1. Introduction and Setting

The Semitropic Improvement District of the Semitropic Water Storage District (Semitropic or District) is proposing the Tulare Lake Storage and Floodwater Protection Project, which includes water storage and conveyance facilities in the historic Tulare Lake, groundwater storage in the existing Stored Water Recovery Unit (SWRU) of the Semitropic Groundwater Bank as expanded to previously approved capacities, and the California Department of Water Resources’ (DWR) use of those facilities to achieve Delta ecosystem and other benefits through extension and amendment of the DWR’s existing Banking Agreement and Bank Account with the District. These main elements of the Tulare Lake Storage and Floodwater Protection Project are collectively referred to as “the Project.” The Project, located in Kings and Kern counties (Figure 1-1), will include facilities sufficient to capture and store surplus floodwater from the Kings River and the Sacramento-San Joaquin Delta (Delta) for beneficial uses during drier periods, providing local water supply reliability for Semitropic and public and non-public benefits as defined in the Water Storage Investment Program (WSIP).

The facilities proposed for the Project include water conveyance and surface storage facilities within the historic Tulare Lake to capture, convey, and regulate surplus floodwater from the Kings River and Delta to the Semitropic Groundwater Bank, which has been in operation for nearly 25 years. Floodwater captured from the Kings River and conveyed through the Tulare Lake facilities will be used to increase the local water supply reliability for Semitropic, by directly replacing groundwater pumping and by recharge and storage in the Semitropic Groundwater Bank and neighboring groundwater banking projects. Surplus floodwater from the Delta will be conveyed and stored in the Semitropic Groundwater Bank to provide a water supply for Delta ecosystem and emergency response benefits. Operation of the Project will require integrated coordination of local projects with the State Water Project (SWP) and the Central Valley Project (CVP).

1.1 Project Benefits

The public and non-public benefits and components of the Project are briefly described as follows and will be expanded upon throughout this document. Figure 1-2 shows the geographic extent of Project benefits with respect to SWP and CVP facilities.
Figure 1-1. Project Location Map
1.1.1 Public Benefits

The Water Storage Investment Program (Proposition 1, Water Quality, Supply, and Infrastructure Improvement Act of 2014, Chapter 8) defines public benefits as ecosystem improvements, water quality improvements, flood control benefits, emergency response, and recreation. The capture of surplus Delta flows that can be stored and re-managed in Project facilities will provide Delta ecosystem benefits and emergency response benefits, specifically increased winter-run Chinook salmon production on the Sacramento River. The capture and management of floodwaters on the Kings River and other Tulare Lake tributaries will provide benefits to flood control and recreation. The public benefits, which are detailed in Section 3.1 of this study are as follows:

- Ecosystem improvement to the Delta and the historic Tulare Lake.
- Flood control improvement by reducing flood risks to Prime Agricultural Lands and Disadvantaged Communities within the Kings River and Upper San Joaquin River.
- Recreation improvements in the historic Tulare Lake.
- Emergency response.

1.1.2 Non-Public Benefits

Non-public benefits accrue from the utilization of existing surface water and groundwater conjunctive use projects in Semitropic and other Kern County water districts to capture, regulate, and store floodwaters from the Kings River and other Tulare Lake tributaries for beneficial uses in Semitropic and Kings and Kern counties. The Project will provide a new water supply to offset reduced reliability of SWP deliveries and reduce groundwater overdraft in Kern County through the expansion of existing local and regional groundwater conjunctive use projects. The non-public benefits, which are detailed in Section 3.2 of this report, are as follows:

- Water supply and operational flexibility improvements for the SWP.
- Groundwater banking (overdraft correction) and enhanced conjunctive use between Semitropic and neighboring agencies.
- Improved water quality in the SWP and local groundwater basins.

The Project’s infrastructure includes new facilities to capture and regulate Kings River floodwater under the Tulare Lake Project, as well as existing and expanded surface water in-lieu recharge and recovery facilities in the SWRU. These facilities, both existing and proposed, will support the public and non-public benefits, including improved water supply reliability that will be critical for meeting the requirement of the Sustainable Groundwater Management Act (SGMA) within Semitropic and neighboring districts in Kern County.

1.2 Project Need

The Project was developed in response to Delta ecosystem restoration needs, compliance with SGMA, and reduced reliability of imported SWP supplies contributing to regional groundwater level
declines (groundwater overdraft). The Project would address local and statewide critical water resource management issues described below.

- **Delta Ecosystem Improvements:** The Sacramento River is unique in its support of winter, spring, fall and late-fall run Chinook salmon, and is the only river to support a population of the federally endangered winter-run Chinook Endangered Species Unit (ESU). All runs of native Chinook have undergone population declines in the Central Valley since the mid-1800s, with winter-run experiencing a particularly sharp decline following construction of Shasta Dam (Stillwater 2007, NMFS 2014). Although a host of factors are thought to have contributed to winter-run declines, there are strong indications that poor spawning and egg incubation conditions are a critical limiting factor for the species (Stillwater 2007, CNRA 2017, Martin et al. 2017).

  Winter-run Chinook are unique in that they spawn during summer months when air temperatures reach their annual maximum. This is of special concern in dry and critical water year types when competing demands for water have made it difficult to provide the cold water releases from Shasta Dam required to maintain suitable water temperatures for spawning and egg incubation. Water temperature requirements downstream of Keswick Dam are managed by annual development of Sacramento River Temperature Management Plans. However, competing demands for water in dry and critical water years have prevented maintenance of target water temperatures at temperature compliance points in the spawning reach of the Sacramento River between Keswick Dam and Balls Ferry. Thus, in 2014 and 2015 Keswick flows were insufficient to maintain suitable habitat and water temperatures in excess of the lethal threshold are believed to have contributed to low egg-to-fry survival rates, severely limiting the number of returning adults produced in these years.

  The Project will provide a water supply that will assist managers in surpassing current performance measure criteria for management of water temperatures in the Sacramento River, allowing compliance in dry and critical water years and improving performance as measured under current metrics.

- **Sustainable Groundwater Management Act:** Signed into law in September 2014, SGMA requires achievement of sustainable groundwater management to improve long-term reliability while avoiding undesirable impacts within California’s groundwater basins (including the long-term decline in groundwater elevations and storage). While SGMA grants local agencies substantial new powers to monitor and control groundwater use, it also requires establishing water balances and measurable objectives for the sustainable management of groundwater basins. In the Central Valley portion of Kern County, a collaborative effort is underway to meet the requirements and objectives of SGMA. The Kern Sub-basin of the Tulare Groundwater Basin which has been declared Critically Overdrafted by the DWR. Therefore, the District established itself as a Groundwater Sustainability Agency (GSA) and is working cooperatively with the Kern County Groundwater Authority to achieve compliance with SGMA. The Tulare Lake Project is one component of the District’s Groundwater Sustainability Plan which will
augment its existing surface water supply and enhance the District’s ability to replenish the groundwater basin while continuing to support the District’s existing agricultural base.

- **Reduced State Water Project Reliability**: Restrictions on pumping from the Delta in recent years have significantly and adversely affected the reliability of SWP deliveries. Per DWR’s Draft State Water Project Delivery Capability Report (2015), the SWP is projected to yield only 62-percent of contracted “Table A” volumes, on average, under existing conditions. The District’s contract for SWP water would yield 155,000 AF in a year with a 100-percent allocation. Accordingly, a reduction of 38-percent in the District’s SWP allocation equates to almost 59,000 AF less water available in an average year (under current conditions). Reduced SWP deliveries in recent years has led to increased groundwater extractions, causing a decline in groundwater levels in the basin underlying the District’s service area. Under the proposed Project, the District would amend its existing Groundwater Banking Agreement with DWR which would enhance the District’s ability to reduce its reliance upon Delta exports through operational exchanges with DWR. The District would utilize surplus floodwater from the Delta, stored in the Semitropic Groundwater Bank under DWR’s Groundwater Banking Agreement, in exchange for water that would have been released from Shasta Lake and exported from the Delta to meet the District’s local water supply needs. A similar mechanism has been successfully used for returning banked water to the existing Semitropic Groundwater Banking partners served through the South Bay Aqueduct.

### 1.3 Project Goals and Objectives

The goals of the Project are to construct and operate facilities that will:

1. capture, regulate, and store surplus water from the Delta in Semitropic’s Groundwater Bank for later use to provide public benefits important species and habitat of the Delta ecosystem and emergency response benefits as defined by WSIP, and

2. capture and temporarily store floodwaters and other excess wet-year water supplies from the Kings River and other Tulare Lake tributaries within the proposed surface storage facilities located within the historic Tulare Lake for beneficial water supply use thereby reducing reliance upon groundwater, including direct use for irrigation demands and groundwater recharge.

Fulfillment of these goals will allow Semitropic, in partnership with local and regional water supply entities, the DWR, California Department of Fish and Wildlife (CDFW) and the State Water Resources Control Board (SWRCB), to achieve the following Project Objectives:

- **Statewide Operational Flexibility for Meeting Critical Delta Ecosystem Needs**: The Project’s surface storage, combined with the expansion of groundwater recharge and recovery capacity in the SWRU element of Semitropic’s existing groundwater banking program, allows for capture and banking of surplus Delta flows south of the Delta. Banked surplus Delta water would provide the SWP and CVP operational flexibility for meeting
critical Delta ecosystem needs by allowing either agency via the amended DWR water banking contract to call on this banked water, in-lieu of an equivalent volume scheduled for delivery to Semitropic, thereby making that volume of water available in Shasta reservoirs. The proposed Project identifies increased winter-run Chinook salmon production on the Sacramento River as the primary public benefit. However, the operational flexibility of this program will allow for future adaptive management of this supply to meet other critical ecosystem needs on the Sacramento, Feather, American, and San Joaquin rivers.

- **Improved Local and Regional Water Supply Reliability:** The capture of otherwise lost floodwaters from the Kings River system and floodwaters from Tulare Lake would provide new local and regional water supplies and allow for a reduction in the reliance upon declining groundwater resources. Combined with an expansion of existing groundwater recharge and recovery capacity, the proposed Project provides a critical resource management tool that supports both long-term sustainability for agriculture and reduced groundwater overdraft in the Kern Sub-basin.

- **Expanded Groundwater Conjunctive Use Opportunities:** The Project would expand groundwater conjunctive use opportunities by capturing and regulating floodwaters and other available waters, to existing groundwater banking projects in Kern County, allowing for greater water supply benefits at the local, regional and state levels. The Project will be critical to Semitropic’s and other local districts ability to comply with the SGMA. Furthermore, the Project would enhance local and statewide water systems integration by making water available for banking, exchanges, and transfers with other agencies, including neighboring agencies in Kern County, actions which are covered under the approved National Environmental Policy Act (NEPA) evaluation for the project entitled the *Poso Creek Integrated Regional Water Management Plan: 25-Year Groundwater Banking, Transfer and Exchange Program* and CEQA evaluation entitled *Groundwater Banking and Exchanges within the Poso Creek Plan Area*.

- **Flood Risk Reduction:** For the benefit of local communities, including those impacted by subsidence, additional protection from flooding is provided by diversion of floodwaters from the Kings River and other local rivers to storage within the now dry Tulare Lake. Communities directly benefiting from the Project include Firebaugh and Tranquility on the San Joaquin and Kings rivers, respectively. The Project will benefit agricultural lands within the now reclaimed Tulare Lake, through the Projects’ capacity to capture floodwater that would otherwise be impact these reclaimed lands during high flood events.

- **Emergency Response:** In addition to supplying banked Delta water stored in the Semitropic Groundwater Bank for ecosystem benefits, the Project can also supply water for public health and safety as an emergency response during drought emergencies at the request of DWR instead of supplying water for ecosystem benefits.

- **Improved Environmental and Recreational Areas:** The now dry Tulare Lake was once the largest freshwater lake west of the Mississippi River but presently supports only marginal
wetlands and marshes. The Project would support waterfowl and migratory bird populations along the Pacific Flyway, and enhance recreational birdwatching opportunities for area residents and outdoor-oriented tourists.

1.4 Project Background

1.4.1 Sacramento-San Joaquin Delta Ecosystem

The adult populations of four Sacramento River salmon runs, including winter-run Chinook, and other important fish species that spawn in the upper Sacramento River have considerably declined over the last 40 years. Several fish species in the upper Sacramento River have been listed under the Federal Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered), Central Valley spring-run Chinook salmon (threatened), Central Valley steelhead (threatened), and the Southern Distinct Population Segment of North American green sturgeon (threatened). Two of these species are also listed under the California Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered) and Central Valley spring-run Chinook salmon (threatened). Construction and operation of the Tulare Lake project would provide Shasta Lake storage sufficient to make ecological flow releases to increase production of Sacramento River Winter-run Chinook (*Oncorhynchus tshawytscha*) during dry and critical water years.

High summer water temperatures are a critical limiting factor for Sacramento River Winter-run Chinook, especially in dry and critical water years. Water temperatures that are too high can be detrimental to various life stages of Winter-run Chinook. Elevated water temperatures can negatively impact holding and spawning adults, egg viability and incubation, preemergent fry, and rearing juveniles and smolts, significantly diminishing the next generation of returning spawners. Stress caused by high water temperatures also may reduce the resistance of fish to parasites, disease, and pollutants.

Development of incubating Chinook salmon eggs is heavily influenced by water temperature with temperature-induced mortality increasing above a critical threshold of 13.4 °C. Water temperature requirements of incubating eggs in the spawning reach between Keswick Dam and Balls Ferry are managed by annual development of Sacramento River Temperature Management Plans. However, competing demands for water in dry and critical water years have prevented maintenance of target water temperatures at temperature compliance points in this spawning reach. In 2014 and 2015 water temperatures in excess of the lethal threshold are believed to have contributed to low egg-to-

<table>
<thead>
<tr>
<th>Delta Ecosystem Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Project will integrate with the existing CVP/SWP system to effectively store and utilize surplus Delta flows to improve the survival of threatened and endangered salmonid species in the Delta.</td>
</tr>
</tbody>
</table>

By improving instream flow conditions under this project:
- Water temperatures will improve
- Egg-to-fry survival will increase
- More adult salmon return to spawn

The project can provide improved instream conditions during dry and critical water years, when it is most ecologically important.
fry survival rates of 5.6% and 4.2%, respectively (by comparison, mean egg-to-fry survival = 22.7%, 2002 – 2016).

Various Federal, State, and local projects are addressing factors contributing to declines in anadromous fish populations. Recovery actions range from changing the timing and magnitude of reservoir releases to structural changes at Shasta Dam. Despite these steps, further action is needed to address anadromous fish survival in the upper Sacramento River.

### 1.4.2 California’s Water Storage Investment Program

In November 2014, California voters overwhelmingly approved Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014 affirming the need for a safe and reliable supply of water to support the state’s economy, environment, and quality of life. The bond includes $2.7 billion for public benefits of water storage projects that provide measurable benefits to the Delta ecosystem or its tributaries. The California Water Commission (CWC), through WSIP, will fund the public benefits of eligible water storage projects. Public benefits are defined as ecosystem improvements, water quality improvements, flood control benefits, emergency response, or recreational purposes.

Water storage has played a key role in California where the quantity, timing, and location of water demand frequently does not match natural water supply availability. Water storage is fundamental to managing variability in water supply for human purposes and is a critical tool for providing water management flexibility in California. A water balance analysis presented in the California Water Plan Update 2013 indicates that in an average water year like 2010, the total water used in California was just over 40 million acre-feet (MAF) of which about 23 MAF (approximately 58%) came from surface water and about 15 MAF (approximately 38%) came from groundwater. Both surface storage and groundwater storage are critical to meeting the State’s water needs.

Water storage projects can provide a robust set of benefits, including water supply reliability for municipal and industrial uses, agriculture, and ecosystem purposes. Surface storage can also provide water to improve flow regimes and temperatures to increase fish survival in rivers and the Delta; flood storage space; water quality improvements; hydropower generation; and recreation. Groundwater storage can provide groundwater recharge.
and subsidence avoidance or stabilization. Conjunctively managed storage projects can provide all or many of these benefits. Storage can act as an integrator of strategies to improve water supply reliability and provide other benefits. Improving water supply reliability depends upon the ability to capture and store water during peak flows and during wet years.

### 1.4.3 Local Water Supply Reliability

Semitropic was organized in 1958 in response to a long-term decline in groundwater levels to provide supplemental water for irrigation within its service area. Prior to its formation, landowners within what would become the District’s service area, relied exclusively on groundwater. Semitropic is one of a few water storage districts in California and is located in north-central Kern County in the San Joaquin Valley, about 20 miles northwest of the City of Bakersfield (Figure 1-1). The District currently covers an area of more than 221,000 acres (or 345 square miles), with about 138,000 acres of irrigated land. (Note, the irrigated area varies from year to year.) Semitropic is located within DWR Groundwater Basin No. 5-22.14 (San Joaquin Valley Groundwater Basin, Kern County Subbasin).

The District formulated, adopted, and implemented a project in the late 1960s and early 1970s to import surface water from the SWP, thereby reducing the District’s reliance on groundwater. The District began importing water from the SWP in or about 1973 under its “member unit” sub-contract with the Kern County Water Agency (KCWA), which has a long-term SWP water supply contract with DWR for about 983,000 AF of SWP Table A water (the maximum amount of SWP water that each contracting agency can receive in a specific year is presented in a document published by DWR known as Table A). The District’s SWP water contract was for 158,000 acre-feet per year (AFY) of SWP Table A water, but was subsequently reduced to its current allocation of 155,000 AFY due to the District permanently relinquishing 3,000 AFY to acquire an interest in the Kern Water Bank Authority. The District is a member entity of the Kern Water Bank Authority and, as such, has rights to use the Kern Water Bank for water storage and recovery, including its SWP water supplies, delivered through the California Aqueduct.

The District’s primary source of surface water is imported SWP water, which is conjunctively managed with the underlying groundwater. From time to time – mostly during “wet” years – other, less reliable supplies have been delivered to the District, including surface water from Poso Creek, the Kern River, and Friant-Kern water. The District’s water sources are primarily used within the District’s boundaries for a wide variety of agricultural crop purposes. Pumped groundwater and/or surface water supplies are conveyed to lands within the District’s Semitropic Improvement District (including the Pond-Poso Improvement District and Buttonwillow Improvement District), SWP contract water service areas (consisting of about 44,000 irrigated acres) and Semitropic Banking Project in-lieu water service areas (consisting of about 39,000 irrigated acres, excluding the SWRU areas). The District also provides another approximately 25,000 irrigated acres with temporary surface water service, and approximately 40,000 acres of irrigated acres with only groundwater. However, this area would reduce by the addition of the SWRU’s in-lieu facilities, which would provide surface water service to up to approximately 13,000 of those 40,000 acres.
Year round, in addition to storing water in various groundwater banks as described below, the District imports supplemental water (mostly SWP supplies) principally for irrigation uses within its boundaries. This water is used to irrigate about 135,000 to 145,000 acres (the total varying annually) through a system of canals, pipelines and associated facilities; the District’s irrigated acreage has remained stable, despite fluctuations in water availability. Of this irrigated acreage, approximately 110,000 gross acres are served with surface water, and about 40,000 acres are totally reliant on groundwater (with plans to extend surface water connections to some of those lands). The amount of water needed to irrigate crops within the District can be as much as approximately 350,000 to 400,000 AF, annually. The District’s available surface water supplies have recently ranged from 234,655 AF (in 2011, a wet year) to 32,179 AF (2016, a critically dry year). Existing crops include almonds, pistachios, grapes, fruits and vegetables, nursery, cotton, alfalfa, and grain/pasture.

With regard to environmental uses, in or about 1992, Semitropic established a Wildlife Improvement District (WID). The WID covers approximately 34,000 acres and includes most of the Kern National Wildlife Refuge and various local duck clubs, both of which are served with water by Semitropic for environmental purposes.

In the mid-1990’s, the District developed the Semitropic Groundwater Bank to provide long-term underground storage of surplus water to its Banking Partners, and conversely to counteract declining groundwater levels associated in part with the increasing unreliability of SWP supplies due to regulatory requirements associated with conveying water through Delta and other factors. Water from SWP entitlements that is surplus to the immediate needs of the Banking Partners is brought into the District’s Service Area via the California Aqueduct and stored within the Semitropic Groundwater Bank for later use. During dry years, stored water is recovered and conveyed to District facilities for distribution within the District’s service area to replace the District’s entitlement water which is in turn released to its Banking Partners, and/or directly to the California Aqueduct, for delivery to its Banking Partners. The banking of supplemental surface waters in the aquifers underlying the District’s service area provides an effective way to reduce short-term groundwater level declines. Since its inception, the Semitropic Groundwater Bank has stored

### Local Water Supply Reliability

Irrigated agriculture demand within Semitropic is estimated at: 375,000 acre-feet

The reliability of the District’s primary surface water resource, the SWP, has steadily decreased since the SWP began deliveries in the early 1970’s.

The SWP estimates its long-term average annual delivery to be 62% of Table A entitlements. Meaning Semitropic can expect an annual average SWP delivery of: 96,100 acre-feet

Groundwater pumping to meet the estimated irrigation demand in the District is: 278,900 acre-feet

The Project will develop a supplemental surface water supply with estimated average annual yield of up to: 120,000 acre-feet

This Project is critical to the District’s strategy improving local water supply reliability and for compliance with SGMA. The Project will reduce the District’s estimated average groundwater demand by 43%.
over 1.75 million AF of which 1.08 million AF has been recovered on behalf of the Banking Partners.

1.4.4  **Project Planning Horizon**

As required under WSIP, analyses conducted must include without-project future conditions at 2030 and 2070, unless there are certain milestone years for which an individual project is expected to reach a breakpoint or change that would require an analysis of the changed conditions, outside the 2030 and 2070 conditions. The Project has an expected project life of 100 years; thus, the Project’s effects are evaluated for 2030 and 2070 conditions to assess public and non-public benefits over the expected project life.

1.5  **Integration with Water Storage Investment Program Goals and California Water Action Plan Objectives**

In November 2014, California voters approved Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Water Code, §§ 79700-79798) to provide funding to meet the three broad objectives of the California Water Action Plan:

- More reliable water supplies
- Restoration of important species and habitat
- A more resilient and sustainably managed water infrastructure

Chapter 8 of Proposition 1 appropriated $2.7 billion to the CWC to fund public benefits associated with water storage projects that improve the operation of the state water system, are cost effective, and provide a net improvement in ecosystem and water quality conditions.

The proposed Project, through the nature of the public and non-public benefits provided through the capture and regulation of floodwater from the Delta, the Kings River and other Tulare Lake tributaries, integration with Semitropic’s existing groundwater banking and conjunctive use project, expansion of Semitropic’s SWRU groundwater recharge and recovery capacities and operational flexibility provided through integration with SWP and CVP facilities, will contribute to meeting the specific goals and objectives set forth under WSIP and the California Water Action Plan. The CWC has established overarching goals for WSIP that represent the values of the CWC and help achieve the desired out comes of the California Water Action Plan. These goals are listed below along with a description of Project’s contribution to each goal.

**Provide for a transparent public process.**

The Semitropic Water Storage District has been an active participant in the CWC’s public hearing and workshop process and submitted a Concept Paper to the Commission in March 2016. Semitropic released a Public Draft Environmental Impact Report for the Project in August, 2017. The District will actively engage in the CWC application review process.
Maximize the expected return for public investment as represented by the magnitude of public benefits.
This Project will generate estimated public benefits of approximately $735 million under 2030 conditions and $589 million under 2070 conditions. The public benefits directly linked to Delta Ecosystem improvements range from $636 million under 2030 conditions, which is approximately 86-percent of the total public benefits to $514 million under 2070 conditions which is equivalent to approximately 87-percent of the total public benefits.

Given the magnitude of the public benefits and the conjunctive use nature of the Project, Semitropic is requesting $452 million of the Prop 1 funds which is equivalent to 75-percent of the total project cost of $603 million. This provides a cost benefit ratio of 1.6 and 1.3 for 2030 and 2070 conditions, respectively, for the State’s investment in ecosystem restoration through integration with groundwater storage and conjunctive use in the San Joaquin Valley and water supply during drought emergency.

Support the co-equal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.
This Project will capture an annual average of 120,000 acre-feet (AF) of the 201,000 AF of average annual water supply that is currently leaving the Kings River system which will dramatically improve the local water supply reliability for the vital agricultural economy of the San Joaquin Valley. This water supply will be generated from the capture of floodwater, currently unmanaged and the cause of local flooding, which is lost to the basin as outflow to the San Joaquin River during conditions of surplus flow throughout the Central Valley. In addition, the capture and storage of surplus Delta flows will generate an estimated 20,000 AF in dry and critically dry years for the benefits of Delta’s ecosystem, specifically the enhancement of cold water released below Shasta and Keswick Dams to increased winter-run Chinook salmon production in the Sacramento River system. For the water year 2017, approximately 700,000 AF of flood water has left the Kings River system.

Improve water supply reliability in average and dry years for all purposes through water storage projects.
The Project will expand Semitropic’s existing groundwater banking program through the buildout of previously approved recharge and recovery facilities with the expansion of the SWRU. This will allow the District to recharge greater amounts of water in wet years, specifically surplus flows from the Kings River and the Delta. This banked water will then be available for use in dry years to meet agricultural demands, but will also improve groundwater level in the local area to reduce regional overdraft and assist in avoidance of subsidence, while also improving the reliability of groundwater in disadvantaged communities in Kern County.

Increase local and regional water supply reliability (i.e., “self-reliance”); thereby, reducing reliance on water supplies conveyed through the Delta.
The ability to bank water in the Semitropic Groundwater Bank, will incrementally reduce the District’s needs for supplemental water supplies from the Delta or Northern California during drier periods while enhancing the District’s ability to capture water in wet periods.
Promote and provide incentives for integrated, multi-benefit projects.
The Project provides a range of benefits such as the water supply and Delta ecosystem benefits described above. In addition, the Project will provide:

- **Local flood control** for the communities of Corcoran, Firebaugh and Tranquility and for local agricultural lands in the Tulare Lake area.

- **Recreational benefits** in the form of bird-watching opportunities associated with the periodic inundation of more than 10,000 acres of the historic Tulare Lake, located on the Pacific Flyway near the Kern National Wildlife Refuge.

- **Emergency response** benefits provided by making a portion of the banked Delta water supply stored in the Semitropic Groundwater Bank available for emergency supplies at the request of DWR. In addition to utilizing banked supply for ecosystem benefits, this banking account can be used to fulfill critical human needs for safe drinking water in the San Joaquin Valley during a shutdown of Delta exports.

- Expansion of **groundwater banking and conjunctive use** in the San Joaquin Valley and the reduction of groundwater overdraft and avoidance of subsidence as caused by over drafting the basin.

- Improved **water quality** in the California Aqueduct when Kings River water is being imported. The headwaters of the Kings River watershed originate at elevations above 13,000 feet and its runoff is of superior quality to that of Delta exports. Water quality improvements in the California Aqueduct will reduce water treatment cost for downstream municipalities and improve the quality of water being recharged to groundwater.

Promote integration of projects that will collectively provide benefits that are greater in sum than of those provided by the individual projects.

As proposed, and detailed in this report, the Project will store surplus floodwater from the Delta and the Kings River for use during drier periods. The management, storage, and benefit of Kings River water will be facilitated through integration with SWP and local conveyance facilities and with other local Kern County groundwater conjunctive projects. Such conjunctive projects include the Poso Creek Integrated Regional Water Management Plan (IRWMP), which enables the District to bank, transfer, and exchange water with the SWP, CVP, and Kern River entities. The management, storage, and benefit of Delta surplus water will be integrated with SWP and CVP facilities to improve salmon spawning conditions in the upper Sacramento River during dry and critical years.

Maximize system resiliency to ensure public benefits are provided in an uncertain future (e.g., under climate change scenarios).

The ability to opportunistically capture and store surplus Delta flow in the Semitropic Groundwater Bank and, at a future time, extract and exchange that banked water in lieu of release from Shasta Lake provides an extraordinary amount of flexibility and resiliency for meeting future critical ecosystem needs. The proposed Public Benefit scenario adopted for this application process, could easily be altered in the future to provide release from Oroville, Folsom, or Millerton reservoirs to satisfy future ecosystem needs.
1.6 Expected Return for Public Investment

1.6.1 Public Benefit Ratio and Non-Monetized Public Benefits

The project will provide multiple public benefits in return for the State’s investment (summarized in Table 1-1 and further detailed in Chapter 3) resulting in an overall public benefit ratio of 1.6 for 2030 conditions and 1.3 for 2070 conditions.

Table 1-1. Summary of Project Benefits

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Flood Control</th>
<th>Emergency Response</th>
<th>Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetized</td>
<td>Monetized</td>
<td>Monetized</td>
<td>Monetized</td>
</tr>
<tr>
<td>Magnitude (additional adult returns over Life of Project)</td>
<td>Magnitude (seasonal or intermittent shallow open-water habitat) (acres)</td>
<td>Total Maximum Flood Damage Reduction</td>
<td>Magnitude (AF) Value</td>
</tr>
<tr>
<td>2030 Benefit</td>
<td>6,355</td>
<td>$635,520,000</td>
<td>10,240</td>
</tr>
<tr>
<td>2070 Benefit</td>
<td>5,140</td>
<td>$513,990,000</td>
<td>10,240</td>
</tr>
</tbody>
</table>

1.6.2 Relative Environmental Value

Ecosystem benefits provided by summer flow releases directly address two of the ecosystem objectives defined by CDFW (Ecosystem Priorities 1 and 5) while also addressing all of the Relative Environmental Values (REV’s) as described by CDFW. The project would also peripherally address Ecosystem Priorities 4, 7, 9, 10, 11, 14, and 16 as described in Tables 1-2 and 1-3.

Table 1-2. CDFW Ecosystem Priorities Addressed by the Project

<table>
<thead>
<tr>
<th>Ecosystem Priority or REV</th>
<th>Benefit Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1: Provide cold water at times and locations to increase the survival of salmonid eggs and fry.</td>
<td>Flows provided in the summer of dry and critical water year types will provide cold water for egg and fry survival. This will result in a 13.8% increase in adult returns annually</td>
</tr>
<tr>
<td>P4: Improve ecosystem water quality.</td>
<td>Water quality will be improved by providing supplemental flows to reduce water temperature in the Keswick Dam to Airport Road reach of the Sacramento River. Flow is one of the main management controls on instream water temperatures in this reach of the Sacramento River. Egg incubation habitat quality is improved by reducing water temperatures below the critical temperature for incubating winter-Run Chinook eggs. This in turn will</td>
</tr>
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ES-15
increase the egg-to-fry survival rate of winter-run Chinook in years in which a flow release is made.

Ecological flows resulting from the project could be used to increase dissolved oxygen and reduce water temperature to benefit all species of anadromous fish during key passage periods. Flow magnitude is not likely to vary between dry and critical water year types and is forecasted to be approximately 20,000 acre-feet distributed over an appropriate duration to suit critical fish passage needs. The project also makes available releases of 1,000 – 18,000 acre-feet in an additional 1 – 3 years of partial recovery operations depending on future meteorological conditions.

Additional Delta outflow resulting from the Project will originate at Shasta Lake and flow downstream into the Delta where it will provide an increase in low salinity habitat over baseline conditions for the life the Project under 2030 and 2070 conditions.

Ecological flows resulting from the project could be used to increase the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species by releasing Project water to supplemental high flow events, inundating more riparian or floodplain habitat.

Flows would benefit approximately 18 miles of prime spawning habitat along 18 miles of the Sacramento River, below Keswick Dam. Providing cold water will support incubating winter-run Chinook eggs during the 60-day peak timing of the egg incubation period.

Ecological flows resulting from the project could be used to improve the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species by releasing Project water to supplemental high flow events, inundating more riparian or floodplain habitat.

Ecological flows resulting from the project could be used to improve the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species by releasing Project water to supplemental high flow events, inundating more riparian or floodplain habitat.

Salmon are the most commercially, recreationally, scientific and educationally important fish species in California. Increasing their survival is in the State’s interest.

Nine ecosystem priorities are addressed by the project and priority 1 is monetized.

The Project will provide increased flows for incubating winter-run Chinook eggs during the 60-day peak timing of the egg incubation period. This will result in a 13.8% increase in adult returns annually. Timing of the release can be coordinated via existing management teams to

<p>| Table 1-3. Relative Environmental Values |
|-----------------------------------------|---------------------------------------------------------------------------------|
| REV 1: Number of ecosystem priorities addressed by the project. | Nine ecosystem priorities are addressed by the project and priority 1 is monetized. |
| REV 2: Magnitude of ecosystem improvements. | The Project will provide increased flows for incubating winter-run Chinook eggs during the 60-day peak timing of the egg incubation period. This will result in a 13.8% increase in adult returns annually. Timing of the release can be coordinated via existing management teams to |</p>
<table>
<thead>
<tr>
<th>REV 3: Spatial and temporal scale of ecosystem improvements.</th>
<th>Optimize the resulting benefits to incubating winter-run eggs. Flow magnitude is not likely to vary between dry and critical water year types and is forecasted to be approximately 20,000 acre-feet distributed over a 60-day period, equivalent to an additional 168 cfs per day for 60 days. The project also makes available releases of 1,000 – 18,000 acre-feet in an additional 1 – 3 years of partial recovery operations depending on future meteorological conditions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>REV 4: Inclusion of an adaptive management and monitoring program that includes measurable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits.</td>
<td>Flows would benefit approximately 18 miles of prime spawning habitat along 18 miles of the Sacramento River, below Keswick Dam. The Sacramento River from Keswick Dam to Airport Road has on average supported ~99% of total winter-run redds over the period 2001 – 2011. This location is critical to production of juvenile winter-run salmon and has exhibited lethal water temperatures in critical and dry water year types during the egg incubation period.</td>
</tr>
<tr>
<td>REV 5: Immediacy of ecosystem improvement actions and realization of benefits.</td>
<td>The timing and the size of the supplemental flows provided in the winter-run Chinook spawning reach of the Sacramento River are intended to be adjusted by the existing Sacramento River Temperature Management Plan team to optimize the resulting ecosystem improvements. Annual monitoring and evaluation of biological, hydrological and meteorological factors affecting winter-run egg survival in the Sacramento is anticipated to guide management of benefits in accordance with existing objectives and performance measures.</td>
</tr>
<tr>
<td>REV 6: Duration of ecosystem improvements.</td>
<td>The project would be fully constructed by the end of year 2024 and construction would take approximately 3-5 years. Benefit flows would be available immediately upon completion of project construction and entry into a banking agreement with DWR, during the first dry or critical year that occurs.</td>
</tr>
<tr>
<td>REV 7: Consistency with species recovery plans and strategies, initiatives, and conservation plans.</td>
<td>The ecosystem improvement will occur continually in all dry and critical water year types over the 100-yr life of the Project.</td>
</tr>
<tr>
<td>REV 8: Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values.</td>
<td>Project ecosystem improvements will help support implementation of DEL-1.6, SAR-1.2, SAR-1.4, of the NOAA Fisheries Recovery Plan for Sacramento River winter and spring-run Chinook salmon and Central Valley steelhead by providing additional flows to improve the quantity and quality of floodplain habitats for anadromous fish.</td>
</tr>
<tr>
<td>REV 9: Efficient use of water to achieve multiple ecosystem benefits.</td>
<td>Flows would benefit approximately 18 miles of prime spawning habitat along 18 miles of the Sacramento River, below Keswick Dam.</td>
</tr>
<tr>
<td></td>
<td>Water released in the Sacramento River would be managed in accordance with all regulatory and State/Federal water operations criteria governing the SWP/CVP system. The location of releases can be adaptively managed in order to meet critical ecosystem needs in other watersheds, if necessary.</td>
</tr>
</tbody>
</table>
The project is not providing any public benefits related to water quality, thus water quality benefits are not quantified in this application.

1.6.3 **Resiliency**

The Project as conceived is structured to provide maximum flexibility and resiliency as needed to manage irregular water supplies. This flexibility and resiliency is accomplished by providing storage and conveyance capacity at the local, regional and state levels to capture and store floodwater from the Kings River and the Delta. The Project is designed to opportunistically capture and store water during period of surplus flow, a condition that is becoming less frequent, while at the same time providing the greatest opportunities for augmenting our current water supplies.

Based on both historic flow data and future hydrologic forecasts (provided by the CWC for WSIP), the Project is able to provide both a local/regional water supply from the Kings River as well as public benefitting water supplies from the Delta. Both of these supplies would be stored in the Semitropic Groundwater Bank, which has been successfully operating for past 25 years. Increased groundwater recharge and recovery capacity through the expansion of the SWRU will provide additional capacity to manage floodwaters and to recovery bank supplies during periods of need. The Project also includes, through existing agreements and completed environmental compliance, access to regional groundwater banking facilities that can be integrated as needed to manage available floodwaters.

The certainty of future hydrology, particularly under the influence of climate change, is challenging for all water management projects. The design and proposed operation of the Project will allow Semitropic and DWR to take advantage of surplus floodwaters on Kings River and those entering the Delta from either San Joaquin or Sacramento Rivers so they can provide water supply reliability and ecosystem benefits during periods of drought. It is certain that despite changes in future hydrology, floods will occur and floodwater will be available for those projects that have the capacity to capture and regulate that water into groundwater banking projects, such as Semitropic’s. The Project’s integration with the SWP also provides impressive flexibility to manage and exchange banked water to nearly every major Central Valley reservoir operated by the SWP or CVP.

1.6.4 **Implementation Risk**

The proposed Project includes water storage and conveyance facilities in the historic Tulare Lake, expansion of the existing SWRU groundwater recharge and recovery capacities of the Semitropic Groundwater Bank, and the California Department of Water Resources’ (DWR) use of those facilities to achieve Delta ecosystem and other benefits through extension and amendment of the DWR’s existing Banking Agreement and Bank Account with the District. The Feasibility Study
provides details regarding the technical and environmental feasibility (Chapter 6 - Constructability) and the financial and economic feasibility (Chapter 7 – Project Cost and Economic Feasibility).

The proposed Tulare Lake facilities have been planned and designed to the 10-percent level and engineering and design will continue in the coming year. The District has already entered into an easement purchase agreement with a landowner for the property necessary to construct all of the required facilities. The District has also filed a water rights application for Kings River floodwaters and is in active discussions with Kings River interests regarding joint floodwater management. The DEIR for the Tulare Lake facilities was released on August 14, 2017. The DEIR did not identify any significant and unavoidable impacts for the Project. From a technical and environmental feasibility perspective, the Tulare Lake component of the Project do not pose any significant risk to implementation.

Completed in 2007, SWRU Phase 1 included a turnout at the California Aqueduct, 38,000 linear feet (LF) of 120” transmission pipeline and the Junction Facility, and these facilities provided a two-way water conveyance system between the District and the Aqueduct. The SWRU facilities will be expanded under the Project to accommodate recharge and recovery capacity for an amended DWR contract. Phase 2 of the SWRU will need to be partially constructed to support the Project. Phase 2 of the SWRU facilities have been designed to the 60-percent level. The EIR and supplements have been certified by the District and do not identify any significant or unavoidable impacts.

To facilitate a banking account to support the development of a water supply for ecosystem benefits, an existing groundwater banking agreement between DWR and the Semitropic Groundwater Bank will be amended to extend the term of the contract and to specify recharge and recovery capacities and banking volumes for DWR’s banking account. In discussions with DWR’s State Water Project Analysis Office, Semitropic received indication that amending the existing contract could be easily accomplished and did not pose a risk for implementation.

The most significant risk to implementation is hydrology. This project, like all water resources projects, are subject to changing and variable hydrologic conditions. It is certain, however, that California will continue to see flood conditions as part of any future climate scenario. And it is likely that flood conditions become more prevalent as temperatures increase. The Project will provide operational flexibility to allow water resources managers to take advantage of flood conditions to capture surplus Delta flows and Kings River floodwater to bank them for use in later years. This operational flexibility will increase the likelihood that the Project will be able to perform under future conditions.