Central Valley including TID. According to the ASCE article on Lessons Learned from 2012-2016 drought, In the San Joaquin Valley, groundwater overdraft is about 17% of the total water supply (Arnold et al. 2017).

TID's drought risks and water management challenges are felt most acutely along Lateral 5.5. In the 1950's levee systems reclaimed a large area of land which sought water services. In response, TID extended Lateral 5.5 to this new area; however, the extension resulted in long water service wait times for downstream users due to capacity constraints since Lateral 5.5 was sized for the original service area not the expanded area. TID has utilized groundwater wells along the canal to supplement supplies and avoid crop damage.

These measures to overcome capacity constraints have resulted in high volumes of groundwater pumping even during wet and above normal years just to reduce service times that is necessary for maintaining healthy crops. In addition, many farmers own private wells that are utilized by TID when TID cannot meet delivery schedules. Groundwater pumping has led to an overdraft of the underlying groundwater basin which has led to statewide measures (SGMA, 2014) to reduce groundwater pumping to sustainable levels by year 2040. To meet the SGMA sustainability goals, an average net reduction of consumptive use of approximately 1.8 million AFY will be needed in San Joaquin Valley (TID's service area) to maintain groundwater for future droughts. The proposed Project aims to fulfill potion of this goal.

- *Describe any projected increases to the severity or duration of drought or water scarcity in the project area resulting from changes to water supply availability and climate change. Provide support for your response (e.g., reference a recent climate informed analysis, if available).*

A study posted on the Drought.gov website sponsored by the National Oceanic and Atmospheric Administration (NOAA) Climate Program Office and NASA, states that a "dry future is likely unavoidable for the Southwest". The study puts the likelihood of 21-year mega drought events at a roughly 50% chance through 2100. To discuss the urgency of climate crisis, the National Integrated Drought Information System (NIDIS) recently hosted a "Southwest Drought Virtual Forum". The forum was a four-day long discussion assembling stakeholders, decision makers and drought experts for a dialogue on worsening drought conditions in the Southwest, as well as response and relief effort. This indicates the extent to which droughts are becoming common and the urgency of the response and actions needed from all the stakeholders.

Although the majority of California received heavy rain and snowfall in the winters of 2022/23 and 2023/24, the State endured varying drought conditions with extreme drought conditions from 2012 to 2017 and 2019 to 2022 and the majority of central and northern California (project location) are already considered abnormally dry by the U.S. Drought Monitor. The ongoing droughts have drastically increased the reliance on imported water supplies by millions throughout the State and nation that made lasting impacts in the available volumes of these supplies and simultaneously depleted groundwater reserves putting many groundwater basins in overdraft conditions. The drought is primarily a consequence of natural climate variability. Scientists have added that the likelihood of any drought becoming acute is rising because of climate change. The Intergovernmental Panel on Climate Change (IPCC) has also concluded that the warming of the climate system is unequivocal. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere (IPCC, 2014). California's temperature record reflects global temperature trends. The NOAA Climate Divisional Dataset is a long-term dataset used to generate historical (1895-2016) climate analyses for the contiguous United States. In a recent report covering California, within Climate Division 2 (Sacramento Drainage), the long-term record depicts a dramatic shift in annual average temperature. The three years (2014-2017) are depicted as being some of the warmest and driest years on record followed by three digit temperatures in this past summer in TID's service area.

Substantial research on climate change points to dryer and hotter conditions to come. Therefore, it is still imperative that water providers, including TID, continue optimize water management efforts to ensure reliability during possible future droughts.

- *What are the ongoing or potential drought or water scarcity impacts to specific sectors in the project area if no action is taken (e.g., impacts to agriculture, environment, hydropower, recreation, tourism, forestry), and how severe are those impacts? Impacts should be quantified and documented to the extent possible. For example, impacts could include, but are not limited to:*
  - *Whether there are public health concerns or social concerns associated with current or potential conditions (e.g., water quality concerns including past or potential violations of drinking water standards, increased risk of wildfire, or past or potential shortages of drinking water supplies; does the community have another water source available to them if their water service is interrupted?).*

The Lessons Learned articled by ASCE indicates that drought greatly increased overdraft-related land subsidence, a long-term problem in parts of the San Joaquin Valley in TID's service area (Faunt and Sneed 2015; Sneed et al.2013; Borchers et al 2014). In some areas, new land subsidence approached several feet during drought. The greatest economic impact of subsidence has been reduced conveyance capacities for some major canals by up to 60% (Farr et al. 2017; Friant Water Authority 2017).

The deepest years of the drought (2014-2015) also reduced hydropower production by more than 50% from its long-term average, going from 13% of California's electricity use to 5%, resulting in approximately $2 billion cost for using more expensive gas-turbine generation, increased air pollution and greenhouse gasses.

According to the Centers for Disease Control and Prevention (CDC), severe drought conditions can negatively affect **air quality**, as reduced water usage results in higher dust and related particles, as well as an increased risk for wildfires and dust storms. Particulate matter suspended in the air from these events can irritate the bronchial passages and lungs making chronic **respiratory illnesses** worse and increasing the risk for respiratory infections like bronchitis and pneumonia. Other potential **public health and social concerns** associated with drought include compromised quantity and quality of drinking water; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease.

- *Whether there are ongoing or potential environmental impacts (e.g., impacts to endangered, threatened or candidate species or habitat).*

There have been tremendous environmental impacts from recent drought conditions in California. According to the Public Policy Institute of California (PPIC), during the drought period, many of California's environmental flows went unmet, affecting aquatic ecosystems and decreased protections for endangered species (PPIC, 2021). The drought has caused losses or destruction of fish and wildlife habitat, loss of wetlands, more wildfires and lower water levels in reservoirs, lakes, and ponds. Dry creeks and rivers led 18 fish species to diminish to near extinction. Wildlife that has historically thrived in urban habitats also struggled to adapt as state and local conservation regulations forced California homeowners to let their lawns and gardens dry and die. Although TID's service area is not currently in a drought, the area is historically vulnerable to intense droughts and therefore similar impacts are projected if another intense drought occurs. The proposed Project will allow the potential for up to **6,000 AFY** to be conserved by TID thereby reducing the impacts on these fragile species.

- *Whether there are local or economic losses associated with current water conditions that are ongoing, occurred in the past, or could occur in the future (e.g., business, agriculture, reduced real estate values).*

Based on the ASCE's Drought Hydrology investigation for 2012-2016 (article published in 2018) "the droughts unusually high temperatures depleted soil moisture more rapidly, yielding a drought frequency estimate of 1 in 1,200 years." And "The warmer temperatures accounted for as much as 25% of the drought's cumulative moisture deficit (M. Dettinger)". This article further states that the **agriculture sector** was most severely impacted by drought. The primary direct economic impact of drought in the agricultural sector is crop failure and pasture losses, whose costs are often passed on to consumers through increased prices. To quantify the scenario of groundwater loss, TID considered the loss of all groundwater pumping along Lateral 5.5 considering it is plausible that TID could lose all groundwater supply along Lateral 5.5 if 1) continued pumping was in violation of SGMA, 2) water quality degraded to a point that applying low-quality groundwater would damage/kill the crops, or 3) was simply not available due to chronic over drafting. It is estimated that TID's current groundwater pumping supports 1,720 acres above what surface water can provide alone. The crops along Lateral 5.5 are comprised of a mix of Almonds, Alfalfa and Corn which has an average crop value of $2,259 per acre (U.S. Farm Bureau crop valuations). Multiplying the acres supplied by groundwater (1,720) by value ($2,259) produces a crop loss value of **$3,885,480** annually.

Drought conditions may also expand the distribution and incidence of pests and diseases that affect crops, forage, and livestock. The depletion of water availability in soils causes significant declines in crops and livestock productivity. The ASCE article indicated a $900 million loss in crop revenue and $350 million loss in dairy and livestock revenue, and 5.1% job loss in direct farm jobs. Surface and groundwater supplies decline during drought, affecting water availability for crops and livestock and increasing costs. For example, extreme drought conditions throughout California in 2022 cost the State's agricultural industry billions of dollars. According to researchers at the University of California, Merced in the Central Valley, California suffered a $1.7 billion loss in crop revenues in 2022 due to water cutbacks, making farmers reduce the acreage of crops they could produce. The drought also caused the loss of 19,414 agricultural and food processing jobs throughout the state. The proposed Project will allow an estimated of 6,000 AFY be better managed and available to downstream customers even during times of droughts, potentially reducing the possibility of rate increases while maintaining level of service. According to the ASCE article published in 2018, "the economic effects of drought depend on the economy's reliance on water and the extent of regional and global trade." The service area of TID and its economy is directly reliant on the water distribution system to allow for its regional trade of crop that the Project proposes to achieve.

- *Whether there are other water-related impacts not identified above (e.g., tensions over water that could result in a water-related crisis or conflict).*

As a result of past extreme drought conditions present in California and particularly along the San Joaquin River's tributaries, the SWRCB issued a curtailment order to various water agencies and water districts restricting the amount of water diverted from the Tuolumne and other San Joaquin River tributaries, severely impacting water users from Turlock to San Francisco. Similar impacts may occur during future droughts, which are likely given the drought history of the Central Valley.

Evaluation Criterion B- Project Benefits (30 points)

Sub-criterion B.1. Project Benefits (Task A, B, D only)

- *What is the estimated quantity of additional supply the project will provide and how was this estimate calculated? Clearly state this quantity in AFY as the average annual benefit over ten years (e.g., if the project captures flood flows in wet years, state this and provide the average benefit over ten years or longer including dry years).*

The Project will better manage **6,000 AFY** of irrigation water for TID's agricultural customers. The regulating reservoir will capture surface water that is currently spilled from the canal system by utilizing an existing turnout in the Harding Drain, conveying that water from the Harding Drain into the Lateral 5.5 Regulating Reservoir, and storing it for subsequent release to downstream customers, making additional critical water supplies available during drought events. The Project will also provide the infrastructure necessary to introduce up to 2,000 AFY (maximum contractual amount) of recycled water from the City of Turlock into TID's canal system. Therefore, the amount of water better managed (6,000 AFY) is proportional to the amount of water that would be captured and recycled water introduced because of Project implementation. The amount of water that would be captured due to the improved operational flexibility offered by the regulating reservoir is estimated to be 4,000 AFY and conservatively assumes that the Project will operate only during the irrigation season and conserve spillage into the Harding Drain from the Lateral 4.5, Ceres Main Extension, Lateral 5, and Lateral 5.5 canals. The actual annual benefits will be determined through boundary outflow monitoring following Project implementation using TID's existing SCADA at all spill sites. The 4,000 AFY estimated average volume of captured water made available by this Project was quantified and validated through the following two approaches, both summarized in Table 3:

1. Agricultural Water Management Council (AWMC) Spillage Reduction Methodology: The difference between "without-project" spillage (over representative conditions without the Project) versus "with-project" spillage (over the same representative conditions, but with the Project), as described in **Performance Measures**, following AWMC guidelines prepared for the CALFED Bay Delta Water Use Efficiency program (AWMC, 2007) and the related verification-based planning methodology developed by Burns, et al. (2000) The spillage reduction at each spill site benefitted by the Project was estimated based on: (1) historical flow analyses using TID's extensive SCADA data, (2) actual historical spillage reduction benefits observed from TID's Lateral 8 Reservoir and Total Channel Control Project, and (3) typical spillage reductions for a spillage interception/reuse and regulating reservoir project as identified by AWMC (2007) and Burns, et al. (2000) (50-90% reduction for spillage interception/reuse, 30-50% for downstream canals benefitted by flow control from the regulating reservoir). Estimated reductions in this analysis (70% average reduction of the Lateral 4.5, Lateral 5, and Lateral 5.5 upper spill, 38% average reduction of the Lateral 5.5 lower spill) are within this range.

2. TID Reservoir Operations Model: Appendix C provides the Reservoir Operations Model and supporting documentation based on the actual Project design criteria and proposed Project operations. Estimates in Table 1 are calculated based on measured and recorded spills between 2010-2020, a recent period that contains both wet (2011 and 2017) and dry years, including a significant multi-year drought (2012-2016) that is expected to be representative of potential future 10-year periods. This is as realistic an estimate as it is possible to make, not knowing future water conditions over the next 10 years.

Average estimates calculated by both methods are compared across 2016-2020, a more recent period coinciding with canal operations that are representative of expected future canal operations in response to drought. Confidence in the 4,000 AFY savings estimate is supported by the close agreement between these two independent estimates of average annual projected savings, and the similarity in average estimated spillage reduction over both periods. Further support is provided by analyses reviewing actual spillage reduction data for the TID Lateral 8 Reservoir and Total Channel Control Project. As described above in "**Performance Measures",** the average without-project spillage values in Table 1 also provide a basis for quantifying actual, future with-project benefits following Project implementation.

Table 3. Lateral 5.5 Regulating Reservoir Operations Model Results Summary

Summary (Analysis Period)[1]	**Year Type (TID Available Water)**[2]	**AWMC Spillage Reduction Methodology**			**TID Reservoir Operations Model**
		Without-Project Spillage (AFY)	**With-Project Spillage (AFY)**[3]	**Projected Savings (AFY)**[3]	**Projected Savings (AFY)** [3]

Average (2010-2020)[1]	All Years	6,300	2,400	**4,000**	--
	Normal Years	8,400	3,100	5,000	--
	Dry Years	4,600	1,800	3,000	--
Average (2016-2020)[1]	All Years	6,100	2,200	**4,000**	**4,000**
	Normal Years	7,000	2,600	4,000	5,000
	Dry Years	4,700	1,800	3,000	3,000

1 Analysis Periods consider spillage only during the irrigation season. Period from 2010-2020 is considered to be representative of a 10-year period containing both wet and dry years, and years of significant drought that are expected to provide a realistic estimate of potential Project water savings under future drought conditions. Period from 2016-2020 is considered to be similarly representative of potential Project water savings, and more representative of future canal operations. Results of the TID Reservoir Operations Model are only available for the 2016-2020 period.

2 In "normal" years, 48 inches per acre of "available water" are available to TID's customers. In "dry" years when surface water supplies are constrained, less than 48 inches per acre of "available water" are available to customers.

3 Projected Savings are rounded to the nearest 1,000 AFY. The difference between Without-Project Spillage and With-Project Spillage may not equal Projected Savings exactly due to rounding.

- *What percentage of the total water supply does the project's water yield represent? How was this estimate calculated? It is recommended to use your 10-year average that was presented in the Executive Summary to calculate this percentage. It is recommended to use the following chart:*

Given the vulnerability to drought conditions for the Central Valley, dry year conditions are more important in water management and drought preparedness. TID's drought resilience is closely tied to sustainable and conjunctive management of the District's surface water and groundwater supplies. The Project is expected to improve management of water supplies in the Lateral 5.5 region through a combination of reduced supplemental groundwater pumping and surface water diversions, depending on hydrologic and water supply conditions. In terms of groundwater pumping along Lateral 5.5, the Project benefits (6,000 AFY) exceed TID's 20-year average groundwater pumping on Lateral 5.5 (4,300 AFY). In terms of total water deliveries on Lateral 5.5, the Project benefits (6,000 AFY) represent 15% of TID's 20-year average deliveries on Lateral 5.5 (26,800 AFY).

Table 4. Project Yield

Total Project Water Yield in AFY	6,000
Average Annual Water Supply in AFY	26,800
Percentage Yield	15%

- *How will the project build long-term resilience to drought or other water reliability issues? Include factors such as the predictability of supply, variability in availability, and the likelihood of interruptions or failures. How many years will the project continue to provide benefits?*

TID relies on a combination of surface water, recycled water from the City of Turlock, and groundwater pumped from the San Joaquin Valley Basin-Turlock Subbasin, which has been classified as a "High" priority subbasin under SGMA. This means that groundwater is being pumped at a higher rate than it is being recharged and a decline in groundwater levels, loss of groundwater storage capacity, reduction in water quality, and other negative consequences to groundwater supplies is being recognized. In addition, TID's water sources are being compromised due to extreme drought conditions that are causing water allocations for irrigation to be reduced as a conservation measure. High priority basins are required by SGMA to develop GSP via GSAs to manage groundwater that achieves long-term sustainability. TID predominately relies on surface water; however, following operational spills, when surface waters are constrained, and/or surface water can't be provided in a timely manner, TID pumps groundwater to counteract losses and meet the growers water demands.

The Project will build long-term drought resilience and improve water management and operational flexibility by providing a new regulating reservoir to store surface water during operational fluctuations on an ongoing basis throughout the irrigation season, which will reduce operational spills, provide water promptly to growers, and reduce the need to pump from the high-priority underlying basin to counteract these losses. Up to 6,000 AFY is expected to be conserved and better managed by the Project following implementation.

The availability of high quality and adequate water supplies for TID's service area is extremely important for the health of the people and economy at both a local and national level. In response, TID has been prioritizing projects that support regional drought resilience through improving water management and operational flexibility to ensure adequate water services to its customers. The Project is expected to build long-term drought resilience by:

(1) Improving operational flexibility: the conserved water in the proposed regulating reservoir will allow for controlled delivery that is critical during drought events to prevent crop damage.
(2) Improving customer service through stable and prompt flow rates: TID will be able to maintain delivery from a reliable source (the Project) and reduce long water delivery wait times.
(3) Capturing water that would have been lost to spillage and conserving surface water in Don Pedro River for beneficial uses, including irrigation and recharge.
(4) Providing additional water during drought events that would otherwise be lost and providing a way to introduce a new source of recycled water into TID's system for the first time.
(5) Reducing demand for groundwater pumping in a high-priority, overdrafted groundwater basin and surface water diversions in drought-stricken and downstream areas.
(6) Enhancing conjunctive management of surface water and groundwater supplies.
(7) Improving water quality by increasing the beneficial use of surface water supplies.
(8) Supporting a sustainable economy for the region and healthy agricultural crops within the TID service area, that contributes to a portion of the Central Valley's production that makes up 40% of the nation's fruit, nuts and table foods.

These benefits will collectively enhance the conjunctive management of TID's surface water and groundwater resources. Approximately 18% of TID's supplies are obtained from groundwater pumping (1991-2019 average; See Table 4.2 in Appendix A of the AWMP), which has historically been recharged by surface water supplies in wet years. During drought conditions, when surface water supplies are more constrained, this percentage increases. For example, in 2015 (a historically dry year) groundwater comprised 38% of TID's water supply, and in droughts of the 1970s and 1980s groundwater pumping accounted for as much as 56% and 67% of TID's water supply portfolio. TID's drought response is also impacted by increased groundwater pumping in neighboring areas, including Eastside Water District, which has led to a decline in groundwater levels along TID's eastern boundary over the last few decades. Increasingly, groundwater has also been needed to irrigate parcels along the lower reaches of Lateral 5.5 to compensate for capacity constraints upstream of the Project location**. Surface water better managed by the Project will be used to support groundwater recharge, offset groundwater pumping demands, or support other efforts to achieve and maintain groundwater sustainability and support local drought resilience**. In 2015, TID constructed the Lateral 8 Regulating Reservoir to conserve water normally spilled from the Highline Canal to improve customer service along the canal. This reservoir project was so successful at capturing spillage and improving irrigation service that TID expanded the storage capacity from 29 AF to 130 AF in 2016 to allow even more water to be captured and utilized. Since 2015, the Lateral 8 Regulating Reservoir has saved an average of 6,400 AFY.

The Lateral 5.5 Regulating Reservoir Project is estimated to save an average of approximately 6,000 AFY from a combination of reduced supplemental groundwater pumping and surface water diversions needed every year providing this magnitude of benefit to support drought resilience. The Project is expected to continue to provide this benefit every year of its expected to be at least **50 years** (with proper maintenance and pump replacements as needed), and even longer with lining replacement and repair.

- *Provide a qualitative description of the degree/significance of the benefits associated with the additional water supplies and how will the project supply help buffer against water shortages, reduce the need for emergency responses, and enhance the resilience of water systems?*

According to the Project's draft Initial Study/Mitigated Negative Declaration, AWMP and other documents, by enhancing management of up to **6,000 AFY (4,000 AFY in conserved spillage and 2,000 AFY in recycled water supplies)**, the proposed Project will:

- Improve operational flexibility: the conserved water in the proposed regulating reservoir will allow for controlled delivery that is critical during drought events to prevent crop damage.
- Improve customer service through stable flow rates: TID will be able to maintain delivery from a reliable source (the Project) and reduce long water delivery wait times.
- Capture water that would have been lost to spillage and conserving surface water in Don Pedro for beneficial uses, including irrigation and recharge,
- Provide additional water during drought events that would otherwise be lost and providing a way to introduce a new source of recycled water into TID's system for the first time,
- Reduce demand for groundwater pumping in a high-priority groundwater basin and surface water diversions in drought-stricken and downstream areas with,
- Enhance conjunctive management of surface water and groundwater supplies,
- Improve water quality by increasing the beneficial use of surface water supplies, and
- Support a sustainable economy for the region and healthy agricultural crops within the TID service area, that contributes to a portion of the Central Valley's production that makes up 40% of the nation's fruit, nuts and table foods.

Analyses of surface water supply constraints and customer service levels (i.e., delivery wait time, consistency, and duration; grower interview results) reported in the Draft **IFMP identified the Lateral 5.5 canal as the highest priority lateral** for projects that benefit water management. This Project is expected to provide significant benefits to water users served by the Lateral 5.5 canal by enhancing surface water availability downstream of the most severely capacity constrained section of the TID irrigation service area, which in turn will reduce the unnecessary groundwater pumping caused by timeliness of water deliveries.

Sub-criterion B.3. Additional Project Benefits (All tasks)

Sub-criterion B.3.a. Climate Change

- *In addition to drought resiliency measures, does the proposed project include other natural hazard risk reductions for hazards such as wildfires or floods?*

Yes, the proposed project will construct a new regulating reservoir in which excess water can be diverted to during storm events that may cause TID canal levels to overflow and flood surrounding areas. In addition to flood protection offered by the regulating reservoir storage, the stored surface water could be available during wildfires for firefighting.

- *Will the proposed project establish and use a renewable energy source?*

Not applicable.

- *Will the proposed project reduce greenhouse gas emissions by sequestering carbon in soils, grasses, trees, and other vegetation?*

Yes, the Project will better manage 6,000 AFY of irrigation water by capturing 4,000 AFY of surface water that would prior be lost due to operational fluctuations and the introduction of up to 2,000 AFY of recycled water from the City of Turlock into the canal system. TID's water service provides irrigation water for approximately 148,000 acres of farmland that will produce wood perennial crops whose trees are powerful sequesters of carbon including but not limited to almonds, apples, peaches, pears, and walnuts.

- *Does the proposed project include green or sustainable infrastructure to improve community climate resilience?*

TID is a major agricultural water provider in California's Central Valley, providing supplies necessary to grow crops to farmers who rely on a combination of surface water supplemented with groundwater pumping during dry periods, which is becoming more frequent given the ongoing and growing intensity of drought conditions. Groundwater in this region is pumped primarily through electric powered wells. It is projected that the Project will save up to 6,000 AFY of water by introducing 2,000 AFY of recycled water into the irrigation system as a new water source and by conserving 4,000 AFY of surface water and groundwater that would otherwise be pumped from the underlying, overdrafted, high-priority groundwater basin and/or released from Don Pedro Dam to meet the demands of downstream customers during droughts.

Therefore, the improvement in water management is anticipated to reduce the energy consumption associated with supplemental groundwater pumping.

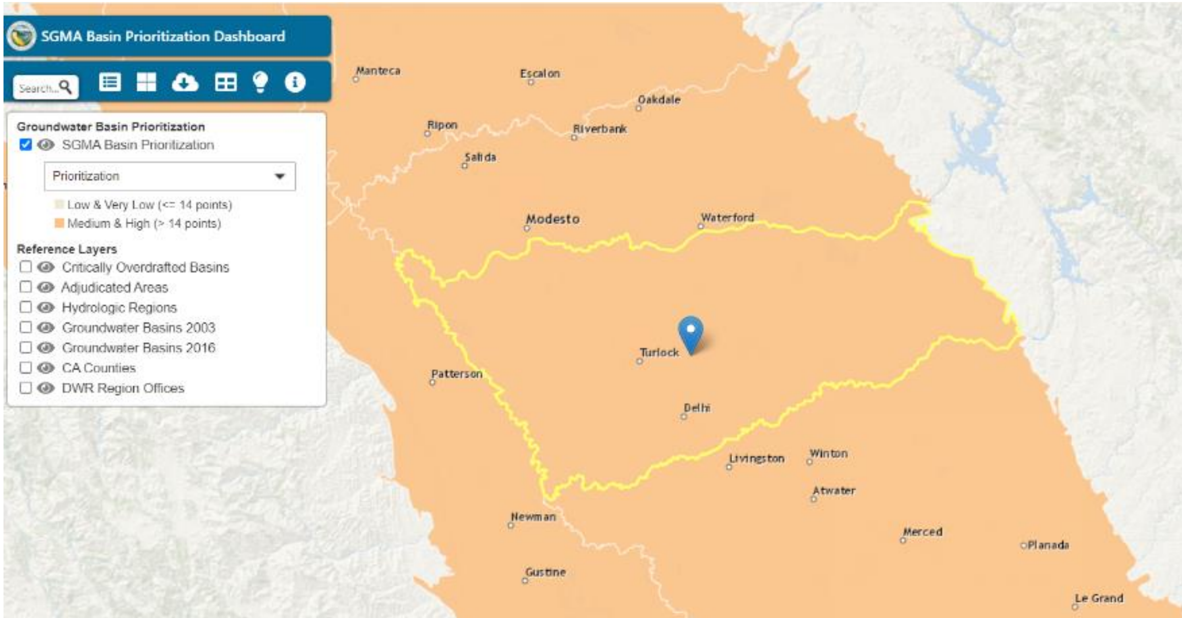
- *Does the proposed project seek to reduce or mitigate climate pollutions such as air or water pollution?*

As mentioned in the AWMP, TID practices resource stewardship as one of its main climate change mitigation strategies, supporting stewardship of surface water and groundwater supplies through its comprehensive conjunctive management program, watershed monitoring programs, development of the Tuolumne River Management Plan, and active engagement in GSP planning and implementation in the Turlock Subbasin, as just a few of its many efforts. The proposed Project will provide water management strategies supported by the AWMP. The Project's water savings will reduce the need for additional surface water diversions, which will help reduce salinity, algal production, dilution, and oxygen levels to be negatively altered from transferred water. The Project will also allow TID to fill the canal with surface water in lieu of pumped groundwater, which has proven to be of higher quality through groundwater testing. Decreased reliance on groundwater will also improve the water quality of the groundwater by diluting the impacts of contaminants present.

- *Does the proposed project have a conservation or management component that will promote healthy lands and soils or serve to protect water supplies and its associated uses?*

Yes, the proposed Project will protect the region's water supplies by developing approximately 6,000 AFY of water by conserving 4,000 AF of surface water and groundwater and introducing 2,000 AFY of recycled water into the irrigation system as a new water source. Without the Project, most of this surface water would be lost from the canal system and irrecoverable for use by TID, resulting in increased demand for groundwater pumping to avoid crop damage due to longer delivery wait times, especially during peak summer months when water supplies are scarcer. Instead, water captured by the Project will reduce pumping from the underlying, overdrafted groundwater basin that would otherwise have been necessary to supplement the water losses and improve reliability and timeliness of deliveries to customers downstream. TID practices resource stewardship as one of the strategies in AWMP to mitigate climate change impacts. As a part of this measure, TID intrinsically supports the stewardship of agricultural lands within and surrounding its service area through its irrigation operations and resulting groundwater recharge via percolation from irrigation. As depicted in Figure 3, TID overlies the San Joaquin Valley Basin-Turlock Subbasin which is identified as a "High" priority subbasin by the California Department of Water Resources (DWR) on the SGMA Basin Prioritization Dashboard. This means that local agencies that overly this basin, including TID, must implement measures to sustainably manage local groundwater resources. The Turlock Subbasin GSP was finalized and submitted to DWR in January 2022, and is now being implemented through 2042. The Project directly benefits the local groundwater basin through the reduction of pumping of local groundwater resources by better managing surface waters.

Figure 3. SGMA Basin Prioritization



- *Does the proposed project contribute to climate change resiliency in other ways not described above?*

Section 6 of TID's AWMP is devoted entirely to evaluating the potential impacts of climate change and strategies for mitigating and preparing for those impacts. The proposed Project benefits are directly consistent with many of TID's "Strategies to Mitigate Climate Change Impacts" identified in the AWMP including: improve operational efficiency and transfers, increase water supply, improve water quality, practice resource stewardship: agricultural lands, surface and groundwater supplies, support long term and regional water management planning, aggressively increase water use efficiency, and lastly to expand the District's water storage and conjunctive management.

Sub-criterion B.3.b. Ecological Benefits

- *Does the project seek to improve the ecological resiliency of a wetland, river, or stream in the face of climate change? Provide a narrative discussion, quantification, and metrics to support the anticipated improvements in ecological resilience.*

The Project supports conjunctive management of TID's water resources for beneficial uses throughout the region. The TID service area lies within the San Joaquin River Hydrologic Region (HR). This HR is 15,214 square miles and contains ecologically sensitive habitat, which is home to various flora and fauna listed as Federal and State Endangered Species.

According to the California Audubon (Audubon) the Pacific Flyway, connecting Alaska and South America, is a major migratory pathway for birds. The Central Valley is an important stopover site for birds to feed and rest. Flooded habitat provided by Central Valley farms, refuges, and other managed areas supports between 5-7 million waterfowl and 350,000 shorebirds each year- that's over 60% of the Pacific Flyway and 20% of the nation's waterfowl population (California Audubon, 2021).

California Audubon further states that "As California addresses its decades-long pattern of groundwater overuse, special protections are needed for wetlands that depend on groundwater. Groundwater pumping has been almost entirely unregulated throughout California's history, leading to a race to the bottom that pitted neighbor against neighbor to dig the deepest well and pump the most water for short-term gain." and issues this warning "***We must allocate sufficient groundwater to managed wetlands or this will spell disaster for migratory birds***.*"*

Over the long-term, the best opportunities to ensure the long-term conservation of birds and other wildlife in the Central Valley are to protect and enhance working landscapes for birds and wildlife while also ensuring a vibrant system of managed wetlands on public and private lands.

The proposed Project's goal is specifically to reduce water loss that will result in reduction of groundwater pumping.

Recently, scientists have determined that groundwater and aquifer health is vital to riparian ecosystems considering the hydraulic interconnectedness of rivers and the underlying aquifers. Specifically, the U.S. Environmental Protection Agency (EPA) has determined that aquifer depletion from overdrafting can "totally dry perennial streams" which can harm aquatic and riparian habitats (EPA – Ground Water). Considering the Project will generate approximately 6,000 AFY of water from existing surface and recycled water resources, the Project will offset water demand from groundwater sources that may otherwise adversely impact the HR's sensitive aquatic and riparian habitats.

- *Identify ecological benefits expected to result from project implementation. Provide a narrative discussion, quantification, and metrics addressing, as applicable, the types and status of species benefited, acreage of habitat improved, restored, or protected, the amount of additional stream flow added, and the improvements in relevant water quality metrics? Support all metrics and quantifications with appropriate calculations.*

The Project will secure up to 6,000 AFY in a local water supply, equating to a proportional amount of water to remain in the 15,214 square-mile San Joaquin HR and underlying aquifers through decreased water diversions and groundwater pumping, where species of flora and fauna rely on water to flourish. Therefore, the Project will provide a significant benefit to this ecologically sensitive habitat. Some endangered species in the San Joaquin River Basin include the California Central Valley Steelhead and Central Valley Spring-Run Chinook Salmon. The 4,000 AFY estimated average volume of additional water supply made available by this Project was quantified and validated through the following two approaches, both summarized in Table 1: Agricultural Water Management Council (AWMC) Spillage Reduction Methodology and TID Reservoir Operations Model and the additional 2,000 AFY in benefits is proportional to the volume of recycled water made available to TID once the permitting process is complete.

- *Will the proposed project reduce the likelihood of a species listing or otherwise improve the species status? Identify the species of interest, explain how the project will positively impact the species and potential contribute to delisting.*

The Project will provide substantial water savings for the San Joaquin River HR through the reduction in pumping from the underlying groundwater basin which has shown to have benefits to maintaining surface water levels (i.e., San Joaquin River and its tributaries) that are vital to maintaining health riparian and aquatic ecosystems (EPA – Ground Water). Although the amount of water produced by the Project is small, from a basin wide perspective, any savings is crucial to sustaining sensitive and listed habitat, especially in the Central Valley due to the region's drought history and vulnerability. Supporting projects such as this Project, which conserve surface water and reduce groundwater pumping from overdrafted aquifers will, in aggregate and over time, result in substantial benefits to the survival and recovery of endangered species within the HR. Many of the endangered species need higher water levels and lower temperatures to survive. Any incremental increase of water helps provide these necessary conditions for the endangered species.

Sub-criterion B.3.c. Other Benefits

- *Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)? Describe the associated sector benefits.*

Up to 6,000 AFY of irrigation water will be better managed through Project implementation which will allow TID to continue to provide its agricultural customers with the necessary water to maintain food production. Food production in the Central Valley, in which TID's service area is within, accounts for 40% of the fruits, nuts, and other table foods produced in the United States. Water savings from Project implementation will provide the agricultural sector with more reliable water supplies, thus a more reliable agricultural output for the entire country. Additionally, California's water systems are widely interconnected. As such, TID works in coordination with the City and County of San Francisco, San Joaquin Tributaries Authority (SJTA), the East San Joaquin Water Quality Coalition (ESJWQC) and other various water committees and groups at the county and state level to ensure availability of water resources for agricultural, environmental, urban and other uses. Therefore, any improved water management within TID's service area will result in benefits to a variety of users throughout the immediate region and the state.

Considering the interconnectedness of water systems in California, the impacts of drought have shown to have broad negative impacts to agricultural, urban, and environmental systems in California with environmental and rural communities bearing the brunt of drought impacts (LA Times, 2022). From an agricultural economy and rural community perspective (many of which are disadvantaged communities as discussed in more detail in Department of the Interior priorities section), droughts can create a slew of negative impacts including public health degradation due to fallowed land and associated poor air quality, economic degradation due to lower crop production, and long term consequences to vital water resources such as local aquifers which are currently overdrafted (PPIC, 2022). For example, the PPIC published a report in April 2022 which details the many ways in which drought is impacting agricultural production by 1) increasing costs due to water scarcity and increased production costs, and 2) decreased revenue from losses in crop production (PPIC, 2022). Water shortages have led to fallowed (or "non-farmed") land and deficit irrigation which involves farmers watering below crop water needs. According to another study published by PPIC for the San Joaquin Valley (TID location), it is expected that by 2040, average annual water supplies could decline by 20% which could result in 900,000 acres of farmland being fallowed and almost 50,000 jobs being lost (PPIC, 2023). Furthermore, the PPIC report states that "Farming and related industries play an outsized role in the San Joaquin Valley's economy, accounting for 14 percent of GDP, 17 percent of employment, and 19 percent of revenues. Valley agriculture employs around 340,000 people; its crops produce more than $24 billion in revenues, led by orchards and vines (almost $20 billion) and vegetables ($2.8 billion). Dairies and beef produce about $6.4 billion and $3.2 billion in revenues, respectively. A $34 billion food and beverage processing industry also relies directly on the valley's crops (PPIC, 2023)." This Project will create an additional 6,000 AFY which will directly benefit agricultural producers in the Central Valley and help bolster the drought resiliency of TID and the local economy that relies on agricultural production.

These impacts to agriculture within the San Joaquin Valley are not only felt directly within the rural communities that rely on agriculture and water resources for their income but are also felt in urban areas that are impacted by drought not only by limitations on water use (i.e., outdoor irrigation restrictions) but also by higher food costs (Marketplace.org, 2022). Higher food prices will have a disproportional impact on disadvantaged communities which pay a higher amount on food proportional to their income (GAO, 2023). Therefore, by supporting this Project and adding an additional 6,000 AFY of sustainable water supplies, this Project will also provide incremental benefits to urban economies by ensuring food costs remain affordable especially for DACs.

From an environmental standpoint, legislation in California has been enacted to preserve environmental systems such as SGMA, curtailments to surface water rights, and other methods to ensure that the delicate environmental systems have enough water to survive especially during drought periods. Considering the impacts of drought induced water shortages and the need to maintain crop health, TID customers that utilize Lateral 5.5 have had to turn to groundwater resources to ensure timely delivery of water to the crop fields despite the groundwater basin being classified as an overdrafted and high-priority basin by SGMA. The impacts of aquifer health on riparian and other surface ecosystems have been documented extensively. Specifically, the Journal of Hydrology published a paper in 2020 which looks at the environmental impacts of climate change and how the overdrafting of groundwater basins can lead to decreased levels in surface water resources which riparian and other surface ecosystems rely upon for survival. Therefore, this Project will indirectly provide benefits to riparian ecosystems within the San Joaquin River Basin by reducing the need to pump groundwater to meet crop demands (Journal of Hydrology, 2020).

- *Will the project benefit a larger initiative to address sustainability?*

Yes, as previously mentioned, TID overlies the San Joaquin Valley Turlock Subbasin which is a high-priority basin. High-priority basins are required to develop a GSP. TID is a member of the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA). As a member of this agency, TID works with other agencies and stakeholders within the Turlock Subbasin to comply with the SGMA and the WTSGSA GSP. TID and other agencies in the subbasin work together to develop the tools needed to achieve long term groundwater sustainability by identifying additional ways to maximize local water supplies, enhance conjunctive management practices and recharge the water system. Surface water supplies are also a crucial component of TID's conjunctive management program. Section 10608.48 of the CWC describes sixteen EWMPs, including one to "construct regulatory reservoirs."

- *Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin?*

Given the drought susceptibility of the Central Valley and the large agricultural customers that rely on the water resources within, there is often local conflict over water supplies during water shortages. For example, several agencies in the Central Valley of California filed a lawsuit against the SWRCB and DWR in 2020, for curtailment of surface and groundwater resources. The Project will provide the infrastructure necessary to better manage water during times of drought which in turn may reduce the likelihood of tension or conflict.

Evaluation Criterion C-Planning and Preparedness (15 points)

Please address the following: ***Describe the severity of the impacts that will be addressed by the project:***

- ***Plan Description and Objective:*** *Is your proposed project supported by a specific planning document? If so, identify the plan by name and describe the plan, including:*
  - *When was the plan developed? How often is it updated?*

Yes, TID maintains an Agricultural Water Management Plan (AWMP) which serve as guiding documents for TID operations and planning of its water resources and infrastructure. TID has been actively involved in agricultural water management planning efforts since it joined the AWMC in April 1997. The AWMP also contains the Drought Management Plan (DMP) (Appendix G of the AWMP) which identifies broad strategies to bolster drought resilience, outlines drought response measures, and evaluates the impacts of the most recent drought. The AWMP is updated every 5 years and will be updated in 2025 as part of the next iteration of the AWMP.

- *What is the purpose and objective of the plan?*

The purpose of the AWMP is to serve as a guiding document for TID to evaluate their water management operations and to identify and implement locally cost-effective efficient water management practices that improve the efficient use of irrigation water which is vital considering the frequency of drought in the Central Valley of California. AWMP also provides the TID with an opportunity to reexamine its water management practices every 5-years and to evaluate how these practices support the District's goals to provide reliable and high quality water supplies to its irrigation customers.

- *What is the geographic scope of the plan?*

The AWMP serves as a guiding document to TID and therefore cover the geographic extent of TID's service area.

- *Explain how the applicable plan addresses drought. For Tasks A-C, describe the plan's drought-focused elements (e.g., a system for monitoring drought, drought projections that consider climate change, vulnerability assessments, identification of drought mitigation projects, drought response actions, and an operational and administrative framework).*

The AWMP and subsequent DMP are both the result of the latest comprehensive drought planning efforts implemented by TID. They evaluate current and future resources and outline specific responses to climate-change induced droughts. Since its formation in 1887 and as the first irrigation district formed in California, TID has faced variability in surface water supplies due to drought, which has led to the development of TID's current water shortage allocation policies. A key aspect of TID's drought management policy is to plan for carryover storage and strategic, conjunctive management of surface water and groundwater supplies for a period of forecasted consecutive dry years. In response to California Governor Brown's Executive Order B-29-15AS in 2015 (mandating agricultural water suppliers to include a detailed DMP describing measures taken to manage water demand); and Assembly Bill 1668 that was passed three years later, (amending the CWC and providing more detail on the specific requirements for a DMP); TID adopted their 2020 DMP, which states the DMP "builds upon TID's longstanding shortage allocation policies and describes drought resiliency planning actions undertaken to prepare for drought, along with a broad range of actions undertaken during drought to manage available water supplies and to meet customer demands to the maximum extent possible." The 2020 DMP includes all components that are required by CWC 10826.2 and recommended by DWR in its 2020 AWMP Guidebook. The DMP describes TID's drought resilience and drought response planning efforts organized as follows: 1) Drought Resilience Planning, 2) Drought Response Planning, and 3) Evaluation of the 2012-2016 drought and its impact on TID water supply and demand. The DMP Drought Resilience Opportunities and Constraints Section (page G-7 Appendix C) refers to the AWMP Section 7 - Efficient Water Management Practices that describes the actions that TID is planning to take to accomplish more efficient water management (Appendix B). The actions are organized in EWMPs. The proposed Project is listed as Item 10608.48.c (5); "….**construct regulating reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage."**

The AWMP (pages 111, 112, and 133 of Appendix B in this application) and the DMP (particularly pages G-4 and G-16 of Appendix D in this application) include consideration of climate change impacts to water resources or drought. The AWMP dedicates an entire section (Section 6) to the analysis of climate change impacts and its effect on future water supplies, including potential impact of climate change on water supply, demand, quality and strategies to mitigate the impacts and on-going preparedness efforts. The DMP provides guidance to TID to plan for more frequent drought conditions due to climate change.

- ***Plan Development Process:*** *Was the plan(s) developed through a collaborative process? Describe the process including the following:*
  - *Who was involved in developing the plan? Identify specific entities or organization and describe their involvement. Was the plan was prepared with input from stakeholders with diverse interests (e.g., water, land, or forest management interests; and agricultural, municipal, Tribal, environmental, and recreation uses)? Describe the process used for*

interested stakeholders to provide input during the development of the plan. If the plan was prepared by an entity other than the applicant describe whether and how the applicant was involved in the development of the plan or why they were not part of the planning process.

TID holds joint water rights and ownership of Don Pedro Reservoir with the Modesto Irrigation District (MID). As such, TID works together with MID to coordinate and manage the shared resource, and also maintains close relationships with irrigation districts on other tributaries of the San Joaquin River. TID is also a member of the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA). As a member of this agency, TID works with other agencies and stakeholders within the Turlock subbasin to comply with the SGMA. TID and other agencies in the subbasin work together to develop the tools needed to achieve long term groundwater sustainability by identifying additional ways to maximize local water supplies, enhance conjunctive management practices and recharge the water system. Through those relationships, TID shares information that helps to shape effective regional water management. In addition, TID works and coordinates with the City and County of San Francisco, San Joaquin Tributaries Authority (SJTA), ESJWQC, as well as various water committees and groups forming at the county and state levels. Each authority and association are involved in activities that relate to different aspects of the District's water management activities. The AWMP was developed through a collaborative process considering stakeholder input which is detailed on page G-16 of the DMP (Appendix D of this application). TID has created a dedicated webpage for Drought Resources (Drought Resources - Turlock Irrigation District) that communicates updated information about water supply and reservoir conditions, and current agency projects dealing with drought. TID's website also houses a Groundwater Management page that has the AWMP, Groundwater Management Plan, information on the underlying basin and emphasizes the importance of balanced surface and groundwater use. TID also communicates various water related topics through its publication " The Grower" with its customers.

- ***Plan Support for Project**: Describe to what extent the proposed project is supported by the identified plan, including:*
  - *Does the plan identify the proposed project by name and location as a potential mitigation or water management action? Explain how the proposed project was prioritized in the plan over other potential projects/measures. If the proposed project is not specifically identified in the plan, does implementing the proposed project achieve a goal or need identified in the plan? Is the supported goal or need prioritized within the plan? If so, how is it prioritized?*

Section 7 of the AWMP- Efficient Water Management Practices (Appendix B), describes the actions that TID is planning to take to accomplish improved and more efficient water management. These actions include 14 items to improve TID's water management to bolster drought resiliency which include construction of regulating reservoirs as item 5. Item 10608.48.c(5) discusses and refers to "… constructing the reservoir, depending on funding". The proposed Project is expected to provide significant benefits to water users served by the Lateral 5.5 canal by enhancing surface water availability downstream of the most severe capacity constraints in the TID service area.

The DMP's evaluation of prior efforts emphasize several effective best practices including: (1) conjunctive management of surface water and groundwater supplies in all years; and (2) affordable irrigation water rates and tiered pricing based on water supply availability. The proposed Project implements efficient use of additional water supply and operational efficiency which addresses both of these best practices.

Evaluation Criterion D-Readiness to Proceed and Project Implementation (15 points)

- *Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates for completing the project within the applicable timeframe. Milestones may include but are not limited to preliminary and/or final design, environmental and cultural resources compliance, permitting, and construction/installation.*

The Project has completed the preliminary studies and Initial Study/Mitigated Negative Declaration, and final design plans were completed in July 2022, however the Project has not commenced due to lack of funding. TID plans to construct the Project with in-house workforce and will therefore be ready to start the Project as soon as the required NEPA clearance has been obtained. In an abundance of care, construction activity will not be scheduled during any potential bird nesting seasons (i.e., February 1 through August 30). Project construction will begin after completion of the NEPA process.

Table 5. Project Schedule

Milestone/Task/Activity	Planned Start Date	Planned Completion Date
Task 1: Design	Complete	Complete (July 2022)
Task 2: Environmental Permitting	October 2025	June 2026
Task 3: Material Procurement	July 2026	July 2027
Task 3: Construction	October 2027	January 2028
Task 4: Close-Out	February 2028	April 2028

- *Describe any permits or approvals that will be required (e.g., water rights, water quality, stormwater, other regulatory clearances). Include information on permits or approvals already obtained. For those permits and approvals that need to be obtained, describe the process, including estimated timelines for obtaining such permits and approvals.*

Required permits may include: *Grading Permit from Stanislaus County* (TID has already initiated this discussion and been advised that review is simple, and approval is likely, due to location and scope.); *Electrical Permit from TID* (self-issuance); *General Stormwater Permit (NPDES) from Central Valley Regional Water Quality Control Board* (required for discharges of stormwater during construction; TID has internal QSD staff to generate and submit); *Permit from the San Joaquin Valley Air Pollution Control District and Construction or Excavation Permit from Cal OSHA* (TID staff are skilled in successfully obtaining both.).

- *Identify and describe any engineering or design work performed specifically in support of the proposed project. If design work has commenced, what phase of design is the project current in (e.g., preliminarily or final and percentage-30%, 60%, 90%, or complete). If additional design is required, describe the planned process and timeline for completing the design. Projects that are further in design will receive more points.*

TID conducted an Environmental Site Assessments and Limited Subsurface Survey for the Project site and an AWMC Spillage Reduction Study, as well as a Reservoir Operations Model to estimate water savings of the Project. TID has also completed IS/MND and final design and construction documents. The Project is shovel ready and can begin upon notice of award once BOR's NEPA requirements are completed.

- *Describe any land purchases that must occur before the project can be implemented, and the status of the purchase. (While land purchases are not allowable costs under this NOFO, this information is still important to assess the readiness to proceed.)*

The Lateral 5.5 Regulating Reservoir will be constructed on a 40-acre TID owned property and no land purchases are required to successfully implement the Project.

- *If the project is completely or partially located on Federal land or at a Federal facility, explain whether the agency supports the project and has granted access to the Federal land or facility, whether the agency will contribute toward the project, and why the Federal agency is not completing the project?*

Not applicable.

- *Describe any new policies or administrative actions required to implement the project.*

No new policies or administrative actions are required to implement the Project.

Evaluation Criterion E-Presidential and Department of the Interior Priorities (15 points)
Benefits for Disadvantaged Communities

- *If applicable, describe how the proposed project will directly serve and/or benefit a disadvantaged community. For example, will the project improve public health and safety by addressing water quality, add new water supplies, provide economic growth opportunities, or provide other benefits in a disadvantaged community?*

The ones who bear the burden of water shortages are the most vulnerable people in society, said Jose Pablo Ortiz Partida, a senior water and climate scientist at the Union of Concerned Scientists. Most of the residents affected in the Central Valley are farmworkers, many of whom are immigrants or lack documentation of citizenship. As shown in the figure below, a large portion of TID's service area is classified as disadvantaged per the Climate & Economic Justice Screening Tool (CEJST), due to the following criteria:

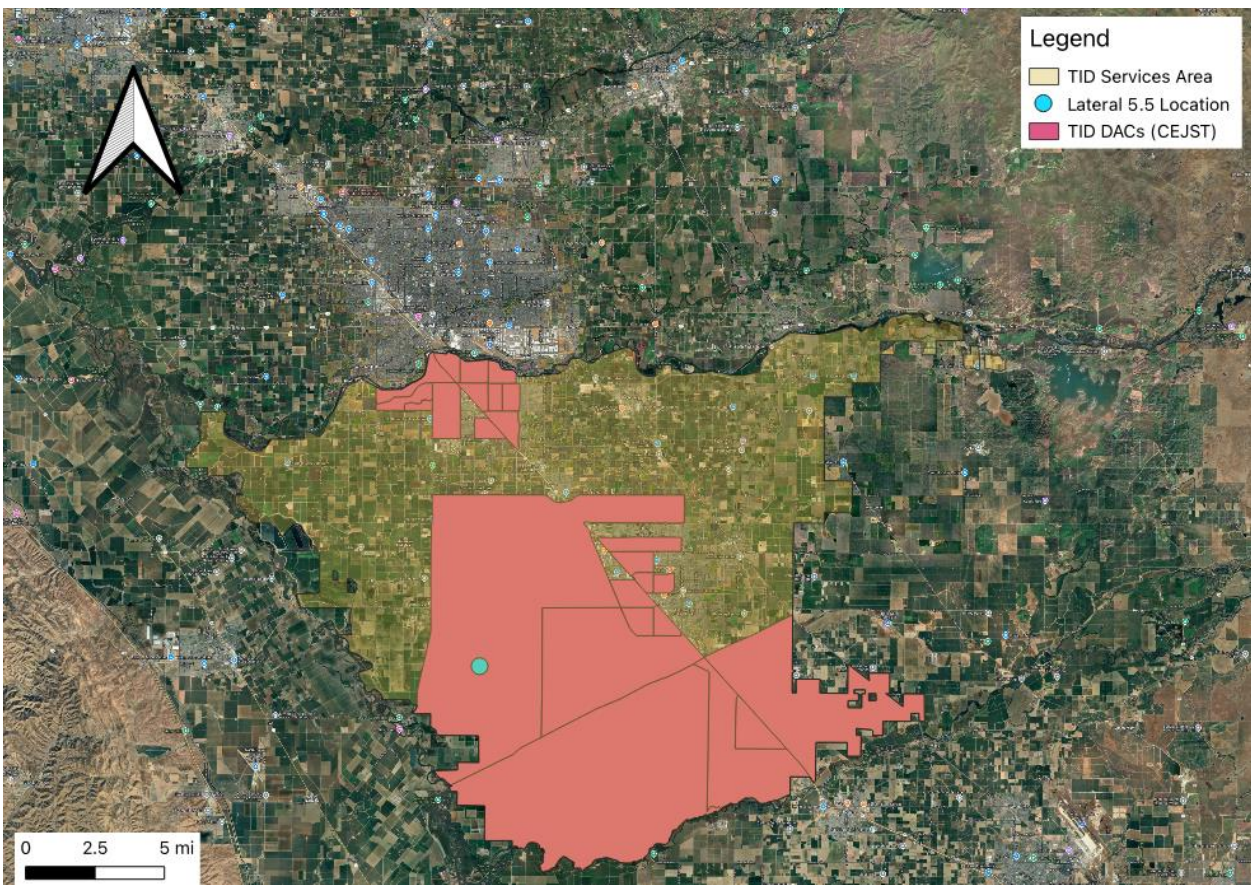
- Having income less than or equal to twice the federal poverty level, and

- Having disproportional exposure to at least one other socioeconomic burden (climate change, energy, health, housing, legacy pollution, transportation, water, and wastewater, and/or workforce development). Each census tract varies on the socioeconomic burden it is enduring and having income less than or equal to twice the federal poverty level.

As shown in Figure 4 below, the Project is located directly within a DAC and will serve the agricultural producers located directly in the vicinity of the Project area all of which are within DACs. Therefore 100% of the Project's benefits listed above will be realized by DACs within TIDs area. Specifically, the Project is located in DAC CT 06099003603 which is 85th percentile in expected agriculture loss rate, 94th percentile in expected flood risk, 79th percentile in low income, and 99th percentile in PM2.5 air pollutants. This Project will directly address these identified characteristics by securing water for agricultural production, assist in preventing flood waters from impacting homes and agricultural fields by capturing excess water flows, and ensure agricultural lands remain in production and therefore don't contribute to increased levels of PM2.5 air pollutants.

Additionally, approximately 62% of TID's service area meeting CEJST's thresholds for disadvantaged, the Project will provide substantial benefits for a healthy environment and economic sustainability (increased water supply reliability, climate resilience, drought resilience) to DACs across the TID service area and 100% of its benefits will be realized by DAC residents in CT 06099003603.

Figure 4. DAC Map



TID's service area is mostly rural, and agriculture is the primary industry. As shown in the unemployment map from CalEnviroScreen 4.0 in Appendix F the service area census tracts suffer from an unemployment rate 58% higher than the statewide rate, with an unemployment rate of 6% compared to California's 3.8% unemployment rate. The surrounding area also suffers from high unemployment rates as compared to the rest of the State of California. Without reliable water sources, agriculture production will be significantly impacted, and more jobs will be lost. The 6,000 AFY that is anticipated to be conserved through Project implementation will provide job security for agricultural workers and potentially stimulate the agricultural industry, creating more jobs in the future. This will offer these communities the opportunity to find higher paying jobs and lessen economic distress for the area.

Although TID is not the local drinking water provider, the water providers for these communities are reliant on the same source for drinking water, the underlying San Joaquin Valley groundwater basin. Therefore, water conservation offered by the Project will support both potable and non-potable water supply reliance for the entire drought-stricken area, including DACs and SDACs which is detrimental for drinking water and irrigation water for a region responsible for producing 40% of the nation's food crops.

Due to the under sizing of TID's Lateral 5.5 due to the reclamation of low value land in the 1950's, several growers along Lateral 5.5 have had long water service wait times which is detrimental to crop health. Agricultural farmers rely on TID water supply to grow fruits, nuts, and table foods. Central Valley farmers, including farmers inside TID's service area, crop production accounts for approximately 40% of the United States' fruits, nuts, and table foods. The Project will increase operational flexibility and efficiency the TID system by increasing surface water supply (capturing losses) which will in turn improve the timeliness and reliability of water services to customers along the Lateral 5.5. The availability of high quality and adequate water supplies for TID's service area is extremely important for the food and job security for this disadvantaged community.

Tribal Benefits

- *Does the proposed project directly serve and/or benefit a Federally Recognized Tribe? Describe the Tribal benefits. Benefits can include, but are not limited to, public health and safety by addressing water quality, new water supplies, economic growth opportunities, or improving water management.*

While there are no tribal communities in the immediate vicinity of the Project site, the improved water management offered by this Project will benefit the entirety of the Central Valley, including Tribes in this region. TID is a major agricultural water provider in the Central Valley, where 40% of the United States' fruits, nuts, and other table foods are grown. The water conserved by this Project will allow TID to continue to provide the necessary water to maintain food production for the Central Valley, including Tribal communities.

- *Does the proposed project support Reclamation's Tribal trust responsibilities or a Reclamation activity with a Tribe?*

There are no Federally recognized Tribal communities in the immediate service area of TID. Therefore, the Project does not support direct tribal trust responsibilities.

Evaluation Criterion F-Nexus to Reclamation (5 points)

Describe the nexus between the proposed project and a Reclamation project or Reclamation activity. Please consider the following:

- *Does the applicant have a water service, repayment, or O&M contract with Reclamation?*

No, TID does not have a water service, repayment, or O&M contract with Reclamation.

- *If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?*

N/A.

- *Will the proposed work benefit a Reclamation project area or activity?*

No. However, the proposed Project will benefit all residents of California's Central Valley, including local Tribal communities by better managing irrigation water for those who depend on agriculture.

- *Is the applicant a Tribe?*

No, TID is an agricultural water and energy provider.

Evaluation Criterion G-Stakeholder Support for Proposed Project (5 points)

- *Describe the level of stakeholder support for the proposed project. Are any stakeholders providing support for the project through cost-share contributions or through other types of contributions to the project?*

TID received letters of support for the Project from the U.S. Congressional District Thirteen and East Turlock Subbasin Groundwater Sustainability Agency Joint Powers Authority. These agencies provide water and groundwater management services to a diverse group of customers, including agricultural, throughout the Turlock Subbasin. As stated in the letters of support in Section 6 of this proposal, these local agencies are in high support of the project and recognize the regional benefits it will provide.

Performance Measures

The Project will allow TID to capture and conserve water from Harding Drain and to receive recycled water from the City of Turlock. The proposed performance measures are as follows:

1) **Improved Water Management through Water Conservation**: Water captured and conserved from the Harding Drain and received from the City of Turlock will be measured to demonstrate that the Project will improve water management and operational flexibility along Lateral 5.5. The Project is designed with sufficient storage capacity to capture 4,000 AFY of operational spillage, in addition to receiving 2,000 AFY of recycled water from the City of Turlock (6,000 AFY total). The spill capture projection was determined using the Agricultural Water Management Council (AWMC) guidelines prepared for the CALFED

Bay Delta Water Use Efficiency program (AWMC, 2007)[1]. This methodology quantifies the difference between average "without-project" spillage (i.e., estimated future spillage that would occur if the Project were not constructed) and average "with-project" spillage (i.e., estimated future spillage that would occur, all else the same, after the Project is constructed). The approximate reduction in spillage thus denotes water conserved directly by the Project. The same method is proposed to quantify Project benefits following implementation.

2) **Reduction in Groundwater Pumping**: By capturing these operational spills and receiving recycled water, TID will have more surface water supplies to convey to downstream customers that historically have had to pump local groundwater via TID's rented pump program to meet demands during water shortages and prevent long wait times resulting in crop damage or inefficient irrigation. Given the high-priority status and sustainable management requirements for the underlying groundwater basin, it is TID's goal to enhance conjunctive management of its local water supplies by reducing unnecessary groundwater pumping to ensure water service can continue during the droughts that the area has historically been highly vulnerable to. This measure would utilize TID's extensive pumping records calculated from electrical energy use data using calibrated conversion factors. Like operational spillage conservation, Project benefits would be calculated as the difference between "with-project" and "without-project" groundwater pumping volumes.

3) Quantifiable Cost Savings: An easily quantifiable Project benefit measure is the operational cost savings to TID after the Project, i.e., the difference between the operating cost of the Project and the avoided costs that would be endured from groundwater pumping or surface water diversions to account for the 4,000 AFY that would prior be lost by the system and the 2,000 AFY of recycled water that will be introduced into the canal system (6,000 AFY total). TID will monitor the actual water savings realized by the Project to calculate the avoided expenses of pumping additional groundwater during times of drought, then subtract the Project's actual operating costs from the actual avoided groundwater pumping costs to determine overall cost savings.

[1] Agricultural Water Management Council, 2007. Spillage Reduction Monitoring and Verification, August 2007.

SECTION 2: PROJECT BUDGET

The proposed budget and budget narrative are attached as a separate submission as required in the NOFO.

SECTION 3: ENVIRONMENTAL AND CULTURAL RESOURCES AND COMPLIANCE

- *Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.*

The Project involves removing and capping the existing concrete pipeline and removing the pipe and irrigation valve boxes running through the center of the Project site. Following the removal of existing facilities, the site will be graded, and the regulating reservoir will be constructed by creating compacted earthen embankments of native material that was produced during grading of the reservoir interior. A 9ft by 34 ft reinforced concrete pump station will be constructed on the northwest corner of the Project site.

The environmental review process of the Project's Initial Study/Mitigated Negative Declaration is nearly complete, and impacts have been identified to be less than significant with mitigation incorporated. Information regarding the findings can be found in Section 2.6 Mandatory Findings of Significance of the Project's Draft Initial Study/Mitigated Negative Declaration.

- *Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?*

A list of regionally occurring special status species in the vicinity of the proposed project site will be compiled based on data identified in the California natural diversity database (CDFW 2020) and the 2020 United States Department of Fish and Wildlife (USFWS) and California Native Plan Society (CNPS) databases. A table documenting special status species identifying their general habitat requirements and assessing their potential to occur at the proposed project site will be included in Appendix A of the Project's approved M&D.

The Project's draft CEQA document determined the proposed project site does not have the potential to contain any special status plants of wildlife species. Although the Project Additionally, the Project does not occur within designated critical habitat for any federally listed species (USFWS 2022). Although the Project site is not located within designated critical habitat for any federally listed species, portions of the site in the immediate vicinity have the potential to support nesting birds, which are monitored and regulated by the Federal Migratory Bird Treaty Act and California Fish and Game Code. In response, 3 mitigation measures were adopted to "protect special-status birds and nesting birds" during their nest season; February 1 to

August 31. The Project schedule therefore is purposely altered so that no construction activities take place during these nesting months. No impact will occur.

- *Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.*

There are no wetlands in the project boundaries as stated in the draft Initial Study/Mitigated Negative Declaration. Also, the Harding Drain and Lateral 5.5 are aquatic features that were constructed in uplands as part of the irrigation system for agricultural fields in the area. Both features were constructed in uplands, and neither are realigned natural channels. Therefore, these features are not considered waters of the U.S.

- *When was the water delivery system constructed?*

The man-made, cement lined canals of TID's irrigation system were constructed between 1900 and 1914.

- *Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

No construction will take place on the Lateral 5.5 canal or the Harding Drain.

- *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

Pursuant to the draft Initial Study/Mitigated Negative Declaration, the Project site includes six buildings and structures in the immediate vicinity. An ESA architectural historian evaluated the buildings for potential historic significance under the criteria of the California Register. There was a lack of association with historic events or people related to the history of California. Therefore, the buildings and structures are suspected to be deemed ineligible for listing in the California Register and will not be considered historical resources. No impact on historical resources is anticipated and no mitigation is required.

- *Are there any known archeological sites in the proposed project area?*

Based on the results of the CCIC records search, no prehistoric or historic-period archaeological resources have been previously recorded within the Project site or within a one-half-mile radius of the Project site.

- *Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?*

Based on the results of the CCIC records search mentioned above, the proposed Project would not affect any known archaeological resources that could be considered Tribal cultural resources, listed or determined eligible for listing the California Register of Historical Resources, or included in the local Register of Historical Resources as defined in PRC Section 50 20.

Additionally, to ensure that no Tribal cultural resources will be impacted by the proposed Project, TID has sent letters to three Native American tribes to provide information on the Project and an invitation to consult. No responses were received. Based on the results of the outreach effort, TID did not determine any resource with potential to be impacted by the proposed project to be a tribal cultural resource pursuant to criteria set forth in PRC Section 5024.1(c).

- *Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?*

The Project will clear the site of any existing vegetation by removing one foot of the top native soil and construction of a concrete lined reservoir. Additionally, it is not anticipated that any new vegetation will be introduced to the Project site as all soil used to construct the regulating reservoir will be from the existing site. Therefore, no noxious weeds or non-native invasive species will be spread.

SECTION 4: REQUIRED PERMITS OR APPROVALS

It is anticipated that the following permits will be required:

- *Grading Permit from Stanislaus County.* TID has already initiated this discussion and been advised that simple review and approval is likely, due to location and scope.
- *Electrical Permit from TID.* Simple process (self-issuance) provides use of licensed electricians and field inspections for construction.
- *General Stormwater Discharge Permit (NPDES) from Central Valley Regional Water Quality Control Board (regional SWRCB).* This permit is required for discharges of stormwater during construction. TID has internal QSD staff and will generate and submit the required documentation to SWRCB. TID staff are skilled in obtaining this permit.
- *Permit from the San Joaquin Valley Air Pollution Control District.* TID staff are skilled in obtaining this permit.
- *Construction or Excavation Permit from Cal OSHA.* TID staff are also experienced and successful in obtaining this permit.

SECTION 5: OVERLAP OR DUPLICATION OF EFFORT STATEMENT

TID certifies that there is no overlap between the proposed Project or any other active or anticipated proposals or projects in terms of activities, costs, or commitment of key personnel. TID also certifies that this proposal does not duplicate any proposal or Project that has been submitted for funding consideration to any other potential funding sources.

SECTION 6: CONFLICT OF INTEREST DISCLOSURE STATEMENT

No actual or potential conflicts of interest associated with the implementation of this Project have been identified prior or during the time of submission of this application.

SECTION 7: UNIFORM AUDIT REPORTING STATEMENT

TID acknowledges the requirement for a Single Audit report and has/will continue to comply with this requirement.

SECTION 8: CERTIFICATION REGARDING LOBBYING

As indicated by the included signed SF-424 and SF-LLL forms, TID certifies the statements in 43 CFR §18, Appendix A-Certification Regarding Lobbying.

SECTION 9: SF-LLL: DISCLOSURE OF LOBBYING ACTIVITIES

Please see attached for the completed SF-LLL form.

SECTION 10: LETTERS OF SUPPORT

Please see Appendix A for letters of support received for this Project.

SECTION 11: LETTER OF PARTNERSHIP AND APPLICANT ELIGIBILITY DOCUMENTATION

Not applicable.

SECTION 12: OFFICIAL RESOLUTION

TID will provide an official resolution adopted by TID's board of directors prior to award detailing an official authorized to commit TID to the financial and legal obligations associated with receipt of a financial assistance award under this NOFO, verifying:

- The identity of the official with legal authority to enter into an agreement
- The board of directors who has reviewed and supports the application submitted; and
- That TID will work with Reclamation to meet established deadlines for entering into a grant or cooperative agreement.

SECTION 13: LETTERS OF FUNDING COMMITMENT

Not applicable.

Appendices

APPENDIX A: LETTERS OF SUPPORT

JOHN S. DUARTE
13TH DISTRICT, CALIFORNIA

1535 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-0513
(202) 225-1947

Congress of the United States
House of Representatives
Washington, DC 20515–0513

October 4, 2024

The Honorable Camille Touton
Commissioner
U.S. Bureau of Reclamation
1849 C Street, NW
Washington, D.C. 20240

Dear Commissioner Touton:

I am writing in support of the Turlock Irrigation District's (TID) application for $5 million in funding through the WaterSMART Drought Response Program: Drought Resilience Project Grant for the Lateral 5.5 Regulating Reservoir Project (Project).

In California's drought-stricken Central Valley, water shortages are now more frequent and more severe. Local projects facilitating regional water resiliency are one such way to combat the effects of drought, as well as increase water efficiency in all water year types. The Project will construct a much-needed regulating reservoir to serve as a surface water regulating and storage facility and reduce usage of groundwater in the local groundwater basin, which is currently experiencing overdraft condition. To achieve this, the Project is designed to capture operational fluctuations caused when supply exceeds demands in certain TID canals and will return these flows back to Lateral 5.5 during water shortages in the canal system downstream of the reservoir.

The anticipated average annual water savings resulting from the Project is approximately 4,000 acre-feet. As such, the Project would support water conservation by reducing TID's reliance on limited and expensive groundwater supplies, thus supporting the Turlock Subbasin's Sustainable Groundwater Management Act goals. In addition to capturing operational fluctuations, increasing water supplies, and reducing supplemental groundwater pumping, the Project is expected to increase operational flexibility and improve customer service through stable flow rates and faster operational response times.

Accordingly, I support TID's application for a WaterSMART Drought Response Program grant for its Lateral 5.5 Regulating Reservoir Project to strengthen drought resiliency and improve future water supply reliability in the region. Thank you for your full and fair consideration of TID's grant application.

Sincerely,

John S. Duarte
Member of Congress

PRINTED ON RECYCLED PAPER

EAST TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY
JOINT POWERS AUTHORITY

October 4, 2024

Bureau of Reclamation
Financial Assistance Operations Attn: NOFO Team
P.O. Box 25007, MS 84-27133
Denver, CA

Re: Letter of Support for Turlock Irrigation District Application for a WaterSMART Drought Response Program Drought Resilience Project Grant for the lateral 5.5 Regulating Reservoir Project

To Whom It May Concern:

On behalf of the East Turlock Subbasin Groundwater Sustainability Agency (ETSGSA), I am pleased to submit this letter that expresses our strong support to Turlock Irrigation District (District) in its application for a WaterSMART Drought Response Program: Drought Resilience Project Grant for the implementation of the Lateral 5.5 Regulating Reservoir Project (Project).

ETSGSA is a Joint Powers Authority with member agencies including Eastside Water District, Ballico-Cortez Water District, Merced Irrigation District, Stanislaus County and Merced County. Together with the West Turlock Subbasin GSA, we are responsible for implementing the Turlock Subbasin Groundwater Sustainability Plan (GSP) in the Turlock Groundwater Subbasin in close collaboration with the District. The success of this endeavor is closely tied to the ability of TID to efficiently and reliably provide water for direct and in lieu recharge so that a long-term sustainable water budget can be achieved.

In California's drought-stricken Central Valley, water shortages are now more frequent and more severe. Local projects facilitating regional water resiliency are one such way to combat the effects of drought, as well as increase water efficiency in all water year types. The Project will construct a much-needed regulating reservoir to serve as a surface water regulating and storage facility and reduce usage of groundwater in the local groundwater basin which is currently experiencing overdraft conditions. The Project will capture operational fluctuations caused when supply exceeds demands in certain District canals and will return these flows back to Lateral 5.5 during water shortages in the canal system downstream of the reservoir.

The anticipated average annual water savings resulting from the Project is approximately 4,000 acre-feet. As such, the Project would support water conservation by reducing the District's reliance on limited and expensive groundwater supplies, thus supporting the Turlock Subbasin's Sustainable Groundwater Management Act goals and ETSGSA priorities and helping to alleviate the existing

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EAST TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY
JOINT POWERS AUTHORITY

overdraft condition. In addition to capturing operational fluctuations, increasing water supplies, and reducing supplemental groundwater pumping, the Project is expected to increase operational flexibility and improve customer service through stable flow rates and faster operational response times.

The District's Lateral 5.5 Regulating Reservoir Project is a key step necessary to strengthen drought resiliency, for future water supply reliability and to help address long-term groundwater overdraft. Thank you for your full and fair consideration of the District's grant application. Please contact me at (916) 200-9038 if you have any questions or require additional information.

Sincerely,

Michael Tietze, PG, CEG, CHG
General Manager

Cc: Ward Burroughs, Board Chairman, ETSGSA
Dirk Ulrich, Board Chairman, Ballico-Cortez Water District
Sarah Woolf, General Manager, Eastside Water District
Christy McKinnon, Stanislaus County Water Resources Manager
Lacey McBride, Merced County Water Resources Manager
Karen Whipp, Board Secretary

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APPENDIX B: AGRICULTURAL WATER MANAGEMENT PLAN

APPENDIX C: WATER SPILLAGE METHODOLOGY

Table 3.1. Irrigated Area[1] of Crops Grown on Lands Receiving TID Surface Water.

Crop	Normal Year Average	Dry Year Average	1991-2019 Average	2015-2019 Average
Alfalfa	12,591	13,440	12,972	9,469
Almonds	45,240	44,618	44,961	52,656
Apples	721	648	688	459
Apricots	28	23	26	2
Beans	558	507	535	289
Beets	6	0	6	0
Berries	27	41	35	22
Carrots	6	71	39	0
Cherries	383	360	373	438
Christmas Trees	7	5	6	19
Citrus	9	9	9	8
Clover	392	348	372	34
Corn	9,559	9,946	9,733	11,214
Double - Other	9,283	7,661	8,556	5,408
Eggplant	10	12	11	9
Garden	81	77	80	106
Grain	166	151	160	72
Gypsophilia	76	120	92	0
Kiwi	29	46	36	0
Lawn	1,139	1,205	1,168	1,327
Melons	272	240	258	398
Oats	2,171	3,061	2,570	1,325
Oats/Corn	16,058	16,742	16,365	10,661
Olives	83	93	88	87
Onions	23	32	27	15
Other Crops	446	361	407	510
Other Trees	350	363	356	348
Pasture	9,235	9,058	9,156	5,629
Peaches	4,840	4,655	4,757	3,188
Pears	8	13	10	7
Peas	0	7	7	0
Plums	29	24	26	4
Pumpkins	88	83	85	64
Sorghum	52	0	52	52
Squash	32	26	29	18
Sudan	788	795	791	879
Sunflowers	8	59	42	0
Sweet Potatoes	2,113	1,707	1,931	2,457
Tomatoes	9	10	9	6
Unirrigated Forage/Corn[2]	11,935	12,832	12,337	21,373
Vineyard	2,582	2,374	2,489	953
Walnuts	4,919	5,219	5,054	5,773
Total	**136,350**	**137,040**	**136,703**	**135,280**

[1] Irrigated area estimated as 94 percent of assessed area (to account for farm roads and non-irrigated areas). Due to rounding of individual crop acres, totals may differ slightly from 94 percent of assessed area.
[2] Unirrigated (rainfed) forage followed by irrigated corn in a double cropped sequence.

TID practices conjunctive water management, the coordinated operation and monitoring of surface water and groundwater supplies to meet defined objectives. In TID's case, the main objective is to provide a firm, reliable water supply to the TID service area. As discussed in this AWMP, given the nature of the crops grown in the TID service area, the water demand in TID varies little from year to year. TID has been able to meet this firm demand in both normal and dry years by using available surface water in normal years to irrigate and recharge groundwater, and by using more groundwater in dry years when the surface water supply is reduced (**Table 4.2**).

However, even with TID's conjunctive water management, groundwater is not an unlimited supply. In accordance with the Sustainable Groundwater Management Act of 2014 (SGMA), local agencies must work together to achieve sustainable groundwater use in the Turlock Subbasin by 2042. As a member of the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA), TID is actively involved in preparing the Turlock Subbasin Groundwater Sustainability Plan (GSP) that will identify the actions needed to achieve groundwater sustainability. GSP development efforts are ongoing, and are on track to result in the adoption and submittal of a SGMA-compliant plan by January 2022. Following completion of GSP implementation efforts, groundwater is expected to generally remain available for use even during drought years because of recharge in normal and wetter years.

Table 4.2. Summary of Water Supplies within TID as a Percentage of Total Supply.[1]

Year	Available Water (inches)[2]	Year Type	Surface Water Supply[3] (%)	Groundwater Supply[4] (%)	Other Water Supply[5] (%)	Total Supply (%)
2015	18	Dry	59%	38%	3%	100%
2016	36	Dry	72%	25%	3%	100%
2017	48	Normal	86%	12%	2%	100%
2018	48	Normal	82%	16%	2%	100%
2019	48	Normal	86%	12%	2%	100%
2015-2019	Average		77%	21%	2%	100%
	Minimum		59%	12%	2%	N/A
	Maximum		86%	38%	3%	N/A
1991-2019	Average		80%	18%	2%	100%
	Normal Year Avg.		84%	14%	2%	100%
	Dry Year Avg.		75%	23%	2%	100%

[1]Percentages rounded to whole percent, totaling 100%.
[2]Depth of water in inches available equally to each acre of land. Prior to 2013, this was referred to as the allotment.
[3]Irrigation releases from Turlock Lake.
[4]Includes TID drainage pumping, TID rented pumping, and private pumping.
[5]Includes reused tailwater and subsurface drainage, measured drain pumping at TID Pump 152, and treated Municipal and Industrial (M&I) effluent delivered to farms.

The subsections below provide more detail describing water supplies in TID. The facilities referred to in this section are described in greater detail in **Section 2** of the AWMP, and are shown in the map provided in **Appendix D**.

4.1.1 Surface Water Supply

The Tuolumne River is the source of TID's surface water supply. TID diverts water according to a series of pre- and post-1914 flow and storage water rights recognized by the State of California. TID's surface water supply is dependent upon annual hydrologic and reservoir storage conditions. Irrigation water from Don Pedro Reservoir is diverted into the TID Upper Main Canal at La Grange Diversion Dam. Diversions flow via gravity through the Upper Main Canal to Turlock Lake for temporary storage and re-regulation for irrigation deliveries. Hydrology can vary widely, but is somewhat mitigated by storage capacity at the Don Pedro Reservoir. While Don Pedro Reservoir is large, TID's share is only 68.46 percent of the reservoir's available storage, above the minimum operating pool.

Table 4.3 summarizes annual TID releases from Turlock Lake for irrigation purposes. Annual surface water supply volumes are provided along with the portion of total water supply that comes from surface water.

Table 4.3. Summary of Surface Water Supply Relative to Total Water Supply.[1]

Year	Available Water (inches)[2]	Year Type	Surface Water Supply	
			Acre-Feet	Percent of Total Water Supply[3]
2015	18	Dry	281,700	59%
2016	36	Dry	384,000	72%
2017	48	Normal	472,800	86%
2018	48	Normal	509,300	82%
2019	48	Normal	470,300	86%
2015-2019	Average		423,600	77%
	Minimum		281,700	59%
	Maximum		509,300	86%
1991-2019	Average		480,000	80%
	Normal Year Avg.		513,500	84%
	Dry Year Avg.		438,800	75%

[1]Irrigation season values, rounded to 100 AF. Volumes may differ slightly from other tables due to rounding.
[2]Depth of water in inches available equally to each acre of land. Prior to 2013, this was referred to as the allotment.
[3]Total water supplies are shown in Table 4.1.

Table 4.4 summarizes the monthly distribution of surface water releases as a percentage of total annual surface water releases into the TID distribution system. Note that these values represent the typical irrigation season of March through October. In special circumstances, such as very dry years, TID can provide a limited amount of water for irrigation during the winter months or, in very wet years, the irrigation season could extend into November.

6. Climate Change

6.1 INTRODUCTION

In the last 25 years, the District has experienced record breaking droughts, floods, and temperature periods compared with the last 100-year record. The District has taken these experiences and developed an evolving suite of tools and adaptation techniques to manage its water resources. The District is committed to adapting to climate change in a manner that continues to maximize water supply reliability for TID customers through conjunctive management, while satisfying Tuolumne River instream flow obligations. These tools and techniques developed to address past changes will be invaluable as we study and experience addition changes in climate and impacts to water resources in the future. Some of these tools include:

- Airborne Remote Sensing for Snowpack Program
- Forecast-Informed Reservoir Operations (FIRO) Program, with support from the Forecast-Coordinated Operations (F-CO) for the San Joaquin River watershed
- Real-Time Hydrologic Modeling of the Tuolumne River Watershed, in partnership with Hydrocomp
- Weather Resources Management Program
- Weather Generator Model
- Sustainable Groundwater Management Planning
- Tuolumne River Management Planning

These programs and planning efforts are described in further detail in **Section 6.5**, "Strategies to Mitigate Climate Change Impacts." The near-term benefits of these programs dovetail with TID's evolving need to prepare for and respond to the effects of climate change on water supply and demand. In the face of future climate uncertainty, TID's leadership in these efforts is now more important than ever.

Over its history, TID has also completed numerous other programs and projects, and enacted policies to enhance the reliability and efficient management of its water resources. **Section 7** of this AWMP describes TID's efficient water management practices and related efforts in recent years.

Section 6 discusses the potential effects of climate change on the District and its water supply, water quality, and water demand. Finally, this section identifies actions currently underway that support climate change preparedness, and actions that could be implemented to help mitigate future impacts of climate change.

6.2 POTENTIAL CLIMATE CHANGE EFFECTS

TID has long recognized the effects of climate change on water supply and demand, including reduced winter snowpack, more variable and extreme weather conditions, shorter winters, and increased evaporative demand. Additionally, climate change could affect water quality through increased flooding and erosion; greater concentration of contaminants, if any, in the water supply; and warmer water, which could lead to increased growth of algae and other aquatic plants. Rising sea level and increased risks of flooding are also potential effects of climate change.

The discussion of potential climate change effects in this AWMP focuses on the potential effects related to TID's water supply and demand, and does not discuss potential effects of rising sea level or increased flooding risks except in the context of reduced firm yield. TID is not located within or adjacent to the Sacramento-San Joaquin River Delta, and is not expected to be directly impacted by rising sea level. TID is also required to follow the flood management criteria established by the Army Corps of Engineers at Don Pedro Reservoir. While the District conveys some stormwater for communities in adjacent urban areas, TID's distribution system and facilities merely provide conveyance to the river system. Stormwater management is the responsibility of the communities.

6.2.1 Sources of Information Describing Potential Climate Change Effects

Potential climate change effects are evaluated based on existing historical data and projections of future hydrology and climate parameters, such as temperature and precipitation. The information sources used to quantify these historical values and projected effects are described below.

6.2.1.1 Hydrology

In this AWMP, the potential impacts of climate change on TID water supplies are evaluated using historical data for full natural flow (unimpaired runoff) in the Tuolumne River below La Grange, along with projected changes to Tuolumne River hydrology over the next 100 years.

Historical full natural flows along the Tuolumne River are reported by DWR's California Cooperative Snow Surveys, available through the California Data Exchange Center.

Projected changes to Tuolumne River flows are derived from a number of studies prepared by the United States Bureau of Reclamation (USBR), DWR, and TID.

TID, in cooperation with the San Francisco Public Utilities Commission, conducted a study completed in 2012 that estimated the sensitivity of upper Tuolumne River flows to various climate change scenarios, with the goal of better understanding potential climate change effects on the District's surface water supply (Hydrocomp et al. 2012). The study evaluated changes in streamflow and watershed hydrologic response to potential temperature and precipitation changes for the years 2040, 2070, and 2100, as compared to the base year of 2010. Hydrologic processes were simulated using a physically-based conceptual model. The results of this study have been summarized as part of this section, with additional details in **Section 6.2.2**.

More recent projections of future streamflow along the Tuolumne River at Don Pedro Reservoir were also extracted from climate change models described by Pierce et al. (2018) in contribution to California's Fourth Climate Change Assessment. Projected future monthly and annual flows were quantified from 32 coarse-resolution (~100 km) global climate models (GCMs). Results of the GCMs were bias corrected, downscaled, and then applied to a land surface model to estimate soil moisture, runoff, surface energy fluxes, and other parameters. Results were reported for a number of models across two key climate change scenarios: scenario RCP 4.5, in which greenhouse gas emissions peak around 2040 and then decline thereafter, with projected statewide warming of 2-4°C; and scenario RCP 8.5, in which greenhouse gas emissions continue to rise

Source	Strategy	Status
	Engage people in water management	TID offers affordable surface water in all years, with a tiered pricing structure that incentivizes surface water use and groundwater recharge in normal years, and water conservation in dry years. As described in **Section 7.4.12**, TID 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 water management planning and SGMA-related water management planning.
	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.
California Climate Adaptation Strategy (CNRA 2009)	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."
	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, TID staff monitors the quantity and quality (EC and temperature) of water in the distribution system on a real-time basis to support operations and conjunctive management. TID has also expanded SCADA monitoring and automation of canal structures over time. TID's water balance analysis is updated on an annual basis to inform near- and long-term water management decisions. TID also conducts extensive monitoring throughout the upper Tuolumne River watershed and implements several innovative programs to forecast runoff and manage reservoir operations, including ARSS, F-CO, FIRO, and HFAM.
	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 7**.
	Improve resource stewardship	Described above under "Practice resource stewardship."
	Improve institutional flexibility	TID cooperates with Modesto Irrigation District, which co-owns Don Pedro Reservoir with TID, and works with agencies that affect the flexibility with which TID can store and deliver water, including the Federal Energy Regulatory Commission (FERC) and the U.S. Army Corps of Engineers. TID also implements ARSS, FIRO, and watershed monitoring to better track and understand the amount of water in the upper watershed and optimize reservoir operations to balance flood storage and water supply storage
	Improve data and management	Described above under "Preserve, upgrade, and increase monitoring, data analysis, and management."

Table 7.1. Summary of Critical and Conditional EWMPs (Water Code Sections 10608.48 b & c)

Water Code Reference No.	EWMP Description	Implementation Status	AWMP Section
Critical EWMPs – Mandatory			
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 10608.48.b(2).	Implementing	7.2
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Implementing	7.3
Additional (Conditional) EWMPs – To be Implemented if Locally Cost-Effective and Technically Feasible			
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	7.4.1
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	7.4.2
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems	Implementing	7.4.3
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.	Implementing	7.4.4
10608.48.c(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Implementing	7.4.5
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Implementing	7.4.6
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems	Implementing	7.4.7
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Implementing	7.4.8
10608.48.c(9)	Automate canal control structures	Implementing	7.4.9

maintenance program helps to maintain hydraulic efficiency, prevent canal failure, and reduce seepage from the lined portions of the distribution system.

A substantial portion of the 700 miles of ID conveyance facilities have been replaced by pipeline systems. Aging or leaking pipelines are actively maintained and are replaced as necessary. TID provides low interest loans for these improvements (see **Section 7.4.3**).

7.4.5.2 Evaluation and Construction of Regulating Reservoirs

In addition to canal lining and pipeline conversion, TID has considered the construction of a number of regulating reservoirs at key locations in the distribution system.

During the 2014-2015 winter season, TID constructed a regulating reservoir, referred to as the Lateral 8 Regulating Reservoir. The reservoir began operations in 2015 with 29 acre-feet of storage. The reservoir is located such that water which would normally be spilled from the Highline Canal or Lateral 8 can instead be routed to the new reservoir. TID expanded the storage capacity to 130 acre-feet in 2016 to allow more water to be captured.

In 2010, reservoirs on the Ceres Main Canal at the headings of Lower Lateral 3 and Lower Lateral 4 were evaluated as part of a phased project aimed at providing increased monitoring and control of the distribution system along with regulating storage to facilitate increased flexibility to growers and reduction of spills. Ultimately, the evaluation of the project including only the benefits to spill reduction resulted in a benefit-cost ratio of 0.23, denoting that local project benefits would provide only about one quarter of the cost required to implement the project at that time.

TID is currently working on a multi-year planning effort to improve irrigation service and modernize infrastructure, referred to as the TID Irrigation Facilities Master Plan (IFMP). The draft IFMP identifies and evaluates a suite of potential modernization projects for the District's water distribution infrastructure below Turlock Lake, including a variety of projects to construct regulating reservoirs and improve canal conveyance. Projects are being developed with the intent of allowing growers to adopt more efficient and productive on-farm irrigation systems, leading to increased water conservation over time as well as increased farm profitability. Projects have been conceptualized through input from TID staff at all levels and considering responses from 27 grower interviews that discussed existing and future cropping practices, irrigation systems, and water source preferences. The draft IFMP encompasses more than 50 work products, and will provide a strategic plan for future modernization of the TID system in the coming years.

TID has acquired land at the head of Lower Lateral 3 for the proposed regulating reservoir, has begun designing the new reservoir and has begun preparing an Initial Study in accordance with the California Environmental Quality Act (CEQA). Construction of the regulating reservoir could potentially occur in the future depending on funding.

In addition to constructing and studying new regulating reservoirs, TID has also conducted ponding tests at Turlock Lake as a means of evaluating existing reservoir operations. These tests have provided TID with more information about reservoir recharge to support efficient water management and to support decisions on future operations at Turlock Lake.

As described above, TID has implemented this EWMP in several ways through canal lining, canal maintenance, and evaluation and construction of regulating reservoirs. TID also assists IDs in doing the same. TID will continue these efforts in the future, and will continue planning efforts to modernize the TID system, including the draft IFMP. Additionally, TID will continue to consider the construction of regulating reservoirs to increase distribution system flexibility and reduce operational spillage.

7.4.6 Increased Flexibility to Water Users (10608.48.c(6))

STATUS: IMPLEMENTING

TID is implementing this EWMP by providing arranged-frequency demand deliveries to its customers. TID has been a pioneer in providing increased flexibility to water users for decades, offering a wide range of flexibility in the frequency and duration of irrigation deliveries.

In TID's arranged-frequency demand ordering and delivery system, the irrigation frequency (day of irrigation) is arranged between TID and the customer through the water ordering process, the delivery flow rate is requested by the customer with some flexibility, and the delivery duration is controlled by the customer with complete flexibility (growers are allowed to irrigate until finished). On average, between 2011 and 2019 growers received water approximately 50 to 55 hours after they placed an order with the Central Call Center.

TID has also taken several steps to provide increased levels of customer service. Prior to the start of the 2008 irrigation season, TID moved its Central Call Center to the TID Customer Service Department in order to improve customer service in taking water orders. In 2014, TID implemented online ordering and made water use information available online to growers. Growers can plan and manage water use on each parcel by requesting a copy of their water use records when placing a water order or at any other time of the year. At the end of each irrigation season, growers are also mailed a water use statement that details the number of irrigations, the amount of water applied during each irrigation, and total water use for the season. Additionally, TID provides customers with access to real time monitoring of Rubicon SlipMeters and permanent FlumeGates.

TID continues to work to accommodate growers' evolving needs. Real-time SCADA monitoring of distribution system flows, water levels, and spillage by Water Distribution Operators (WDOs) has allowed TID to improve flexibility to water users while maintaining distribution system efficiency. In recent years, these improvements and efforts have allowed TID to increasingly provide non-standard heads of water (i.e., less than 15 to 20 cfs) to customers who are using micro irrigation systems. In 2014, TID provided tablets to all WDOs and provided real-time access to 397 SCADA sites, including nine miles of Rubicon Total Channel Control (TCC) automation provided by Rubicon SlipMeters and permanent FlumeGates, as well as remote drainage pump controls. Intermediate system flows at several locations are also monitored to better meet customer demands and prevent operational spillage.

During the 2014-2015 winter season, TID constructed a regulating reservoir to improve customer service on Lateral 8. The Lateral 8 Regulating Reservoir, as it is called, provided 29 acre-feet of storage beginning in 2015. The reservoir is located such that water which would normally be spilled from the Highline Canal or Lateral can instead be routed to the new reservoir, allowing

WDOs to provide water with greater flexibility. The reservoir was so successful that TID expanded the storage capacity to 130 acre-feet in 2016 to allow more water to be captured.

In some dry years, TID allows growers to pump groundwater into the canals and then receive a delivery "credit" equal to the volume they supplied at any sidegate that serves their property. This practice supplements the water supply available to downstream users, and allows growers the flexibility to transport water that they pump to any of their fields served by an active sidegate. The District implemented this practice in 2014-2015, and will consider implementing it again in future dry years.

In February 2019, TID completed an Irrigation Delivery Operations Assessment to evaluate the efficiency and flexibility of TID's irrigation delivery system operations through (1) comparison of system parameters and deliveries between TID and other California irrigation water suppliers, and (2) evaluation of WDOs' activities and roles in providing high-quality and flexible irrigation deliveries. The assessment found that overall TID ranks high among the water suppliers that were evaluated for their operational efficiency. During peak-season operations, TID's WDOs provide, on average, the largest number of deliveries and the largest delivery volumes per hour worked among the suppliers that were compared. Observation and surveys of WDOs found that while TID's policies to provide flexible irrigation deliveries to customers pose operational challenges and complicate delivery scheduling, TID's WDOs are generally doing a good job of maintaining high operational efficiency.

TID is currently working on a multi-year planning effort to improve irrigation service and modernize infrastructure, referred to as the TID Irrigation Facilities Master Plan (IFMP). As described in the previous section, the draft IFMP identifies and evaluates a suite of potential modernization projects for the District's water distribution infrastructure, with the goal of maintaining and improving the level of irrigation service provided to its customers. This effort will result in detailed project descriptions and implementation plans for a suite of potential projects to increase operational flexibility, among other benefits, while minimizing operational costs and life cycle costs of TID infrastructure.

TID has implemented numerous measures to increase flexibility in water ordering by, and delivery to, water users within operational limits, and will continue to implement locally cost-effective improvements consistent with this EWMP in the future.

7.4.7 Supplier Spill and Tailwater Recovery Systems (10608.48.c(7))

STATUS: IMPLEMENTING

TID is implementing this EWMP in several ways, through:

- interception of spillage from upper laterals and Improvement District pipelines by the District's canals, allowing water to be utilized to the greatest extent possible for deliveries downstream
- spillage recovery from the Harding Drain
- real time monitoring of distribution system spills
- operation of drainage wells and rented wells to provide a localized source of supply and reduce spillage.

Table 7.4. Summary of TID Implementation Status for EWMPs Listed Under CWC 10

Water Code Reference No.	EWMP	Implemented Activities (pre-2015 and ongoing)	Updates Since Last AWMP (2015-2020)
Critical EWMPs			

10608.48.b(1)	Measure deliveries with sufficient accuracy	Initiated delivery measurement accuracy improvement program under a corrective action plan for SBx7-7 compliance:
		• Installed new permanent measurement devices with laboratory-certified flow rate accuracy at 142 sidegates serving roughly half the irrigated acreage in TID.
		• Developed calibrated flow rates at remaining sidegates for each specific combination of sidegate-parcel-irrigation method-requested flow rate:
		  o Temporarily installed 57 mobile Rubicon FlumeMeters at 550 sidegates that serve 1,196 parcels (representing approximately 21 percent of TID)
		  o Used Hach FH950 meters to determine parcel-specific calibrated flow rates at 349 sidegates serving 536 parcels (approximately 13 percent of TID)
		  o Used Fuji Portaflow meters to determine parcel-specific calibrated flow rates at 471 sidegates serving 877 parcels (approximately 19 percent of TID)
			• Completed initial corrective action plan goals, providi or calibrated delivery flow rates to 100% of the assess active, non-exempted sidegates
			• Updated water ordering, delivery, and billing software and calibrated flow rates for billing.
			• Used updated values to calculate the measured volume reporting to DWR.
			• Conducted a formal certification of the volumetric mea consistent with 23 CCR §597.
			  o Verified accuracy of new permanent measurem
			  o Verified accuracy of existing measurement devi due to operational challenges associated with C

10608.48.b(2)	Adopt a water pricing structure based in part on quantity delivered	Tiered pricing structure based on volume of water delivered (in effect since 2013; current rate structure in effect since 2015 after completion of the Proposition 218 process)	• Continued using tiered volumetric pricing structure in • Updated water ordering, delivery, and billing software and calibrated flow rates (described under 10608.48.b(
Conditional EWMPs			
10608.48.c(1)	Facilitate alternative land use (lands with exceptionally high water duties, or lands that contribute to significant problems, e.g. drainage)	Not Technically Feasible (not an issue in TID – lands with exceptionally high water duties or significant problems do not exist in TID's service area; Irrigation Rules prohibit wasteful use, precluding exceptional water duties or significant problems)	No change (Not Technically Feasible)
10608.48.c(2)	Facilitate recycled water use	• Dairy nutrient water and industrial process water from Hilmar Cheese is recycled and applied to TID irrigated lands. • Treated M&I water is recycled and applied to TID irrigated lands. • Spillage recovery and tilewater/tailwater flow into canals, where this water is available for reuse downstream. • Active spillage recovery from Harding Drain • Tertiary treated effluent from City of Turlock used for cooling at TID's Walnut Energy Center • Completed Water Sales Agreement with SRWA in July 2015, with the provision that the SRWA will provide additional "offset" water to TID from recycled or stored groundwater supplies in exchange for surface water supplies from TID.	• Continued existing use of recycled water within TID s the previous column. • Continued support of SRWA's Regional Surface Wate which will eventually provide "offset" water to TID fr groundwater supplies to offset a portion of the surface TID.

Technical Memorandum

Date: 06/13/2022
To: Turlock Irrigation District
From: Davids Engineering, Inc.
Topic: Lateral 5.5 Regulating Reservoir Project Water Savings Estimates using the Agricultural Water Management Council Spillage Reduction Methodology, in Support of the Turlock Irrigation District WaterSMART Drought Resiliency Projects Grant Application for FY2023

EXECUTIVE SUMMARY

Turlock Irrigation District (TID, or District) is planning to complete the design and subsequently construct the Lateral 5.5 Regulating Reservoir project (Project) as a key component of the District's ongoing drought management planning and drought resiliency efforts. The Project seeks to recapture surface water that has historically spilled from TID's conveyance system, convey that surface water to a regulating reservoir using an existing turnout in the Harding Drain, and then deliver the recovered surface water to irrigation customers on the lower reaches of Lateral 5.5, a region of TID that has become increasingly dependent on groundwater. Among its many benefits, the Project is expected to reduce the net operational spillage (herein referred to as "spillage") from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill and Lower Spill). As of spring 2022, TID is applying for grant funding for the Project through the WaterSMART Drought Response Program's Drought Resiliency Projects funding opportunity.

This Technical Memorandum (TM) summarizes Project water savings estimates included in the WaterSMART grant application derived from application of the spillage reduction methodology as developed by the Agricultural Water Management Council (AWMC). The spillage reduction benefits of the Project are generally expected to include: (1) direct recapture and use of spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill) that will be recovered from the Harding Drain, and (2) reduction of spillage from Lateral 5.5 (Lower Spill) by providing TID's Water Distribution Operators (WDOs) greater flexibility and control of deliveries downstream of the Project.

The spillage reduction methodology and results summarized in this TM follow the AWMC guidelines prepared for the CALFED Bay Delta Water Use Efficiency program (AWMC, 2007) and the related verification-based planning methodology developed by Burns, et al. (2000). This methodology quantifies spillage reduction by comparing the average "without-project" spillage to the average "with-project" spillage from canals benefitted by the Project. Average without-project spillage represents the estimated future spillage that would occur if the Project were not constructed, while average with-project spillage represents the estimated future spillage that would occur (all else the same) after the Project is constructed. The reduction in spillage thus denotes the estimated water savings benefits attributable to the Project. Spillage reduction estimates in this TM were quantified at each spill site expected to benefit from the

Project based on: historical flow analyses, including analyses of actual spillage reduction benefits from the existing TID Lateral 8 Regulating Reservoir and Total Channel Control Project; consultation with TID staff; and review of typical spillage reductions for spillage capture and regulating reservoir projects, as identified by AWMC (2007) and Burns, et al. (2000). Spillage reduction estimates for this Project were also calculated with consideration of the estimated spillage reduction benefits of the Ceres Main Regulating Reservoir project. The Ceres Main Regulating Reservoir project is currently in development, but is expected to be completed prior to completion of this Project. The estimated spillage reduction of the Ceres Main Regulating Reservoir project was removed from the without-project spillage at all applicable spill sites considered in this analysis to avoid double-counting benefits.

While the Project could potentially reduce spillage from other areas in TID's conveyance system, the spillage reduction estimates included in the WaterSMART grant application assume that the Project will conserve spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill and Lower Spill), herein referred to as the "Project benefit area." The total estimated spillage reduction in the Project benefit area ranges between approximately 5,300 AF per year during average normal years and approximately 2,800 AF per year during average dry years, with an average annual total spillage reduction of approximately 3,900 AF per year over the 2010-2020 period (Table ES-1). This represents a reduction of approximately 63% of the total without-project spillage in the Project benefit area in an average year. The actual annual benefits will be determined through monitoring following Project construction using TID's existing SCADA-integrated measurement equipment installed at all spill sites.

Table ES-1. Summary of Estimated Spillage Reduction from the Project Benefit Area.[1]

Summary (Analysis Period)[2]	Year Type (TID Available Water)[3]	Without-Project Spillage, AFY	With-Project Spillage, AFY	Estimated Spillage Reduction, AFY
Average (2010-2020)	All Years	6,300	2,400	3,900
	Normal Years	8,400	3,100	5,300
	Dry Years	4,600	1,800	2,800

[1] Spill sites expected to benefit from the Lateral 5.5 Regulating Reservoir project include: Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill and Lower Spill).

[2] Analysis period considers spillage only during the irrigation season. The 11-year period from 2010-2020 is considered to be representative of a multi-year period containing both wet and dry water years, and sequential years of drought that are expected to provide a realistic estimate of potential Project water savings benefits under future drought conditions.

[3] In "normal" years, 48 inches per acre of "available water" is available to TID's irrigation customers. In "dry" years when surface water supplies are constrained, less than 48 inches per acre of "available water" is available to irrigation customers.

1. INTRODUCTION

1.1 Background

Turlock Irrigation District (TID, or District) is planning to complete the design and subsequently construct the Lateral 5.5 Regulating Reservoir project (Project) as a key component of the District's ongoing drought management planning and drought resiliency efforts. The Project will be constructed along Lateral 5.5, adjacent to a reach of the Harding Drain where spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill) collects. The Project seeks to capture surface water that has historically spilled from TID's conveyance system, convey that surface water to a regulating reservoir using an existing turnout in the Harding Drain, and then deliver the recovered surface water to irrigation customers on the lower reaches of Lateral 5.5, a region of TID that has become increasingly dependent on groundwater. Among its many benefits, the Project is expected to reduce the spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill and Lower Spill).

For the most part, TID's conveyance system is an upstream level control gravity flow system that delivers surface water to irrigation customers through an arranged-frequency demand ordering and scheduling process. TID's Water Distribution Operators (WDOs) schedule and sequence deliveries with irrigation customers, operate the conveyance system to time flows that accommodate those deliveries, and help to coordinate timed handoffs of deliveries between irrigation customers in sequence. As a result of mismatches in supply and demand, surface water that is not diverted for on-farm irrigation ultimately flows into drains and/or downstream rivers at locations referred to as spills. Most spillage from the TID conveyance system is irrecoverable for beneficial use within the TID irrigation service area.

The combined spillage in the Project benefit area – Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill and Lower Spill) – represents 20 to 30 percent of the total spillage from the TID conveyance system each year. Spillage of varying magnitudes occurs in all years, including years when severe drought conditions constrain available surface water supplies. Hodges Spill is located at the terminus of the Ceres Main Canal, one of the primary canals in the TID conveyance system where much of the system's operational fluctuations converge. Lateral 4.5 is also located near the terminus of the Ceres Main Canal, and excess flows along the Ceres Main Canal are released through the Lateral 4.5 spill site as needed. The Lateral 5.5 Upper Spill and Lower Spill are located downstream of the most severe capacity constraints in the TID conveyance system. Increasingly, groundwater pumping has been needed to meet consumptive use needs along the lower reaches of Lateral 5.5 to compensate for upstream capacity constraints.

The proposed Project is strategically located and operated to directly capture or reduce spillage at these sites caused by mismatches in supply and demand. Surface water stored by the Project could then be released back to Lateral 5.5 near the Upper Spill when there is demand downstream of the Project. Operation of the Project will effectively conserve surface water for other beneficial uses within the TID irrigation service area, enhancing conjunctive management of surface water and groundwater, and will also help to improve irrigation service to TID's irrigation customers.

As of spring 2022, TID is applying for grant funding to support construction of the Project. TID plans to submit a grant application for the United States Bureau of Reclamation (USBR) WaterSMART Drought Response Program's Drought Resiliency Projects funding opportunity. As part of the application, TID must propose a methodology for quantifying the water savings benefit of the Project and provide estimated Project benefits.

The proposed Project is expected to provide multiple benefits that support TID's ongoing drought management planning and drought resiliency efforts, including, but not limited to:

- Water savings benefits, quantified by spillage reduction.
- Enhancement of groundwater sustainability and conjunctive management of surface water and groundwater, by capturing and conserving spillage for other beneficial uses in TID, including irrigation and recharge.
- Improved irrigation service to TID's irrigation customers, by enhancing the operation of TID's conveyance system.

1.2 Purpose

The purpose of this TM is to summarize Project water savings estimates included in the WaterSMART grant application derived from application of the spillage reduction methodology as developed by the AWMC (herein referred to as the "spillage reduction methodology" or "methodology"). The spillage reduction methodology and results summarized in this TM follow the AWMC guidelines prepared for the CALFED Bay Delta Water Use Efficiency program (AWMC, 2007) and the related verification-based planning methodology developed by Burns, et al. (2000).

Required elements of the WaterSMART grant application that are supported by this spillage reduction methodology and related documentation in this TM include:

- **Performance Measures:** This section of the grant application summarizes the proposed method (performance measure) of quantifying Project benefits that support water management and drought resiliency.

  Section 2 of this TM describes the proposed methodology to quantify the water savings benefits of the proposed Project through spillage reduction.

- **Evaluation Criterion A - Project Benefits**: This section of the grant application documents, among other aspects of the Project: (1) the expected drought resiliency benefits of the proposed Project, (2) the expected mechanism by which the proposed Project will improve drought resiliency, and (3) the estimated quantity of additional surface water supply that will result from the Project. Volumetric benefits must be reported as an average annual volume expected over a representative 10-year period.

Section 3 of this TM documents the estimated water savings benefits of the proposed Project that are available due to spillage reduction. These estimates are calculated according to the methodology described in Section 2.

The remaining sections of this TM provide background and support for the spillage reduction methodology, including support for the spillage reduction estimates through comparison with TID's reservoir operations model for the Project (Section 4).

2. METHODS

2.1 Overview

The Project is expected to provide numerous benefits that support TID's ongoing drought management planning and drought resiliency efforts, including, but not limited to:

- **Quantitative benefits**: Water savings benefits, quantified by annual reductions in net operational spillage from the TID conveyance system.

- **Qualitative benefits**:
  - Enhancement of groundwater sustainability and conjunctive management of surface water and groundwater, to the extent that: (1) water conserved by the Project can be directly delivered for groundwater recharge (direct recharge) or for irrigation instead of groundwater (in-lieu recharge), and (2) improved operational flexibility enhances the convenience of surface water deliveries and encourages use of available surface water, especially by irrigation customers along Lateral 5.5 downstream of the Project where groundwater use has increased in recent years. Using surface water to meet consumptive use needs provides recharge benefits to the Turlock Subbasin and preserves the availability of groundwater for use in dry years.
  - Improved irrigation service to TID's irrigation customers, to the extent that WDOs can schedule and deliver water with greater flexibility upstream and downstream of the Project, potentially reducing delivery wait times and increasing customers' utilization of available surface water supplies.

While these benefits all support TID's ongoing drought management planning and drought resiliency efforts, this TM focuses only on the quantitative water savings benefits expected by implementation of the Project. Spillage reduction benefits of the Project are quantified according to the procedure described in the remainder of this section.

2.2 Spillage Reduction Estimation Procedure

Water savings benefits of the Project are quantified by annual reductions in spillage from the TID conveyance system. Spillage reduction estimates were calculated for all spill sites in the Project benefit area: Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper and Lower Spill). A schematic of the Project benefit area is shown in Figure 2-1.

Spillage reduction estimates were developed from application of the spillage reduction methodology as developed by the AWMC (AWMC, 2007) and the related verification-based planning methodology developed by Burns, et al. (2000). This methodology requires careful documentation and analysis of historical spillage records, which are the foundation for estimating “without-project” spillage, “with-project” spillage, and potential spillage reduction (i.e., water savings benefits).

Following this methodology, spillage reduction is calculated as the difference between the amount of spillage that would occur under representative conditions without the Project (historical baseline spillage adjusted for possible changes in future conditions; termed “without-project” conditions) and the amount of spillage projected to occur under conditions with the Project (spillage adjusted for possible changes in future conditions plus the expected effects of the Project influencing spillage; termed “with-project” conditions). The calculated spillage reduction thus denotes the estimated water savings benefits that are attributable to the Project, considering representative future conditions.

The procedures used to estimate the spillage reduction of the Project are outlined below:

1. Quantified the without-project spillage for all spill sites in the Project benefit area, based on:
    a. Location of spill sites relative to the Project inflow and outflow locations.
    b. Analysis of available spillage data over a recent historical period that is considered to be representative of future operational conditions.
    c. Subtraction of the estimated spillage reduction of the Ceres Main Regulating Reservoir project at all applicable spill sites to avoid double-counting Project benefits (The Ceres Main Regulating Reservoir project is currently in development, but is expected to be completed prior to completion of this Project. Among other benefits, the Ceres Main Regulating Reservoir is expected to reduce spillage from Lateral 4.5 and the Hodges Spill).

2. Estimated the with-project spillage for all spill sites in the Project benefit area, based on:
    a. Historical spillage components at that spill site.
    b. Anticipated operational effect of the Project on the spill site, based on technical literature review, discussion with TID staff, and review of actual spillage

reduction benefits from the existing TID Lateral 8 Regulating Reservoir and Total Channel Control Project.

3. Estimated the spillage reduction benefit of the Project as the difference between the without-project spillage (step 1) and the with-project spillage (step 2).

The methodology, considerations, and data sources consulted for each step of this procedure are summarized in the sections below.

2.2.1 Quantifying Without-Project Spillage

Without-project spillage was first computed as the volume of spillage expected to occur under future operational conditions without the Project. Without-project spillage was quantified as the sum of the measured spillage at the four spill sites in the Project benefit area during a historical period considered to be representative of future operational conditions. Identification of the Project benefit area and a representative historical period are each described below. Without-project spillage functions as a baseline for estimating spillage reduction as a result of implementation of the Project.

2.2.1.1 Project Benefit Area

Spill sites expected to be benefitted by operation of the Project were identified through review of the planned Project design and operating strategy, discussion with TID staff, and consultation with technical literature.

A schematic of the Project benefit area is shown in Figure 2-1. The Project will be constructed on a 40-acre parcel owned by TID between Lateral 5.5 (near Drop 16) and a section of the Harding Drain. Inflows to the Lateral 5.5 Regulating Reservoir will be pumped from the section of the Harding Drain downstream of Hodges Spill, and outflows from the Lateral 5.5 Regulating Reservoir will be pumped back to Lateral 5.5 near the Lateral 5.5 Upper Spill.

Based on the location and planned operation strategy of the Project, the Project is expected to conserve some portion of spillage from all spill sites identified in Table 2-1. The Lateral 5 (Hodges) Spill, Lateral 4.5 Spill, and Lateral 5.5 (Upper) Spill sites are expected to benefit most significantly because the Project will directly recapture, store, and reuse that spillage. The Project is expected to provide temporary storage for much of the spillage that may have otherwise occurred at these sites. The Lateral 5.5 Lower Spill site is also expected to benefit from flow control and regulating storage to the extent that surface water recaptured and stored by the Project can be used to regulate downstream flows and meet consumptive use needs downstream on Lateral 5.5 with greater precision than may have otherwise occurred without the Project. Information about the quantitative spillage reduction benefits expected at each spill site is provided in Section 2.2.2.3.

Schematic of Lateral 5.5 Regulating Reservoir Project Benefit Area (Not to Scale)

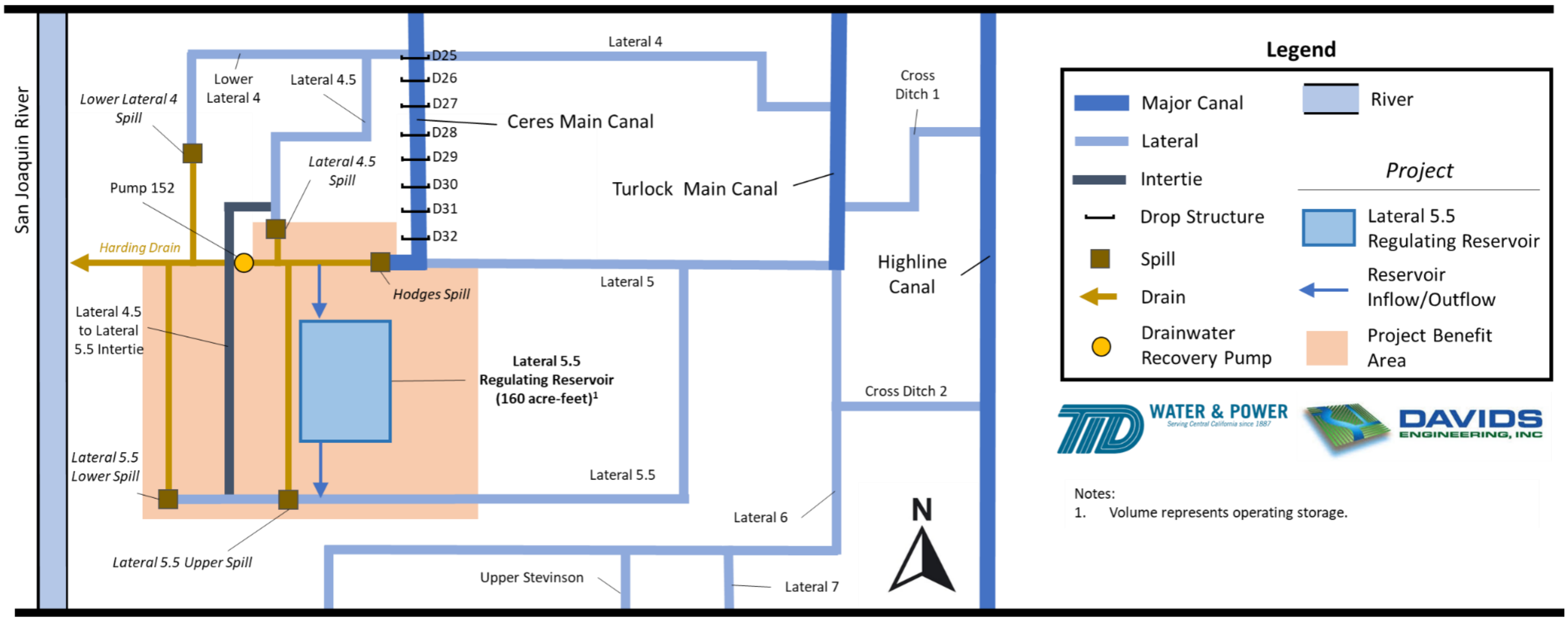


Figure 2-1. Schematic of Lateral 5.5 Regulating Reservoir Project Benefit Area.

Table 2-1. Spill Sites in the Lateral 5.5 Regulating Reservoir Project Benefit Area.

Spill Site	Project Spillage Reduction Mechanism	Note
Lateral 5 (Hodges Spill)	Spillage Interception and Reuse	Spill site at the end of the Ceres Main Canal below Drop 32; spillage enters the Harding Drain upstream of the proposed Project inflow site.
Lateral 4.5	Spillage Interception and Reuse	Spill site at the end of Lateral 4.5; spillage enters the Harding Drain near the proposed Project inflow site.
Lateral 5.5 (Upper Spill)	Spillage Interception and Reuse	Spill site on Lateral 5.5 near Drop 16; spillage enters the Harding Drain near the proposed Project inflow site.
Lateral 5.5 (Lower Spill)	Flow Control, Regulating Storage	Spill site at the end of Lateral 5.5.

2.2.1.2 Representative Historical Period

The recent historical period of 2010-2020 was identified as an appropriate baseline to represent “without-project” conditions in the Project area according to the following considerations:

1. **Representative operating conditions during this period**: TID staff considered the period since 2010 to be generally representative of expected future operational conditions, accounting for changes in spillage volumes and conveyance system operation that have resulted from TID’s upgrades to its monitoring and automation infrastructure since the late 1990s. Among other efforts, TID has automated canal control structures, installed more than 150 permanent Rubicon measurement devices at sidegates, and expanded its SCADA network to approximately 400 SCADA sites, including nine miles of Rubicon Total Channel Control (TCC) automation and remote control systems for many of the District’s drainage pumps. WDOs also have remote access to real time flow data through tablets and mobile computers, allowing them to monitor and respond and in a timely manner to changing conditions throughout the irrigation service area.

2. **Adequate historical data is available for this period**: TID has SCADA-integrated measurement devices at all spill locations in the TID conveyance system. Hourly or daily spillage data is available in recent years (daily data since 1991; hourly data since 2015 and select years prior). TID also maintains a semi-automated water budget that contains all available data describing system inflows and outflows beginning in 1991.

3. **Hydrologic Conditions**: The 2010-2020 period contains both wet and dry water years, and sequential years of drought that are expected to provide a realistic estimate of potential Project water savings under future drought conditions.

2.2.2 Estimating With-Project Spillage

With-project spillage was next estimated as the volume of spillage expected to occur under future operational conditions with the Project. With-project spillage was quantified as the sum of the adjusted spillage at the same spill sites in the Project benefit area over the representative historical period considered for determining the without-project conditions.

Adjustments to the historical spillage data were made to simulate the anticipated operational effect of the Project on spillage at each site in the Project benefit area. As detailed in the spillage reduction methodologies described by AWMC (2007) and Burns, et al. (2000), the potential spillage reduction benefits of the Project can be estimated by considering the Project's spillage reduction mechanism(s) (Table 2-1) and by understanding how each spillage reduction mechanism would affect the underlying causes of spillage (i.e., spillage components). The three causes and related spillage components are described in Section 2.2.2.1, below.

By providing spillage interception, reuse, flow control, and regulating storage benefits (Table 2-1), the Project is expected to conserve different components of spillage at each spill site. Estimated with-project spillage was calculated considering: (1) the historical spillage components observed at each spill site, and (2) the anticipated operational effect of the Project on each spillage component at each spill site. These considerations are described in Sections 2.2.2.2 and 2.2.2.3.

With-project spillage represents the volume of spillage that is expected to occur at all sites benefitted by the Project, based on the best available data, technical methodologies, and understanding of planned reservoir operations prior to Project implementation. Following construction and operation of the Project, spillage data will continue to be collected at all spill sites and will be used to calculate the actual with-project spillage and resultant spillage reduction.

2.2.2.1 Overview of Spillage Components

To assess the "with-project" effect on spillage, historical spillage was split into three flow components, or spillage components, that each result from different causes and driving forces in the conveyance system:

- **Head change spillage** is spillage that results from imperfect timing of delivery handoffs ("head changes") within the conveyance system. During head changes, deliveries are passed from one sidegate to another. If the receiving sidegate is opened too early, this can result in shorted deliveries for other irrigation customers. Conversely, if the receiving sidegate is opened too late, this can result in unsteady system flows, excessive canal water levels, and spillage. Head change spillage is typically identified by high flow rate and short flow duration.

- **Overage flow spillage** is spillage that is caused by ordering additional water into the conveyance system, above what is needed to make deliveries, to compensate for possible flow fluctuations within the conveyance system. Along main canals, adding overage flow increases the probability of providing adequate lateral inflows even as flow fluctuations occur. Along laterals, adding overage flow reduces the chance that flow fluctuations will impact deliveries. Spillage resulting from using overage flows typically occurs at low, consistent flow rates between the late morning and early afternoon, a time when head change spillage is relatively low due to there being greater WDO monitoring of the conveyance system.

- **Slow system responsiveness spillage** typically results from mismatches between water supplied into a lateral and water demands along the lateral. WDOs typically schedule water deliveries with the objective of leveling water demand at the lateral heading each day, but some variation in water demand typically occurs due to different irrigation customers ordering different flows. Because of the frequency with which system flow changes can be made and the associated travel time, WDOs sometimes have to over-order to ensure that flow is sufficient to meet the highest expected demand along a lateral during the day. This results in spillage during non-peak delivery times. Slow system responsiveness spillage tends to occur at night for a few hours at a full head flow rate, and is quantified as the remaining spillage after head change and overage flow spillage are quantified. All three spillage components can be identified from historical hourly flow data through analysis of flow-frequency (exceedance) plots and average hourly hydrographs.

Different Project-related spillage reduction mechanisms are expected to reduce different spillage components by different amounts. Table 2-2 summarizes the typical spillage reduction mechanisms and affected spillage components associated with a spillage recapture and regulating reservoir project.

To estimate the with-project spillage reduction of the Project, the total spillage at each spill site in the Project benefit area was first split into its representative spillage components (see Section 2.2.2.2). Each spillage component was then independently adjusted to estimate with-project conditions using a Project-related spillage reduction factor identified from flow analyses of similar projects in TID and those reported in technical literature (see Section 2.2.2.3).

Table 2-2. Typical Spillage Reduction for a Regulating Reservoir, by Project Mechanism and Spillage Component.

Project Spillage Reduction Mechanism	Spillage Component Reduced[1]			Spillage Reduction[1]	
	Head Change	Overage Flow	Slow System Responsiveness	Typical Reduction	Typical Range of Reduction
Spillage Interception and Reuse	X	X	X	80%	50-90%
Flow Control	X		X	40%	30-50%
Regulating Storage	X	X	X	80%	70-95%

[1]Source: *Spillage Reduction Monitoring and Verification* (AWMC, 2007). Head Change, Overage Flow, and Slow System Responsiveness spillage correspond to Unsteadiness, Over-Ordering, and Lack of Responsiveness spillage "driving forces," respectively.

2.2.2.2 Historical Spillage Components at Spill Sites in the Project Benefit Area

Spillage components were quantified at each spill site in the Project benefit area using available hourly and daily spillage data according to the following procedure.

1. Hourly and daily spillage data was analyzed for the spill sites identified in Table 2-1 during years with available flow data, including four "normal" years when available surface water supplies were sufficient to allow TID's irrigation customers to purchase 48 inches of water per acre (2011, 2017, 2018, 2019), and two "dry" years when available surface water supplies were reduced and less than 48 inches of water was available for purchase (2015, 2020). This data were used to create:
    a. Spillage flow-frequency (exceedance) curves
    b. Average hourly spillage hydrographs
2. From the hydrographs (1.b.), the overage flow spillage component was identified as the minimum average hourly spillage rate each year during the period from May to October (typically occurring mid-day, 11:00 AM to 3:00 PM).

3. From the exceedance curves (1.a.), the head change spillage component was designated as the high flow rate spillage occurring between 0% and 10% exceedance probability, net of the underlying overage flow spillage.

4. Slow system responsiveness spillage was identified as the remaining hourly spillage after accounting for head change and overage flow spillage.

5. The hourly spillage components were summed to monthly and annual total spillage and spillage by component. The average percent of total spillage contributed by each spillage component (referred to as "average spillage component percentages") was

calculated for all years with available hourly data, and for average normal and average dry years.

6. The average spillage component percentages were applied to historical spillage data during the representative historical period (2010-2020) to identify each spillage component at each spill site in each year. In years when hourly spillage data was available, average spillage component percentages from that year were applied to estimate the average spillage component volume in that same year. In other years, the normal year average or dry year average was applied, depending on the "available water" conditions that year.

This process was used to determine the annual fraction of total spillage resulting from: (1) overage flows, (2) head change, and (3) slow system responsiveness based on the sum of hourly data, when available, or based on representative average operational patterns observed in TID, by year type. Results of these analyses are reported in Section 3.1

2.2.2.3 Spillage Reduction Based on Anticipated Operational Effect of the Project on the Spill Site

The volume of spillage reduction attributed to operation of the Project was estimated based on: (1) the historical spillage volume in 2010-2020 attributed to each spillage component (quantified in the previous section), and (2) the anticipated operational effect of the Project on each spillage component at each spill site.

Operation of the Project is expected to have different effects on each spillage component at each spill site in the Project benefit area, depending on whether spillage can be directly recaptured, how easily operational fluctuations can be recaptured and regulated, and whether some overage flow can be mitigated. The estimated spillage reduction mechanisms and spillage reduction estimates associated with the Project are summarized in Table 2-3. All spill sites that could potentially be benefitted by the Project are identified within the Project benefit area as identified in Figure 2-1.

Constructing a regulating reservoir between the Harding Drain and Lateral 5.5 is expected to directly recapture spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill), reducing all spillage components by an estimated 70% (Table 2-3). The Project is also expected to reduce spillage at the Lateral 5.5 Lower Spill site by providing storage regulation and providing TID's WDOs greater flexibility and control of deliveries downstream of the Project. Total spillage components are expected to be reduced by 30-50% at Lateral 5.5 Lower Spill (downstream of the reservoir), as summarized in Table 2-3. These reductions are based on the sites' proximity to the reservoir, discussion with TID staff about typical and expected system operations, spillage reduction analyses for the existing TID Lateral 8 Reservoir and Total Channel Control (TCC) project, and typical spillage component reductions for this type of project as described by AWMC (2007).

Table 2-3. Lateral 5.5 Regulating Reservoir Project Spillage Reduction Mechanisms and Spillage Reduction Estimates, by Spill Site.

Spill Site	Project Spillage Reduction Mechanism(s)[1]	Estimated Spillage Reduction by Spillage Component[2]		
		Head Change	Overage Flow	Slow System Responsiveness
Lateral 5 (Hodges Spill)	Spillage Interception and Reuse	70%	70%	70%
Lateral 4.5	Spillage Interception and Reuse	70%	70%	70%
Lateral 5.5 (Upper Spill)	Spillage Interception and Reuse	70%	70%	70%
Lateral 5.5 (Lower Spill)	Regulating Storage, Flow Control	50%	30%	50%

[1] Spillage reduction measures identified from *Spillage Reduction Monitoring and Verification* (AWMC, 2007).

[2] Estimated spillage reduction based on flow analysis of hourly spillage data, analysis of actual observed spillage reductions from the Lateral 8 Reservoir and TCC Project, and typical reductions identified in *Spillage Reduction Monitoring and Verification* (AWMC, 2007).

2.2.3 Estimating Spillage Reduction

Spillage reduction was estimated each year as the total without-project spillage in the Project benefit area minus the sum of the three with-project spillage components at all sites in the Project benefit area. Estimated spillage reduction was calculated for each individual year during the 2010-2020 period, and is reported as an average annual volume in all years, an average annual volume in normal years, and an average annual volume in dry years.

3. RESULTS

Results of the spillage reduction estimation procedure are presented below, showing: (1) the without-project spillage components at each spill site benefitted by the Project, and (2) the estimated spillage reduction benefits of the Project.

3.1 Spillage Component Analysis Summary for All Sites

The without-project average annual spillage at each spill site is summarized in Table 3-1 through Table 3-3 for all years, normal years, and dry years during the period 2010-2020. Without-project average spillage values are reported as average annual volumes in acre-feet per year (AFY). These tables also provide the percent of total spillage contributed by each component, as calculated following the procedure described above. Because the Ceres Main Canal feeds directly into Hodges Spill, and is subject to complex operational dynamics and interactions with upper and lower laterals, spillage components are not clearly distinguished at Hodges Spill. Thus, only total spillage is summarized for Hodges Spill.

Table 3-1. Without-Project Average Spillage by Component, Average Volume in All Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	Head Change Spillage, % of Total	Overage Flow Spillage, % of Total	Slow System Responsiveness Spillage, % of Total
Lateral 5 (Hodges Spill)[1,2]	300	-	-	-
Lateral 4.5[2]	1,400	36%	47%	17%
Lateral 5.5 (Upper Spill)	3,100	37%	34%	29%
Lateral 5.5 (Lower Spill)	1,500	25%	62%	13%
Total	**6,300**			

[1] Spillage components are not clearly distinguished along the main canals due to complex operational interactions with upper and lower laterals.
[2] To avoid double-counting spillage reduction benefits, the without-project spillage excludes the anticipated spillage reduction benefits of the Ceres Main Regulating Reservoir project.

Table 3-2. Without-Project Average Spillage by Component, Average Volume in Normal Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	Head Change Spillage, % of Total	Overage Flow Spillage, % of Total	Slow System Responsiveness Spillage, % of Total
Lateral 5 (Hodges Spill)[1,2]	500	-	-	-
Lateral 4.5[2]	1,800	38%	41%	21%
Lateral 5.5 (Upper Spill)	4,200	23%	43%	34%
Lateral 5.5 (Lower Spill)	1,900	31%	56%	13%
Total	**8,400**			

[1] Spillage components are not clearly distinguished along the main canals due to complex operational interactions with upper and lower laterals.
[2] To avoid double-counting spillage reduction benefits, the without-project spillage excludes the anticipated spillage reduction benefits of the Ceres Main Regulating Reservoir project.

Table 3-3. Without-Project Average Spillage by Component, Average Volume in Dry Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	Head Change Spillage, % of Total	Overage Flow Spillage, % of Total	Slow System Responsiveness Spillage, % of Total
Lateral 5 (Hodges Spill)[1,2]	200	-	-	-
Lateral 4.5[2]	1,000	35%	51%	14%
Lateral 5.5 (Upper Spill)	2,300	49%	26%	25%
Lateral 5.5 (Lower Spill)	1,100	21%	67%	12%
Total	**4,600**			

[1] Spillage components are not clearly distinguished along the main canals due to complex operational interactions with upper and lower laterals.
[2] To avoid double-counting spillage reduction benefits, the without-project spillage excludes the anticipated spillage reduction benefits of the Ceres Main Regulating Reservoir project.

3.2 Spillage Reduction Estimates

Spillage reduction was estimated for the Project as the sum of the spillage reduction calculated for each spill site in the Project benefit area. Spillage reduction at each spill site was calculated based on the annual spillage components identified at that site over the 2010-2020 period and the project-specific spillage reduction identified in Table 2-3.

All spill sites that could potentially benefit from operation of the Project are included within the Project benefit area. The benefitted spill sites include the Lateral 5 (Hodges Spill), Lateral 4.5 Spill, and Lateral 5.5 (Upper Spill and Lower Spill).

Average spillage reduction estimates in all years are summarized in Table 3-4. Table 3-5 and Table 3-6 similarly summarize the average spillage reduction estimates for normal years (years with 48 inches per acre of available surface water) and dry years (years with less than 48 inches per acre of available surface water) over the same period.

The Project is expected to directly recapture spillage from Lateral 5 (Hodges Spill), Lateral 4.5, and Lateral 5.5 (Upper Spill). Spillage of all causes, including outflows from the upper laterals that feed into Ceres Main Canal, could be directed to the Project instead of leaving the TID irrigation service area through the Harding Drain. Likewise, some spillage of deliveries controlled from the Lateral 5.5 headgate could be preserved, and water stored by the Project could be delivered for downstream use instead.

Across the sites in the Project benefit area, the total estimated spillage reduction ranges between approximately 5,300 AF per year during average normal years and approximately 2,800 AF per year during average dry years, with an average annual total spillage reduction of approximately 3,900 AF per year over the 2010-2020 period. Taking into account the without-Project average annual total spillage of approximately 6,300 AF, the average annual total spillage reduction represents a reduction of approximately 63% across all sites.

In addition to spillage reduction, the Project is expected to have other consequential effects on water supplies in the TID irrigation service area, primarily including evaporation and seepage from the reservoir. As the reservoir will be constructed with concrete lining, the estimated seepage from the reservoir is expected to be less than approximately 2 AF per day. Over the course of a typical irrigation season, this equates to less than approximately 400 AFY. However, seepage from the reservoir provides groundwater recharge benefits, and is considered a drought resiliency benefit of this Project. The only nonrecoverable loss from the Project is a small volume of evaporation losses, totaling less than approximately 150 AFY.

Table 3-4. Estimated Spillage Reduction for All Spill Sites in the Lateral 5.5 Regulating Reservoir Project Benefit Area, Average Volume in All Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	With-Project Estimated Spillage, AFY	Estimated Spillage Reduction, AFY	Estimated Spillage Reduction, %
Lateral 5 (Hodges Spill)	300	200	100	70%
Lateral 4.5	1,400	400	1,000	70%
Lateral 5.5 (Upper Spill)	3,100	900	2,200	70%
Lateral 5.5 (Lower Spill)	1,500	900	600	38%
Total	**6,300**	**2,400**	**3,900**	63%

Table 3-5. Estimated Spillage Reduction for All Spill Sites in the Lateral 5.5 Regulating Reservoir Project Benefit Area, Average Volume in Normal Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	With-Project Estimated Spillage, AFY	Estimated Spillage Reduction, AFY	Estimated Spillage Reduction, %
Lateral 5 (Hodges Spill)	500	200	300	70%
Lateral 4.5	1,800	500	1,300	70%
Lateral 5.5 (Upper Spill)	4,200	1,300	2,900	70%
Lateral 5.5 (Lower Spill)	1,900	1,100	800	39%
Total	**8,400**	**3,100**	**5,300**	63%

Table 3-6. Estimated Spillage Reduction for All Spill Sites in the Lateral 5.5 Regulating Reservoir Project Benefit Area, Average Volume in Dry Years (2010-2020).

Spill Site	Without-Project Average Spillage, AFY	With-Project Estimated Spillage, AFY	Estimated Spillage Reduction, AFY	Estimated Spillage Reduction, %
Lateral 5 (Hodges Spill)	200	100	100	70%
Lateral 4.5	1,000	300	700	70%
Lateral 5.5 (Upper Spill)	2,300	700	1,600	70%
Lateral 5.5 (Lower Spill)	1,100	700	400	37%
Total	**4,600**	**1,800**	**2,800**	62%

4. VALIDATION OF SPILLAGE REDUCTION ESTIMATES

This spillage reduction methodology was validated through comparison of the spillage reduction estimates for the Project with the results of a TID reservoir operations model for the Project. Results from this comparison are described below.

4.1 Comparison with the TID Reservoir Operations Model

TID has developed a reservoir operations water balance model (referred to as the TID Reservoir Operations Model) for the Project that evaluates reservoir inflows and outflows during the irrigation season (March through October) over the 2016-2020 period. The TID Reservoir Operations Model calculates a daily water balance for the Project based on the actual Project design criteria and proposed Project operations. Flow paths accounted in the TID Reservoir Operations Model are quantified and evaluated in the context of the water delivery start time (6:00 AM) and the next day delivery order time (4:00 PM). The daily water balance generally occurs around the next day delivery order time, and accounts for (among other flow paths) the:

- Spillage from Lateral 5 (Hodges), Lateral 4.5, and Lateral 5.5 (Upper Spill) into the Harding Drain that could be recaptured by the reservoir
- Irrigation demand downstream of the Project
- Usable volume of water that can be stored by the Project and used to meet downstream customer demands
- Seepage from the Project

Table 4-1 compares the average annual estimated spillage reduction results of the AWMC Spillage Reduction Methodology documented in this TM with the projected savings (estimated spillage reduction) results of the TID Reservoir Operations Model. The results of both approaches correspond closely, on average. Across all years, the TID Reservoir Operations Model estimates slightly higher spillage reduction.

Table 4-1. Comparison of Estimated Spillage Reduction for Spill Sites in the Lateral 5.5 Regulating Reservoir Project Benefit Area between the AWMC Spillage Reduction Methodology and the TID Reservoir Operations Model.

Summary (Analysis Period)[1]	Year Type (TID Available Water)[2]	AWMC Spillage Reduction Methodology	TID Reservoir Operations Model	Comparison (AWMC Methodology – TID Model)	
		Estimated Spillage Reduction, AFY[3]	Projected Savings (Estimated Spillage Reduction), AFY	Difference, AFY	Percent Difference, %
Average (2016-2020)	All Years	3,800	4,100	-300	-8%
	Normal Years	4,500	4,700	-200	-4%
	Dry Years	2,900	3,100	-200	-7%

[1] Analysis Period considers spillage only during the irrigation season or the months from March-October.
[2] In "normal" years, 48 inches per acre of "available water" is available to TID's irrigation customers. In "dry" years when surface water supplies are constrained, less than 48 inches per acre of "available water" is available to irrigation customers.
[3] Estimated spillage reduction for spill sites in the Project benefit area (Lateral 5 (Hodges Spill), Lateral 4.5, Lateral 5.5 (Upper Spill), and Lateral 5.5 (Lower Spill)).

5. SUMMARY

The Project is expected to provide multiple benefits that support TID's long-term drought management planning and drought resiliency efforts, including water savings benefits: the focus of this TM. The Project is strategically located between the Harding Drain, which conveys much of TID's spillage to the San Joaquin River, and the lower reaches of Lateral 5.5, downstream of the most severe capacity constraints in the TID conveyance system. Spillage from the conveyance system is no longer available for beneficial use within the TID irrigation service area, and most surface water in the Harding Drain is currently irrecoverable. The Project will allow TID to reduce spillage and recover surface water from the Harding Drain, resulting in additional surface water supplies available for TID's irrigation customers on Lateral 5.5 and for other beneficial uses, including irrigation and recharge.

Across the sites in the Project benefit area, the total estimated spillage reduction ranges between approximately 5,300 AF per year during average normal years and approximately 2,800 AF per year during average dry years, with an average annual total spillage reduction of approximately 3,900 AF per year over the 2010-2020 period. Taking into account the without-Project average annual total spillage of approximately 6,300 AF, the average annual total spillage reduction represents a reduction of approximately 63% across all sites.

As described in detail within this TM, some surface water saved by the Project could be stored and delivered downstream of the Project to meet consumptive use needs and enhance surface water supply availability, especially during prolonged drought, offsetting some demand for groundwater pumping downstream of the Project. Some water savings could also reduce surface water diversions, retaining that water in other TID storage facilities, like Don Pedro Reservoir, and allowing that surface water to be used later for beneficial purposes. In either case, beneficial use of spillage conserved by the Project is expected to support direct and in-lieu groundwater recharge and sustainable operation of the underlying groundwater subbasin.

6. REFERENCES

Agricultural Water Management Council (AWMC). 2007. Spillage Reduction Monitoring and Verification, Agricultural Water Management Council. August 2007.

Burns, J.I., G.G. Davids, A.K. Dimmitt and J. Keller. 2000. Verification-based planning for modernizing irrigation systems in Irrigation and Drainage in the New Millennium. USCID. Denver. pp. 51-63.

Turlock Irrigation District (TID). 2021. Turlock Irrigation District 2020 Agricultural Water Management Plan, Final. March 2021.

APPENDIX D: DROUGHT MANAGEMENT PLAN

Introduction

Since its formation in 1887, TID has faced variability in surface water supplies due to drought, leading to the development of TID's current water shortage allocation policies. These policies have been developed in response to the 1976-1977 drought, the most severe two-year drought in TID, and to the 1987-1992 and 2012-2016 droughts, the most severe and longest droughts in California's recorded history. Given the recent impacts and severity of the 2012-2016 drought, this drought is considered to be the archetypal drought for planning purposes in TID. A key aspect of TID's drought management policy is to plan for carryover storage in Don Pedro Reservoir and to plan for strategic, conjunctive management of surface water and groundwater supplies for a period of forecasted consecutive dry years. Prudent water supply planning requires TID to consider that the first dry year encountered may be the first year in a series of dry years, similar to the 1976-1977, 1987-1992, or 2012-2016 periods.

On April 1, 2015 Governor Brown issued Executive Order B-29-15, mandating agricultural water suppliers to include a detailed Drought Management Plan (DMP) describing actions and measures taken to manage water demand during drought in their 2015 Agricultural Water Management Plan (AWMP) update. In response to the Governor's Executive Order, TID developed a detailed description of existing policies and extraordinary actions undertaken in response to drought conditions. Three years later, Assembly Bill 1668 (AB 1668) was passed on May 31, 2018. AB 1668 amended the California Water Code (CWC) and requirements for AWMPs, providing more detail on the specific requirements of a Drought Plan, or DMP (CWC 10826.2). This DMP builds upon TID's long-standing shortage allocation policies and describes drought resiliency planning actions undertaken to prepare for drought, along with a broad range of actions undertaken during drought to manage available water supplies and to meet customer demands to the maximum extent possible.

The 2020 DMP includes all components that are required by CWC 10826.2 and that are recommended by DWR in its 2020 AWMP Guidebook (DWR 2020). Additionally, the 2020 DMP reflects on the impacts of the 2012-2016 drought.

The DMP describes TID's drought resilience and drought response planning efforts, organized under the following categories:

- Drought resilience planning
    - Determination of water supply availability and drought severity
    - Potential vulnerability to drought
    - Drought resilience opportunities and constraints, specifically:
        - Availability of new technology or information
        - Availability of additional water supplies
        - Other planned actions
- Drought response planning
    - Policies and processes for water shortage declaration and water shortage allocation and implementation
    - Operational modifications to increase efficiency
    - Methods and procedures for triggering and enforcing water shortage response actions

Between 2015-2019, approximately 66,000 combined acres of pasture, alfalfa, corn, and grain were grown in TID each year to support the area's extensive dairy and livestock operations. While irrigation of these crops is important to support local dairy and livestock operations, these crops are more adaptable to reduced or variable water supplies than permanent crops. In recent years, the acreage of permanent crops (primarily almonds) has been increasing due to their demand and profitability. If this trend continues, it could present a new potential vulnerability to drought within the District.

DROUGHT RESILIENCE OPPORTUNITIES AND CONSTRAINTS: AVAILABILITY OF NEW TECHNOLOGY OR INFORMATION (§10826.2(A)(3)(A))

TID has prioritized implementation of new technology and improvements in data collection throughout the District for many decades. In recent years, TID has also made substantial, long-term improvements to distribution system infrastructure and operational practices that have increased operational efficiency and improved TID's drought resilience. Several highlights of TID's activities are described below and in **Section 7** of the 2020 AWMP:

- TID began installing and implementing its SCADA system in 1997. As of 2020, TID has implemented and upgraded SCADA monitoring equipment at 397 sites throughout the District. These sites monitor distribution system flows, water levels, gate openings, pumping, and spillage at regular intervals.
- In 2014, TID provided tablets to all Water Distribution Operators (WDOs), allowing them to remotely access SCADA data and operational information. Real-time access to SCADA data has helped WDOs improve the flexibility of deliveries to water users while maintaining distribution system efficiency and reducing spillage.
- TID implemented remote-control capabilities for drainage pumps, allowing WDOs to quickly monitor and operate pumps in response to real-time canal flows, further reducing spillage.
- During the 2014-2015 winter season, TID constructed a regulating reservoir and installed Total Channel Control (TCC) on Lateral 8. The reservoir storage capacity was expanded to 130 AF near the Highline Spill, providing storage for water that would have previously been spilled. With TCC on Lateral 8, TID is better able to match supply and demand, and thus provide better service with increased flexibility to customers on Lateral 8 while simultaneously reducing spillage.
- As of December 2020, TID has installed 151 new, permanent Rubicon flow measurement devices at sidegates, sites downstream of sidegates, and ID pipeline spillage sites throughout the District.
- TID installed the California Irrigation Management Information System (CIMIS) Weather Station #168 (Denair) in 2002, which was relocated and assigned a new station number (#206) in 2009. TID provides growers access to the CIMIS data on its website along with other weather information and forecasts (see **Section 7.4.12.2** of 2020 AWMP).
- TID actively monitors water supply data and forecasts, and provides the following information to growers (see **Section 7.4.12.3** of the 2020 AWMP):

- Real-time flows, water levels, and available storage for six sites via TID's Water Information Systems by KISTERS (WISKI) web portal (available at http://wiskiweb.tid.org/index.htm)
- Current weather reports and Tuolumne River flows below La Grange Dam (https://www.cnrfc.noaa.gov/graphicalRVF.php?id=MDSC1)
- List of seven online telemetry gauges used by TID, with links to each on the USGS National Water Information System website
- Groundwater monitoring implemented by TID as part of SBx7-6 (California Statewide Groundwater Elevation Monitoring or CASGEM
- Results of the upper Tuolumne River watershed collaborative project to implement Forecast Informed Reservoir Operations (FIRO), a reservoir-operations forecasting strategy that is communicated to the TID Board of Directors, and available to the public through the Board process

- TID staff are administering two grants on behalf of the Turlock Subbasin Groundwater Sustainability Agencies (GSAs), and are actively engaged in the planning and development of each effort. The first grant is funding a significant portion of the Groundwater Sustainability Plan (GSP) development. The second grant will fund a Groundwater Recharge Assessment Tool for the Subbasin, the installation of monitoring wells, and a Draft Programmatic Environmental Impact Report for the GSP. Both efforts will further aid conjunctive management in the Subbasin and the TID service area.
- TID is currently working on a multi-year planning effort to improve irrigation service and modernize infrastructure, referred to as the TID Irrigation Facilities Master Plan (IFMP). The draft IFMP identifies and evaluates a suite of potential modernization projects for the District's water distribution infrastructure, with the goal of maintaining and improving the level of irrigation service provided to its customers. This effort will benefit TID's future drought resilience through potential projects to increase operational efficiency and flexibility, while minimizing system losses, operational costs, and life cycle costs of TID infrastructure.

TID plans to continue implementing new technologies to improve drought resiliency and operational efficiency and is continually exploring new technologies and information to achieve these ends. The largest impediment to implementing new technologies and disseminating information is cost, which can be restrictive to implementation in some cases. TID staff continually pursue grant funding to support these important efforts.

DROUGHT RESILIENCE OPPORTUNITIES AND CONSTRAINTS: AVAILABILITY OF ADDITIONAL WATER SUPPLIES (§10826.2(A)(3)(B))

As described previously, TID's water supplies have generally been sufficient in all but the driest years through conjunctive management of surface water and groundwater supplies combined with drought management actions. TID has historically increased groundwater pumping to deal with drought conditions, but has limited pumping to areas which do not risk negatively impacting nearby water users.

TID considers potential water transfers from other entities on a case-by-case basis; however, availability of transfers is limited and, even if available, costly. As described in **Section 4.1.3** of the 2020 AWMP, TID actively utilizes available recycled water and drainage water to supplement

COMMUNICATION PROTOCOLS AND PROCEDURES (§10826.2(B)(4))

This section describes communication protocols and procedures within TID as well as broader communication and collaboration efforts with regional stakeholders during times of drought.

Communication Protocols and Procedures within TID

TID strives to have clear communication protocols and procedures with landowners and customers within the District and recognizes the importance of this, especially in times of drought. Typically, informational materials are made available through multiple channels of communication. TID communicates through the District website; delivers announcements and notices through physical mail, email, and targeted social media; and posts announcements at the TID office.

Communication materials are made available to irrigation customers at the front office and on the TID website. Special announcements, public notices, and press releases from the Board of Directors are also made available on the TID website (https://www.tid.org/news-and-resources/public-notices/; https://www.tid.org/news-and-resources/press-releases/). Examples of TID's communication during the 2012-2016 drought are included in **Attachments G.2 and G.3**. TID also supplies growers with up-to-date weather information and forecasts through its "Weather" web page (https://www.tid.org/news-and-resources/weather/).

Finally, TID office staff and WDOs are available during business hours to answer questions related to water supply availability or drought management from landowners and customers.

Coordination and Collaboration with Regional and Statewide Entities

Extensive coordination and collaboration with others is a vital component of TID operations. The District reports data to the California Energy Commission, the California Department of Water Resources, and other governmental entities, as necessary. TID also partners with cooperating entities at Don Pedro Reservoir on watershed studies and other efforts surrounding Tuolumne River water supply and demand, including instream flows, snowpack, agricultural and urban demand, climate change, and other considerations. TID also works with applicable regulatory agencies that affect the flexibility with which TID can store and deliver water.

One example of such coordination is TID's role in the formation and ongoing operation of the West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA), an association of local municipal water systems and agencies located in the western portion of the Turlock Subbasin. As a member of the WTSGSA, TID is actively involved in subbasin-wide SGMA-implementation efforts. Both the WTSGSA and the East Turlock Subbasin GSA anticipate adopting and implementing the Turlock Subbasin Groundwater Sustainability Plan (GSP) beginning in 2022.

Additionally, the District meets with local cities and counties regarding groundwater resources, water conservation and recycling projects, and public education and outreach.

APPENDIX E: GROUNDWATER SUSTAINABILITY PLAN

8.3.2.3.9. Management of Groundwater Extractions and Recharge

Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, in-lieu recharge benefits of this Project are expected to increase the use and recharge of available surface water supplies during wetter years and reduce groundwater pumping in the lower portions of TID's distribution system, helping to offset potential increases in groundwater pumping during drought when surface water supplies are limited.

8.3.2.4. TID Lateral 5.5 Regulating Reservoir (Project 8)

8.3.2.4.1. Project Description

This Project would construct a new regulating reservoir on Lateral 5.5, with 140 AF of operating capacity. Water would be pumped to the reservoir from Harding Drain and would be pumped out to Lateral 5.5. The reservoir's operations are expected to reduce spillage and to supply deliveries while alleviating capacity constraints along Lateral 5.5, enhancing delivery service especially to customers along the lower reaches of Lateral 5.5. The reservoir would also reduce pumping along Lateral 5.5 that has historically occurred to compensate for limited surface water supplies stemming from capacity constraints.

The reservoir is designed to minimize excavation and off-haul of dirt over the Project area and would be constructed near the City of Turlock's recycled water pipeline. TID is evaluating a potential connection to route 2,000 AFY of recycled water from the City of Turlock (uses same recycled water described in Project 6, described in **Section 8.3.2.2**) into the Lateral 5.5 reservoir, providing additional water supplies to customers along Lateral 5.5.

As a secondary benefit of the reservoir, in addition to site specific hydrogeology, the reservoir is anticipated to store storm water during the non-irrigation season for direct or in-lieu groundwater recharge purposes. The frequency and magnitude of storm water retention would require further analysis.

8.3.2.4.2. Public Notice

Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

8.3.2.4.3. Permitting and Regulatory Process

Required permitting and regulatory review will be Project-specific and initiated through consultation with applicable governing agencies. TID is in the process of securing the necessary permits required for the Project. Governing agencies for which consultation will be initiated may include, but are not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB.

8.3.2.4.4. Expected Benefits

Benefits to Sustainability Indicators

The reservoir is expected to conserve surface water supplies that may have otherwise spilled and make that water available for irrigation. Both features are expected to provide in-lieu groundwater recharge benefits to the Subbasin by enhancing the availability of surface water for irrigation instead of groundwater. The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, land subsidence, and interconnected surface water. This Project may also benefit water quality, to the extent that surface water deliveries offset groundwater pumping requirements. The surface water supply for TID originates as snowmelt from the Sierra Nevada Mountains and is of very high quality with lower TDS concentrations relative to groundwater in the San Joaquin Valley. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites, identified in the GSP.

Benefits to Disadvantaged Communities

The Project is expected to provide in-lieu recharge benefits to customers along Lateral 5.5 within the TID irrigation service area. Most communities in the Turlock Subbasin, particularly the TID irrigation service area, are classified as DACs, SDACs, or EDAs (according to 2018 census data, evaluated by place, tract, and block group). This Project is expected to directly benefit those communities in the TID irrigation service area. Benefits to groundwater conditions in the Turlock Subbasin are also expected to broadly benefit all DACs, SDACs, and EDAs in the Turlock Subbasin.

Volumetric Benefits to the Subbasin Groundwater System

The expected yield was estimated by simulating this Project in the C2VSimTM model. General information and assumptions used to simulate this Project are summarized in the Implementation section below. Additional information is provided in **Section 8.5**.

On average across all years, the Project is expected to reduce spillage losses from the TID distribution system by an average of approximately 4,000 AFY, of which 1,400 AFY would be provided to customers along Lateral 5.5 in the form of in-lieu recharge.

Evaluation of benefits will be based on analysis of without-project and with-project effects on the SGMA sustainability indicators. Each project is evaluated as part of a scenario and the C2VSimTM is used to assess the benefits and impacts on the Subbasin sustainability.

8.3.2.4.5. Implementation Criteria, Status, and Strategy

This Project would construct a new regulating reservoir on Lateral 5.5 with 140 AF of operating capacity. The reservoir would be operated to capture spillage, alleviate capacity constraints on Lateral 5.5, improve delivery service to customers, and potentially reduce groundwater pumping requirements along Lateral 5.5. The reservoir may also be constructed with a connection to the City of Turlock's recycled water pipeline to provide additional water supplies to customers along Lateral 5.5.

The Project's planning and design were completed in early 2024. The Project implementation schedule is contingent upon approval of amendments to the City of Turlock's wastewater NPDES permit authorizing discharge to Lateral 5.5. It is anticipated the amendments will be adopted by February 2025 with construction commencing shortly after. Project construction is expected to take approximately one year; thus, the Project completion date and implementation start date are anticipated to occur early 2026.

Implementation Assumptions for Modeling

The Project was modeled by the C2VSimTM model. Additional information about project-related modeling is described in **Section 8.5**.

The following general information and assumptions were used to simulate implementation of the Project:

- Volume of spillage reduction: Reduced spillage by an average of 4,000 AFY, distributed in Lateral 5 ½. Spillage reduction results in both reduction of groundwater pumping and in in-lieu recharge across TID's service area.
- Volume of groundwater pumping reduction: Reduced groundwater pumping by TID-operated pumps along Lateral 5 ½ by 1,400 AFY.
- Volume of in-lieu recharge: 2,600 AFY to be distributed across TID's service area during irrigation season.
- Assumed that the net volume of spillage reduction conserved by the reservoir may instead be stored in Don Pedro Reservoir for future beneficial use by TID.

8.3.2.4.6. Water Source and Reliability

This Project would manage and enhance deliveries of surface water diverted from the Tuolumne River. TID has existing water rights on the Tuolumne River. The proposed reservoir may also store recycled water available from the City of Turlock. Municipal water supply and demand are expected to be reliable in all years.

8.3.2.4.7. Legal Authority

The GSA, Districts, and individual project proponents have the authority to plan and implement projects. TID has the authority to construct and operate a regulating reservoir in its irrigation distribution system, subject to applicable regulatory requirements.

8.3.2.4.8. Estimated Costs and Funding Plan

The anticipated costs of this Project are approximately $10 million. These costs include reservoir construction costs and indirect permitting costs. The precise costs of ongoing Project activities will be refined through continued Project evaluation. Updated costs will be reported in Annual Reports and Periodic Evaluations when known. TID is identifying potential funding sources to cover Project costs as part of implementation. These may include grants (e.g., Prop 1, Prop 68, WaterSMART), fees, local cost share, loans, and other assessments. TID is in the process of securing the USBR WaterSMART grant opportunity to fund this Project.

8.3.2.4.9. Management of Groundwater Extractions and Recharge
Per 23 CCR § 354.44(b)(9), all Projects developed for implementation are targeted to maintain the balance of groundwater extractions and recharge to help ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years.

In particular, this conservation and conjunctive use Project is expected to increase the use and recharge of available surface water supplies during wetter years (in-lieu recharge), helping to offset potential increases in groundwater pumping during drought when surface water supplies are limited.

8.3.2.5. Main Canal Automation (Project 9)

8.3.2.5.1. Project Description
The Main Canal Automation (Project) will provide TID with the capabilities for automating the Main Canal (below Turlock Lake) by installing a Level 4 Rubicon Total Channel Control system. The Project will be able reduce error from flow in the canals and thus reduce both pumping and spills. TID anticipates the Project will also increase flexibility of surface water deliveries to in-district growers and conserve water supply to ultimately increase the amount available elsewhere in the district. The Project would include the automation of 10 canal drops and 60 canal side gates and will also be used to pilot the Rubicon Demand Management System.

8.3.2.5.2. Public Notice
Public and/or inter-agency noticing will be facilitated through GSA and/or district board meetings, GSA and/or district website(s), GSA and/or district newsletters, inter-basin coordination meetings, GSP Annual Reports and Five-Year Assessment Reports, public scoping meetings, and environmental/regulatory permitting notification processes.

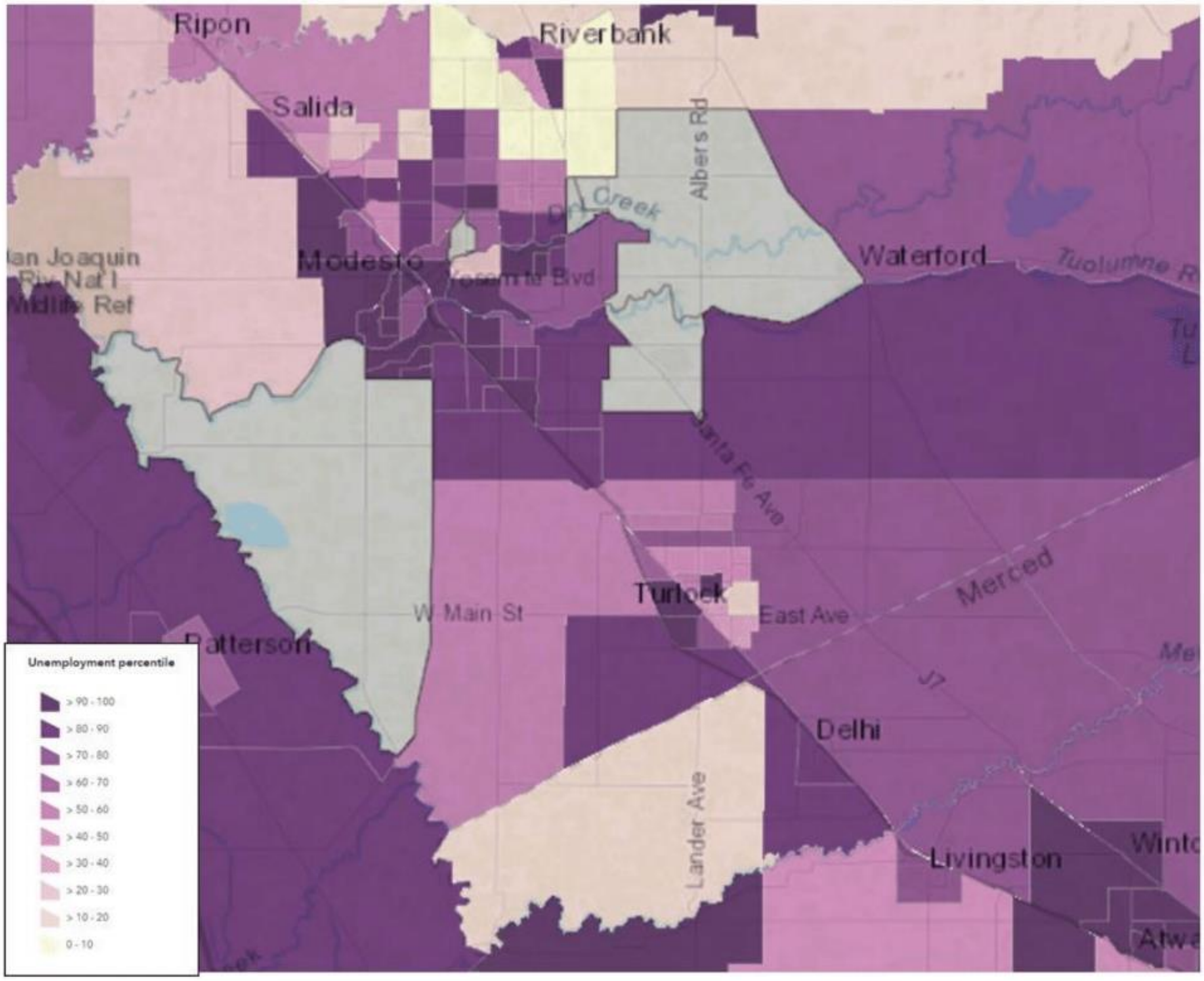
8.3.2.5.3. Permitting and Regulatory Process
Required permitting and regulatory review will be Project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but are not limited to: DWR, SWRCB, CDFW, Flood Board, RWQCBs, USFWS, NMFS, LAFCO, County of Stanislaus, and CARB.

8.3.2.5.4. Expected Benefits

Benefits to Sustainability Indicators
The sustainability indicators expected to benefit from this Project are groundwater levels, groundwater storage, land subsidence, and interconnected surface water. All benefits to sustainability indicators in the Turlock Subbasin will be evaluated through groundwater monitoring at nearby monitoring sites.

Benefits to Disadvantaged Communities
The Project is expected to provide in-lieu recharge benefits to customers upstream of Lateral 5.5 within the TID irrigation service area. Most communities in the Turlock Subbasin,

APPENDIX F: CALENVIROSCREEN UNEMPLOYMENT MAP



Turlock Irrigation District
Lateral 5.5 Regulating Reservoir Project
Budget Proposal

WaterSMART: Drought Response Program: Drought Resiliency Projects for FY 2025
No. R25AS00013

Prepared For:
Bureau of Reclamation
Financial Assistance Support Section
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October 7, 2024

Budget Proposal

Table 6 shows the proposed funding for this Project if it is awarded funding and Table 7 shows the proposed budget in more detail.

Table 1. Non-Federal and Federal Funding Sources Summary

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1.TID	$7,863,580
Non-Federal Subtotal	$7,863,580
REQUESTED RECLAMATION FUNDING	**$3,000,000**

Table 2. Budget Proposal

Budget Item	Computation		Quantity Type	Total Costs
	$/Unit	Quantity		
Salaries and Wages				
Project Manager (Matthew Hazen)	81.96	240	hrs	$19,670
Fringe Benefits				
Project Manager (Matthew Hazen)	82.29	240	hrs	$19,750
Travel				
N/A				
Equipment				
Electrical Transformers	$50,000	1	ls	$50,000
Supplies/Materials				
Electrical, Electronics and Communications Wiring	$50,000	1	ls	$50,000
Construction				
Clearing, Grubbing, Demolition and Removal	$20,000	1	ls	$20,000
On-Site Earthwork and Grading	$10.00	120,000	yd	$1,200,000
Dirt Hauling to Offsite Locations	$10.00	65,800	yd	$658,000
Concrete Side Lining	$3.90	196,200	sf	$765,180
Concrete Bottom Lining	$2.23	1,020,000	sf	$2,274,600
Aggregate Base Bank and Perimeter Road Construction	$0.90	153,200	sf	$137,880
Fencing and Security	$40.00	6,800	ft	$272,000
Reinforced Concrete Pump Structure for Reservoir Intake	$600,000	1	ls	$600,000
Reinforced Concrete Discharage Structure for Reservoir Intake	$400,000	1	ls	$400,000
36" DR41 C900 Plastic Pipes for Reservoir Intake	$575	274	ft	$157,600
24" DR41 C900 Plastic Pipes for Reservoir Intake	$300	1,190	ft	$357,000
15 cfs Variable Speed Lift Pumps for Reservoir Intake	$80,000	2	ls	$160,000
Pump Discharge Components for Reservoir Intake (Steel Pipe, Valves, Fittings, VFD Panels, Enclosures)	$100,000	2	ls	$200,000
Reinforced Concrete Pump Structure for Reservoir Outlet	$800,000	1	ls	$800,000
Reinforced Concrete Canal Discharge Structure for Reservoir Outlet	$400,000	1	ls	$400,000
48" DR41 C900 Plastic Pipe for Reservoir Outlet	$910	1,650	ft	$1,501,900
20 cfs Variable Speed Lift Pumps for Reservoir Outlet	$100,000	2	ls	$200,000
Pump Discharge Components for Reservoir Outlet (Steel Pipe, Valves, Fittings, VFD Panels, Enclosures)	$140,000	2	ls	$280,000
Flow Meters, Level Sensors and Enclosures	$50,000	3	ls	$150,000
Electrical, Electronics, and Communications Wiring and Setup	$100,000	1	ls	$100,000
Third Party In-Kind Contributions				
N/A				
Other				
Enviornmental Surveys and Soils/Materials Testing	$80,000	1	ls	$80,000
TOTAL DIRECT COSTS				**$10,853,580**
Indirect Costs				
Reclamation Environmental Review				$10,000
TOTAL ESTIMATED PROJECT COSTS				**$10,863,580**

Budget Narrative

Salaries and Wages

The Project Manager will be Matthew Hazen, PE, who is a Civil Engineer at TID. His hourly salary is $81.96/hour, and it is anticipated that he will spend an estimated 240 hours for the construction period (7 months) on various tasks associated with the implementation of the Project.

Fringe Benefits

The only fringe benefits associated with the Project are the fringe benefits received by the Project Manager, Matthew Hazen, PE. His fringe benefits are $82.29/hour, and it is assumed that he will spend a total of 240 hours on various tasks for the duration of the Project.

Travel

Not applicable.

Equipment

All equipment purchases are included in the construction contract.

Materials and Supplies

All consultant material and supplies expenses are covered within their contract which is listed in the "Contractual" section below.

Contractual

As noted previously, TID self-performed construction of three similar structures and will self-perform construction of the proposed Project. The total costs associated with the construction of the regulating reservoir will be as indicated in Table 7 above. Procurement of all equipment, materials, supplies, goods, and services will be done in accordance with District procedures.

Third-Party In-Kind Contributions

Not applicable.

Environmental and Regulatory Compliance Costs

TID has allocated an estimated $10,000 for Reclamation to complete its environmental review of the Project.

Other Expenses

All the required expenses for implementation of the project have been identified as part of the cost estimate.

Indirect Costs

Not applicable.