Chapter 2 Project Description and Alternatives

This chapter describes the Project and alternatives analyzed in this Final EIR/EIS. The Project would consist of the implementation of Alternative 1, 2, or 3, and a No Project Alternative/No Action Alternative would represent the continuation of existing conditions. These alternatives were developed in accordance with the CEQA objectives and the NEPA purpose and need as described in Chapter 1, *Introduction*. The appendices to this chapter provide additional supporting information and are referenced where relevant.

2.1 Alternatives Development Process

The range of alternatives evaluated in the EIR/EIS is the product of an extensive screening process that has included extensive public input and involvement. This process has spanned several decades and involved multiple distinct water resource planning efforts. The planning efforts considered a wide variety of factors, including the feasibility of implementation and opportunities for reducing potentially significant environmental impacts while meeting the Project's CEQA objectives and NEPA purpose and need. See Appendix 2A, *Alternatives Screening and Evaluation*, and Appendix 2B, *Additional Alternatives Screening and Evaluation*, for information on alternatives considered but eliminated and the alternatives that are evaluated in this document.

2.1.1 Evaluation Prior to 2019

Beginning in 1995, CALFED initiated the evaluation of expanded surface water storage in the Sacramento and San Joaquin Valleys. This assessment was part of a long-term comprehensive plan to restore the ecological health of the Delta and improve water management to protect beneficial uses in the Delta and its watershed. CALFED initially identified more than 50 potential surface storage locations during development of its EIR/EIS and retained several reservoir locations statewide for further study. The screening criteria applied to the potential locations indicated a preference for offstream surface water storage to avoid redirected impacts on aquatic species in the primary tributaries of the Delta.

Following the CALFED Record of Decision (ROD) for the EIR/EIS in 2000, the California Department of Water Resources (DWR) and Reclamation continued to evaluate potential locations for a reservoir on the western side of the Sacramento Valley as part of the Surface Water Storage Investigation (Bureau of Reclamation and California Department of Water Resources 2006). The objectives of this effort were to formulate a project that would enhance water management flexibility in the Sacramento Valley, increase the reliability of surface water supplies in California, and provide storage and operational benefits to enhance water supply reliability and improve water quality and ecosystems. The results of the investigation identified four potential options: Red Bank (Dippingvat and Schoenfield Reservoirs), Newville Reservoir, Colusa Reservoir, and Sites Reservoir. These four reservoir options were evaluated against additional screening criteria. This secondary screening determined that the Sites Reservoir location was the most conducive to meeting the goals and objectives of the Surface Water Storage Investigation while minimizing environmental impacts and providing the greatest potential benefits.

The Surface Water Storage Investigation also evaluated a variety of water sources and associated conveyance options that included diversions from the Colusa Basin Drain (CBD), Sacramento River, and local tributaries. The evaluation process culminated in the selection of the existing TC Canal and GCID diversion and conveyance facilities and the addition of a new pipeline from the Sacramento River near the Moulton Weir (i.e., Delevan Pipeline). These facilities were determined to be the most reliable and capable of meeting the goals and objectives of the Surface Water Storage Investigation.

The 2017 Draft EIR/EIS evaluated four surface water reservoir size and conveyance alternatives. All alternatives included a Sites Reservoir to be filled using existing Sacramento River diversion facilities and the new Delevan Pipeline to allow for release and diversion of flows to and from the Sacramento River. Associated facilities for all alternatives were generally similar but varied in location and size. Appendix 2B contains a detailed comparison of the Project evaluated in this Final EIR/EIS and the alternatives analyzed in the 2017 Draft EIR/EIS.

In August 2017, the Authority submitted a Water Storage Investment Program (WSIP) application to the California Water Commission (CWC) to determine the eligibility for funding under Proposition 1. The WSIP application evaluated the technical, economic, financial, and environmental feasibility of constructing and operating Sites Reservoir. The CWC made nine specific determinations, including the determinations that the Sites Reservoir would provide a net ecosystem improvement, would provide measurable improvements to the Delta ecosystem, and would advance the long-term objectives of restoring the ecological health of the Delta and improving water management to protect beneficial uses in the Delta and its watershed. The CWC conditionally approved $816 million in Proposition 1 funding (California Water Commission 2021).

2.1.2 Value Planning Process and Alternatives Post-2019

In October 2019, the Authority pursued a value planning process to determine if further refinements to the alternatives in the 2017 Draft EIR/EIS were warranted. Between October 2019 and April 2020, the Authority considered previous input from state and federal agencies, non-governmental organizations, elected officials, landowners, and local communities, and decided to "right size" the Project to better meet the needs of Storage Partners[1], the statewide water supply, and the environment. Multiple alternatives were considered during the value planning process that took into consideration the public and agency comments received on the 2017 Draft EIR/EIS (Sites Project Authority 2020). The primary objectives of this process were to:

[1] The Storage Partners consist of the governmental agencies, water organizations, and other entities who are funding the Project and who are receiving a storage allocation in Sites Reservoir and the resulting water supply or water supply-related environmental benefits from the Project. Storage Partners could include local agencies, the State of California, and the federal government. https://sitesproject.org/participants/

- Improve water supply and water supply reliability;
- Provide Incremental Level 4 water supply for refuges;
- Improve the survival of anadromous fish; and
- Enhance the Delta ecosystem.

The secondary objectives of the value planning process were to provide opportunities for flood damage reduction and recreation.

Value planning alternatives combined different types and sizes of diversion, release, reservoir, road, and bridge facilities. The Authority analyzed operational, environmental, and permitting considerations for different alternatives. For example, operational considerations included the ability of several reservoir sizes and conveyance capacities to meet Storage Partner subscriptions and participation by the State of California through WSIP. Environmental considerations included reducing the footprints of facilities or eliminating facilities to avoid or minimize impacts and reducing the amount of water diverted to storage. In addition, the Authority evaluated the costs of facilities associated with each value planning alternative to understand whether each alternative achieved a reasonable cost-per-acre-foot that the Storage Partners could support to ensure that the Sites Reservoir was economically viable.

The value planning process identified three recommended alternatives. Alternative Value Planning (VP) 5 involved a 1.3 million-acre-foot (MAF) reservoir and used an existing regulating reservoir (Funks Reservoir) and a new regulating reservoir (the Terminal Regulating Reservoir [TRR]) to fill Sites Reservoir with releases (1,000 cubic feet per second [cfs]) from the southern end of the TC Canal through a pipeline that went to the CBD. Alternative VP 6 was similar to Alternative VP 5, but the releases from the southern end of the TC Canal were conveyed through a pipeline that extended to the Sacramento River. Alternative VP 7 was similar to Alternative VP 5 but included a 1.5-MAF reservoir. The value planning process culminated in a Value Planning Report that was adopted by the Authority in April 2020 (Sites Project Authority 2020). As described in Section 2.3, *Overview of Alternatives*, Alternatives 1, 2, and 3 in this Final EIR/EIS are based on Alternatives VP 5, VP 6, and VP 7 in the Value Planning Report.

2.2 CEQA and NEPA Requirements

2.2.1 CEQA Requirements

The Authority, as the CEQA lead agency, is responsible for the development of alternatives that meet CEQA requirements. Section 15126.6 of the CEQA Guidelines requires that:

- An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. An EIR is not required to consider alternatives which are infeasible.

- The range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects.
- The specific alternative of “no project” shall also be evaluated along with its impact.
- The EIR should briefly discuss the rationale for selecting the alternatives to be discussed. The EIR should also identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency’s determination. Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are:
    - Failure to meet most of the basic project objectives
    - Infeasibility
    - Inability to avoid significant environmental impacts

This Final EIR/EIS was prepared in accordance with NEPA and CEQA, with Alternatives 1, 2, and 3 analyzed at an equal level (consistent with NEPA standards).

2.2.2 NEPA Requirements

Reclamation, as the federal lead agency, is responsible for the development of alternatives that meet NEPA requirements. For project alternatives, including the proposed action, NEPA requires that federal government agencies shall (40 Code of Federal Regulations Section 1502.14):

(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

(c) Include reasonable alternatives not within the jurisdiction of the lead agency.

(d) Include the alternative of no action.

(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.

(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.

2.3 Overview of Alternatives

The Project would use existing infrastructure to divert unregulated and unappropriated flow from the Sacramento River at Red Bluff and Hamilton City and convey water to a new offstream Sites Reservoir west of the community of Maxwell, California. New and existing facilities would move water into and out of the reservoir. Releases from Sites Reservoir would ultimately return to the Sacramento River system via existing canals and a new pipeline located near Dunnigan. Construction of the Sites Reservoir would necessitate building a bridge across the reservoir or constructing a bypass road (i.e., South Road) to connect Maxwell with the community of Lodoga. Additional components would include development of new recreational facilities at the reservoir. This Final EIR/EIS evaluates the potential environmental effects of:

- No Project Alternative
- Alternative 1, 1.5-MAF reservoir, bridge, release to the CBD, and Reclamation investment of up to 7% of the Project costs
- Alternative 2, 1.3-MAF reservoir, South Road, partial release to the CBD, discharge to the Sacramento River, and no Reclamation investment
- Alternative 3, 1.5-MAF reservoir, bridge, release to the CBD, and Reclamation investment of up to 25% of the Project costs

Alternatives 1, 2, and 3 are generally based on the results of the value planning process. Alternative 1 is based on Alternative VP 7, and Alternative 2 is based on Alternatives VP 5 and VP 6. Alternative 3 is based on VP 7 with increased Reclamation investment of up to 25% of the Project costs. Project facilities are shown in Figure 2-1, Figure 2-2, Figure 2-3, and Figure 2-4.

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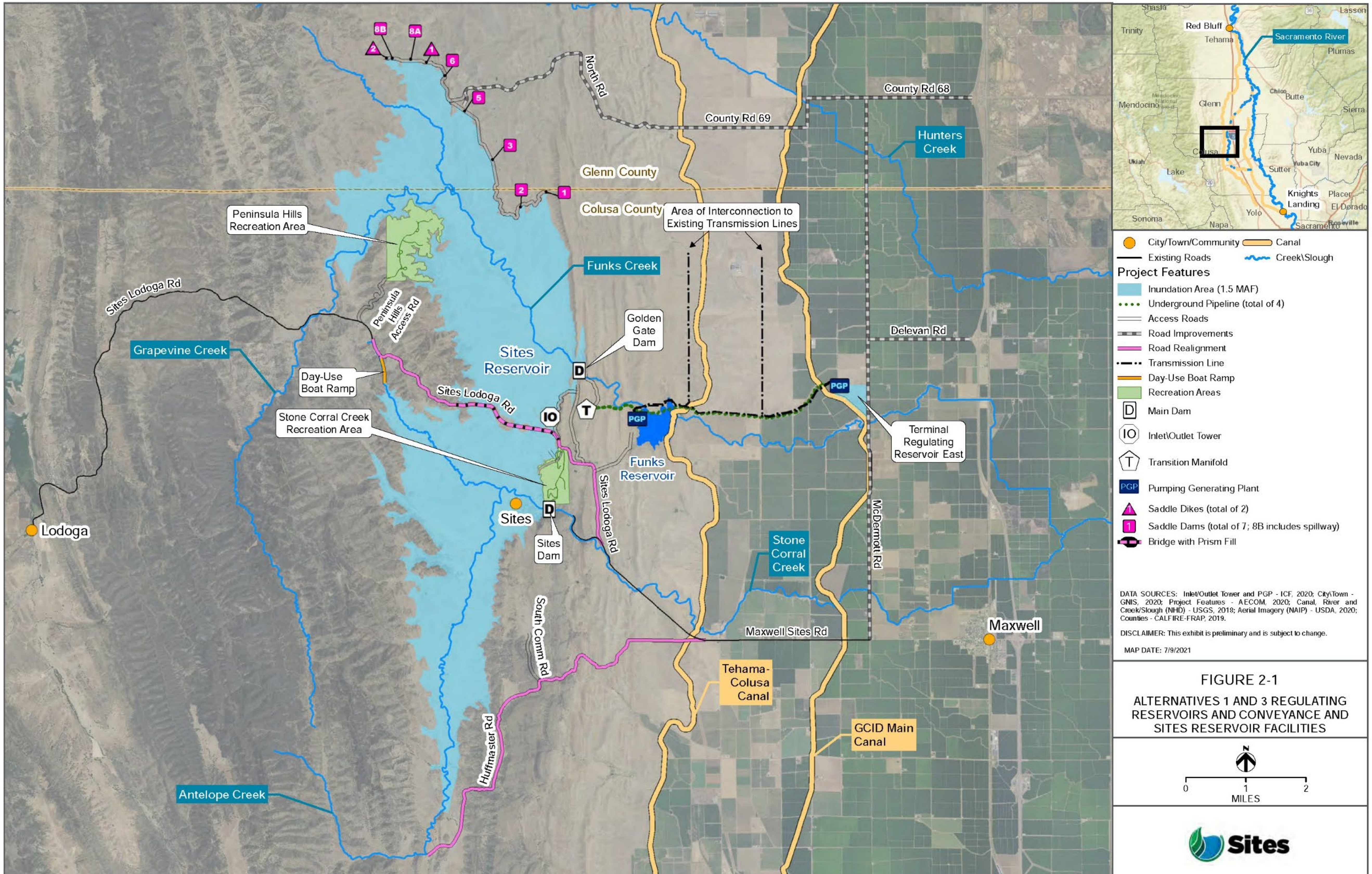

FIGURE 2-1
ALTERNATIVES 1 AND 3 REGULATING RESERVOIRS AND CONVEYANCE AND SITES RESERVOIR FACILITIES

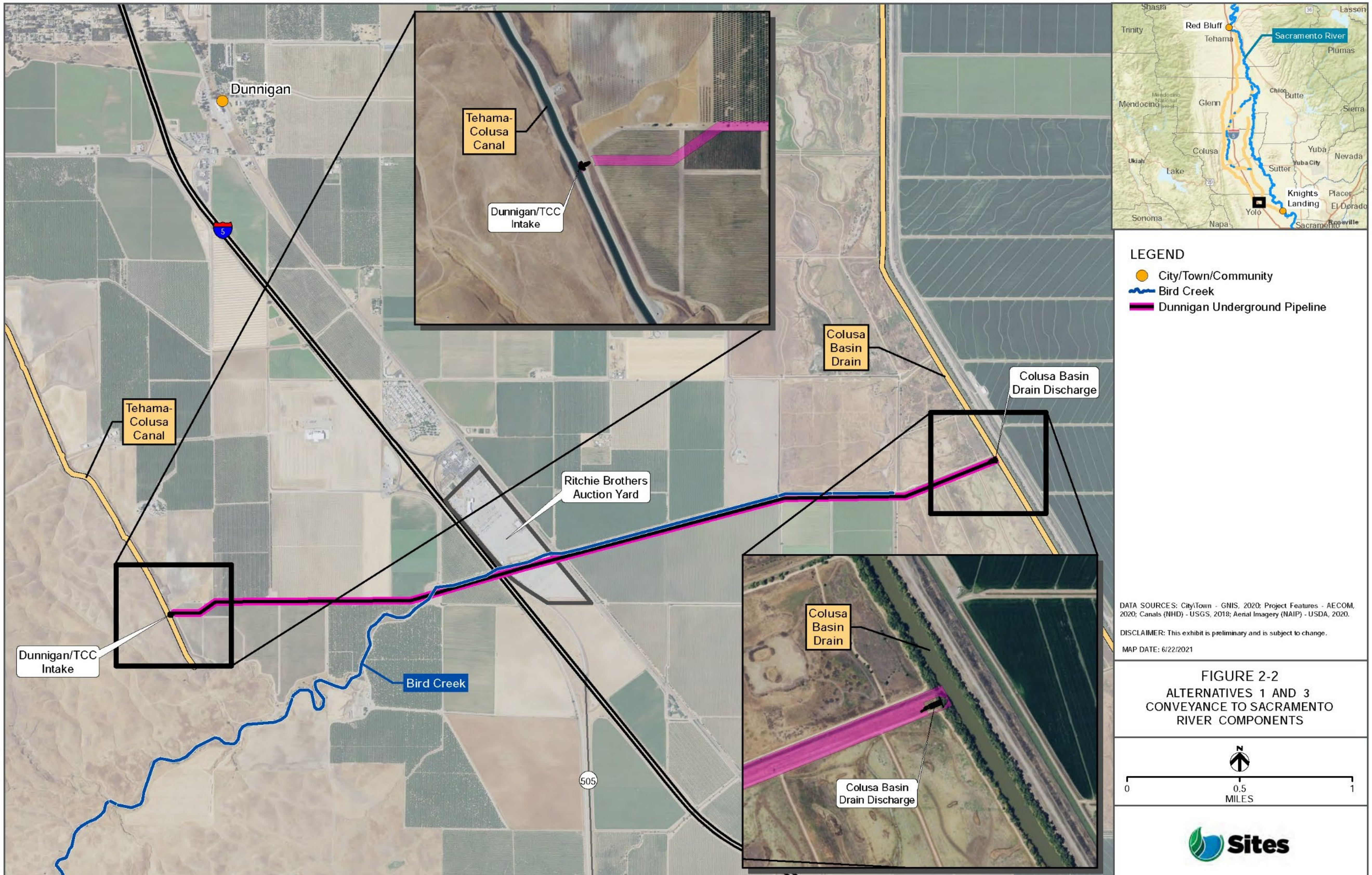

FIGURE 2-2
ALTERNATIVES 1 AND 3 CONVEYANCE TO SACRAMENTO RIVER COMPONENTS

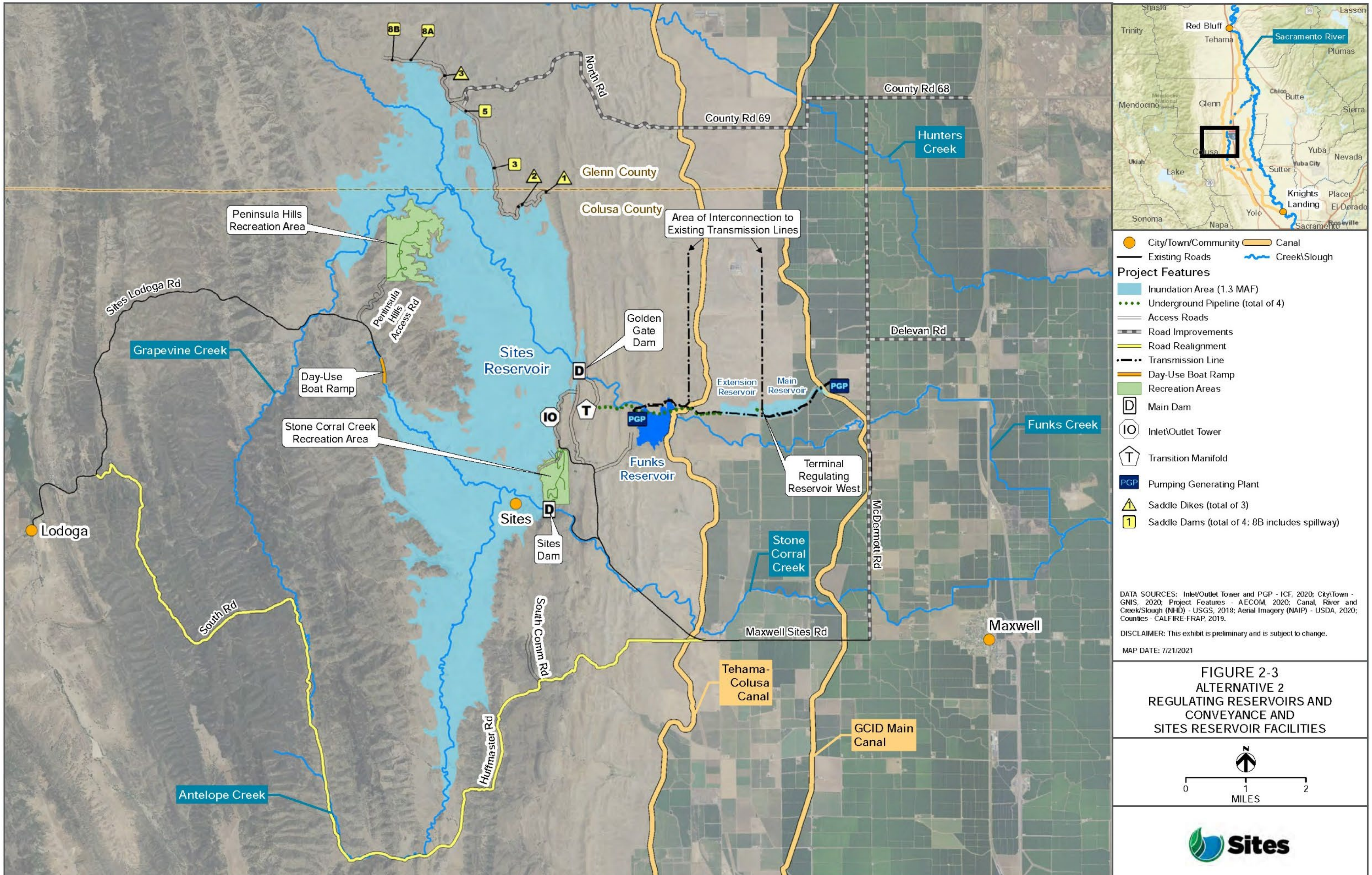

FIGURE 2-3
ALTERNATIVE 2
REGULATING RESERVOIRS AND CONVEYANCE AND SITES RESERVOIR FACILITIES

FIGURE 2-4
ALTERNATIVE 2 CONVEYANCE TO SACRAMENTO RIVER COMPONENTS

Table 2-1 summarizes the components of Alternatives 1, 2, and 3. Due to the availability of federal funding (see Volume 3, Chapter 3, *Master Responses*, Master Response 2, *Alternatives Description and Baseline*), Alternative 3 is the Authority's preferred alternative and is the proposed project under CEQA.

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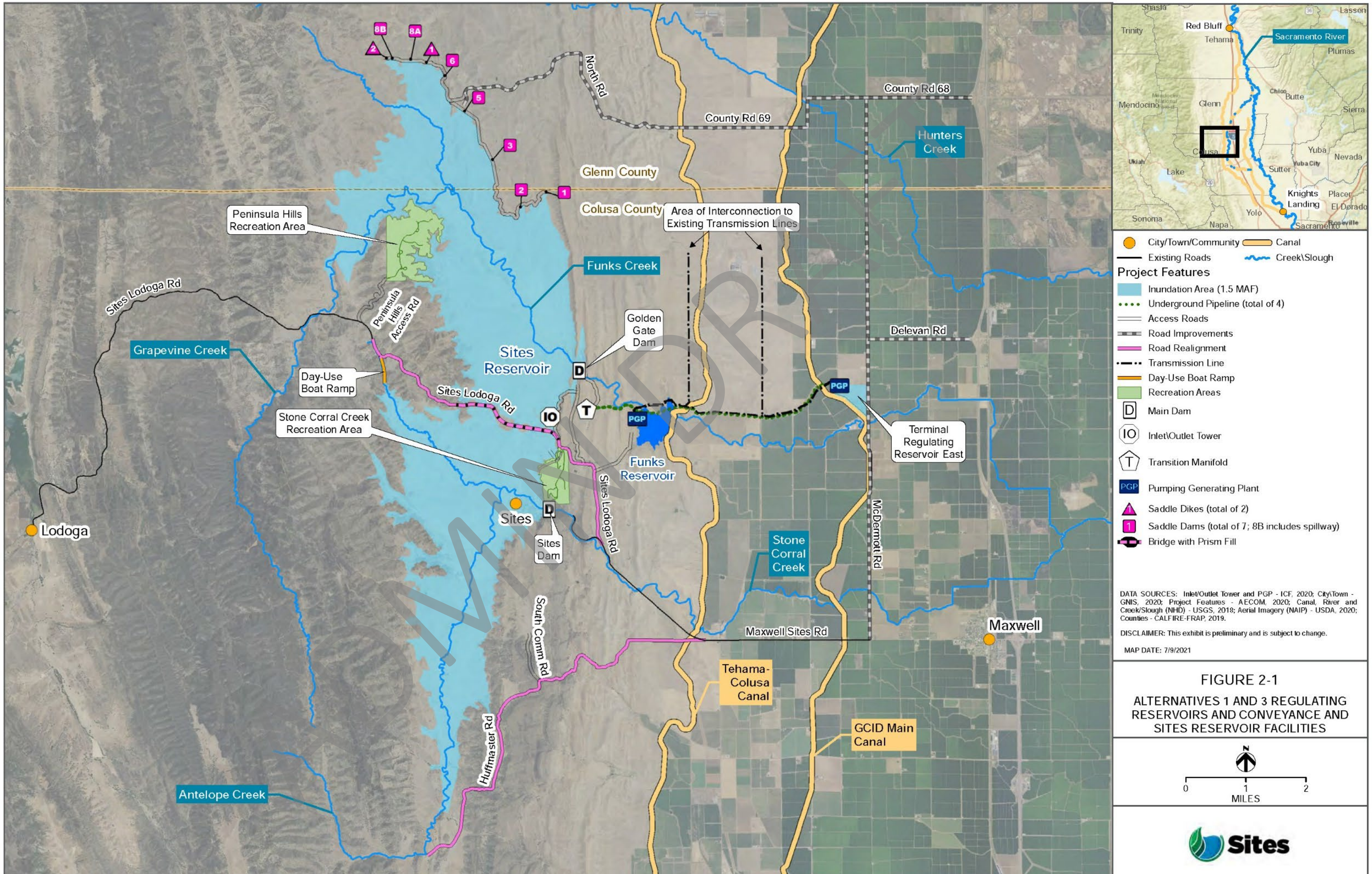

FIGURE 2-1

ALTERNATIVES 1 AND 3 REGULATING RESERVOIRS AND CONVEYANCE AND SITES RESERVOIR FACILITIES

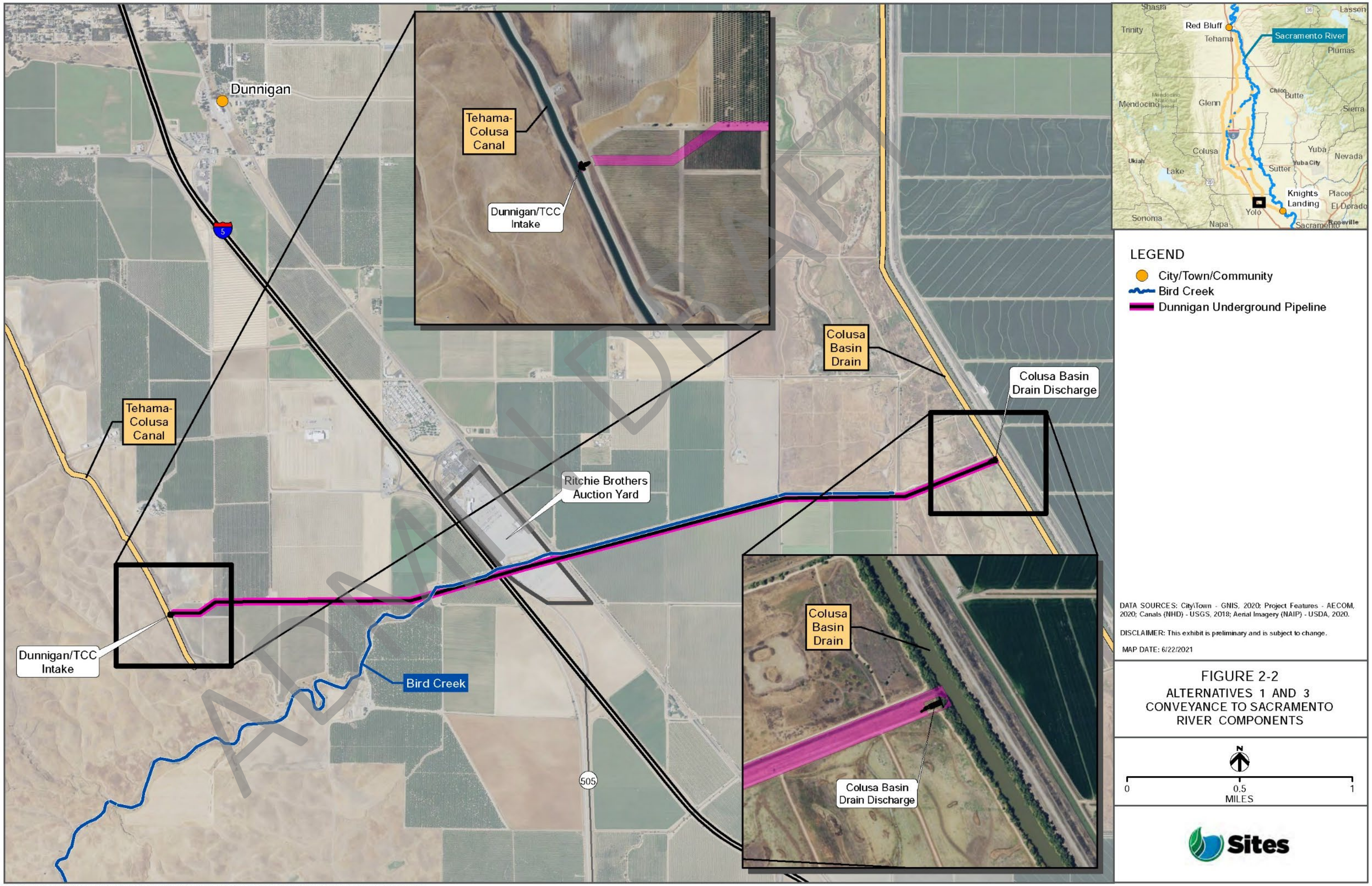

FIGURE 2-2
ALTERNATIVES 1 AND 3 CONVEYANCE TO SACRAMENTO RIVER COMPONENTS

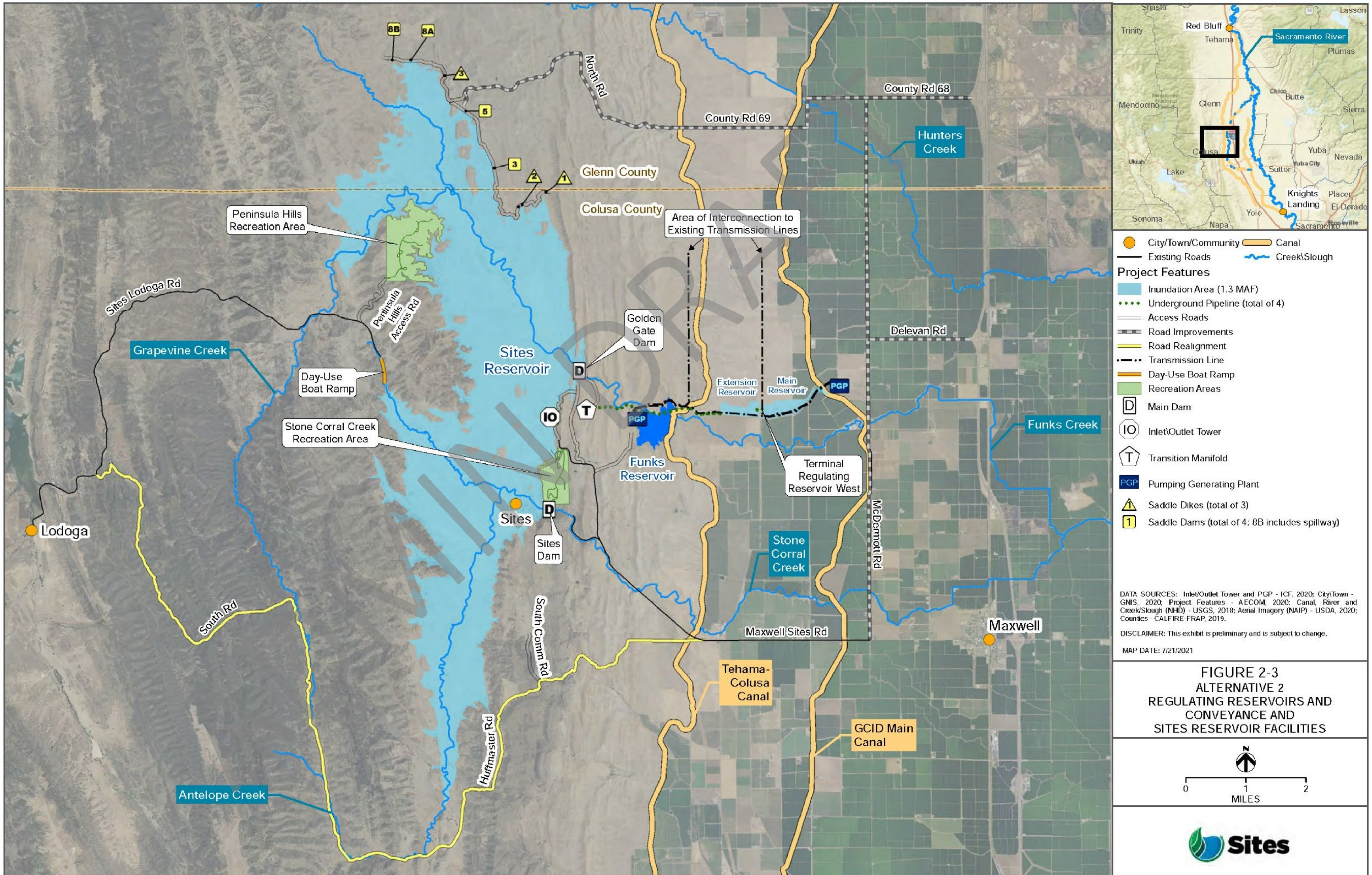

FIGURE 2-3
ALTERNATIVE 2
REGULATING RESERVOIRS AND CONVEYANCE AND SITES RESERVOIR FACILITIES

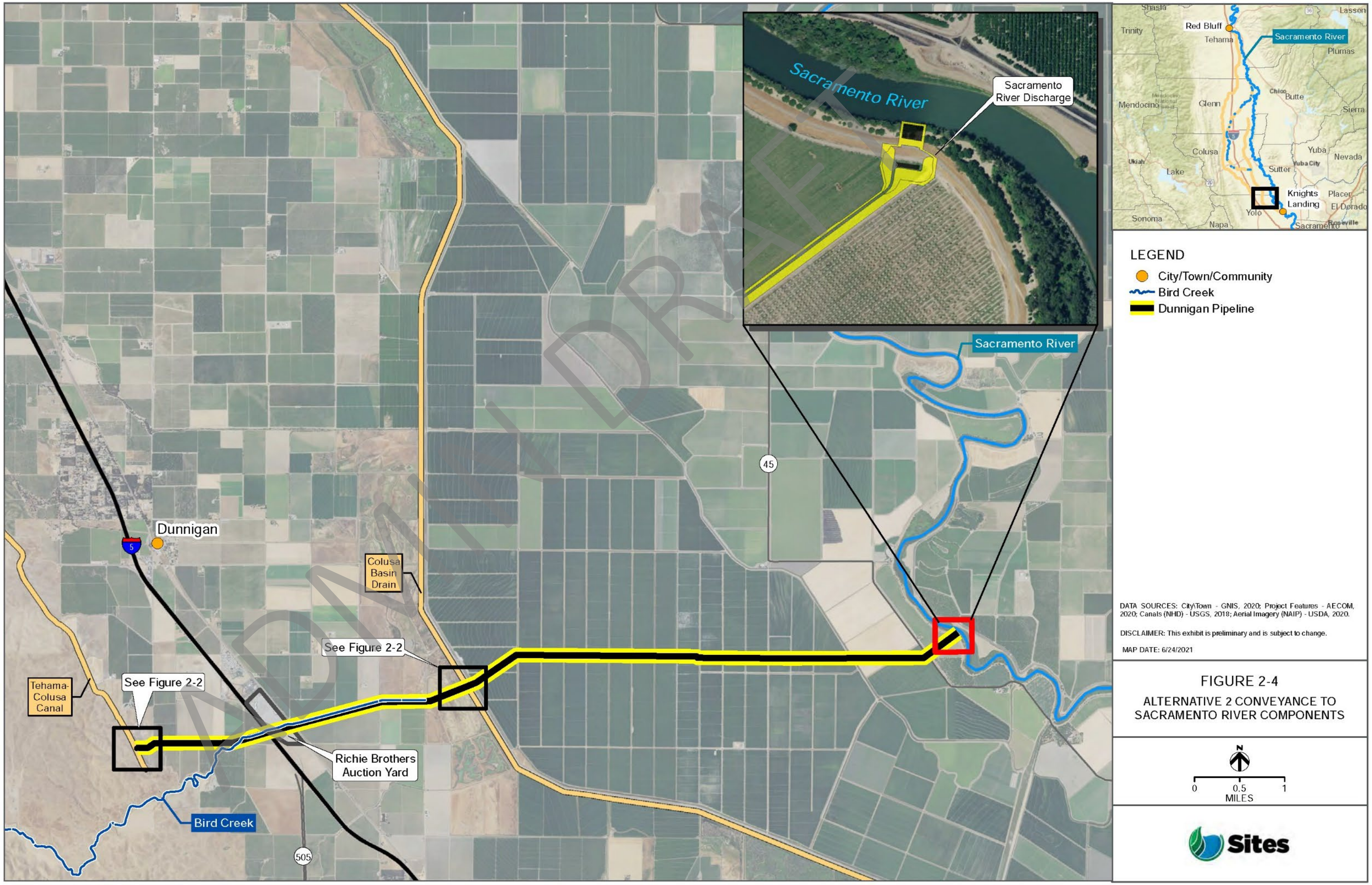

FIGURE 2-4
ALTERNATIVE 2 CONVEYANCE TO SACRAMENTO RIVER COMPONENTS

Table 2-1. Summary of Alternatives 1, 2, and 3

Facilities/Operations	Alternative 1	Alternative 2	Alternative 3
Diversion/Reservoir Infrastructure Details			
Reservoir Size	1.5 MAF	1.3 MAF	Same as Alternative 1
Dams (scaled to the size of the reservoir)	Golden Gate and Sites Dams; 7 saddle dams; 2 saddle dikes	Golden Gate and Sites Dams; 4 saddle dams; 3 saddle dikes	Same as Alternative 1
Spillway	One spillway on Saddle Dam 8B	Similar to Alternative 1	Same as Alternative 1
Funks Reservoir (existing)	New Funks Pumping Generating Plant (PGP) and Funks pipelines	Similar to Alternative 1	Same as Alternative 1
Terminal Regulating Reservoir (TRR)	Construction of TRR PGP and TRR pipelines; TRR East location	Construction of TRR PGP and TRR pipelines; TRR West location	Same as Alternative 1
Hydropower	Incidental power generation up to 40 megawatts each at Funks PGP and TRR PGP	Same as Alternative 1	Same as Alternative 1
Diversion(s)	Diversion from Sacramento River into existing TC Canal at Red Bluff and the existing GCID Main Canal at Hamilton City	Same as Alternative 1	Same as Alternative 1
Emergency Release Flow	Releases into Funks Creek and Stone Corral Creek via Inlet/Outlet Works; Sites Dam; Release from spillway on Saddle Dam 8B north to Hunters Creek watershed	Similar to Alternative 1	Same as Alternative 1
Recreation			
Multiple Facilities Consistent with the Authority's WSIP Application	Two primary areas with infrastructure: 1. Peninsula Hills Recreation Area 2. Stone Corral Creek Recreation Area An additional day-use boat ramp	Same as Alternative 1	Same as Alternative 1
Transportation/Circulation			

Facilities/Operations	Alternative 1	Alternative 2	Alternative 3
Provide Route to West Side of Reservoir	Permanent bridge crossing the reservoir and realignment of a segment of Huffmaster Road with gravel road to residents at the south end of the reservoir	Paved roadway including the realigned segment of Huffmaster Road and a new South Road on the west side of the reservoir	Same as Alternative 1
Operations			
Diversion Criteria	Bypass flows; Pulse flow protection measure to be applied to precipitation-generated pulse flow events from October through May; Wilkins Slough Bypass Flow	Same as Alternative 1	Same as Alternative 1
Reclamation Involvement	1. Funding Partner (up to 7% investment) with operational exchanges; or 2. Operational Exchanges Only a. Within Year Exchanges b. Real-time Exchanges	Operational Exchanges Only a. Within Year Exchanges b. Real-time Exchanges	Funding Partner, up to 25% investment, and Operational Exchanges: a. Within Year Exchanges b. Real-time Exchanges
California Department of Water Resources Involvement	Operational Exchanges with Oroville and use of SWP facilities south of the Delta	Same as Alternative 1 (volumes may vary, however)	Similar to Alternative 1 (volumes may vary, however)
Releases into Funks Creek and Stone Corral Creek	Specific flow criteria to maintain flows to protect downstream water right holders and ecosystem function	Same as Alternative 1	Same as Alternative 1
Conveyance Dunnigan Release	Release 1,000 cfs into new pipeline to CBD	Release into new pipeline to Sacramento River discharge, partial release to the CBD	Same as Alternative 1

The Authority and/or Reclamation could decide to approve a version of Alternative 2 (with a 1.3-MAF reservoir) that incorporates: (1) the bridge component of Alternative 1; (2) the CBD release component of Alternative 1 instead of the Sacramento River discharge; or (3) both of these components. Similarly, the Authority and/or Reclamation could elect to approve a version of

Alternative 1 (with a 1.5-MAF reservoir) or Alternative 3 that incorporates the roadway improvements: (1) without the bridge component; (2) with the Sacramento River discharge component of Alternative 2 instead of the CBD release; or (3) with both of these components. In addition, the level of Reclamation's participation currently shown for Alternatives 1 and 3 could be considered in the context of the smaller reservoir for Alternative 2. In this way, the evaluation of Alternatives 1, 2, and 3 incorporates a variety of options.

2.4 No Project Alternative/No Action Alternative

The CEQA Guidelines require that an EIR analyze the No Project Alternative. Evaluation of the No Project Alternative allows decision makers to compare the impacts of approving a proposed project with the impacts of not approving the proposed project. This Final EIR/EIS evaluates a No Project Alternative that assumes the Project would not be implemented and considers what would be reasonably expected to occur in the foreseeable future if the Project were not approved, based on current plans and consistent with available infrastructure and community services.

NEPA similarly requires an analysis of an alternative in which the project is not implemented, assuming continuation of existing policies and management direction into the future. As with the No Project Alternative under CEQA, the No Action Alternative under NEPA accounts for reasonably foreseeable future changes in existing conditions.

For this Final EIR/EIS the term *No Project Alternative* describes both the No Project Alternative and No Action Alternative for CEQA and NEPA purposes, respectively. Because none of the facilities would be constructed or operated, the No Project Alternative would not materially change conditions as compared to existing conditions. Chapter 3, Section 3.2.1, *Existing Conditions and No Project Alternative/No Action Alternative*, describes how the reasonably foreseeable future conditions under the No Project Alternative would not be materially different from the existing conditions that were used as the environmental baseline. The No Project Alternative assumes the same regulatory criteria as existing conditions. This assumption is made on the basis that reasonably foreseeable programs and projects included in the No Project Alternative would affect water supply, water quality, or anadromous fisheries conditions and are part of existing conditions. For example, the implementation of the 2019 Biological Opinions from the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for the Reinitiation of Consultation on the Long-Term Operation of the CVP and SWP (ROC ON LTO) (U.S. Fish and Wildlife Service 2019, National Marine Fisheries Service 2019) and the Reinitiation of Consultation on the Coordinated Operation of the CVP and SWP Incidental Take Permit for Long-term Operations of the State Water Project in the Sacramento-San Joaquin Delta (State ITP) (California Department of Fish and Wildlife 2020) are included in both existing conditions and the No Project Alternative.

In addition, DWR's projected future land use and water use are typically included as fundamental assumptions in the CALSIM II model as part of the impact evaluation process. These 2030 water demand conditions indicate that the vast majority of the CVP and SWP water contractors would use their total contract amounts and that most senior water rights users also would fully use most of their water rights, depending on the hydrologic condition, and is assumed for purposes of assessing environmental impacts for this document. This increased demand in addition to the projects currently under construction and those that have received approvals and permits at the time of preparation of this Final EIR/EIS constitute the No Project Alternative.

Under the No Project Alternative, existing conditions outlined in the following resource chapters would not be altered by the Project. However, Project benefits would also not be achieved. Under the No Project Alternative, flood control, ecosystem improvement, and recreation benefits that are part of the Project would not be funded and implemented as part of WSIP. The No Project Alternative would also not provide water supply reliability, operational flexibility, benefits to anadromous fish, water supply for refuges and Delta ecosystem benefits sought with potential Reclamation investment. Finally, the No Project Alternative would eliminate one opportunity to provide a multi-benefit project consistent with the Governor's Water Resilience Portfolio. The No Project Alternative would not meet the Project objectives and purpose and need stated in Chapter 1 but is analyzed in this Final EIR/EIS, consistent with CEQA and NEPA requirements.

2.5 Elements Common to Alternatives 1, 2, and 3

Project facilities, operations and maintenance, construction considerations, commitments and best management practices (BMPs), and Proposition 1 benefits common to Alternatives 1, 2, and 3 are described below.

2.5.1 Facilities

The facilities descriptions in this section include design and construction considerations. Detailed construction information is provided in Appendix 2C, *Construction Means, Methods, and Assumptions*. In addition, as further discussed in Section 2.5.4, *Project Commitments and Best Management Practices*, construction activities generally described herein would adhere to multiple BMPs described in Appendix 2D, *Best Management Practices, Management Plans, and Technical Studies*. Preliminary design for facilities described herein will continue to be refined and modifications may occur as needed as the Project proceeds to final design and as part of the ongoing value engineering process undertaken by the Authority. As noted in the RDEIR/SDEIS, potential modifications include refinements to design of certain facilities (e.g., use of a sloped Inlet/Outlet (I/O) tower and elimination of bridge to I/O tower, see below); minor changes in facility footprints; or removal of certain facilities described currently herein (e.g., emergency release structures, see below). Future modifications of any facilities described and evaluated herein would be reviewed by the Authority and Reclamation to determine appropriate CEQA and NEPA compliance.

As part of this Final EIR/EIS analysis, minor changes have been made to this Project description and noted as changes through vertical lines in the margins and described in Master Response 2 in Volume 3. These minor changes do not result in significant new information. For example, no information has been added showing the Project would result in new or substantially more significant impacts.

2.5.1.1 Sacramento River Diversion and Conveyance to Regulating Reservoirs

The Project would involve the diversion of water from the Sacramento River at the existing Red Bluff Pumping Plant (RBPP) and Hamilton City Pump Station. Both facilities have a fish screen that meets NMFS and California Department of Fish and Wildlife (CDFW) criteria. Water diverted at the RBPP enters the TC Canal, and flows diverted at Hamilton City Pump Station enter the GCID Main Canal. The RBPP and TC Canal are owned by Reclamation and operated by the TCCA. Reclamation will need to execute one or more contracts in accordance with Section 1 of the Warren Act of 1911 (36 Stat. 925) for use of federal facilities to pump and convey non-CVP water. The use of these federal facilities is included in the Project, and thus the impacts of the anticipated Warren Act contract(s) are covered by this Final EIR/EIS. Hamilton City Pump Station and GCID Main Canal are owned and operated by GCID. The Project would include improvements to the following facilities, and the locations of the improvements are shown in Figure 2-5.

RBPP

The Project would entail the installation of two additional 250-cfs, 600 horsepower (hp) vertical axial-flow pumps into existing concrete pump bays at the RBPP. The addition of these two pumps would increase the capacity from 2,000 to 2,500 cfs, as well as provide redundancy. Figure 2-6 shows a vicinity map of the RBPP and Appendix 2C includes plan and profile views of the pumps. The installation of the additional pumps at the RBPP would require limited construction equipment and personnel and would require only a few months of onsite construction, thereby allowing for flexibility on the timing of construction.

GCID Main Canal Diversion and System Upgrades

The GCID system may require several upgrades to support the operation of Sites Reservoir. The specific details of these upgrades would be confirmed during future hydraulic modeling and assessment of system conditions. However, for purposes of assessing environmental impacts for this document, it is conservatively assumed that upgrades would be constructed at various locations along the GCID Main Canal, as described below. GCID would manage the facility upgrades using an approach consistent with its existing management practices.

The Project would involve the installation of a new 3,000-cfs GCID Main Canal head gate structure about 0.25 mile downstream of Hamilton City Pump Station (Figure 2-7). A new head gate would be required because the existing structure would be inadequate for winter operation due to the decrease in water elevation across it during high river levels. The existing head gate structure would be left in place to continue to serve as a bridge between County Road 203 and County Road 205 in Glenn County. The existing head gate would continue to operate and diversions would occur during construction of the new head gate. The new head gate structure would be constructed upstream of the existing structure and would include eight automated gates. The water level and flow control functions would involve operating conditions that would result in water surface drops across the head gate of between 3 and 15 feet. The canal reach immediately downstream of the new head gate structure would be lined with concrete for approximately 35 feet to prevent erosion. It is expected that State Route (SR) 32, 6th Street, and Cutler Avenue into County Road 205 would be used to access the GCID Main Canal head gate structure during construction.

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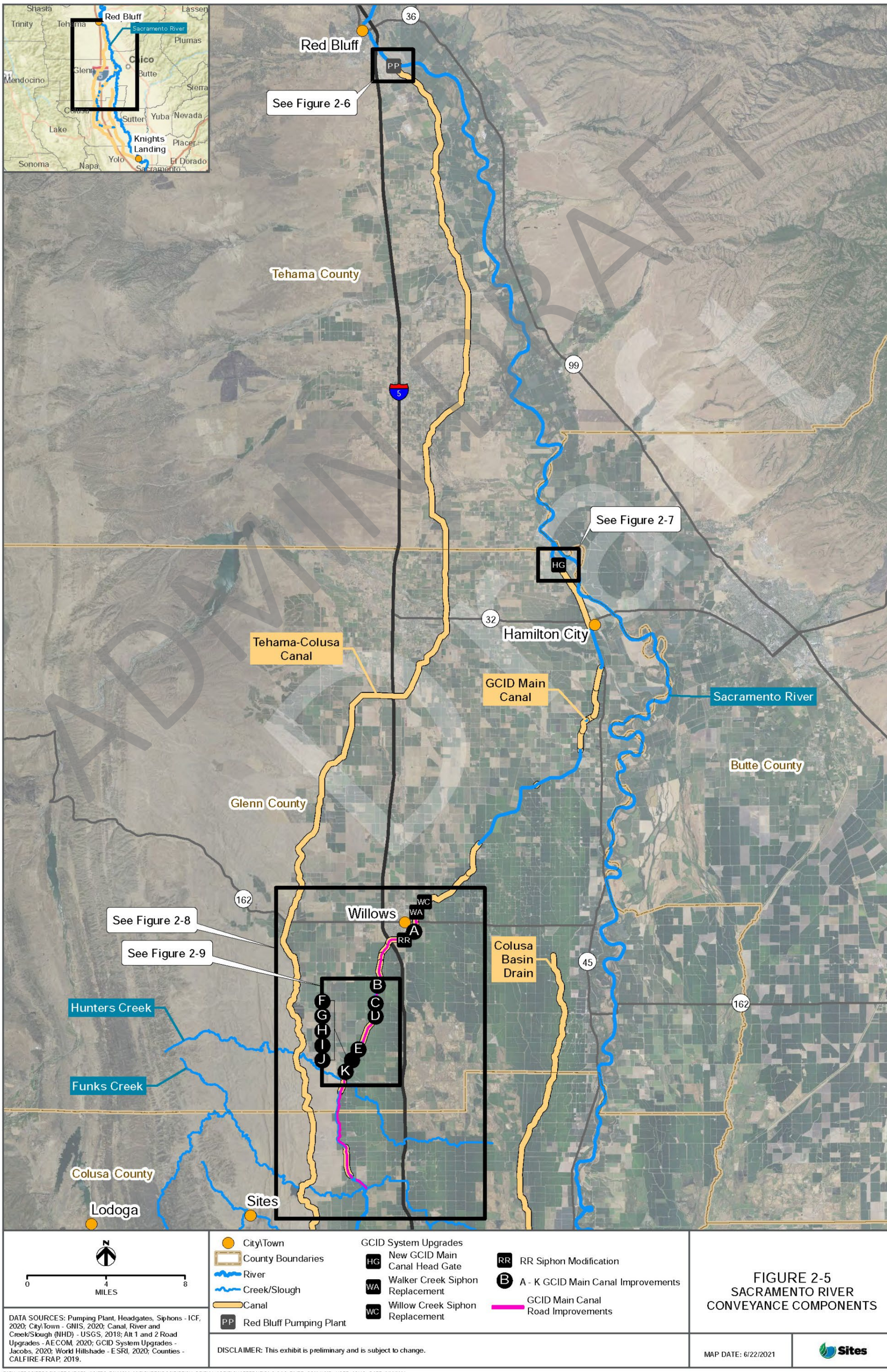

FIGURE 2-5
SACRAMENTO RIVER CONVEYANCE COMPONENTS

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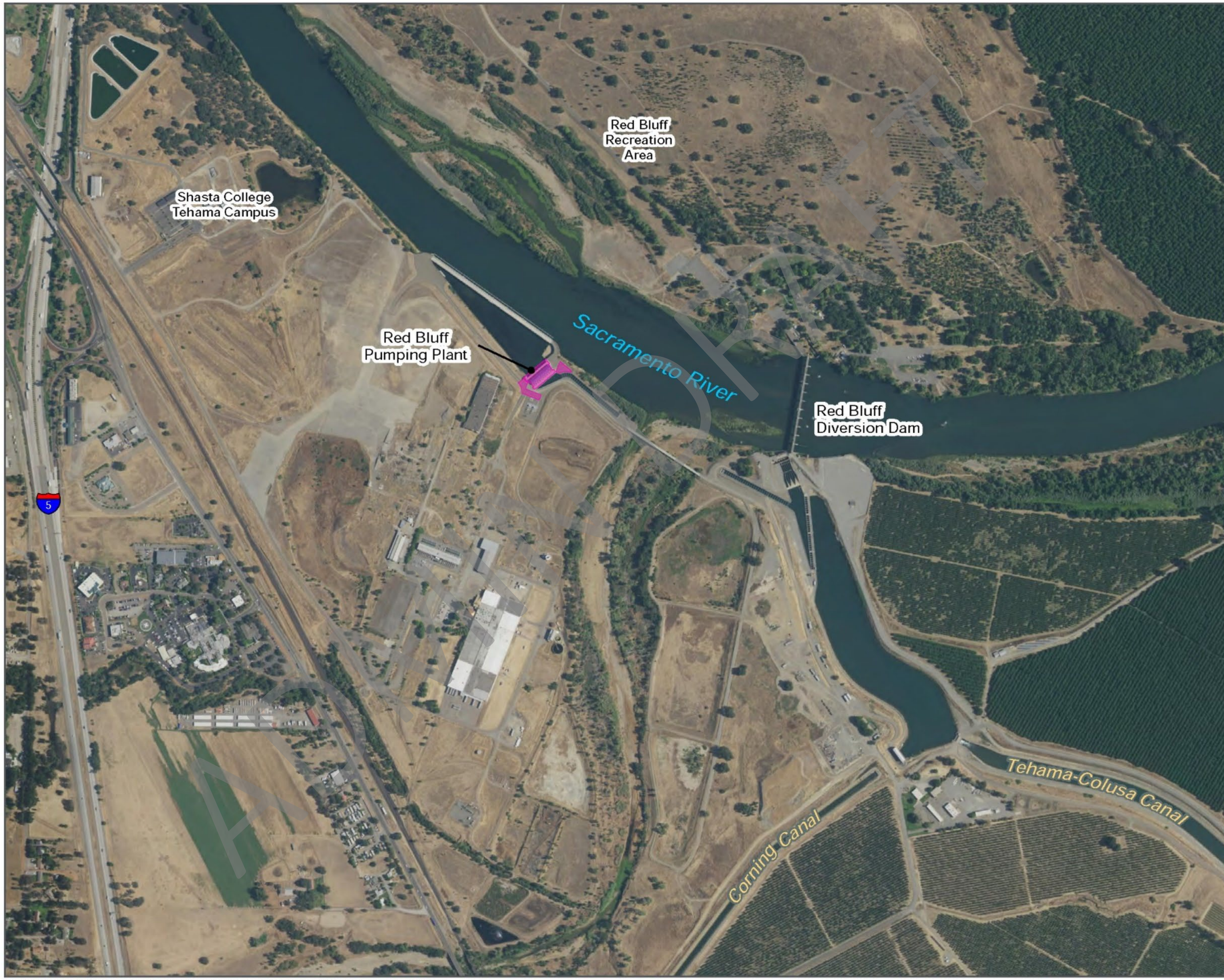

FIGURE 2-6
RED BLUFF PUMPING PLANT

FIGURE 2-7
GCID MAIN CANAL
HEAD GATE STRUCTURE

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GCID typically shuts down (i.e., dewaters) the Main Canal for up to 6 weeks each year between early January and late February for maintenance activities. This is the time of year that the Project would utilize the Hamilton City Pump Station and GCID Main Canal to divert and convey water to Sites Reservoir. To reduce the winter shutdown period from 6 weeks to 2 weeks, other improvements would be required to the GCID system as described below. Construction for the GCID Main Canal improvements would likely occur in the winter during the regular shutdown period.

The Project would involve replacing the Walker Creek siphon (Mile Post [MP] 24.48) and Willow Creek siphon (MP 24.68) on the GCID Main Canal to allow for increased flow capacity (Figures 2-8 and 2-9). The siphon under the Union Pacific Railroad (i.e., railroad siphon) at MP 26.6 would be improved by adding an additional barrel.

The new Walker and Willow Creek siphons would consist of five 10-foot-wide by 8.5-feet-tall barrels. Construction is expected to require canal bypass, and access to the siphon work sites is expected to be from Interstate 5 (I-5) to SR 162. The use of individual county roads would be required (i.e., County Road P, County Road 48, County Road 53). For the railroad siphon, a portion of the canal would be dewatered using an earthen coffer dam lined with geomembrane and sump pumps. The new barrel would be installed using a bore-and-jack procedure, and new headwalls on the upstream and downstream end would be installed to approximately match the existing headwall. Construction staging areas would be in the immediate area of the improvements. It is anticipated that coordination and planning with the railroad owners would be required for work within and adjacent to the railroad right-of-way. Construction restrictions may be required by the railroad owners to minimize interference with regular railroad operations. To the extent possible, upgrades to the railroad siphon would take place during periods of lowest train traffic, and railroad shutdown time would be minimized.

The Project would also involve GCID Main Canal improvements between MP 26 and MP 41.3 to increase the freeboard between the city of Willows and the TRR to a standard 2.5 feet; under existing conditions the freeboard range is 1 to 2 feet. The Project would also require road improvements to approximately 17 miles of left bank canal road between the existing Willow Creek siphon and the existing Funks Creek siphon to ensure an all-weather road surface (Figure 2-8). These road improvements would primarily consist of adding approximately 6 inches of aggregate base material. Earthwork related to the GCID Main Canal to increase the freeboard to 2.5 feet would require a total fill of 5,000 cubic yards. There would be no excavation and only minor reshaping and addition of fill to the sides of the canal. The fill would be sourced from other onsite spoils and there would be no net import. Construction activities for the 17 miles of canal road improvements would require approximately 27,000 cubic yards of aggregate base. It is anticipated the aggregate would be imported from a commercial rock facility within 20 miles of the GCID Main Canal. The GCID improvements along the Main Canal and the existing road would occur within established rights-of-way and construction would not permanently remove any existing crops.

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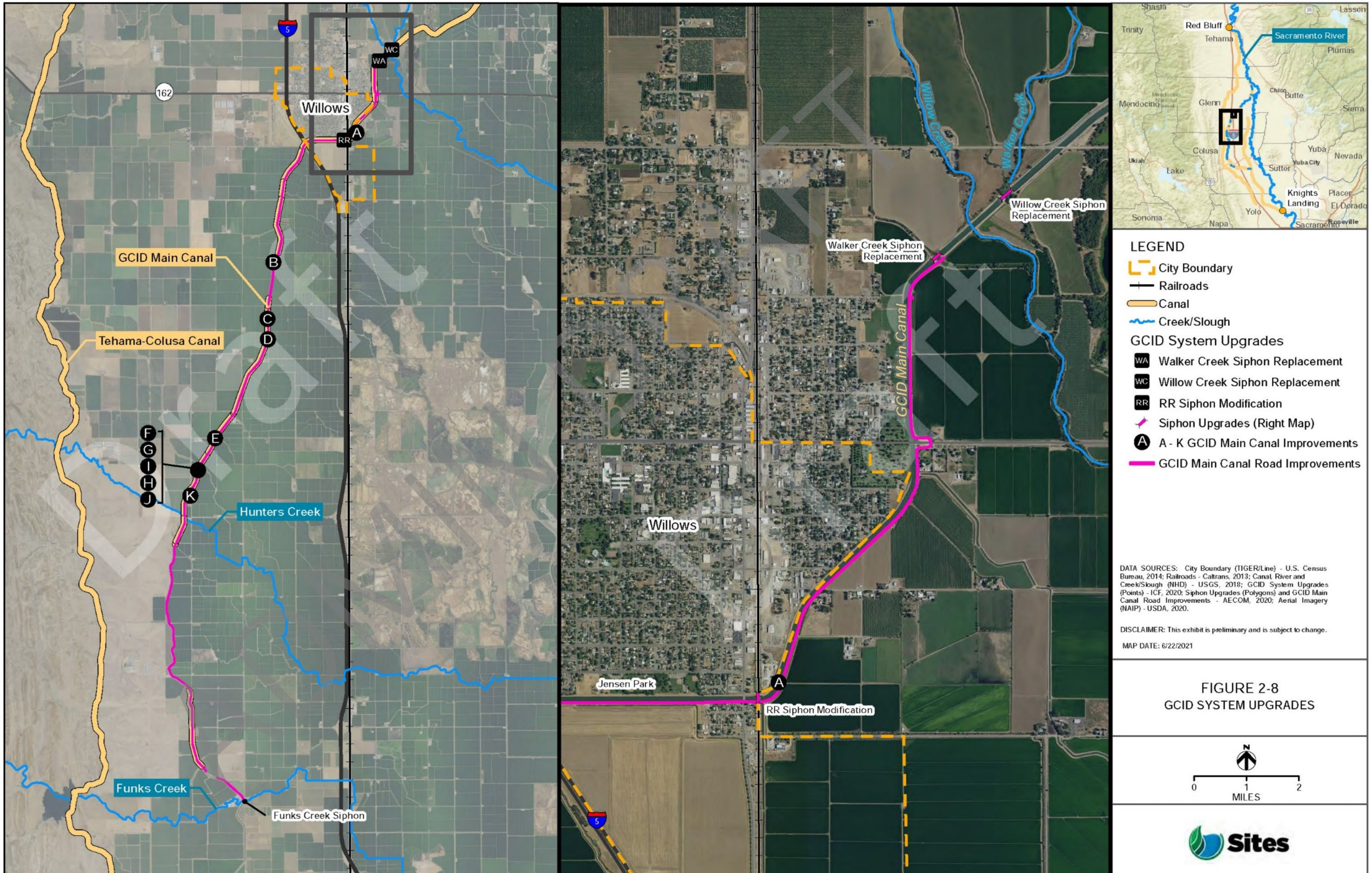


FIGURE 2-8
GCID SYSTEM UPGRADES

FIGURE 2-9
GCID SYSTEM UPGRADES CONTINUED

2.5.1.2 Regulating Reservoirs and Conveyance Complex

Multiple facilities would be required to control the conveyance of water between the Sites Reservoir, TC Canal, and GCID Main Canal. These facilities would include regulating reservoirs, pipelines, pumping generating plants (PGPs), electrical substations, and switchyards.

Terminal Regulating Reservoir

Pumping from the GCID Main Canal to Sites Reservoir would require construction of a TRR, TRR PGP, an electrical substation, and TRR pipelines. Two options for the location of the TRR facilities are being evaluated: TRR East (Alternatives 1 and 3) and TRR West (Alternative 2). Both options and facilities would encompass over 100 acres and would be located in Colusa County near the GCID Main Canal and east of Funks Reservoir. Asphalt concrete paved roads would provide onsite vehicle access between the PGP and electrical substation, with facility spacing to accommodate a mobile crane. Paved parking would be provided near the PGP. The PGP and electrical substation would encompass approximately 7 acres and would be enclosed with security fence with access gates.

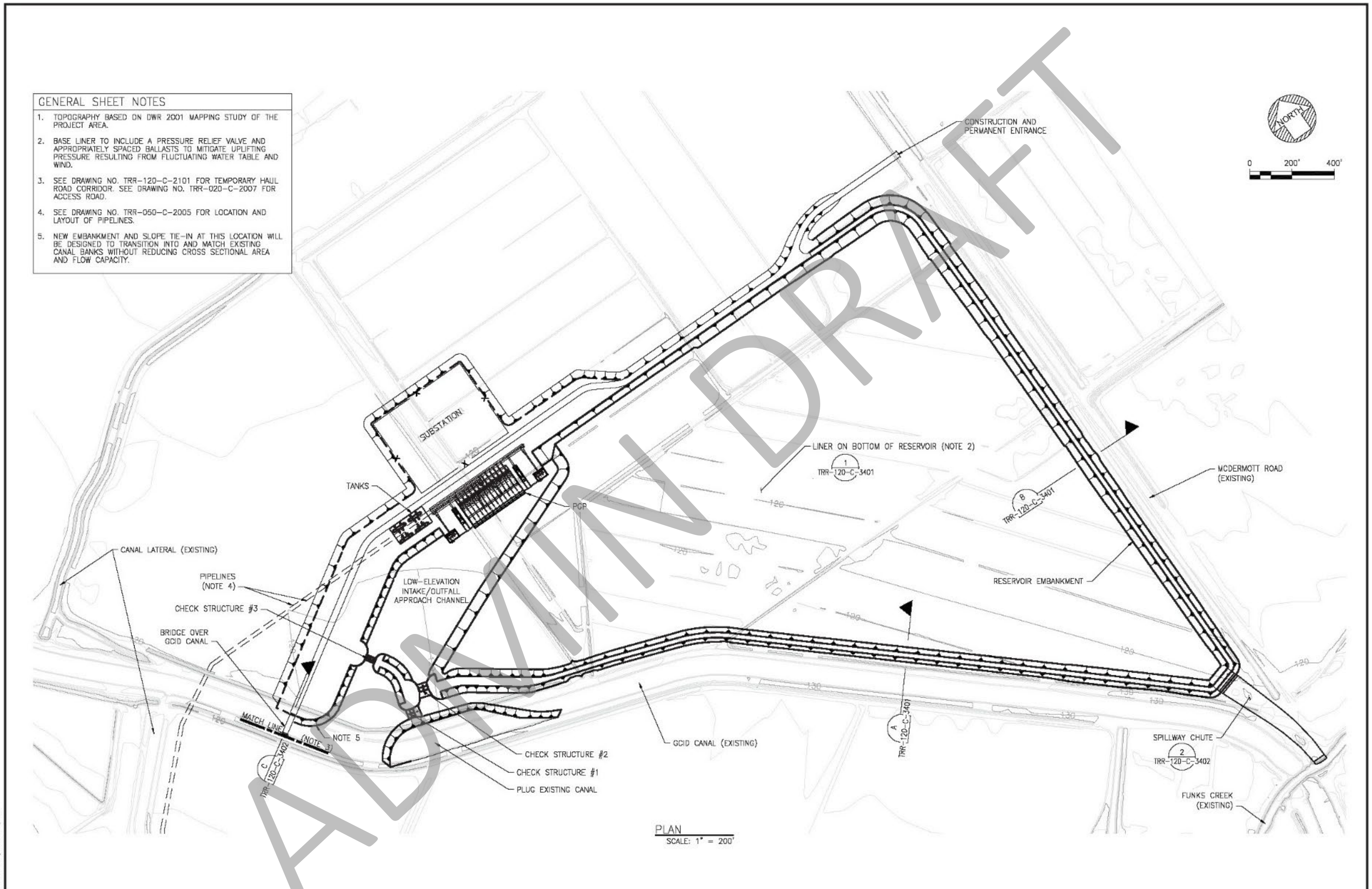
TRR East or TRR West would encompass approximately 100 acres and have a storage capacity of approximately 600 AF. Both TRR East and TRR West would have earthen embankments around the perimeter and an impermeable lining consisting of a geomembrane overlying geocomposite placed over compacted earth. The TRR would be hydraulically connected to the GCID Main Canal to allow water to be conveyed to and from the Sites Reservoir. The TRR would accommodate inflows of up to 1,800 cfs. The GCID Main Canal would be the conveyance source of water for the TRR and its PGP to pump water to Sites Reservoir. The canal would also be the primary conveyance for releases of water from the TRR and its PGP from Sites Reservoir. Figures 2-10a and 2-10b depict the locations of the TRR-related facilities.

The TRR East and TRR West facilities are within a designated Federal Emergency Management Agency (FEMA) Special Flood Hazard Area, Zone A, Without Based Flood Elevation. Site drainage would be conveyed off site to the existing GCID Main Canal or directly into the TRR through shallow swales or overland flow.

TRR Pumping Generating Plant

A TRR PGP would pump water from the TRR to Sites Reservoir; the PGP would include hydroelectric turbines to generate electricity when water was released from Sites Reservoir to the TRR. The PGP would include the following three facilities in five buildings: one pump station, two turbine generator buildings, and two energy dissipating structures (Figures 2-11a and 2-11b). The pumping plant would have a design capacity of 1,800 cfs, the generating plant 1,000 cfs, and the energy dissipation 1,000 cfs.

The pump station would support the pumps at the edge of the TRR and be designed to minimize pump vibration. A trashrack would be installed at the front of the wet well to exclude debris. Bulkhead slots would be provided at each wet well to allow bulkheads to be installed and isolate pump bays for maintenance. The pump station would contain thirteen 900-hp pumps in a single row. Six pumps each would feed into two 12-foot-diameter pipes connecting to the turbines (discussed below), and there would be a single standby pump that could feed into either pipe. It is anticipated that all pumps would have a variable frequency drive to adjust to the variable pumping heads while staying within the pump operating range and efficiency.



Source: Jacobs 2020
Drawing No. TRR-120-C-2401

Figure 2-10A
Terminal Regulating Reservoir East Facilities Site Plan

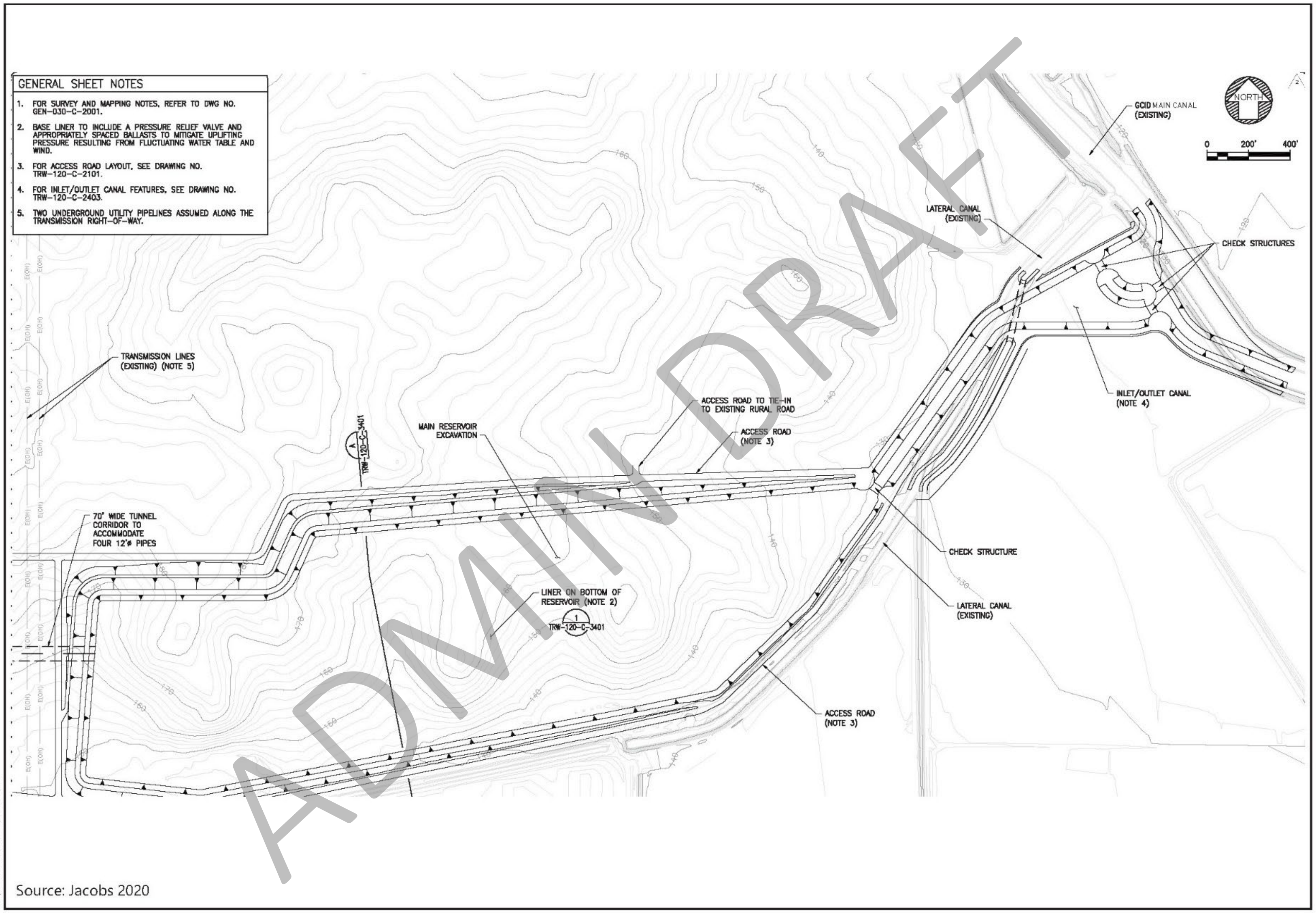
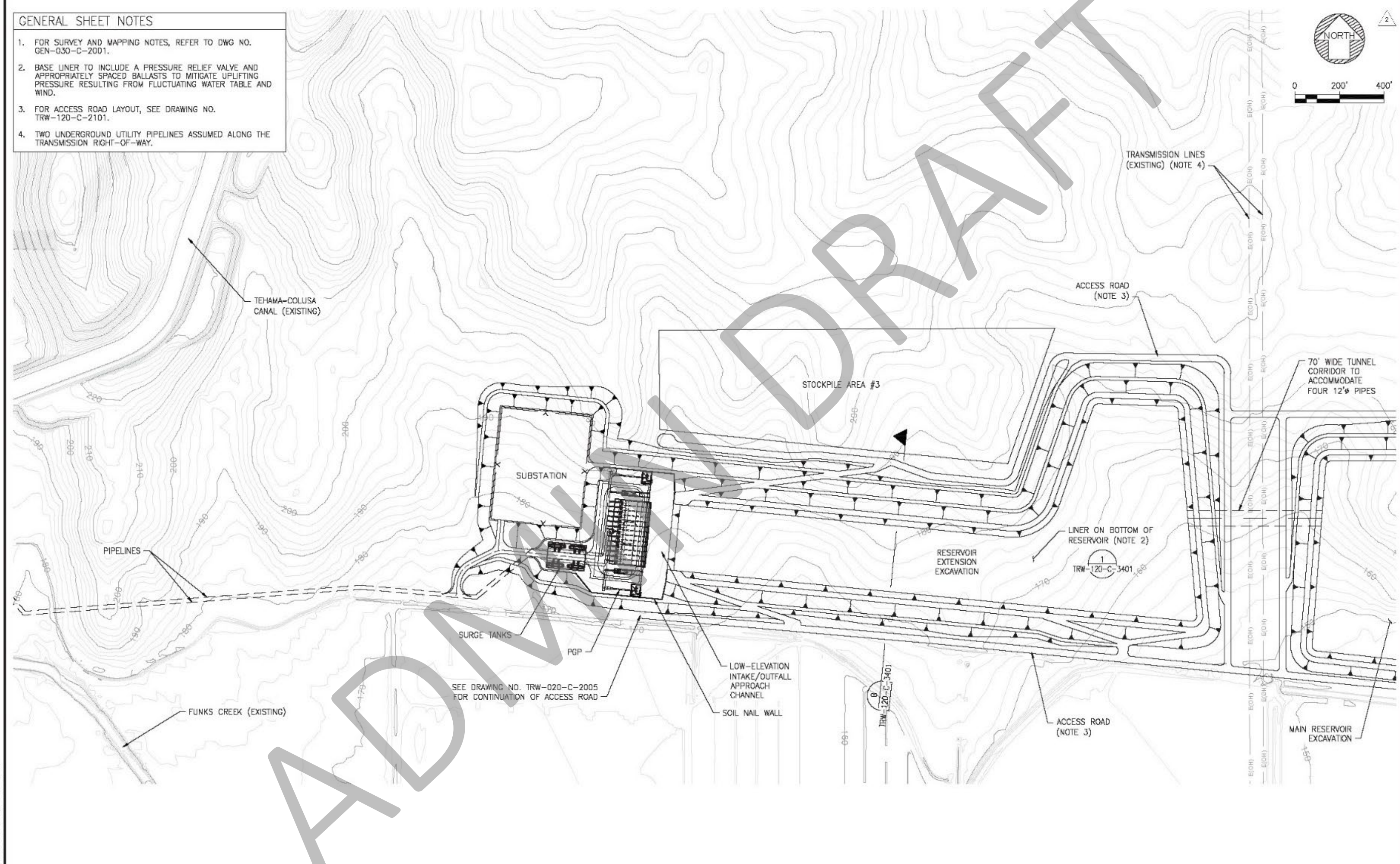
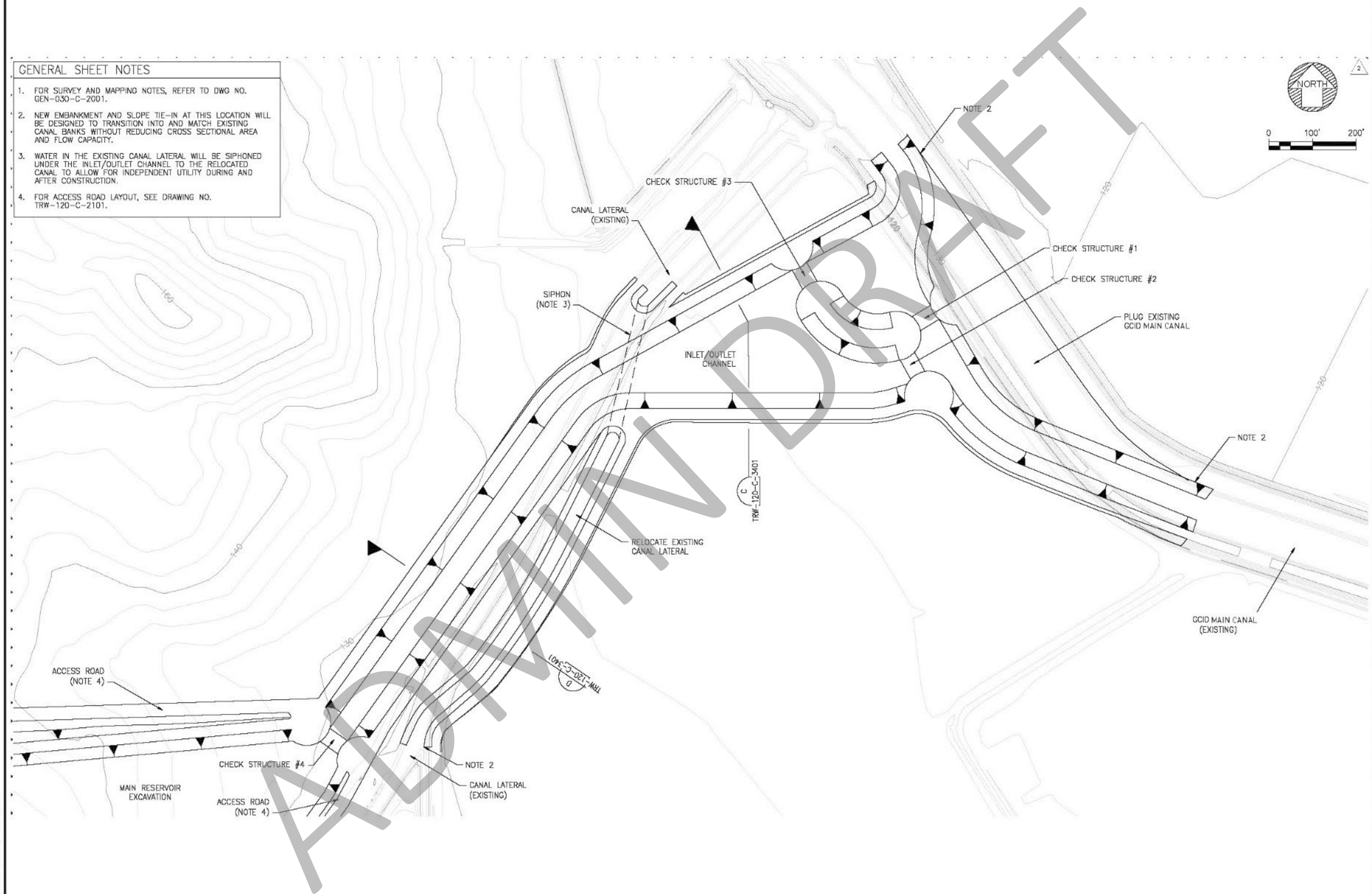


Figure 2-10B1
Terminal Regulating Reservoir West Main Reservior Plan



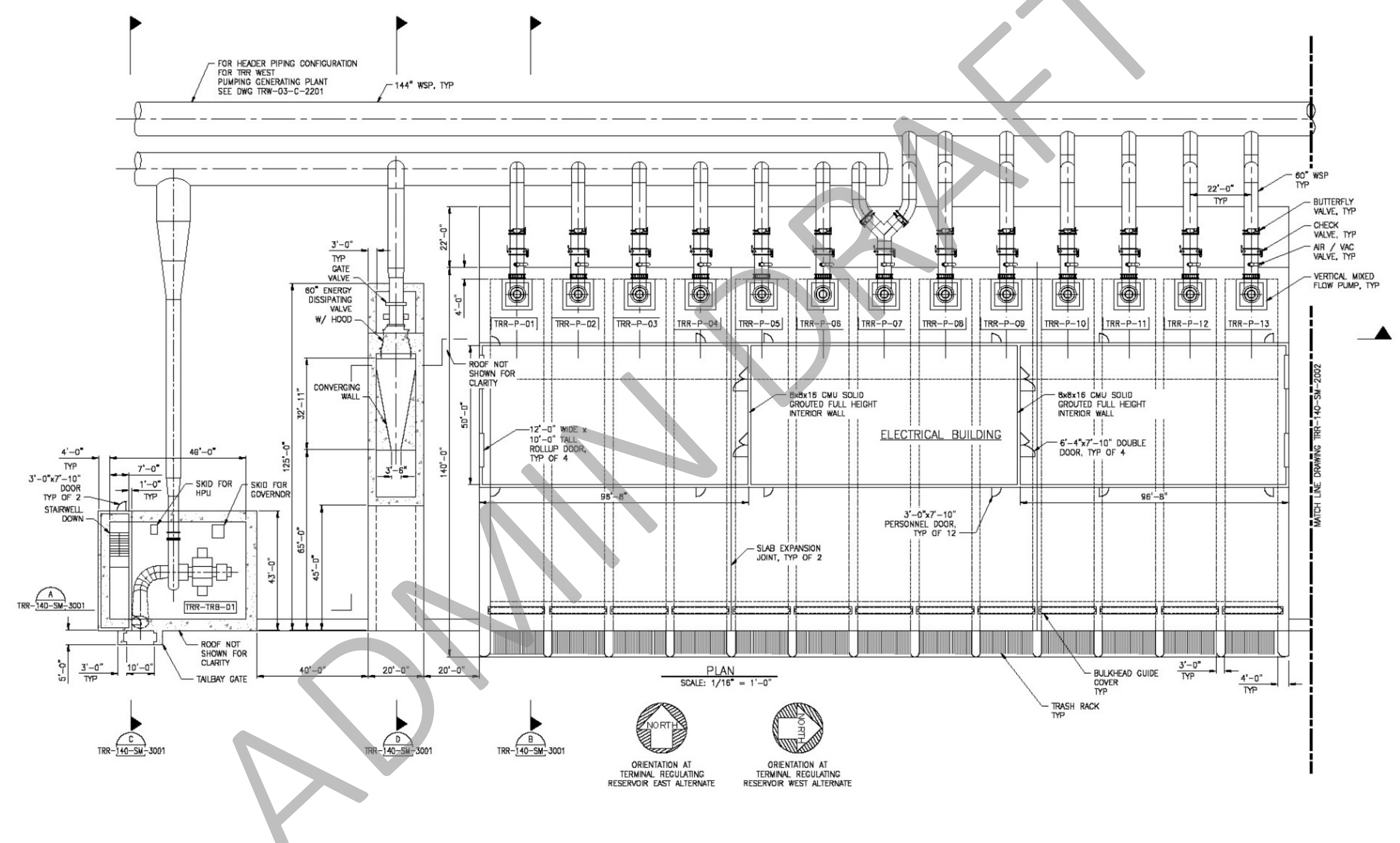
Source: Jacobs 2020

Figure 2-10B2
Terminal Regulating Reservoir West Reservoir Extension Plan



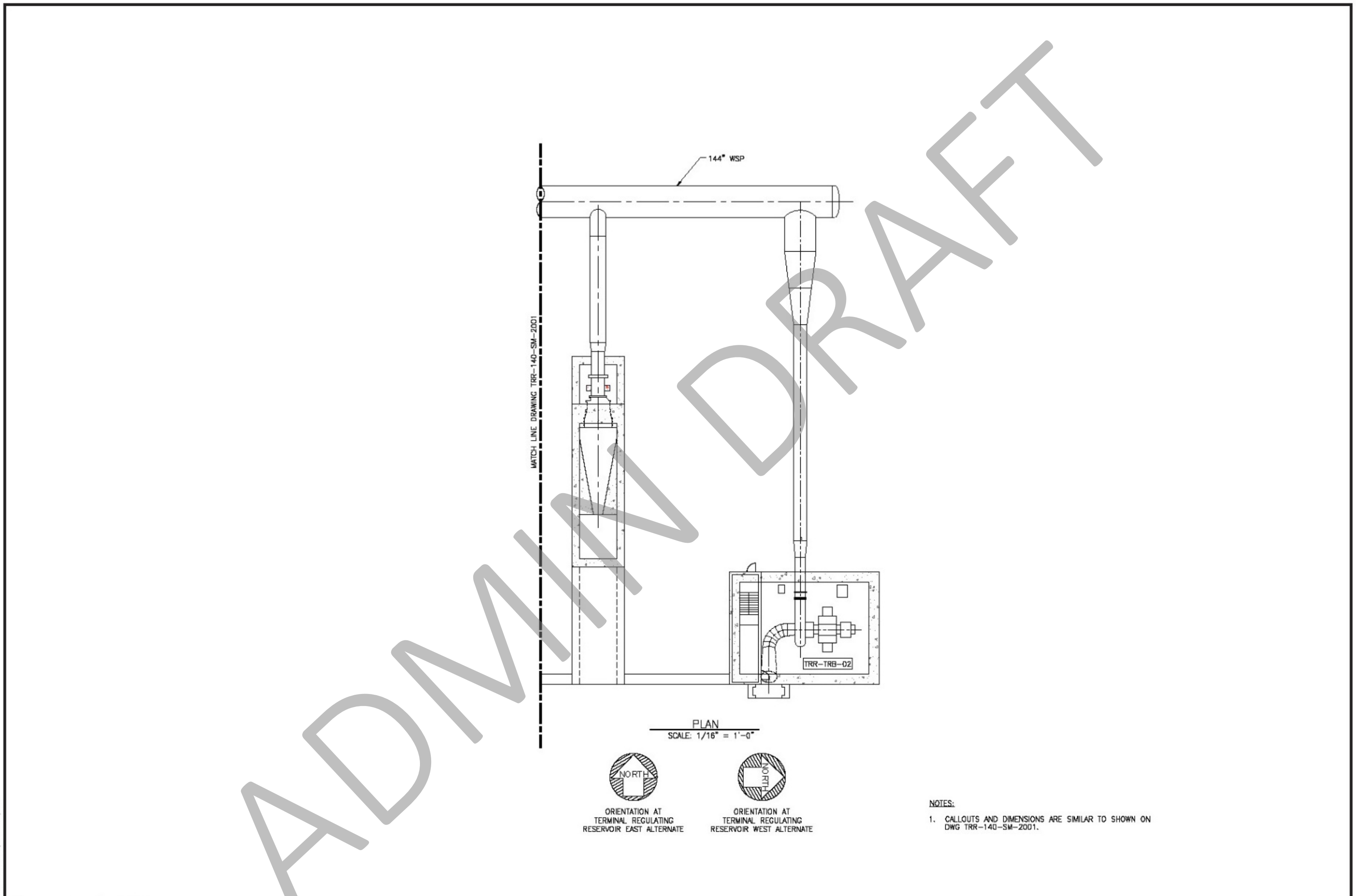
Source: Jacobs 2020

Figure 2-10B3
Terminal Regulating Reservoir West Inlet/Outlet Canal Plan



Source: Jacobs 2020
Drawing No. TRR-140-SM-2001

Figure 2-11A
Terminal Regulating Reservoir East and West Alts Pumping Generating Plant



Source: Jacobs 2020
Drawing No. TRR-140-SM-2002

Figure 2-11B
Terminal Regulating Reservoir East and West Alts Pumping Generating Plant

The two turbine generator buildings would house the turbines, generator, draft tube, associated piping appurtenances, and other electrical equipment. There would be two 13-megawatt (MW) turbines (one for each 12-foot-diameter pipe) that would have a horizontal laying flow pattern. The turbines would discharge water into a draft tube prior to exiting into the TRR. Because the discharge would need to be submerged, the turbines would be in an underground structure with a roof. The aboveground portion of the turbine generator buildings would consist of concrete masonry unit walls.

The two energy dissipation valve structures would allow releases back to the TRR as back-ups to the hydroelectric turbine facilities. These structures would each contain a stilling basin and fixed cone valve to dissipate energy before water enters the TRR. There would be a 60-inch fixed cone valve on each of the two 12-foot-diameter pipes for a total of two 60-inch fixed cone valves and a total flow of 1,000 cfs.

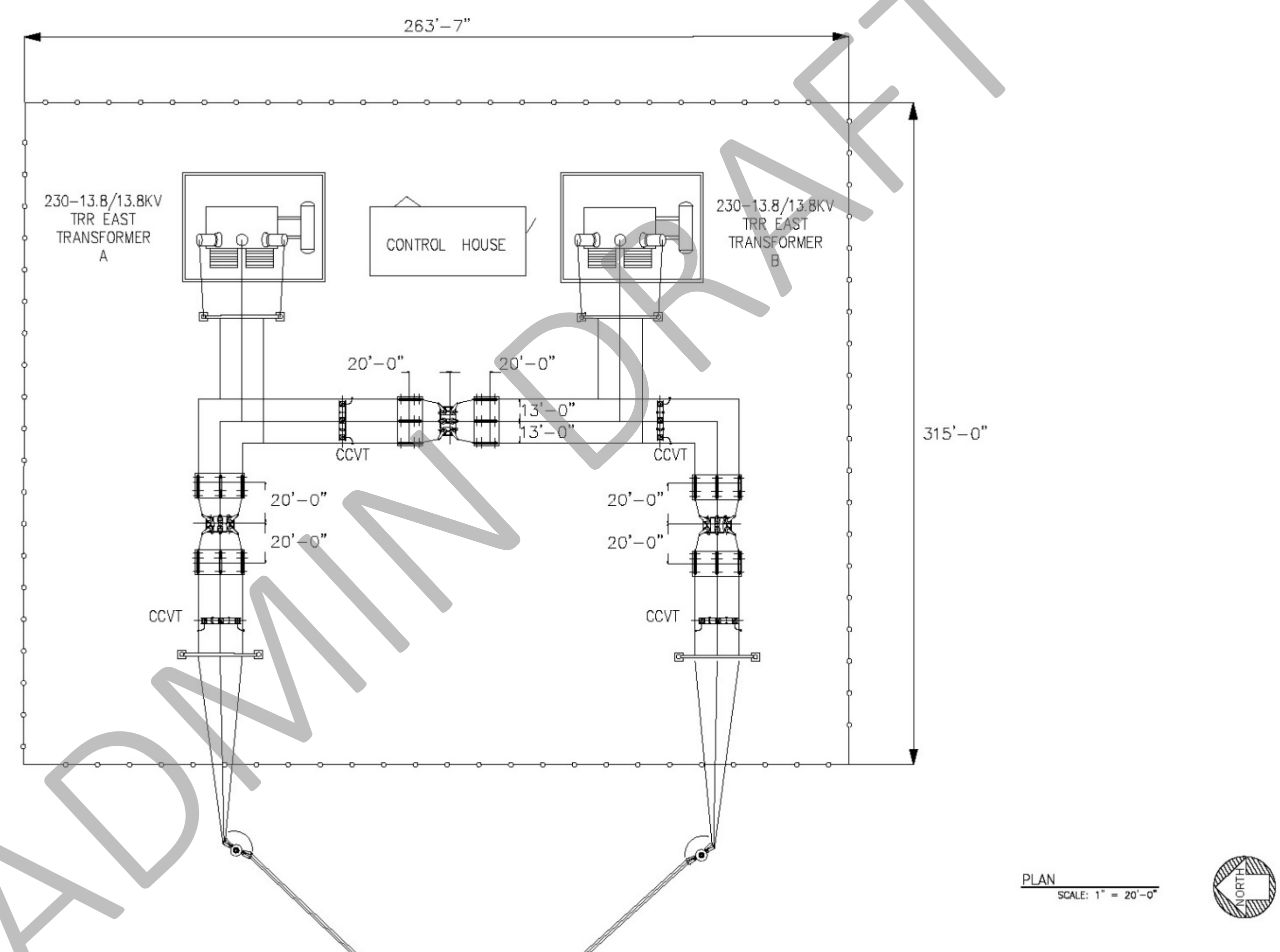
TRR Electrical Substation

An electrical substation would be required to provide electricity to the TRR PGP facilities. The electrical substation would connect to existing Pacific Gas and Electric Company (PG&E) or Western Area Power Administration (WAPA) lines. The substation would be constructed on approximately 1.5 acres within the TRR PGP footprint to the north of the TRR. The dimensions of the electrical substation would depend on whether it is connected with PG&E or WAPA lines. The substation would be approximately 460 feet long by 300 feet wide if connected to PG&E lines and be 300 feet long by 240 feet wide if connected to WAPA lines. Figure 2-12 provides a plan view of the facility.

The electrical substation would use electrical equipment that meets the standards of the National Electrical Manufacturers Association, American National Standards Institute, and Institution of Electrical and Electronics Engineers. Additionally, equipment that is listed or labeled as meeting the safety standards or ratings identified by Underwriter Laboratories or a nationally recognized testing laboratory would also be used. The substation design would include primary safety equipment (e.g., circuit breakers, utility-grade relays) and meet the total pumping power requirements or total generation requirements. Section 2.5.2.2, *Energy Generation and Energy Use,* contains additional information regarding the pumping power requirements or total generation requirements. The substation would have sufficient redundancy such that the failure of any one component would permit the substation to be safely and reliably isolated from the transmission system under fault conditions.

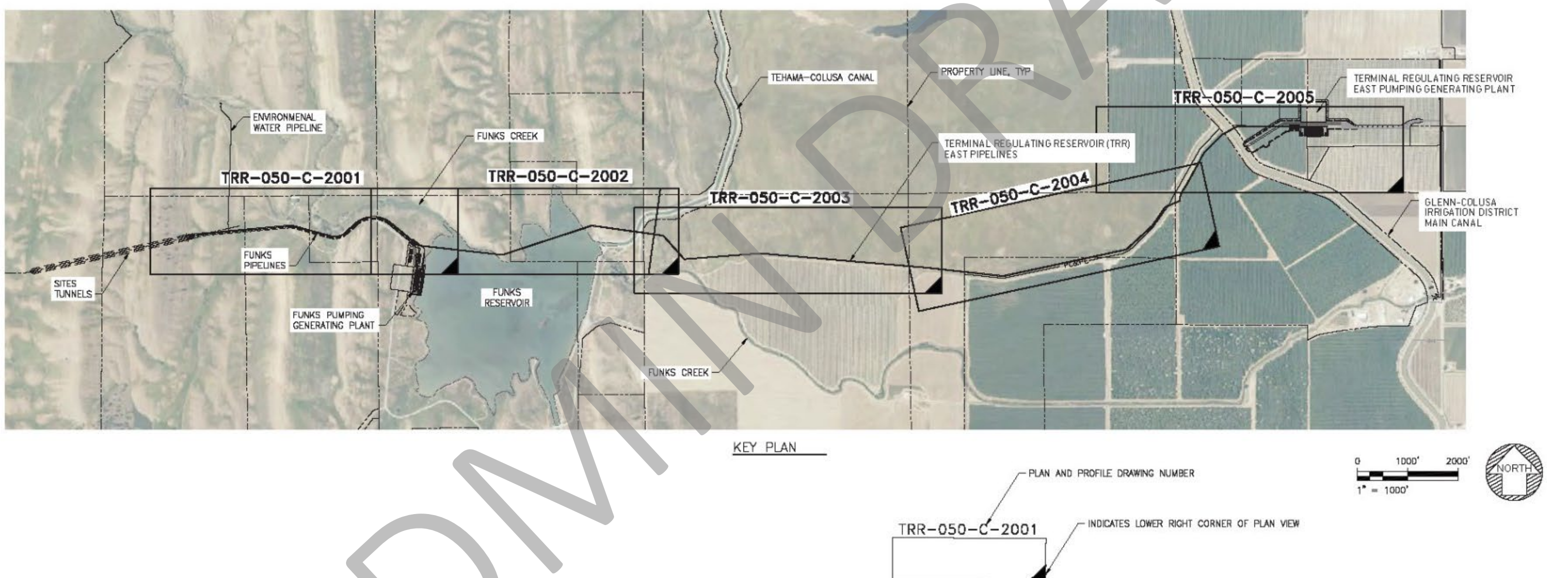
TRR Pipelines

Two underground TRR pipelines would convey water approximately 4–4.5 miles between the TRR PGP and Sites Reservoir. Figures 2-13a and 2-13b show the location and alignment route of the pipelines for TRR East and TRR West, respectively. The 12-foot-diameter pipes for either TRR West or TRR East would extend from the TRR PGP, under Funks Reservoir, and terminate at the transition manifold south of Funks Creek near the Golden Gate Dam. Both TRR pipelines would connect to a 32-foot-inside diameter I/O tunnel at the transition manifold.



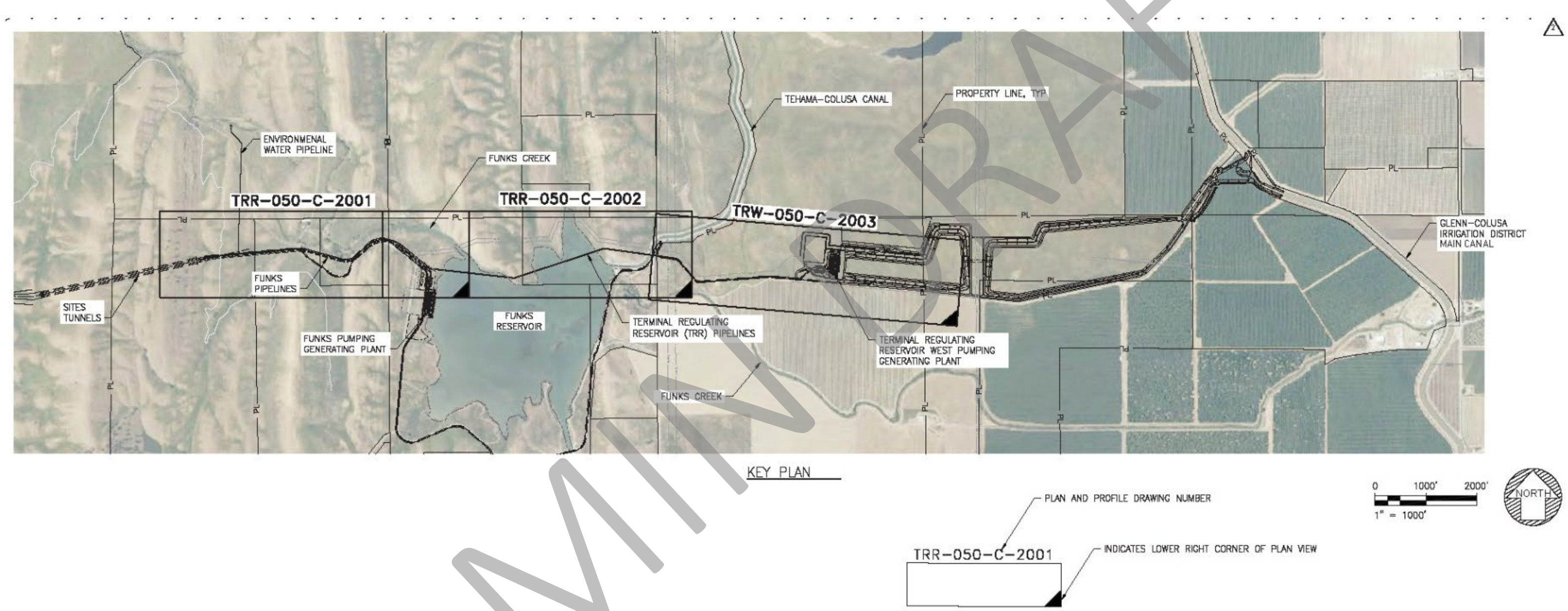
Source: Jacobs 2020
Drawing No. TRR-110-E-2201

Figure 2-12
Terminal Regulating Reservoir East or West Substation



Source: Jacobs 2020
Drawing No. TRR-050-C-2000

Figure 2-13A
Terminal Regulating Reservoir East Pipelines



Source: Jacobs 2020
Drawing No. TRW-050-C-2000

Figure 2-13B
Terminal Regulating Reservoir West Pipelines

Funks Reservoir

The Project would involve excavating sediment from the existing Funks Reservoir and constructing the Funks PGP, an electrical substation, and Funks pipelines. These facilities would be constructed on approximately 7 acres that are west of the TC Canal in Colusa County (Figure 2-14). The existing Funks Reservoir would be used to store and pump water from the TC Canal to and from Sites Reservoir. The Project would not alter the footprint of Funks Reservoir; however, 740,000 cubic yards of sediment that has accumulated since its constructed would be excavated from the reservoir. The excavation is anticipated to restore the original capacity of Funks Reservoir. Excavation would proceed to an elevation of approximately 197 feet in the reservoir and 185.5 feet near the Funks PGP on the western side. The bottom of Funks Reservoir would be reshaped to allow unimpeded flows to and from the Funks PGP. The excavated sediment would be stockpiled adjacent to Funks Reservoir as shown on Figure 2-15. The sediment may be used for construction purposes, if suitable, or graded in place and revegetated. The reservoir is usually dewatered from the end of December through early February for TC Canal maintenance purposes. The Funks Reservoir and associated facilities would be enclosed by a security fence with access gates on the south and northwest sides.

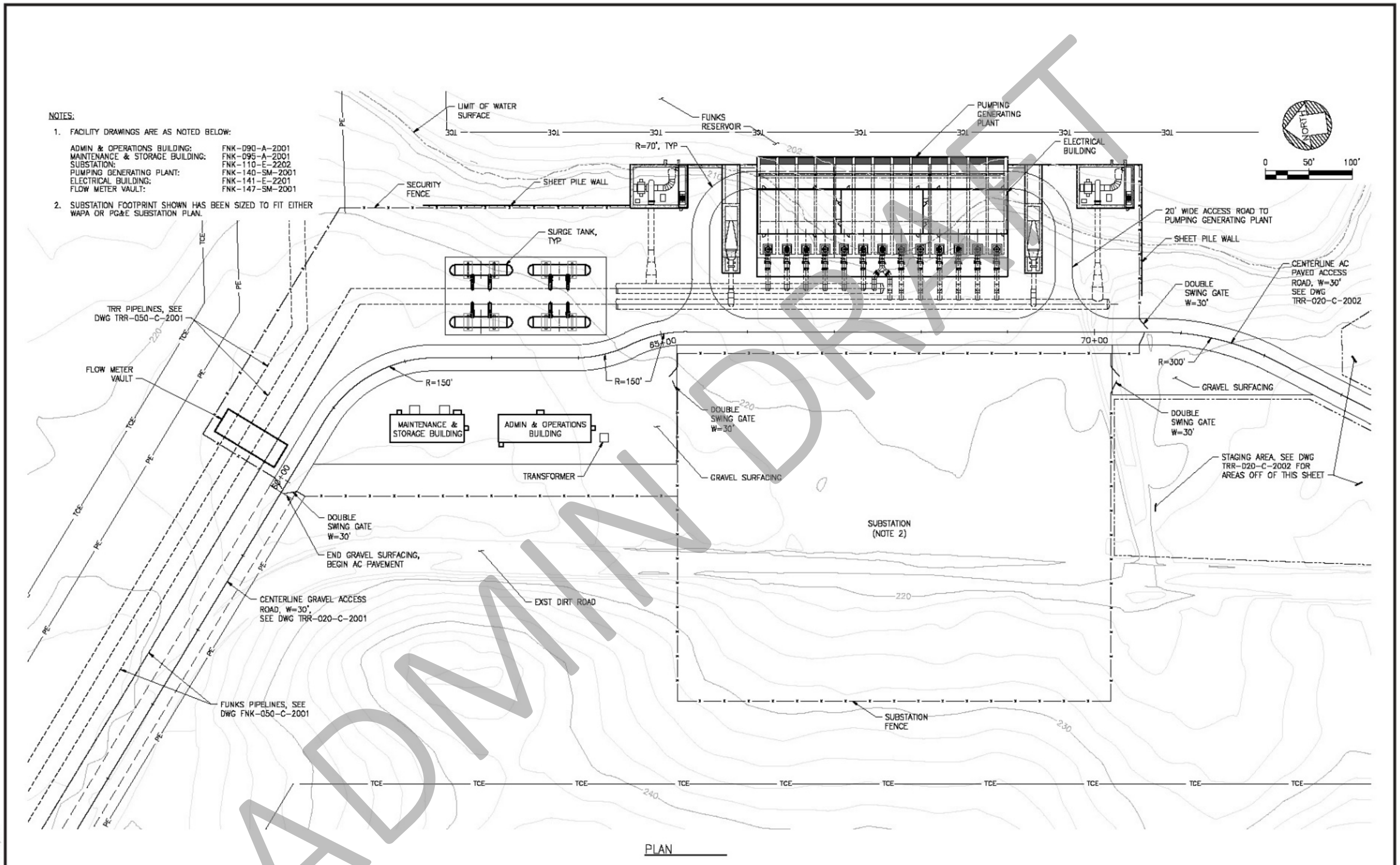
A gravel parking area would be provided near the PGP. Asphalt concrete paved, onsite vehicular access would be provided between the Funks PGP and electrical substation, with facility spacing to accommodate a crane. The facilities site would be accessed by an asphalt concrete paved road from Maxwell Sites Road to the south. Existing gravel roads would be improved to be 30 feet wide, with asphalt concrete surfacing for the southern access route, and would be relocated through the site. A gravel bypass road may be provided to the west of the site. On the north side of the facilities site, the existing dirt road would be improved to be a gravel road that would follow the existing road alignment until it reaches the TRR pipeline. At that location, a new access road would be built along the Funks and TRR pipelines to the connection with the I/O tunnel.

The Funks Reservoir-related facilities would be located in a FEMA Area of Minimal Flood Hazard, Zone X. Onsite drainage would be conveyed offsite directly into Funks Reservoir through shallow swales or overland flow. Offsite stormwater runoff would be collected on the west side of the site in a ditch, conveyed around the site, and deposited into Funks Reservoir.

The existing Funks Reservoir would be used as a source of water to pump to Sites Reservoir and would receive water discharged from the reservoir. The Funks Reservoir operational water surface elevation (WSE) can only vary slightly from the TC Canal and the reservoir WSE typically ranges from 200 to 205 feet, although the preferred operational WSE range is 202 to 204 feet.

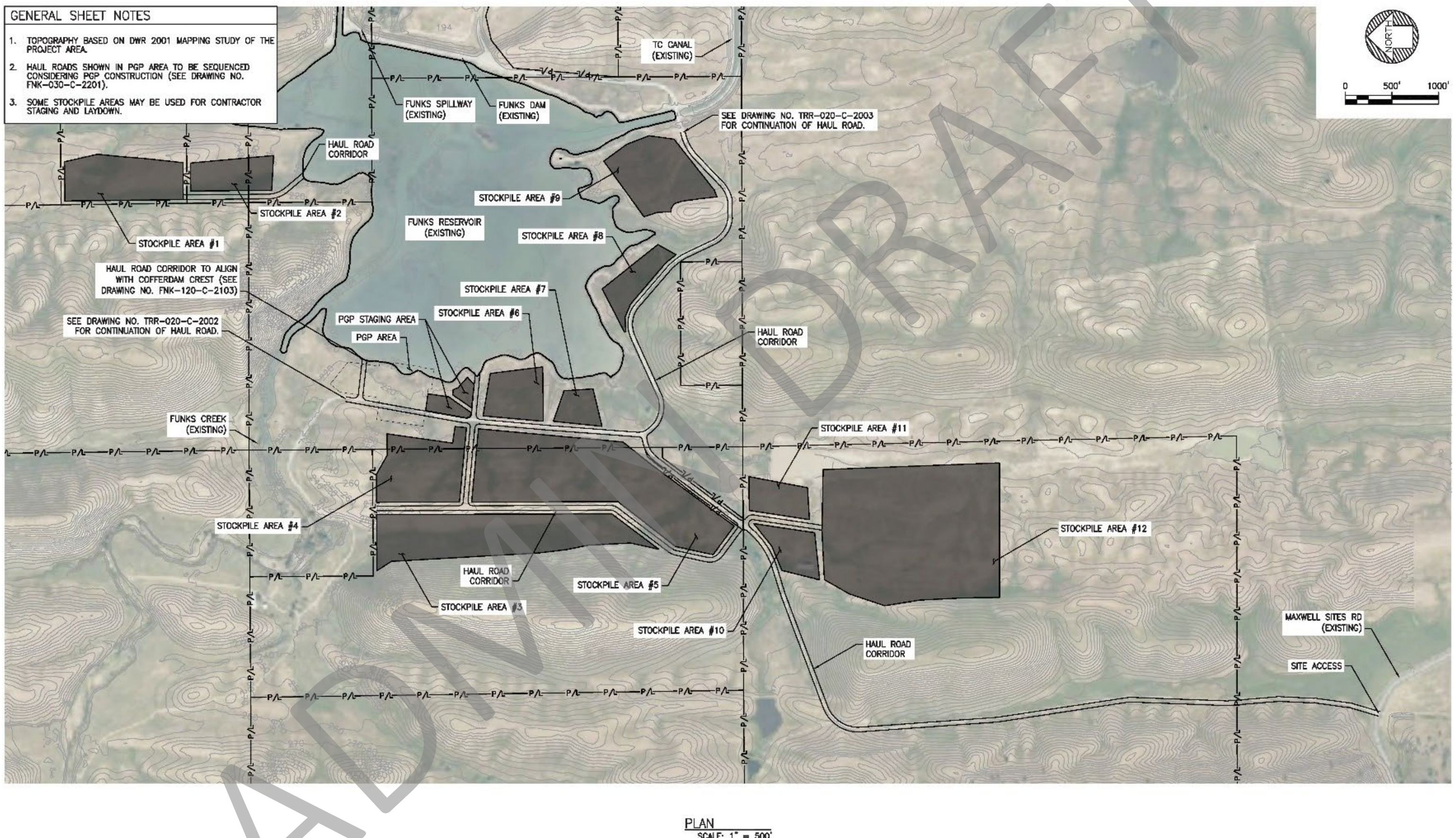
Funks Pumping Generating Plant

The Funks PGP would be used to pump water from Funks Reservoir to Sites Reservoir (Figures 2-16a and 2-16b). The PGP would be constructed on the northwest side of Funks Reservoir. The PGP would include the following three facilities in five buildings: one pump station, two turbine generator buildings, and two energy dissipation structures. An electrical building would also be constructed behind the pumps as part of the pump station.



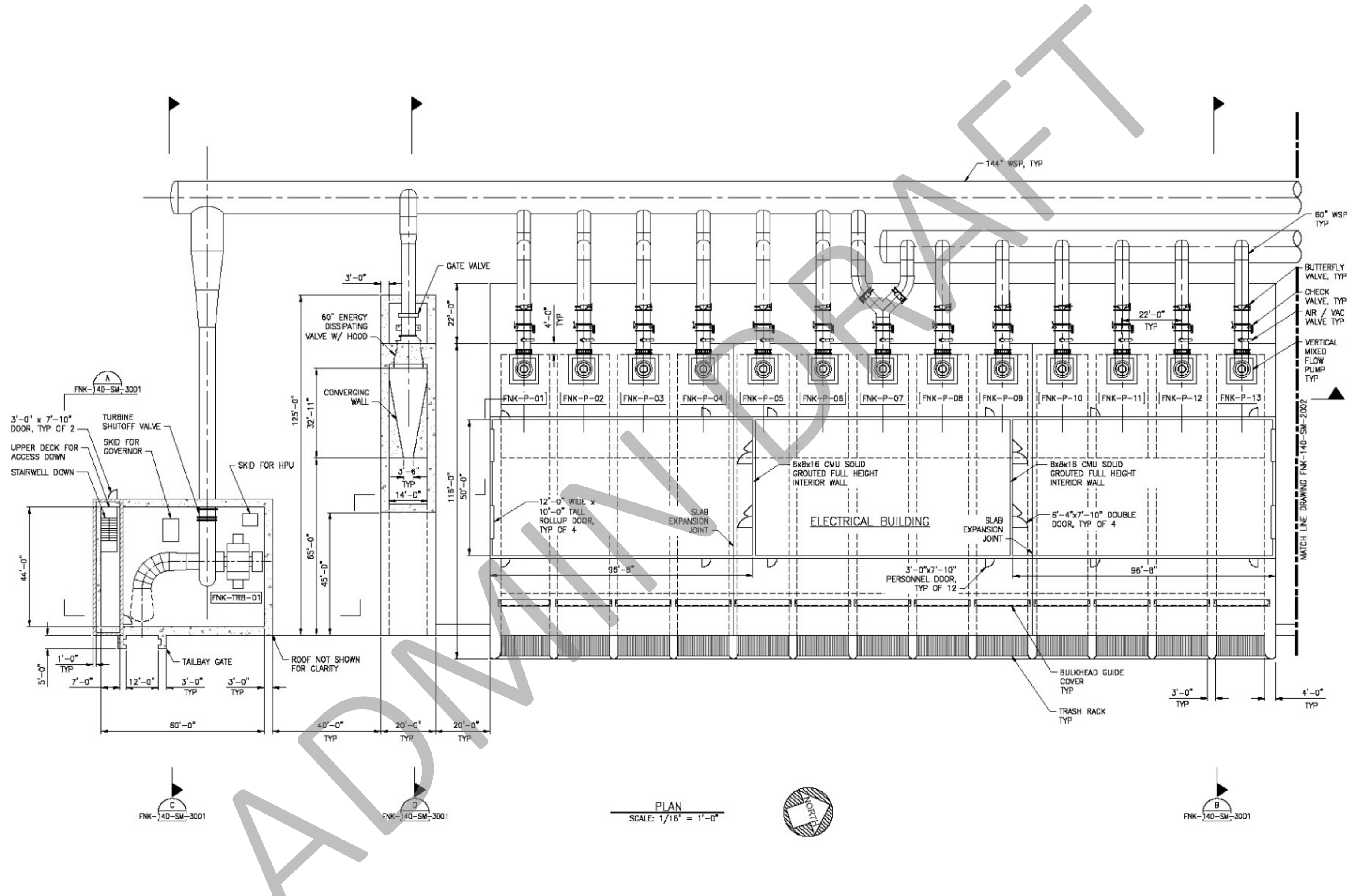
Source: Jacobs 2020
Drawing No. FNK–030–C–2201

Figure 2-14
Funks Reservoir Facilities Site Plan



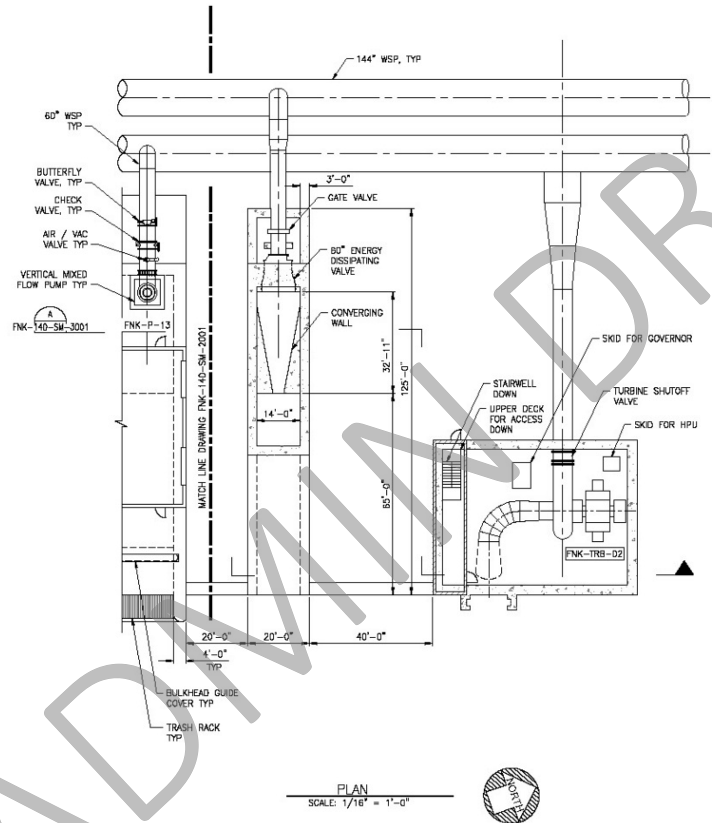
Source: Jacobs, 2020
Drawing No. FNK-120-C-2101

Figure 2-15
Funks Reservoir Stockpile and Haul Route Plan



Source: Jacobs 2020
Drawing No. FNK-140-SM-2001

Figure 2-16A
Funks Pumping Generating Plant Facilities



Source: Jacobs 2020
Drawing No. FNK-140-SM-2002

Figure 2-16B
Funks Pumping Generating Plant Facilities

The Funks pump station would be similar to the TRR pump station, except that the orientation of 12-foot-diameter pipelines would be different. The pump station would have a flow rate of 2,100 cfs and thirteen 800-hp pumps. The turbine generator buildings would be the same as described for the TRR PGP, and each generator would have a design criterion of 1,000 cfs for redundancy. There would be two turbines (20-MW and 14.5-MW). Each of the two energy dissipation structures would consist of a single 60-inch fixed cone valve with a design criterion of 1,000 cfs. There would be a 60-inch fixed cone valve on each of the two 12-foot-diameter pipes for a total of two fixed cone valves and a total flow of 2,000 cfs (1,000 cfs each).

Funks Electrical Substation

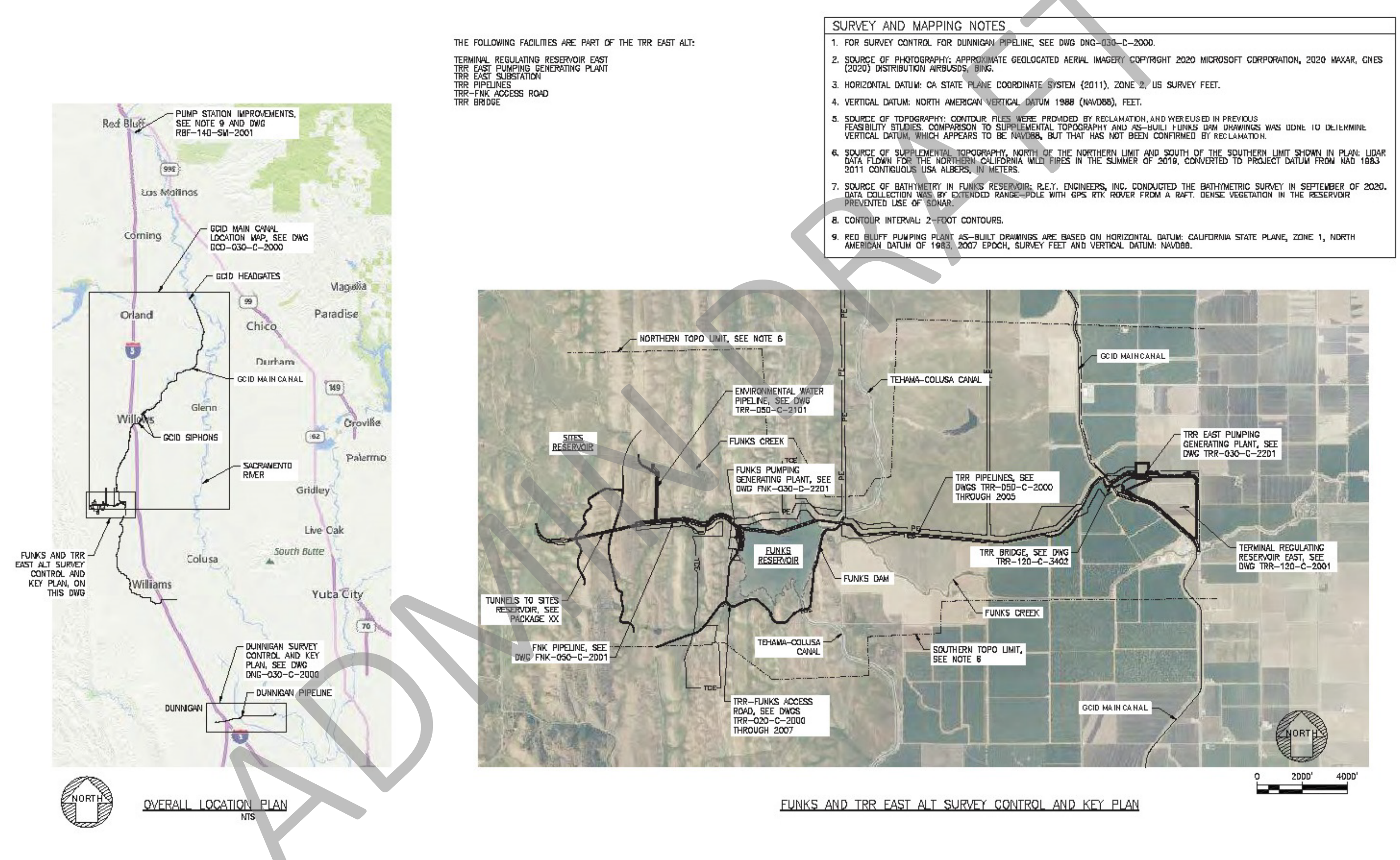
As with the TRR PGP, the Funks PGP would require a substation to provide electricity to the Funks PGP facilities. This substation would connect to either existing WAPA or PG&E lines. The substation would be located west of Funks Reservoir in the footprint of the Funks PGP and would encompass approximately 3 acres. The Funks electrical substation would be similar to the TRR electrical substation; it would be approximately 460 feet long by 300 feet wide if connected to PG&E lines and would be 300 feet long by 240 feet wide if connected to WAPA lines. The substation would be designed to accommodate the total pumping power requirements (import) or total generation requirements (export).

Funks Pipelines

Two underground Funks pipelines would convey water approximately 1 mile between the Funks PGP and Sites Reservoir. Figure 2-17 shows the location and alignment of the pipelines. The 12-foot-diameter pipes would extend from the Funks Reservoir and Funks PGP to the transition manifold south of Funks Creek near the Golden Gate Dam. The Funks pipelines would generally run parallel to the TRR pipelines. After curving around Funks Creek and hilly areas, the Funks pipelines would run south, deviating from the TRR pipeline alignment, to the Funks PGP. The Funks pipelines would connect to the 32-foot-diameter I/O tunnel at the transition manifold. After installation, the pipelines would generally be from 6 feet to 25 feet below ground surface.

Transition Manifold

The transition manifold would be constructed to the south of Golden Gate Dam to connect Sites Reservoir to Funks Reservoir and the TRR. The transition manifold would be installed approximately 6 feet below ground surface and would be approximately 114 feet long by 92 feet wide. The structure would connect the four 12-foot-diameter conveyance pipelines from Funks Reservoir and TRR to one 32-foot-diameter I/O tunnel, which are discussed in Section 2.5.1.4, *Sites Reservoir and Related Facilities*. The transition manifold would have isolation valves to close off the pipelines and allow for maintenance.



Source: Jacobs 2020
Drawing No. GEN-030-C-2001

Figure 2-17
Alternatives 1 and 3 Conveyance Complex Facilities

A 12-inch-diameter underground pipeline would extend 2,800 feet north from the transition manifold to Funks Creek. The pipeline would discharge flows into an energy dissipation structure before they entered the creek. The purpose of this pipeline and energy dissipation structure is to release water to Funks Creek for environmental purposes (described further in *Funks Creek and Stone Corral Creek Releases* subsection). The pressure-reducing valve to dissipate energy before the water is discharged into Funks Creek is necessary because the water pressure would be a function of the Sites Reservoir elevation. The pipeline would be sized to accommodate a range of discharges (zero to 100 cfs) to provide water for the approximately 1.8-mile stretch of Funks Creek below Golden Gate Dam to Funks Reservoir. Construction of the transition manifold would occur after the I/O tunnel is constructed. Construction means and methods would be similar to those for the TRR and Funks pipelines (Appendix 2C).

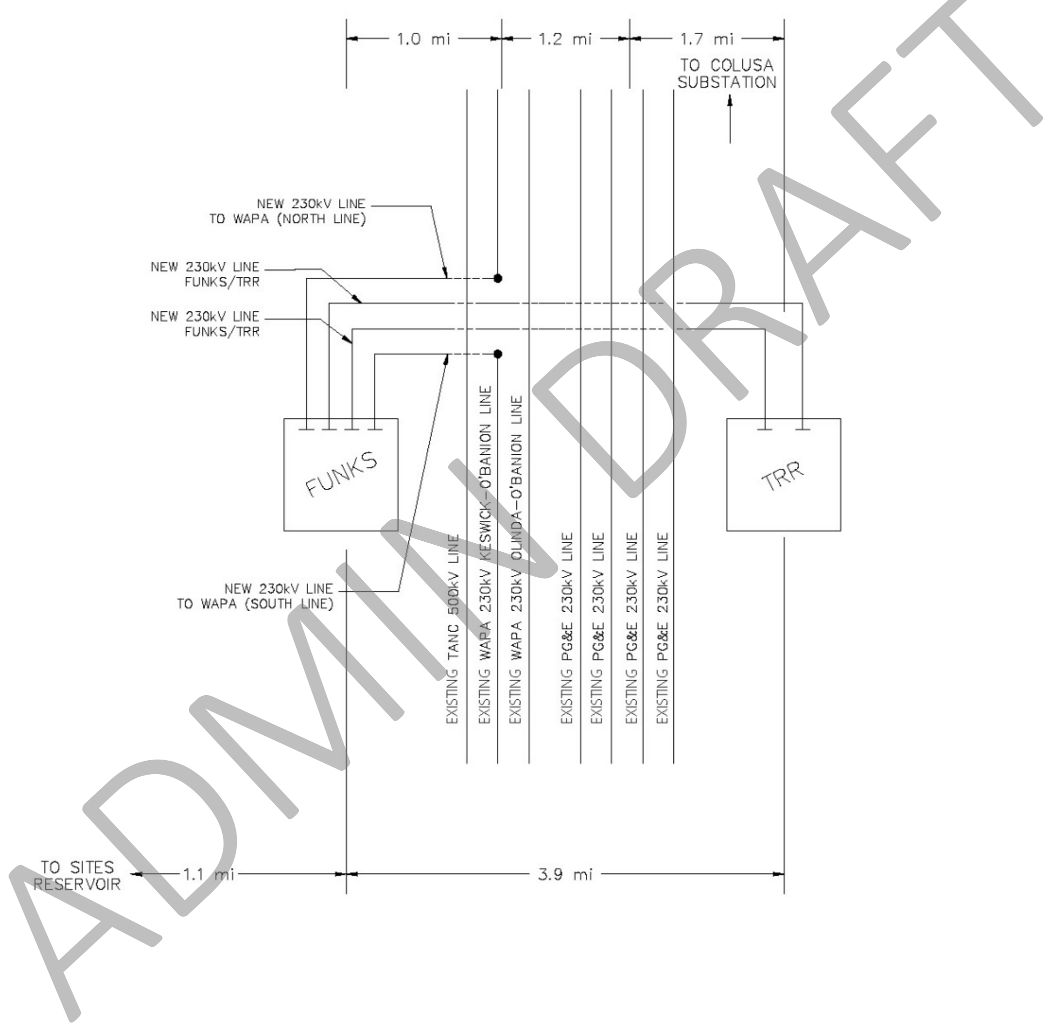
Electrical Transmission Connections

New high-voltage transmission lines would be required to provide power to the Funks and TRR PGPs. Transmission lines connecting Funks and TRR substations would also be required. Interconnecting to the existing transmission system would be necessary to provide the electricity needed to operate the large pumps at the TRR and Funks Reservoir. This interconnection would also enable the energy produced at the Funks and TRR PGPs to enter the transmission system during periods of operation that use their respective turbines/generators. The general laydown areas and construction means and methods of the two substations and the point of interconnection (POI) substation and high-voltage transmission lines that connect either PG&E or WAPA facilities to Sites facilities are provided in Appendix 2C.

North-South Transmission Connections

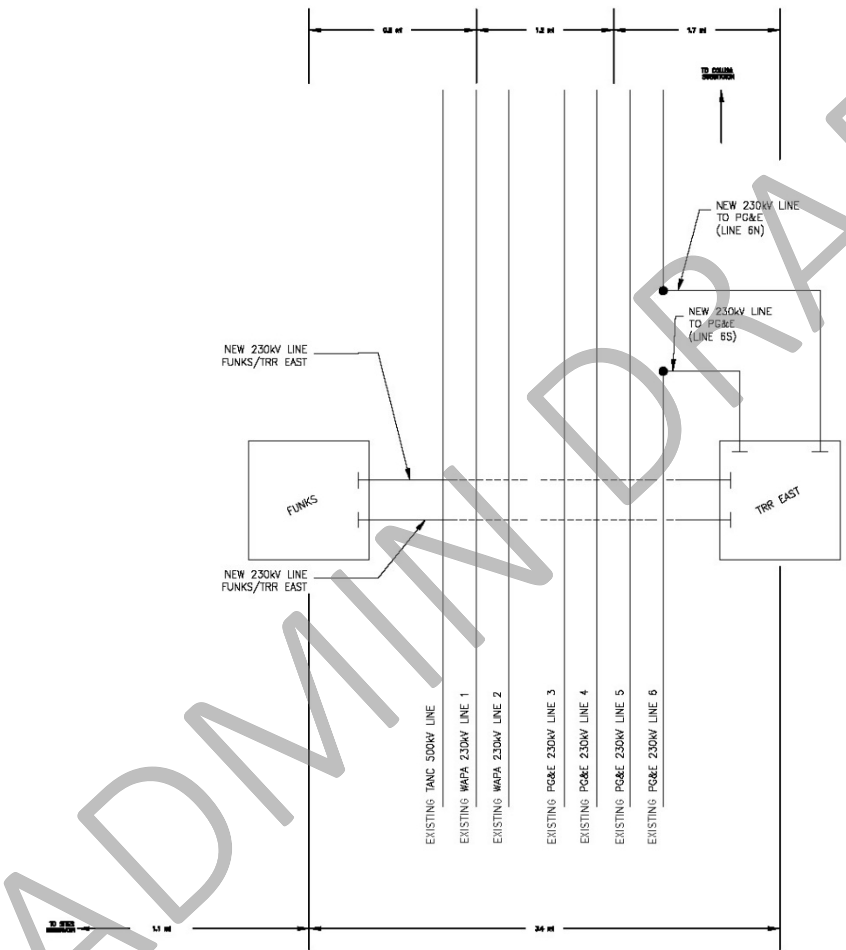
New transmission lines originating between Funks Reservoir and TRR would connect to WAPA or PG&E existing facilities. Two 230-kilovolt (kV) lines owned and operated by WAPA are located north of Funks Reservoir, and four 230-kV lines owned and operated by PG&E are located west and north of the TRR. WAPA and PG&E are defined as the Transmission Owner and the Transmission Operator of their respective high-voltage transmission lines. Each of these lines is a POI location; a POI to a high-voltage electric transmission line would be required to provide power. Figures 2-18 and 2-19 provide a schematic sketch showing the WAPA and PG&E alternative POI arrangements and the required transmission line lengths to the Funks and TRR electrical substations. The POI may require a third substation, which would be located adjacent to the WAPA or PG&E 230-kV lines.

The POI between the electrical substations and existing transmission lines would require that an application for interconnection request be submitted and processed under the California Independent System Operator (CalISO) interconnection process. The location of the POI to the WAPA or PG&E 230-kV transmission lines would depend on the results of a system impact study completed by WAPA or PG&E in conjunction with CalISO.



Source: Jacobs 2020
Drawing No. STD-199-E-5002

Figure 2-18
WAPA Schematic Sketch



Source: Jacobs 2020
Drawing No. GEN-100-E-6003

Figure 2-19
PG&E Schematic Sketch

East-West Transmission Lines

There would also be an interconnection between the Funks and TRR PGPs, and it is anticipated that the transmission lines would parallel the pipelines within the same easement. Up to four 230-kV transmission lines would be required: two for the source supply to either of the PGPs and two between the Funks and TRR electrical substations. The two looped source circuits would be installed on a set of common double-circuit steel monopole structures and would require separate easements because they would not parallel any of the pipelines (Figure 2-20). The two transmission lines between the Funks and TRR electrical substations would be installed on their own common set of double-circuit steel monopole structures within the pipeline easement (Figure 2-21).

2.5.1.3 Administration/Operations and Maintenance/Storage Buildings

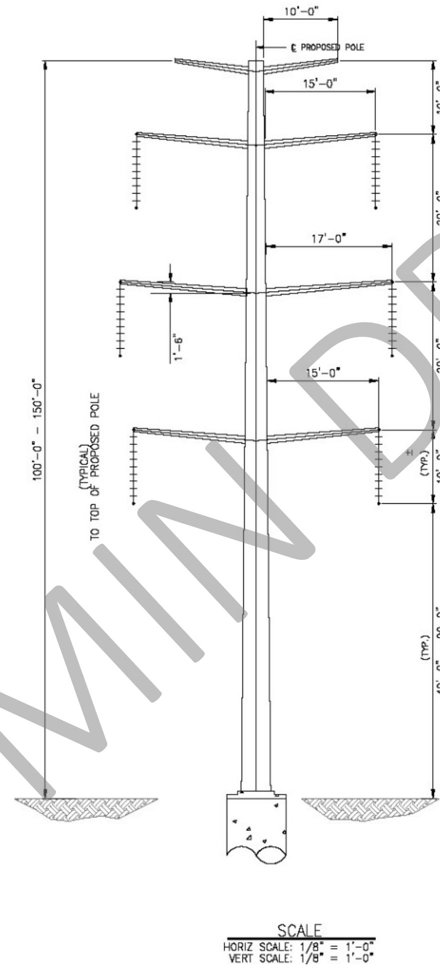
The Project would involve the construction of an administration and operations building and a maintenance and storage building. These two buildings would be located along the existing gravel access road to the Funks PGP on approximately 0.15 acre. The administration and operations building would be a one-story building encompassing approximately 3,400 square feet. The maintenance and storage building would be a one-story building encompassing roughly 2,700 square feet.

Utilities required for these buildings include a septic system at least 100 feet away from Funks Reservoir and Funks Creek (per county code), potable water provided from groundwater wells, and electricity obtained from the Funks Reservoir switchyard. The building designs would be in accordance with the California Building Code and would provide asphalt concrete paved onsite parking and vehicular access. Figures 2-22 and 2-23 show the plan view and elevation view of these two buildings.

Construction of the buildings would include clearing and grading; transporting materials and placing them at staging areas; and constructing ancillary facilities (e.g., potable water source, septic system, lighting, concrete pad for refueling island, aboveground fuel tanks, perimeter fencing).

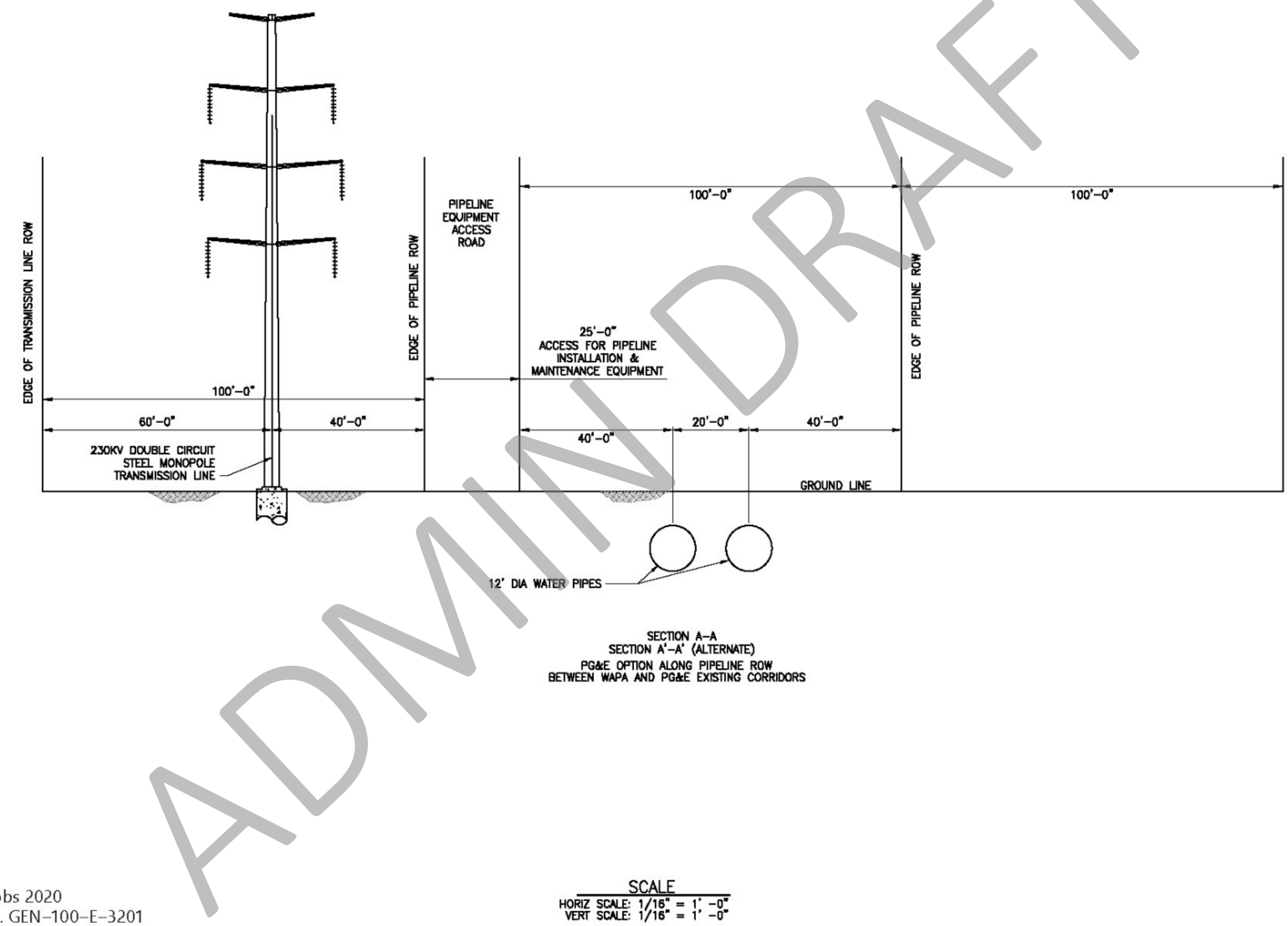
2.5.1.4 Sites Reservoir and Related Facilities

The Project would construct Sites Reservoir, I/O Works, two main dams (Golden Gate Dam, Sites Dam), saddle dams, and saddle dikes. Water from Funks Creek and Stone Corral Creek would be impounded in the inundation area by the construction of Golden Gate Dam and Sites Dam, respectively. A series of saddle dams along the eastern and northern rims of the reservoir would close off topographic saddles in the surrounding ridges to form Sites Reservoir. The saddle dikes would be constructed at the northern end of the reservoir. These components are described in the following sections. A helipad would be constructed near both Sites and Golden Gate Dams for emergency access. Figures 2-1 and 2-3 provide the location of the Sites Reservoir, Golden Gate Dam, Sites Dam, saddle dams, saddle dikes, and I/O Works.



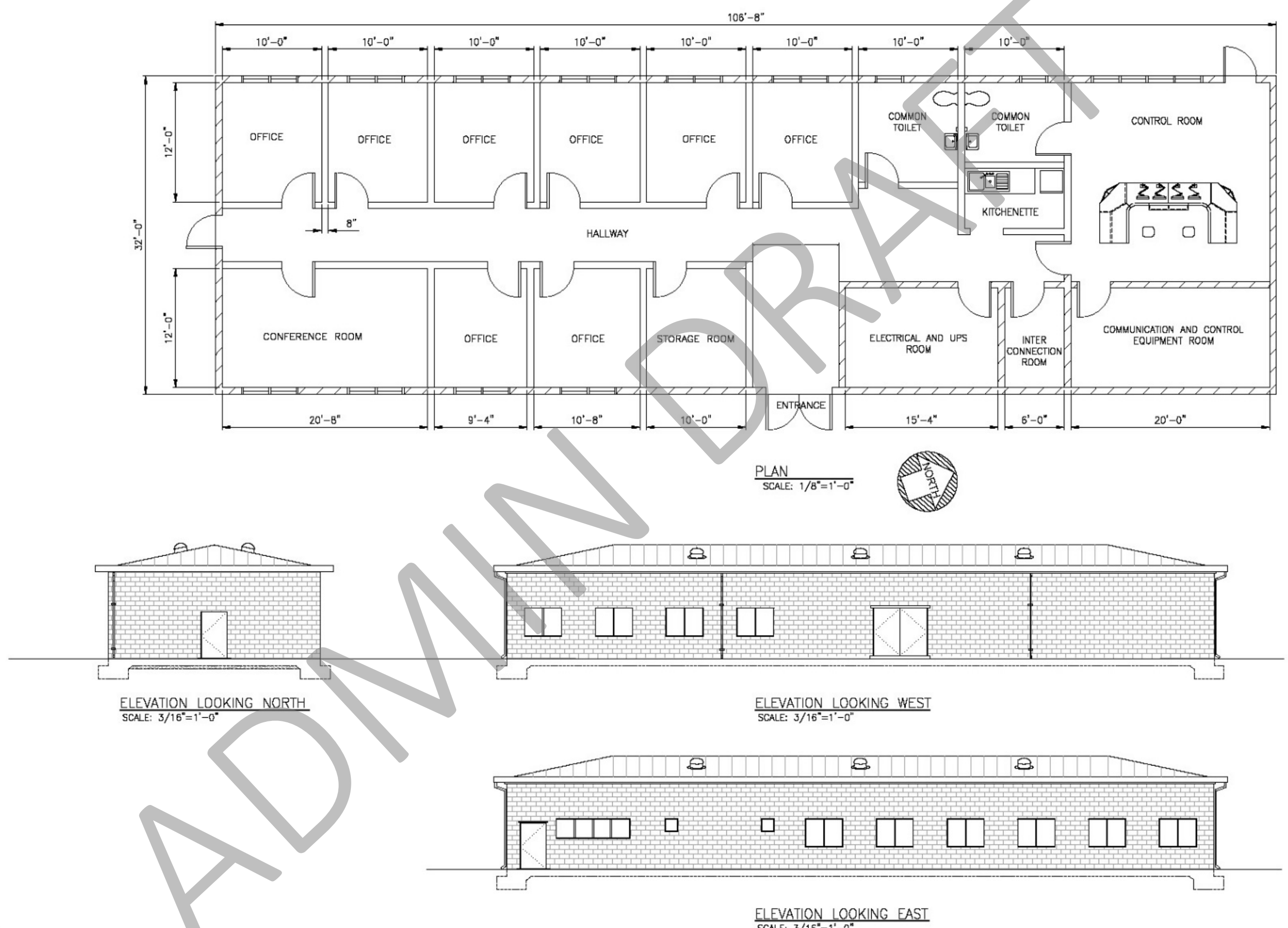
Source: Jacobs 2020
Drawing No. GEN–100–E–5001

Figure 2-20
Double-Circuit Source Transmission Poles



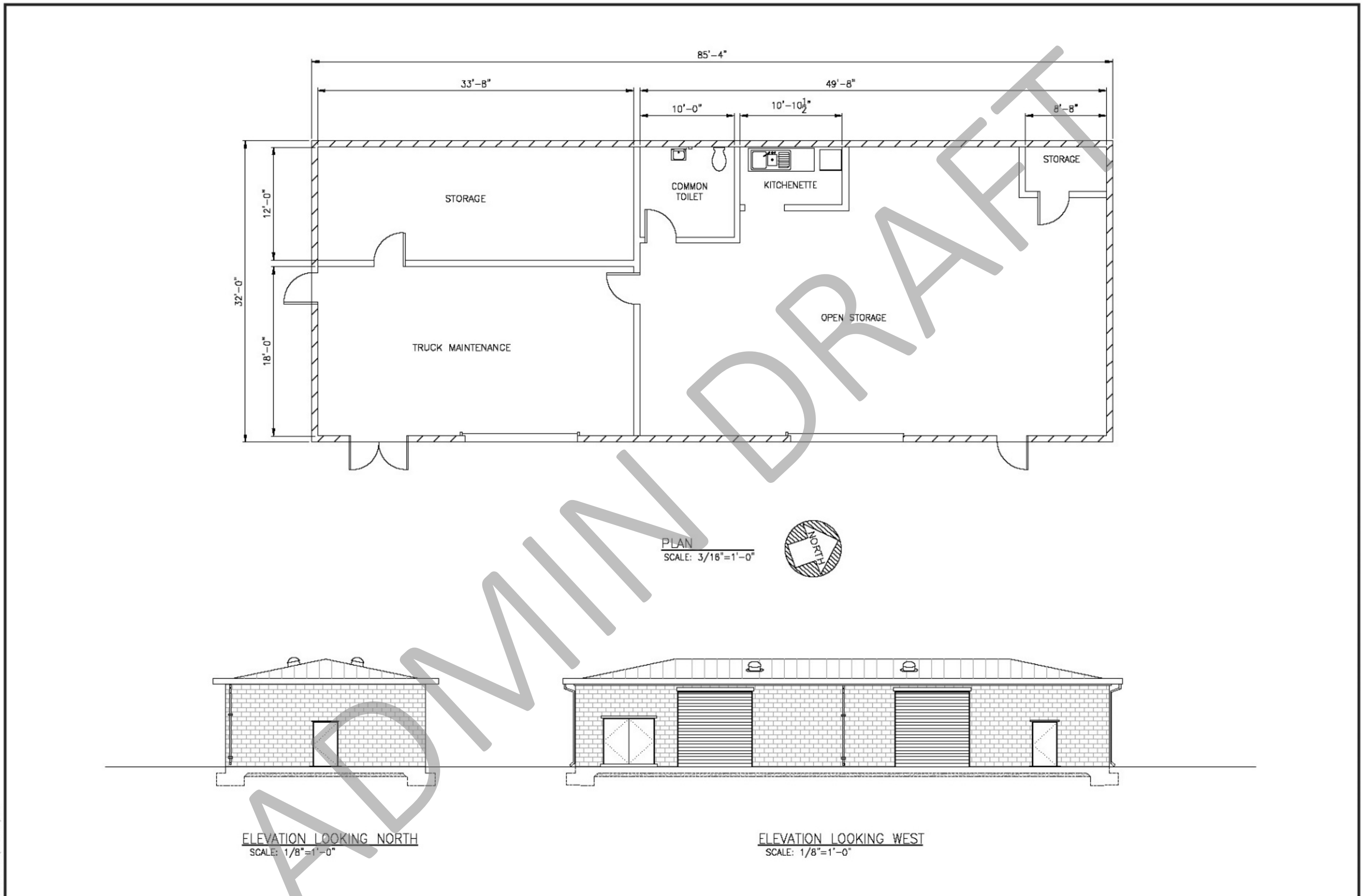
Source: Jacobs 2020
Drawing No. GEN–100–E–3201

Figure 2-21
Alternatives 1, 2, and 3 Funks Reservoir to Terminal Regulating Reservoir East or West Electrical Interconnection



Source: Jacobs 2020
Drawing No. FNK-090-A-2001

Figure 2-22
Administration and Operations Building



Source: Jacobs 2020
Drawing No. FNK–095–A–2001

Figure 2-23
Maintenance and Storage Building

Inlet/Outlet Works

The I/O Works for the reservoir would generally be located south of Golden Gate Dam. Figures 2-24 and 2-25 show the plan and profile view, respectively, of the I/O Works. The I/O Works consists of a low-level intake, multi-level sloped I/O tower, and one I/O tunnel. These structures are described in the subsections below, and Appendix 2C provides the engineering schematics for each structure.

The I/O Works would be designed to meet maximum water supply commitments, as well as safely pass emergency releases per DSOD requirements. The I/O Works would allow a maximum release of 16,000 cfs. The I/O Works would meet summer irrigation demands downstream with an estimated maximum release flow of 3,100 cfs. The I/O Works would also allow inflows pumped into the reservoir from the TC Canal and GCID Main Canal; the maximum inflows are anticipated to be 3,900 cfs.

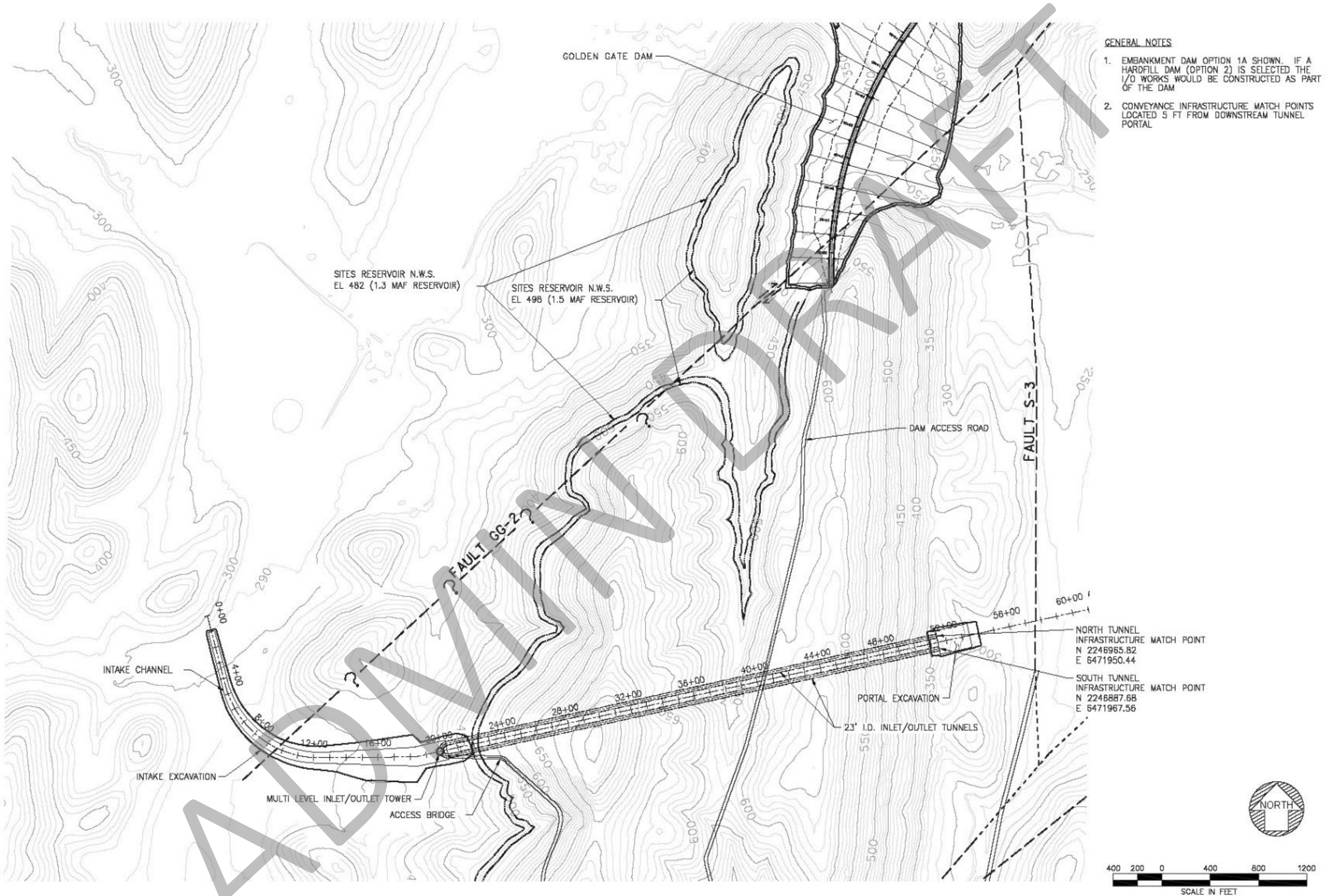
Construction of the I/O Works would disturb approximately 30 acres in the inundation area and a similarly sized area at the downstream tunnel portal. The construction disturbance footprint would encompass the sloping intake; tunnel portal; materials, spoils, and equipment staging areas; and access roads. A portion of the footprint outside the inundation area would overlap with the disturbance area for the conveyance system. Major construction activities associated with the I/O Works would consist of dewatering the construction site with an onsite treatment facility, excavating the hillside for the downstream and upstream tunnel portals, tunneling and hauling tunnel muck to a disposal area, using spoils from the tunnels for Golden Gate Dam or disposing of them in the inundation area, excavating for the multi-level tower shaft, building the multi-level tower, building the low-level intake, and completing grading and site cleanup.

The construction of the tunnels that would connect the Sites Reservoir to the Funks and TRR pipelines would require excavating the tunnels, installing the tunnel support systems, and controlling groundwater. The I/O tunnel would be constructed using a combination of drill-and-blast and road header excavation, depending on the strength of the rock, and pre-excavation measures would be used to stabilize the ground and reduce groundwater inflow. As construction proceeded, support systems would be installed, followed by the placement of the reinforced cast-in-place concrete tunnels and steel carrier pipe.

Low-Level Intake

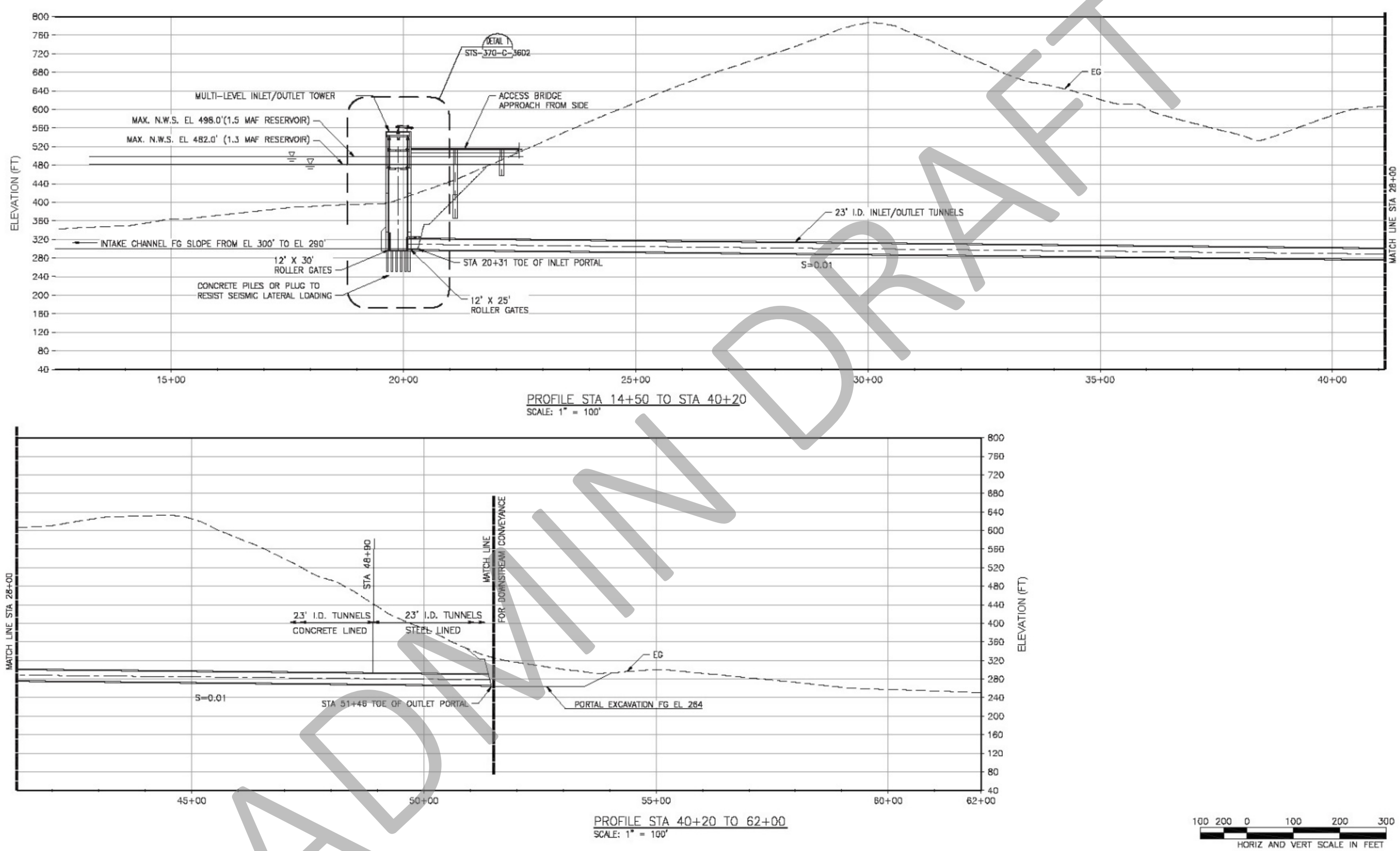
The low-level intake would be used to meet DSOD-required emergency drawdown releases; Section 2.5.2.1, *Water Operations*, contains additional information about these requirements. This intake would also release stored water below the lowest ports in the I/O tower during drought conditions.

The low-level intake would be at an elevation of 300 feet to allow for sediment accumulation over a 100-year Project life. Flows would not be pumped in directly from the Sacramento River, and the main source of sediment is expected to be from local runoff in the reservoir watershed. The intake channel would be excavated down to an elevation of approximately 290 feet. The installation of bar-type trashracks would protect the I/O tunnel from damage and keep debris from clogging the flow streams. The low-level intake would be designed to allow for inspection and maintenance.



Source: AECOM 2020
Drawing No. STS–370–C–2601

Figure 2-24
Plan of Inlet/Outlet Works Site



Source: AECOM, 2020
Drawing No. STS–370–C–3601

Figure 2-25
Profile of Inlet/Outlet Works Site

I/O Tower

The vertical, free-standing I/O tower evaluated in the RDEIR/SDEIS for Alternatives 1, 2, and 3 has been redesigned as a sloped I/O tower. The sloped I/O tower would be supported by the reservoir slope for all alternatives. The sloped I/O tower would eliminate the need for significant seismic reinforcement and therefore provide cost savings. There would not be a measurable change in the size or location of the I/O tower footprint. The 300-foot-tall, multi-level I/O tower would allow flows into and out of the reservoir through the use of ports around the tower's perimeter. These ports would be in tiers at multiple elevations and equipped with roller gates or valves, which would allow for operational flexibility, including managing the temperature/quality of water released from the reservoir. The tower would also have moveable fish screens. The moveable fish screens would be sized as design progresses and criteria are established by the Authority in consultation with the applicable regulatory agencies. Head gates at the bottom (below ground surface) of the I/O tower would allow access to the I/O tunnel. The lower portion of the I/O tower would be anchored in bedrock, and the connections at the tower and abutments would accommodate differential movement that may occur during the design seismic event. Table 2-2 summarizes key design characteristics for the I/O tower.

Table 2-2. Summary of I/O Tower Design Characteristics

Key Characteristic	Alternatives 1 and 3	Alternative 2
Maximum Normal Water Surface Elevation*	498 feet above mean sea level	482 feet above mean sea level
Top of Tower Elevation	558 feet above mean sea level	542 feet above mean sea level
Top Tier Port Centerline Elevation	470 feet above mean sea level	450 feet above mean sea level
Maximum Number of Ports	21 (3 each at 7 tiers)	18 (3 each at 6 tiers)
Minimum Port Size	5.5-foot-wide by 7-foot-high rectangular ports have been assumed; Ports would be sized such that the maximum operational drawdown (3,900 cfs) can be achieved with ports at two levels (6 ports total)	

*This would also be the maximum normal operating water elevation

Six or seven operating levels (or tiers) are anticipated based on the current design. The upper tiers would be spaced 20 feet on center, with centerlines at elevations ranging from 370 to 450 feet (Alternative 2) or 470 feet (Alternatives 1 and 3). The lowest tier would be centered at 340 feet, 30 feet below the next lowest tier at 370 feet elevation (Alternatives 1, 2, and 3). The tiers would be constructed at different elevations to allow flexibility to withdraw water based on its quality. At each tier there would be three ports on alternating faces of the hexagonally shaped tower. These ports would be controlled by roller gates or valves.

The head gates would be located in the I/O tower base (below ground surface) to allow the isolation of its tunnel for maintenance, inspection, and operational needs. The head gates would be designed to prevent outflow from the I/O tower at the full range of reservoir levels. The gates would be able to open (i.e., raise) and close under all normal reservoir operations and if emergency releases were required. Gates for the I/O tunnel would be closed to prevent outflow for operational purposes (downstream release, maintenance, or dewatering for inspection or equipment change out). Emergency raising and lowering of the gates by emergency power upon loss of electricity would be required.

One 32-foot-inside-diameter I/O tunnel would extend from the I/O tower through the ridge on the right abutment of Golden Gate Dam. It would daylight on the other side of the ridge and connect to the transition manifold. The tunnel would be about 3,110 feet long, connect to the multi-level tower at approximately 300 feet elevation, and have a downstream slope of 1%.

Dams and Dikes

The Project would involve the construction of the main dams, saddle dams, and saddle dikes. The heights of these facilities and the numbers of saddle dams and dikes would differ between Alternatives 1 and 3 and Alternative 2 (Table 2-3). The dams and dikes are discussed in more detail below.

Table 2-3. Main Dams, Saddle Dams, and Saddle Dikes for Alternatives 1, 2, and 3

Dam/Dike	Alternatives 1 and 3		Alternative 2	
	Maximum Height Above Streambed (feet)	Length (feet)	Maximum Height Above Streambed (feet)	Length (feet)
Sites Dam	267	781	250	729
Golden Gate Dam	287	2,221	270	2,063
Saddle Dam 1	27	318	--	--
Saddle Dam 2	57	250	--	--
Saddle Dam 3	107	3,422	90	2,677
Saddle Dam 5	77	1,894	60	1,747
Saddle Dam 6	47	362	--	--
Saddle Dam 8A	82	1,300	62	1,140
Saddle Dam 8B	37	475	20	277
Saddle Dike 1	12	122	10	148
Saddle Dike 2	12	198	20	79
Saddle Dike 3	--	--	30	247

Sites Dam and Diversion Tunnel

Sites Dam would be on Stone Corral Creek approximately 0.25 mile east of the community of Sites and 8 miles west of the community of Maxwell. The dam would be designed to safely accommodate potential fault displacement by providing widened filter, drainage, and transition zones. Sites Dam would be an embankment dam consisting of a combination of earth and rockfill embankment zones[2] with a central impervious core, exterior upstream rockfill shell, and downstream earthen shell. The upstream and downstream slopes of the dam embankment would be 2.25:1 (horizontal: vertical; H:V) and 2H:1V, respectively. The upstream and downstream

[2] Zones include: Zone 1 Clay Core; Zone 2 Filter and Drain materials; Zone 3 Rockfill and Zone 4 Random fill.

slopes of the dam's central core would be 0.5H:1V. Figure 2-26 provides a plan view of Sites Dam and Figure 2-27 presents a section view of Sites Dam.

Sites Dam would have a permanent diversion pipeline and tunnel that would be constructed in the left abutment of the dam. The approximately 1,600-foot-long tunnel would contain a 1,900-foot-long pipe with an inner diameter of 12 feet. The pipe would be fitted with one or more valves sized to release flow up to 100 cfs into Stone Corral Creek. The Sites Dam piping system is expected to include a bar trashrack, a slide gate, a separate fish screen and inlet valve to support Stone Corral Creek release flows, a stoplog bulkhead, and a permanent air vent assembly. The fish screen would be designed and sized to meet the requirements for aquatic life protection.

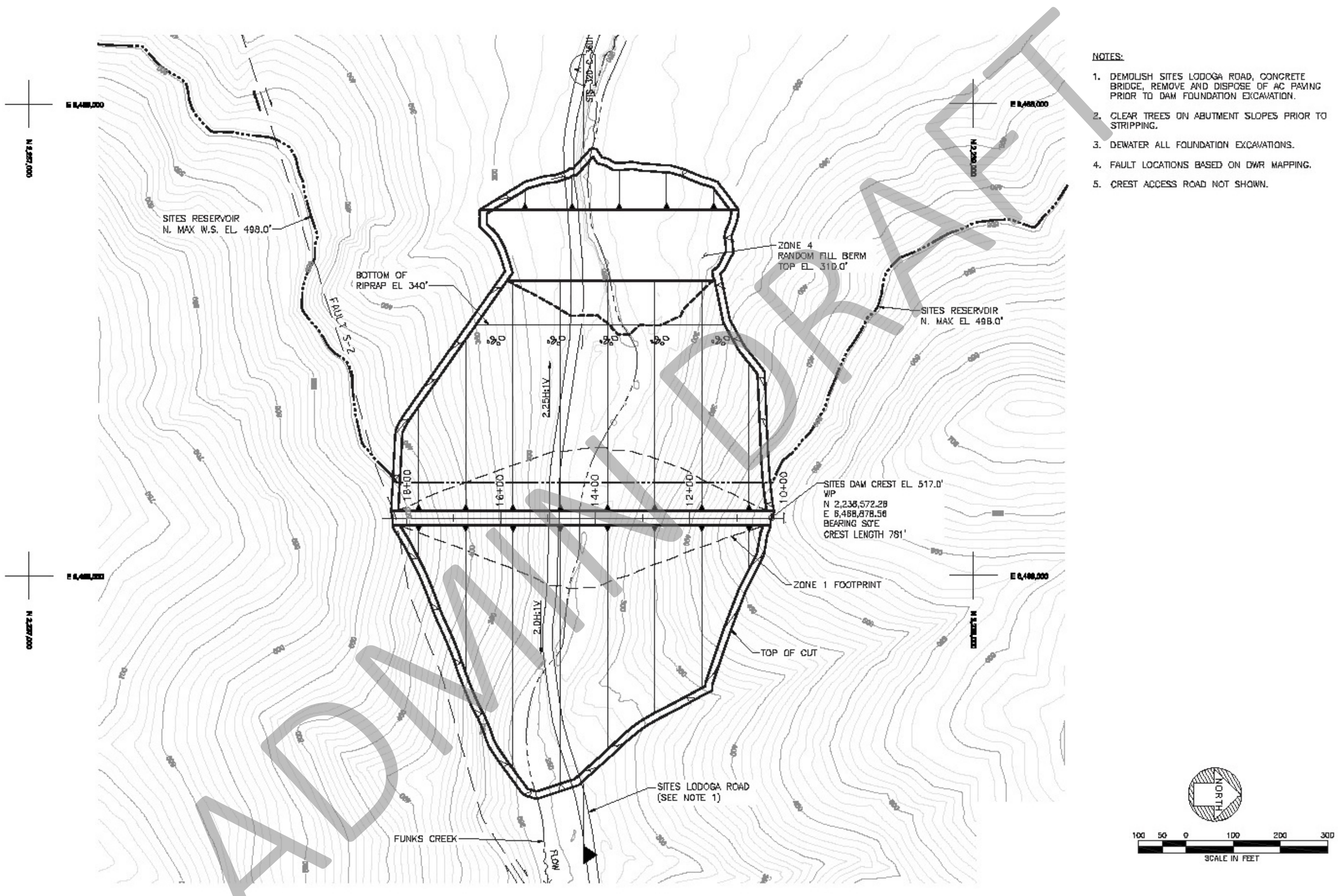
Stone Corral Creek would be diverted for construction of Sites Dam. A coffer dam would be installed to enable construction of the dam embankments in dry conditions. During construction, storm flows would be conveyed in the 12-foot-diameter diversion tunnel through the ridge at Sites Dam. This tunnel would prevent a potential seepage path from forming through the embankment. Water in Stone Corral Creek would be diverted directly into the creek diversion pipeline through the Sites Dam abutment and re-enter the creek channel on the east side of the Sites Dam work area. The outlet tunnel with two 84-inch-diameter fixed cone valves would accommodate these releases, and an energy dissipating chamber would reduce the velocity of the water released.

Golden Gate Dam

Golden Gate Dam would be on Funks Creek approximately 1.8 miles west of Funks Reservoir. The dam type and material, upstream slopes, and downstream slopes would be the same as described for Sites Dam. Golden Gate Dam would not have a permanent diversion tunnel; all releases made would be through the I/O Works. Figure 2-28 provides a plan view of Golden Gate Dam and Figure 2-29 presents a section view of Golden Gate Dam.

Funks Creek would be diverted for construction of Golden Gate Dam. A coffer dam would be installed to enable construction of the dam embankments in dry conditions. At Golden Gate Dam, a 48-inch-diameter diversion pipe would be placed in the foundation of the dam to divert Funks Creek. The diversion pipe would be filled in and decommissioned after construction and prior to operation of the dam. The coffer dam would be left in place and become part of the main dam.

During construction, water would pond behind the coffer dam on Funks Creek, flow through the temporary pipe underneath the Golden Gate Dam construction site to the east side of the dam, and then re-enter the creek channel. The coffer dam would be designed to provide enough residence for settling to occur for typical flows in Funks Creek.



Source: AECOM 2020
Drawing No. STS–320–C–2601

Figure 2-26
Sites Dam Plan

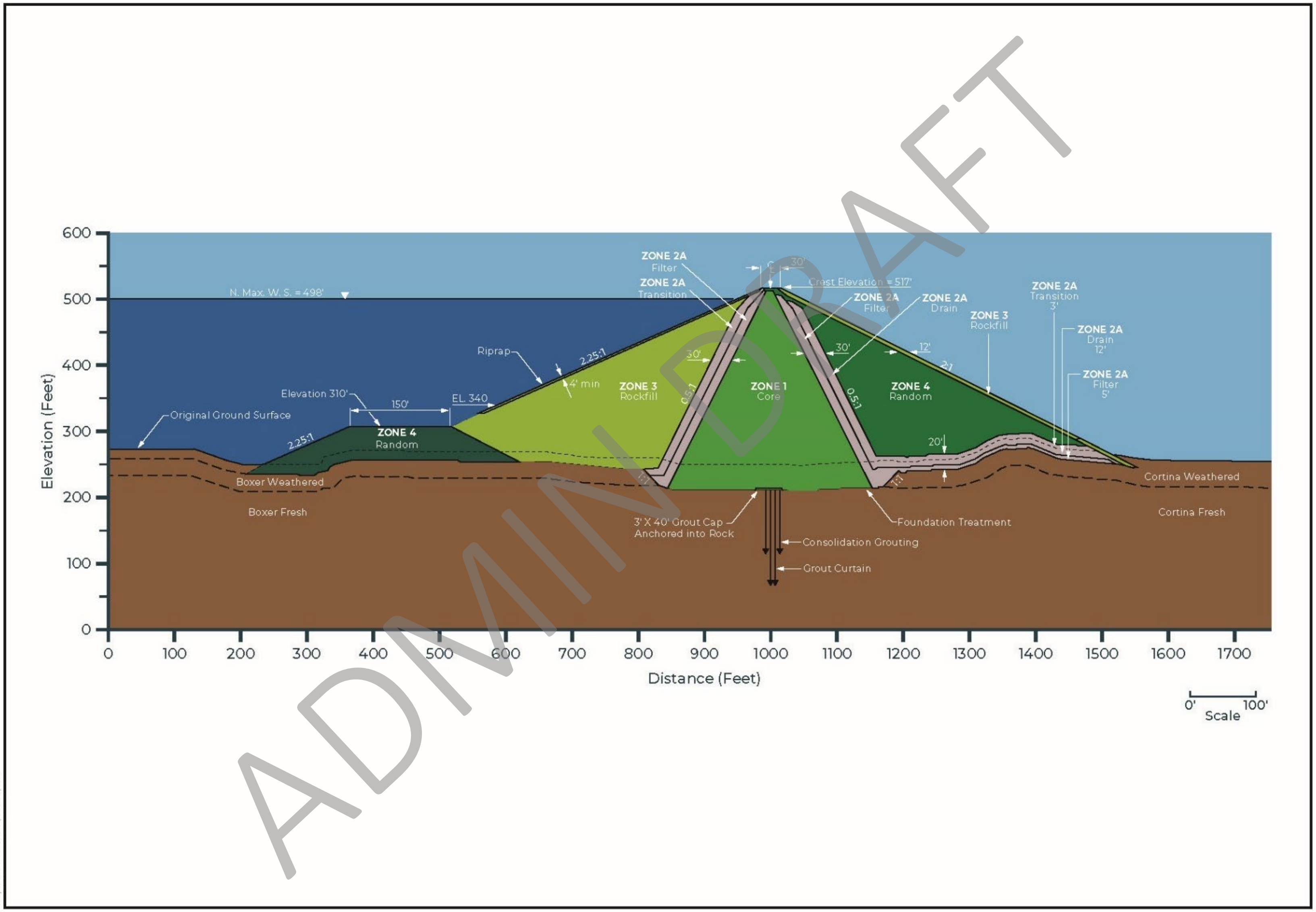
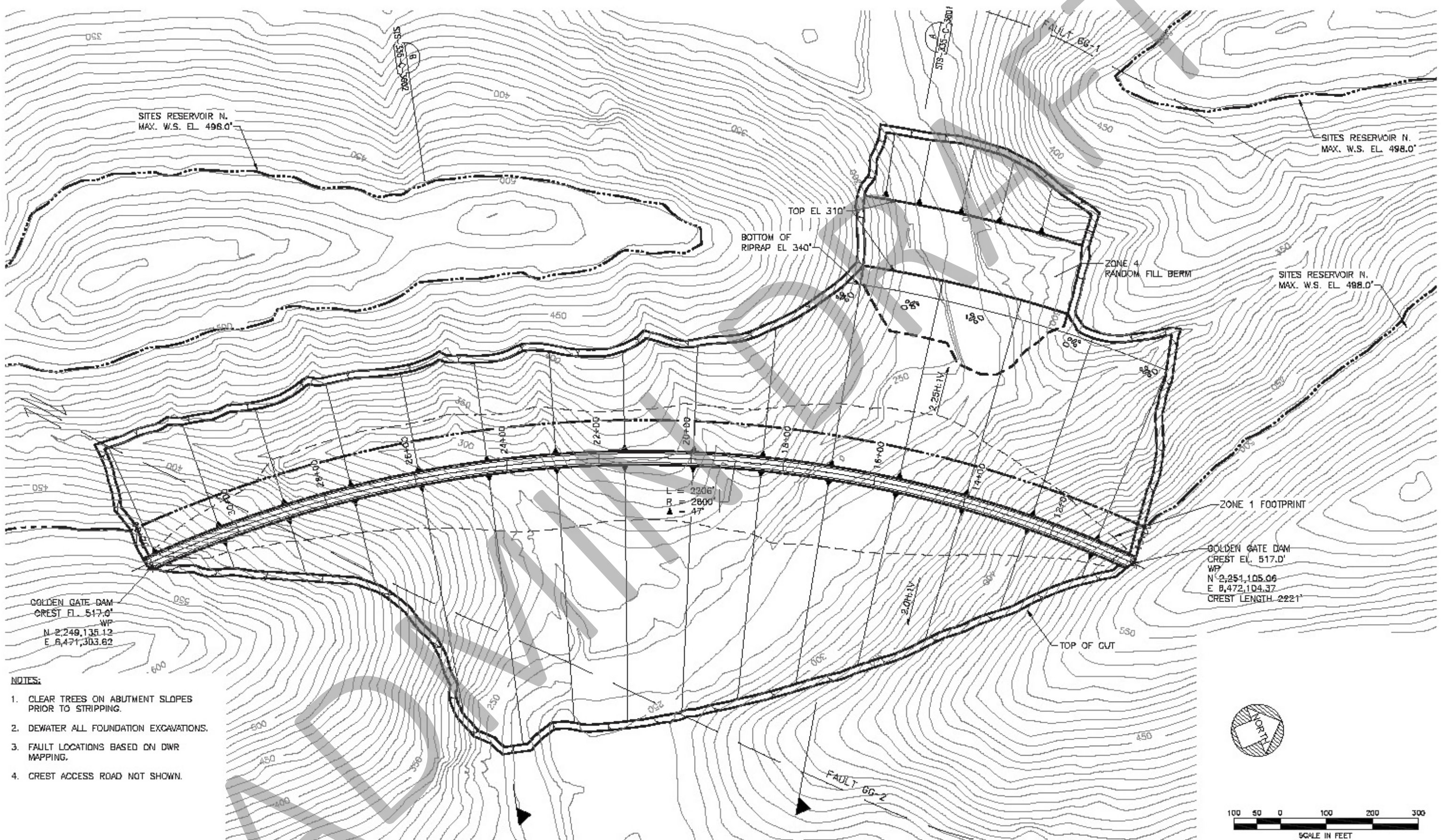


Figure 2-27
Sites Dam Section



Source: AECOM 2020
Drawing No. STS–335–C–2601

Figure 2-28
Golden Gate Dam Plan

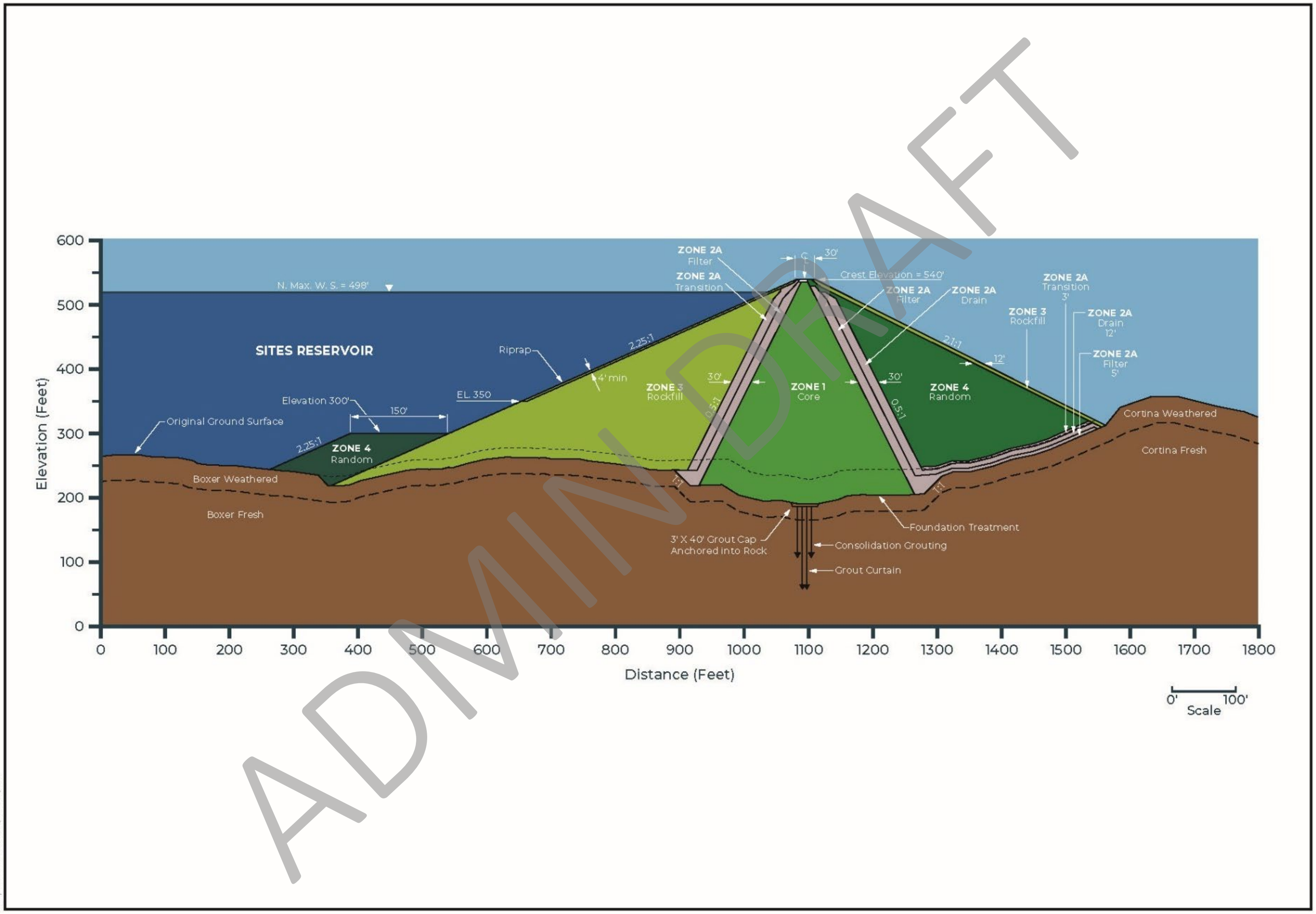


Figure 2-29
Golden Gate Dam Section

Saddle Dams and Saddle Dikes

The saddle dam and saddle dike material would be the same as described for Sites Dam. The number and locations of the saddle dams would be based on the size of the reservoir because they would be needed at topographic saddles along its eastern ridge. The upstream and downstream slopes of saddle dams would be 3H:1V and 2.5H:1V, respectively. The upstream slope of the central core for the saddle dams would be 1H:1V with a vertical downstream face. Figures 2-1 and 2-3 identify the saddle dam and dike locations.

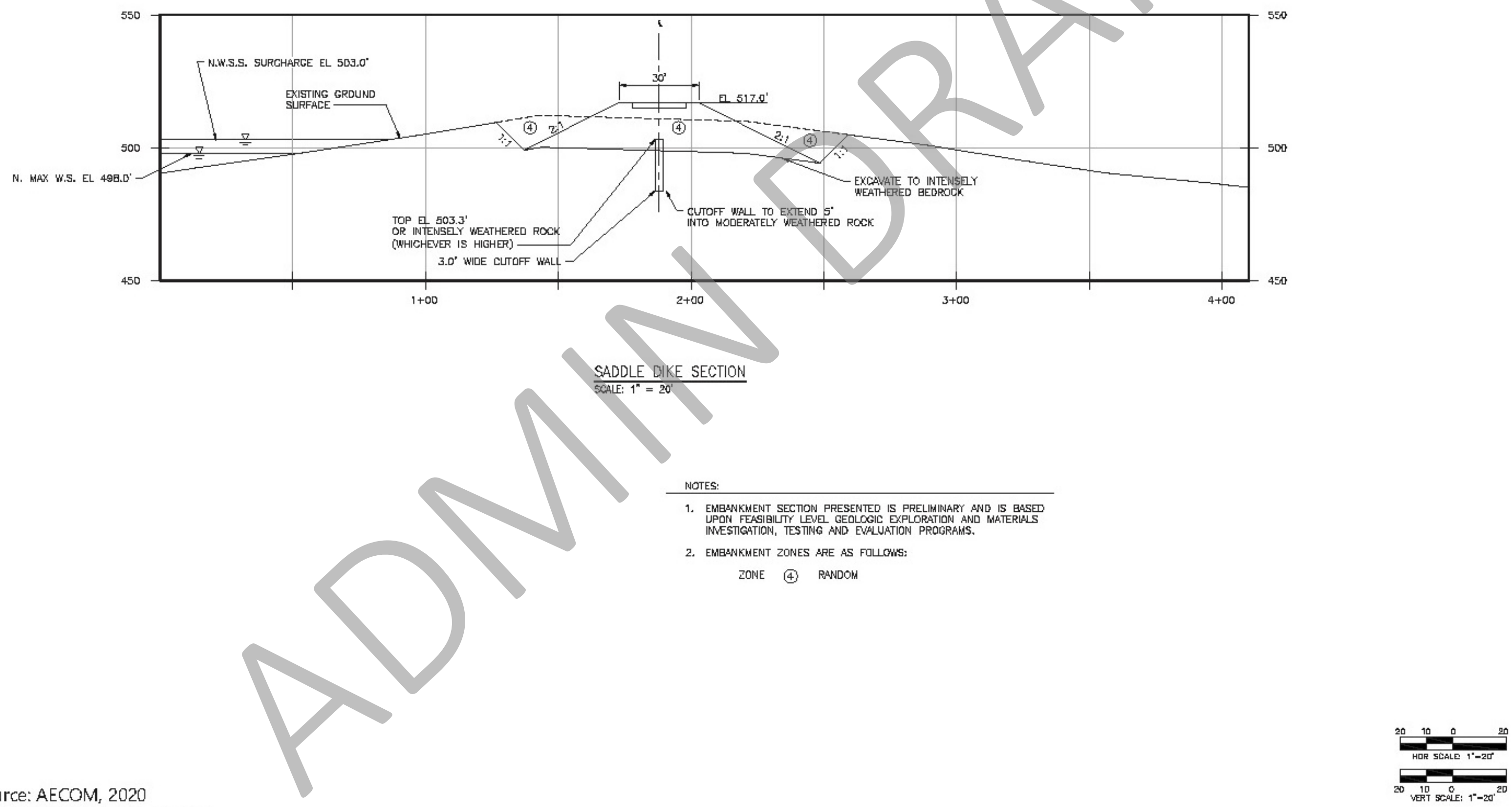
Saddle dikes would be required at topographic saddles along the northern end of the reservoir. The saddle dikes would not retain water like the saddle dams but would raise two saddles that are below the minimum crest elevation to an elevation above the maximum reservoir elevation during the Probable Maximum Flood (PMF). The upstream and downstream slopes of saddle dikes would be 2H:1V. The saddle dikes would not have a central core. A typical saddle dike section is presented on Figure 2-30.

Saddle Dam 8B would contain the reservoir spillway (Figure 2-31). The crest width for the saddle dam would be designed to accommodate a 16-foot-wide crest road with concrete or metal guardrails on both sides. The length of the spillway crest section would be determined from flood routing analyses. The crest elevation would be based on the size of the reservoir and normal operating WSE. The crest elevation would allow storage of the PMF without spilling and have sufficient capacity to pass the volume of over-pumped water and enable controlled emergency spill release to Hunters Creek if needed. Pending approval from DWR DSOD, the size of the spillway would accommodate the peak outflow of a PMF event or the steady-state flow if an over-pumping event occurred, both estimated to produce flows of approximately 3,900 cfs. The design and size of the spillway were developed with the assumption that a PMF overflow event and an over-pumping event have a very low probability of occurring simultaneously. Figure 2-31 provides a schematic of the spillway.

Dam Monitoring

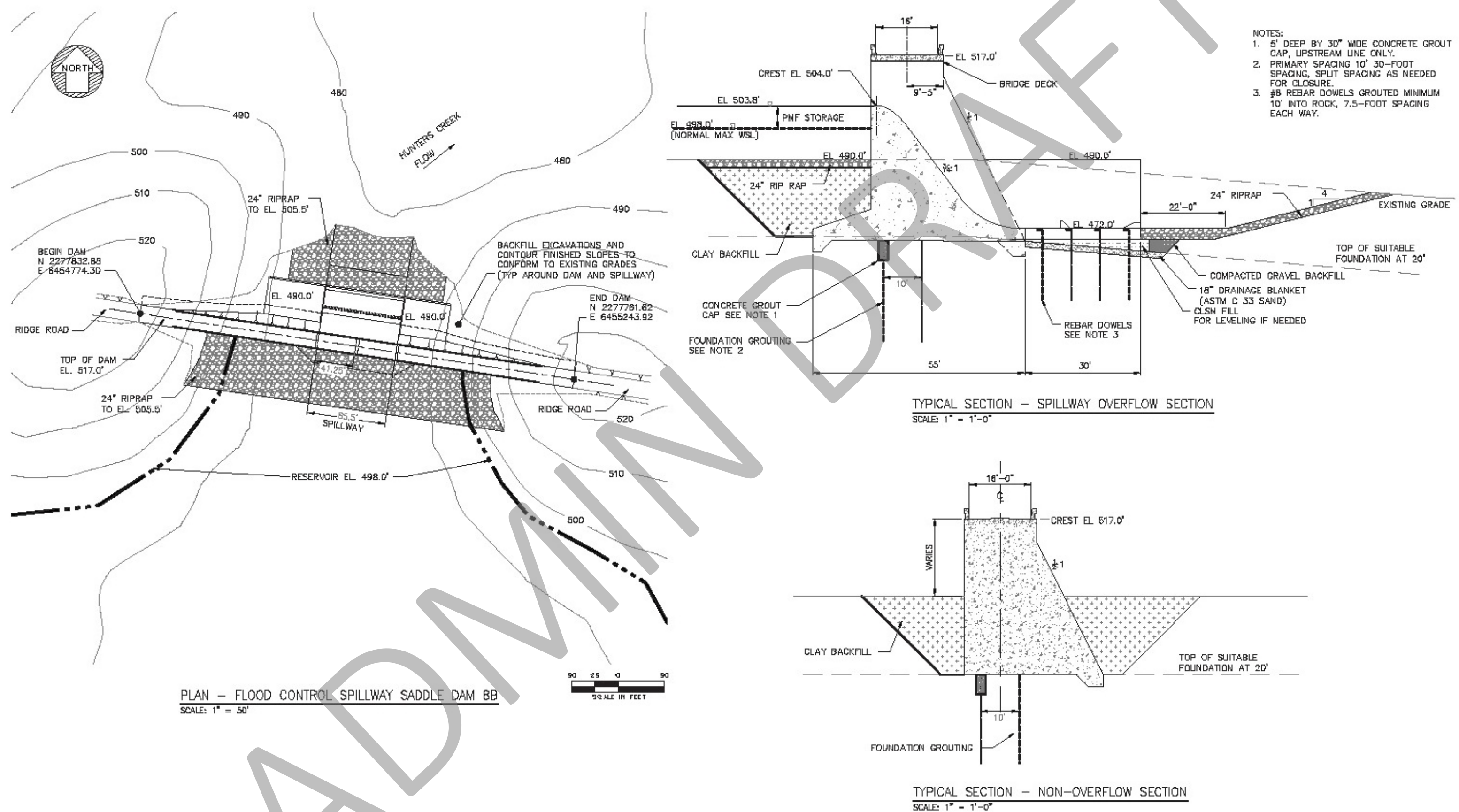
Instrumentation would be installed in the dam abutments, dam embankments, and downstream of the dams for the purposes of monitoring. The objectives of instrumenting the dams include developing physical data for comparison to assumptions made for the design analyses, anticipated behavior based during the studies, and monitoring of dam performance during construction, first filling of the reservoir, and long-term operation of the Project.

The types and locations of instrumentation would be selected to measure specific engineering parameters, including deformation, seepage flows, piezometric levels, pore-water pressure, and seismic response. Types of instrumentation could include piezometers, inclinometers, extensometers, survey monuments, weirs, and strong motion accelerographs. A reservoir level indicator and meteorological station would also be included, and an automated data acquisition system would provide for remote access to dam monitoring data.



Source: AECOM, 2020
Drawing No. STS–351–C–3601

Figure 2-30
Saddle Dike Section



Source: AECOM, 2020
Drawing No. STS-360-C-4601

Figure 2-31
Saddle Dam 8B Spillway

2.5.1.5 Conveyance to Sacramento River

During Project operations, water released from Sites Reservoir would be conveyed south of the reservoir using the existing TC Canal and a new Dunnigan Pipeline. The water would flow south about 40 miles to near the end of the TC Canal, where it would be diverted through a new intake to the Dunnigan Pipeline. The flows would subsequently be conveyed to the CBD and ultimately reach the Sacramento River. Figure 2-2 shows the locations of the facilities associated with conveying water to the CBD and Sacramento River.

TC Canal Intake

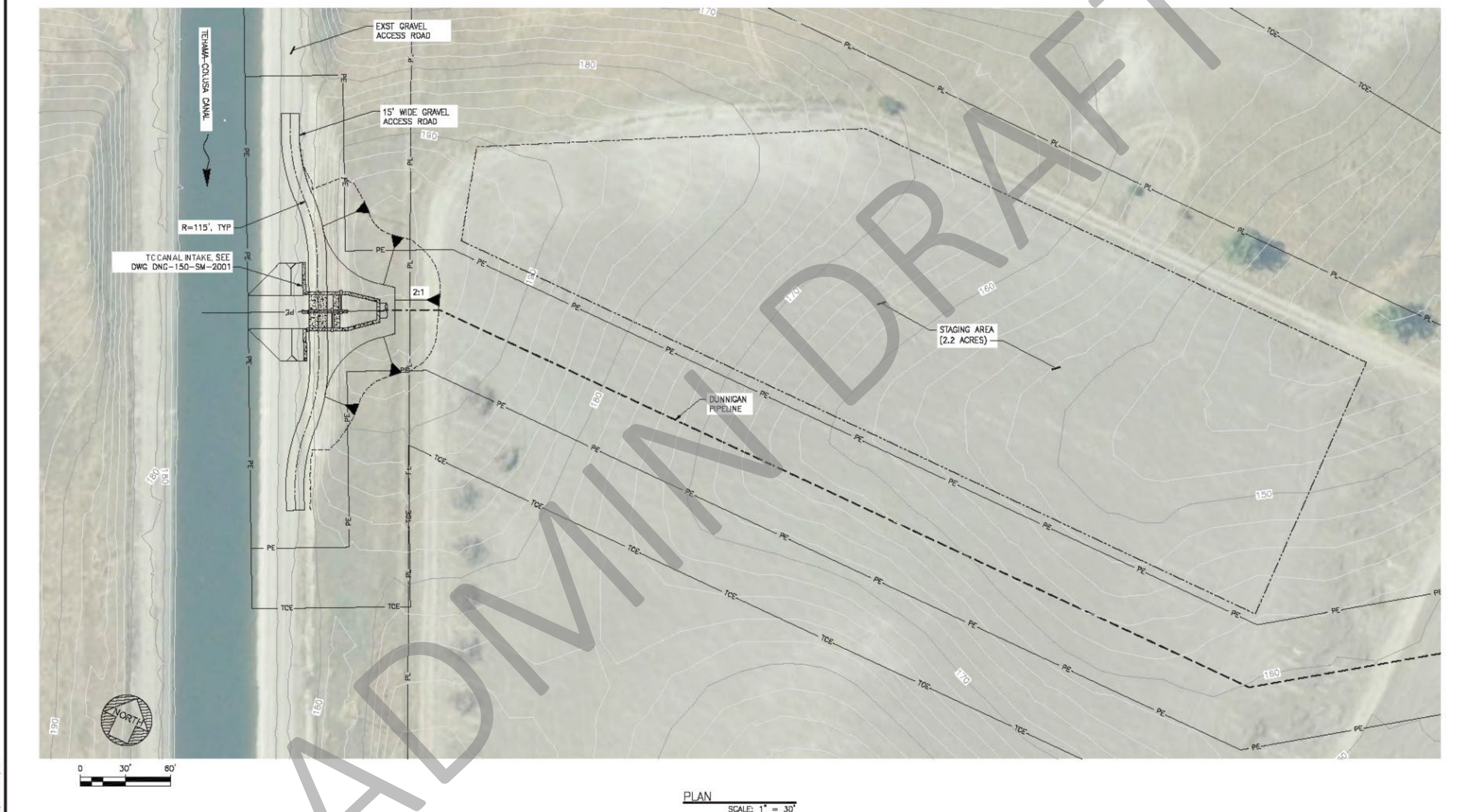
The TC Canal intake and facilities would encompass approximately 0.5 acre and be accessed from the existing TC Canal access road. Figure 2-32 shows a site plan. The intake would be a concrete structure sized for a flow of 1,000 cfs that supports the control gates and associated gate operators. Power would be needed for the operation of a Supervisory Control and Data Acquisition (SCADA) system to let water into the Dunnigan Pipeline; however, there would be a gravity outlet structure from the TC Canal into the Dunnigan Pipeline and no pumping would be required. A concrete bridge deck would provide vehicular access across the top of the intake. Stoplog slots at the inlet and outlet channels would enable isolation of the control gates for maintenance.

Construction of the TC Canal intake would require the temporary disturbance of approximately 2 acres adjacent to the TC Canal for approximately 1 year. The staging area would be located on the east side of the TC Canal and just north of the Dunnigan Pipeline.

Dunnigan Pipeline

The Dunnigan Pipeline would convey water released from the TC Canal to the CBD. Figure 2-33 shows the location of this facility. The Dunnigan Pipeline would be approximately 4 miles (Alternatives 1 and 3) or 10 miles (Alternative 2) in length, have a minimum depth of 6 feet below ground surface, and have an inner diameter of approximately 9 feet (Alternatives 1 and 3) to 10.5 feet (Alternative 2). The Dunnigan Pipeline would extend through existing agricultural lands and would also cross I-5, Road 99W and the railroad (which are close together), and a commercial auction yard between I-5 and Road 99W. The tunneled crossing at I-5 would be 300 feet long and that for Road 99W and the railroad would be 250 feet long. Both tunneled crossings would require 12 5-foot-diameter casings.

A CBD outlet with an energy dissipation structure would be required at the downstream end of the pipeline to allow water to discharge into the CBD. Two 60-inch-diameter, fixed cone valves would be placed at the discharge stilling basin to dissipate energy and adjust the flow being released into the CBD. Hoods on the fixed-cones valves would control spray. The conveyance through the Dunnigan Pipeline to the CBD would use gravity (i.e., no pump station) and have a flow up to 1,000 cfs.



Source: Jacobs 2020
Drawing No. DWG-030-C-2001

Figure 2-32
TC Canal Intake Site Plan

Source: Jacobs 2020
Drawing No. DWG-030-C-2002

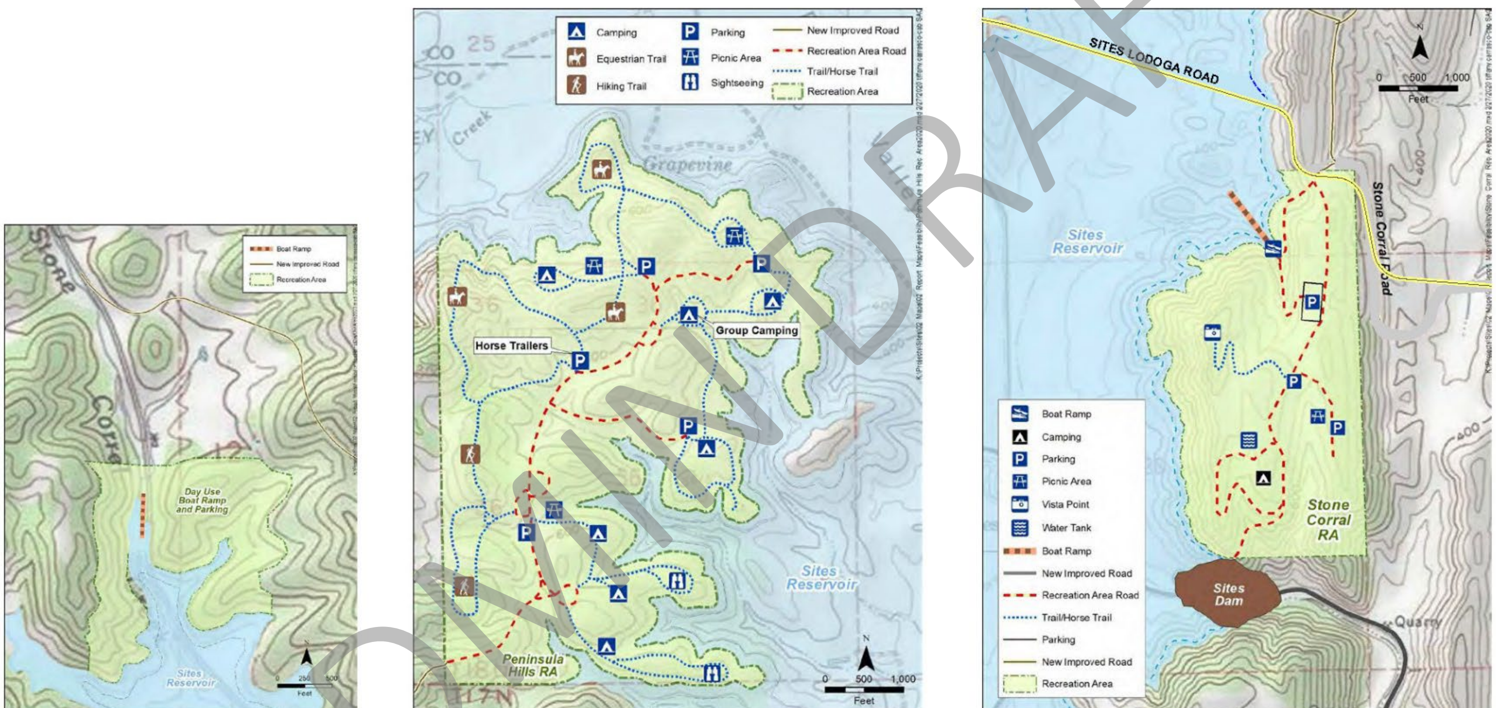
Figure 2-33
Dunnigan CBD Discharge Site Plan

Construction of the Dunnigan Pipeline from the TC Canal to the CBD would require dewatering, trenching, and using pile driving or a vibration hammer. Dewatering would be necessary for a segment of the pipeline to reduce groundwater levels to 20 or 30 feet below ground surface along its length. Trenching and pipeline installation would be completed after dewatering. Pile driving or a vibration hammer would be used to install piles for construction of the CBD outlet. Construction would include open cut of approximately 100 feet to cross Bird Creek in the dry season.

2.5.1.6 Recreation Areas

The Project proposes the development of two primary recreation areas and a day-use boat ramp. Prefabricated structures for storing equipment and materials to assist emergency services personnel may be placed within the footprint of the recreation areas for police and fire emergency response. The recreation areas would also require a network of new roads and upgrades to existing roads for maintenance and local access (Section 2.5.1.7, *New and Existing Roadways*). Figure 2-34 shows a conceptual site map of each recreation area and the recreation areas are described below.

- **Peninsula Hills Recreation Area –** The Peninsula Hills Recreation Area would be located on the northwest shore of the Sites Reservoir, to the north of the existing Sites Lodoga Road and across the reservoir from the Stone Corral Creek Recreation Area. Access would be provided by the existing Sites Lodoga Road west of the reservoir. This recreation area would encompass up to 373 acres and would include a kiosk, access to electricity and potable water, 10 picnic sites (with parking at each site), and hiking trails. There would also be 19 vault toilets, 200 campsites (car and recreational vehicle), and one group camping area.
- **Stone Corral Creek Recreation Area –** The Stone Corral Creek Recreation Area would be located on the eastern shore of the Sites Reservoir, north of the existing Maxwell Sites Road and Sites Dam. Access would be provided from Sites Lodoga Road. This recreation area would encompass up to 235 acres and its facilities would include a kiosk, access to electricity and potable water, 10 picnic sites (with parking at each site), and hiking trails. There would also be 10 vault toilets and 50 campsites (car and recreational vehicle).
- **Day-Use Boat Ramp and Parking Areas –** The day-use boat ramp would be located on the western side of the reservoir where the existing Sites Lodoga Road intersects with the inundation area for the reservoir. A parking area would be added to the existing Sites Lodoga Road where it exits the inundation area footprint of the reservoir. The boat ramp and parking area would encompass up to 10 acres and include a kiosk, access to potable water, and one vault toilet.



DAY-USE BOAT RAMP

PENINSULA HILLS RECEATION AREA

STONE CORRAL CREEK RECREATION AREA

Source: AECOM 2020
Drawing No. STS-312-C-2602

Figure 2-34
Recreation Areas

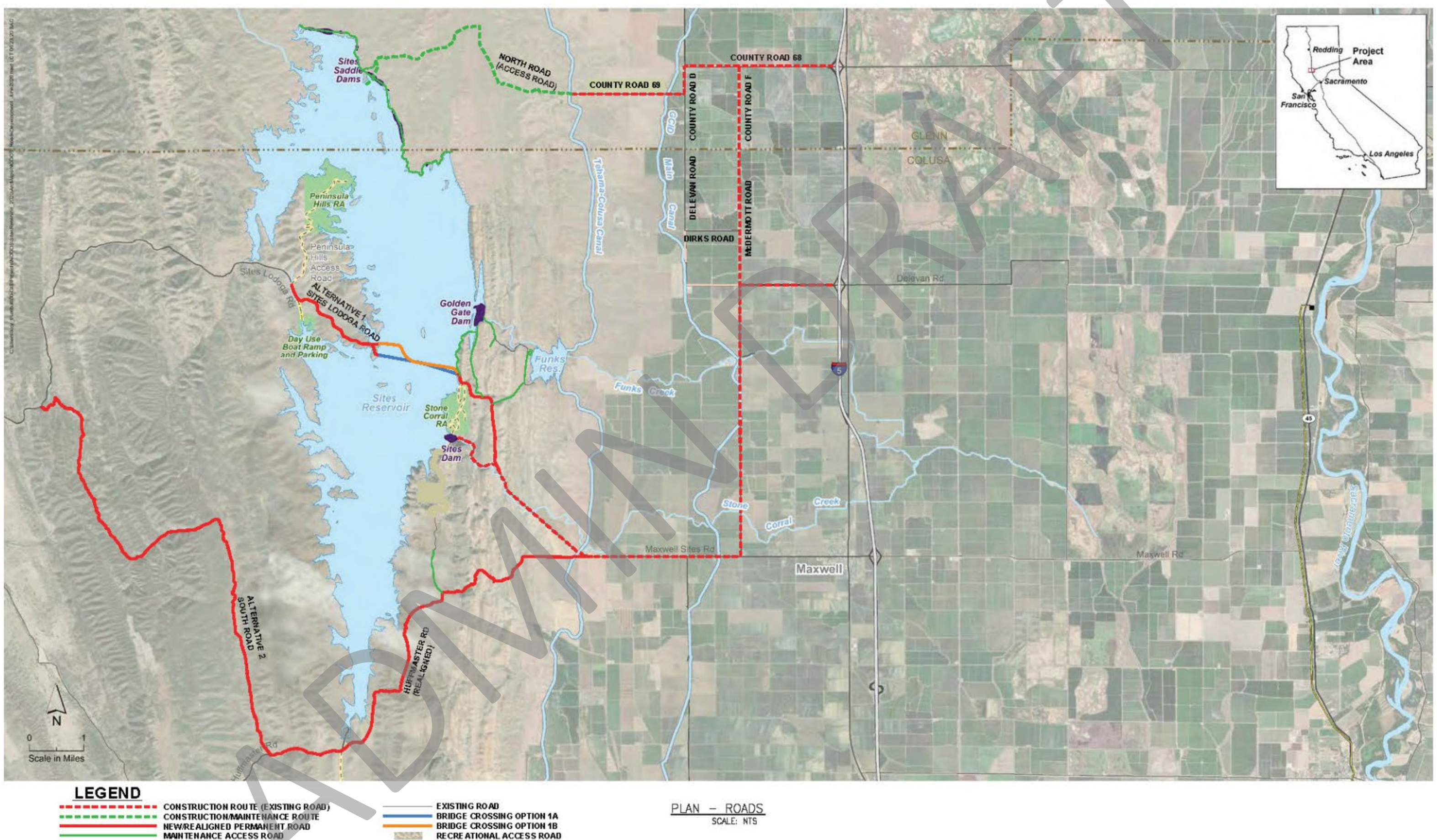
A helipad would be placed within either the Peninsula Hills Recreation Area or the day-use boat ramp area for emergency access. It is anticipated that all construction activities associated with the recreation areas would occur within the footprints of the recreation areas and the temporary and permanent access road areas. The Authority may consider additional recreational areas of varying sizes in the future at other locations around the reservoir. For example, a recreational area of approximately 10 acres to the north side of the reservoir within Glenn County could provide an additional day-use boat ramp, picnic facilities, and parking areas. The preparation of this Final EIR/EIS, and the recreation areas described herein, does not preclude the future consideration of other recreation areas and if needed, additional CEQA and NEPA review, as required.

2.5.1.7 New and Existing Roadways

Approximately 46 miles of new paved and unpaved roads would provide construction and maintenance access to the facilities, as well as public access to the recreation areas. Table 2-4 identifies these roads and their purposes (i.e., construction access, local access, and maintenance access). Figure 2-35 shows the locations of all local access, construction access, and maintenance access roads that would be needed. The general objectives and maintenance responsibilities for these road types are discussed below, and more detailed information for construction access, local access, and maintenance access roads presented in the corresponding subsections. The road improvements and roadway designs are being coordinated with the Counties of Colusa and Glenn.

Construction access roads would be designed to provide the roadway improvements necessary to the movement of construction equipment and transport of materials. Roadways that would be used for construction access and local access would be designed to achieve the objectives for both uses and prioritize needs for local traffic use and safety. Roads used solely for construction access would be designed with two 12-foot-wide gravel lanes and up to 2-foot-wide shoulders. These roads would be used for maintenance access after completion of construction. Permanent facility access roads constructed from gravel and asphalt would facilitate operation and maintenance. These access roads would require new construction or the relocation of existing public county roads. Temporary gravel roads would also be built during construction. The maintenance of roads used for both construction and local access would be the Authority's construction contractor's responsibility during construction and the responsibility of the departments for the Counties of Colusa or Glenn having jurisdiction over those roads after construction.

Local access roads that would be improved or relocated for construction purposes would provide reliable infrastructure for the traveling public, accommodate transportation needs, and be consistent with state and local design standards. These improved roads would enable construction vehicles to safely travel and pass one another. After construction of the reservoir was completed, these roads would be maintained to support the operation of the Sites Reservoir. Some of these roads would also be available for public use. Local access roads would generally have two 12-foot-wide lanes with paved shoulders, and their postconstruction maintenance would be the responsibility of the departments for the Counties of Colusa or Glenn having jurisdiction over them.



Source: AECOM 2020
Drawing No. STS-305-C-2601

Figure 2-35
Local Access, Construction Access, and Maintenance Access Roads

Maintenance access roads would be constructed or improved in accordance with the equipment and personnel required for operations and maintenance of specific facilities. As discussed above, roads installed for construction access would be repurposed for maintenance following construction. Repurposed maintenance roads would have one 15-foot-wide minimum gravel lane with no shoulders.

Table 2-4. Sites Project Roads and Purposes Common to Alternatives 1, 2, and 3

Roads	Road Purpose		Approx. Current Length (miles)	Approx. Improved Length (miles)	Improvement Types
	Colusa County[2]	Glenn County[2]			
Road 68	--	Local, Construction	3	3	Shoulder improvements/ intersection widening, two structure improvements
Road D	--	Local, Construction	0.5	0.5	Shoulder improvements/ intersection widening, two structure improvements
Road 69	--	Local, Construction	2	2	Shoulder improvements/ intersection widening, three structure improvements
North Road	--	Construction, Maintenance	0	5	New gravel road
Delevan Road	Local, Construction		2	2	Shoulder improvements/ widening
McDermott Road	Local, Construction	Local, Construction	8	4	Shoulder improvements/ widening/paving, five structure improvements
Saddle Dam Road – North (5–9) (provide access to northern portions of Sites Reservoir and the saddle dams)	--	Construction, Maintenance	1	2	New gravel road
Saddle Dam Road – South (1–5)	Maintenance	Maintenance	0	3	New road
Huffmaster Road realigned	Local	--	12	7	Gravel road for residents
Sites Lodoga Temporary Detour Road (Shoo-Fly)	Local, Construction	--	1	1	New, temporary gravel road
Day-Use Boat Ramp (westside)	Local	--	0	0.3	New paved road

Roads	Road Purpose		Approx. Current Length (miles)	Approx. Improved Length (miles)	Improvement Types
	Colusa County[2]	Glenn County[2]			
Peninsula Hills Recreation Area (provide access from Sites Lodoga Road to the Peninsula Hills Recreation Area)	Local	--	0	4	New gravel road
Access Road A (Funks PGP/Golden Gate Dam)	Maintenance	--	0	1	New road
Access Road B (Funks PGP/Golden Gate Dam)	Maintenance	--	0	0.4	New road
Access Road C1 (Funks PGP)	Maintenance	--	0.4	0.4	Existing road
Access Road C2 (Funks PGP/Golden Gate Dam)	Maintenance	--	0.6	0.6	Existing jeep road
Stone Corral Creek Recreation Area/Sites Dam	Local	--	0	2.5	New road
Comm Road South	Local	--	0	1	New road

Notes:
Local access includes local road for public use and recreational access.
Any improvement type identified as a new road has an approximate current length of 0.

The roadway alignments discussed below are based on service needs and existing planning-level-based mapping to establish a corridor width along roadways. Corridor widths would vary depending on the level of topographical relief—greater relief requires greater flexibility throughout the design process to allow the engineers to move the road within the corridor.

Construction traffic will be routed around the community of Maxwell as part of the Project and per the traffic management plan. Operation of recreational areas at Sites Reservoir would result in an influx of seasonal recreation use and associated traffic. Additional transportation improvements in Maxwell may be necessary, specifically along Oak Street in Maxwell to support the seasonal recreation trips. The Authority will work with the County of Colusa to identify and implement improvements within Maxwell such as lighted pedestrian crossings, stop signs, and other traffic calming features. The disturbance area for roads would include the footprints of the roads and stream crossings, the staging areas for materials and equipment, and the area needed to construct the facilities and access roads. Traffic not construction related and traveling through certain parts of the construction zone (e.g., Sites Lodoga Road) would be diverted around construction disturbance areas in accordance with a TMP.

Initial construction activities would involve establishing staging areas, surveying and marking roadways, clearing, and grading. Road construction would entail making road cuts and fills;

hauling away excess cut materials; constructing culverts; laying aggregate road base and asphalt; erecting fences, guardrails, and signs; installing roadway striping and reflectors; restoring temporary disturbance areas; and cleaning up the work sites.

Construction Access

Construction access for Sites Reservoir and supporting facilities would occur on public roads from I-5 to the reservoir site on the north and at Sites Lodoga Road on the east. These roads currently cross small creeks and irrigation canals, and the crossings are generally reinforced through concrete box culverts. There are three primary construction access routes for consideration that would most likely be defined for use by the Authority's construction contractor.

The first construction access route would be on 5.5 miles of existing 24-foot-wide paved road from I-5 west along Road 68, south on Road D, and west on Road 69 to just west of the TC Canal. The road would then revert to a single-lane, 12-foot-wide gravel road (North Road), which would be temporary and continue for approximately 5 miles along existing ranch roads and trails to the north end of the Sites Reservoir at the saddle dams. From this location, the Authority's construction contractor would establish their own onsite access roads within the limits of the reservoir.

The second construction access route would be on 7.2 miles of existing paved road from I-5 west along Delevan Road, north along McDermott Road, and west on Road 69 to just west of the TC Canal. Approximately 1.5 miles of McDermott Road between Dirks Road and West Glenn Road consists of gravel; therefore, it is assumed paving would be needed to accommodate the volume of heavy construction traffic.

The third construction access route would be on 12 miles of existing paved road from I-5 along Delevan Road, south along McDermott Road to Maxwell Sites Road, and then west to the existing gravel access road to Funks Reservoir. The first mile of this gravel road would be the initial segment of the Sites Lodoga Road realignment. This gravel road would also provide access to the Funks PGP and Golden Gate Dam. Maxwell Sites Road would provide access to Sites Dam. Construction equipment/materials would not be permitted to pass through the community of Maxwell on the Maxwell Sites Road; therefore, the construction access roads would circumvent Maxwell.

The existing roads are nonstandard in geometry and their roadbed structural sections cannot accommodate the large, heavy vehicles that would be used to transport construction equipment and materials. These roads consist of Road 68, Road D, Road 69, Delevan Road, and McDermott Road. They are narrow and typically include two paved 11-foot- or 12-foot-wide lanes and 1- to 3-foot-wide earthen shoulders. The pavement conditions of Road 68, Road D, and Road 69 pavement conditions were identified as "at risk," "poor," and "very poor," respectively, upon visual inspection by Project engineers. A segment of McDermott Road in Colusa County is gravel. Road 69 transitions to a single-lane, gravel road west of the TC Canal. The following improvements would need to be implemented on these roadways:

- Roadbed and intersection widening to allow for safe mobility of construction traffic that would be comingled with local vehicular and agricultural equipment traffic

- Roadbed reconstruction to enable use by large, heavy vehicles transporting construction equipment and materials
- Horizonal and vertical curve corrections
- Drainage feature improvements to allow for proper drainage

Reconstruction of the aforementioned roads would include the addition of new 2-foot-wide paved shoulders to each lane, as well as potential modifications to existing creek and irrigation canal crossings (as described below). The new shoulders would be within the public right-of-way, as would any temporary work areas needed to reconstruct the roads. All existing roadway improvements would be designed to avoid or minimize impacts on existing utility infrastructure and public right-of-way. Once the roads are constructed, all county roads would be maintained by the Counties of Glenn or Colusa, while specific access and maintenance roads (e.g., North Road, South Comm Road) would be maintained by the Authority.

The following roads have existing creek and irrigation canal crossings. It is assumed that these crossings would need to be widened, strengthened, or replaced, depending on their structural condition and load rating capacity.

- Road 68 – two crossings
- Road D – two crossings
- Road 69 – three crossings (two on paved roads crossing the TC Canal and GCID Main Canal, and one on a gravel road)
- McDermott Road – five crossings

Local Access

In addition to the local roads described above that would be improved for construction purposes and then remain local access roads, a number of other public local roads would be relocated or developed to accommodate reservoir facilities. These roads include Sites Lodoga Road, Huffmaster Road, Comm Road South, and recreation area roads. There would also be one temporary detour during construction, the Sites Lodoga Temporary Detour Road (Shoo-Fly). Permanent changes to Sites Lodoga Road and Huffmaster Road are discussed in Sections 2.6, *Alternative 1 Specific Elements*, and 2.7, *Alternative 2 Specific Elements*.

- **Comm Road South** – Access to existing communication facilities would consist of a gravel road that would start near the northern end of Huffmaster Road and proceed north to the communications tower.
- **Recreation Area Roads** – New recreation area roads would provide access from Sites Lodoga Road to the Peninsula Hills Recreation Area, day-use boat ramp, and Stone Corral Creek Recreation Area. The access road to Peninsula Hills Recreation Area on the west side of Sites Reservoir would be paved. The access road to the day-use boat ramp, which would also be on the west side of the reservoir, would be paved. The access road to the Stone Corral Creek Recreation Area on the east side of the reservoir would be a combination of paved and gravel.

- **Sites Lodoga Temporary Detour Road (Shoo-Fly)** – A temporary detour road would be constructed to expedite construction and maintain traffic movement through the reservoir site during the construction of Sites Dam and the bridge across the reservoir (Alternatives 1 and 3 only). This road would convey local traffic for a period of approximately 1 year and would be aligned around the Sites Dam site. There would be overlap with a section of the Sites Lodoga realignment from Maxwell Sites Road to near the easterly bridge at the top of the ridge. The temporary detour road would then split off to the south and traverse hilly terrain before Comm Road South rejoined Sites Lodoga Road near its intersection with Peterson Road.

Maintenance Access

New and existing maintenance access roads would provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP. Except for the existing road to Funks Reservoir, the maintenance access roads would be single-lane, 15-foot-wide gravel roads with no shoulder. Comm Road South would be a local access and maintenance access road.

North Road would begin at the end of the unpaved Road 69, continue 5 miles to the reservoir's edge, and connect with several new maintenance access roads that would provide access to the saddle dams and dikes. Access Road A1 would be a new gravel road along the crest of the Golden Gate Dam with minor cuts and fills. Access Roads B1 and B2 would be new gravel roads connecting to the I/O Works and Golden Gate Dam with minor cuts/fills. Access Road C1 is would be a two-lane, 30-foot-wide, paved road to access Funks Reservoir and the existing road to the reservoir would be maintained. Access Road C2 would be improved from an existing jeep trail at the east base of the Golden Gate Dam to a gravel road that would extend off Access Road C1.

2.5.1.8 Project Buffer

The Authority would acquire and maintain a buffer encompassing the lands beyond the facility footprints. The buffer width would be 100 feet around the Sites Reservoir and related facilities, all buildings, most aboveground components, and recreation areas. The buffer may be less than 100 feet wide if a facility is near a property boundary and the associated uses do not conflict with those on the adjacent lands. Buffers are not anticipated for underground or buried facilities (i.e., Dunnigan Pipeline), transmission lines, or roads (both public and Project maintenance access roads).

Although buffer areas would generally remain undeveloped, the Authority would install limited features and perform periodic maintenance primarily related to reducing fire hazards. These actions would include erecting and maintaining fencing, grading fire breaks/trails, maintaining vegetation (e.g., grazing, tilling, or disking), and performing limited prescribed/controlled burns. The Authority may manage buffer areas as wildlife habitat where appropriate.

2.5.2 Operations and Maintenance Common to Alternatives 1, 2, and 3

This section describes the Project operations and maintenance activities and plans.

2.5.2.1 Water Operations

The Project would provide water supply reliability and water supply-related environmental benefits to the Storage Partners. Water would be diverted into Sites Reservoir from the

Sacramento River at the existing RBPP into the TC Canal and at the existing GCID Hamilton City Pump Station into the GCID Main Canal. The RBPP and Hamilton City Pump Station each have an existing fish screen that meets NMFS and CDFW fish screen criteria through which flows diverted for the Project would be screened. The TC Canal would convey the water to the existing Funks Reservoir, where it would be pumped into Sites Reservoir via the Funks PGP and associated facilities. The GCID Main Canal would convey the water to the TRR, where it would be pumped into Sites Reservoir via the TRR PGP and associated facilities. Water could be diverted to storage in Sites Reservoir when the diversion criteria are met and when the Delta is in excess conditions as determined by Reclamation and DWR during the timeframe that Sacramento River flows are not fully appropriated (i.e., between September 1 and June 14).

Water would be held in storage in Sites Reservoir until requested for release by a Storage Partner. Water releases would generally be made from May to November but could occur at any time of the year, depending on a Storage Partner's need and capacity to convey water to its intended point of delivery. Water would be released from Sites Reservoir via the I/O Works back through the TRR PGP and into the TRR or back through Funks PGP back into Funks Reservoir. Water released could be used along the GCID Main Canal, along the TC Canal, or conveyed to the new Dunnigan Pipeline and discharged to the CBD. From the CBD, the water may be conveyed via the Sacramento River or the Yolo Bypass to a variety of locations in the Delta or south of the Delta[3]. Exchanges of water may also occur with the CVP and SWP reservoirs. Water impounded from Funks and Stone Corral Creeks would be stored under the Project's water right permit with the exception of the volume needed to meet senior downstream water rights and flow priorities on Stone Corral and Funks Creeks, and what would be required to maintain fish in good condition consistent with California Fish and Game Code Section 5937.

The Authority intends to apply for and obtain a water right permit from the State Water Resources Control Board (State Water Board) for the operations of Sites Reservoir. Actual operations would be subject to the terms and conditions of the water right permit, as well as to all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time. Project operations would also require coordination with Reclamation and DWR. The Authority is working with Reclamation and DWR to develop mutually agreeable operating agreements that would describe the approach for coordinating operations with Sites and the CVP and SWP operations, respectively.

The Project would not affect or result in changes in the operation of the CVP Trinity River Division facilities (including Clear Creek). Reclamation would continue to operate the Trinity River Division consistent with all applicable statutory, legal and contractual obligations, including but not limited to the Trinity River ROD, the 2017 ROD for the Long-Term Plan for the Lower Klamath River, and the provisions of the Trinity River Division CVP Act of 1955.

[3] The term south-of-Delta or phrase south of the Delta is used to refer to areas that can receive water from the South Delta pumping facilities, including the SWP Banks Pumping Plant, Reclamation's Jones and Rock Slough Pumping Plants, and Contra Costa Water District's pumping plants. This includes areas south and west of the Delta, such as Contra Costa, Alameda, and Santa Clara Counties.

Diversion to Sites Reservoir

Sites Reservoir would be filled through the diversion of Sacramento River water that generally originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. A limited volume of the diversions to Sites Reservoir would come from flood releases from Shasta Lake. Diversions to Sites Reservoir would be made from the Sacramento River at the existing RBPP (River Mile [RM] 243) near Red Bluff into the TC Canal and at the existing GCID Hamilton City Pump Station (RM 205) near Hamilton City into the GCID Main Canal. Water could be diverted to storage in Sites Reservoir from September 1 to June 15. Diversions would occur only when all of the following conditions are met:

- Flows in the Sacramento River exceed the minimum diversion criteria (described below);
- The Delta is in “excess” conditions as determined by Reclamation and DWR;
- Senior downstream water rights, existing CVP and SWP and other water rights diversions including CVP 215 water, Article 3F water, and SWP Article 21 (interruptible supply), and other more senior flow priorities (such as diversions associated with Freeport Regional Water Project and existing Los Vaqueros Reservoir) have been satisfied;
- Flows are available for diversion above flows needed to meet all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that diversion occurs. This would include, but is not limited to any flow requirements in Water Right Decision 1641 (State Water Resources Control Board 2000), the 2019 ROC ON LTO Biological Opinions (U.S. Fish and Wildlife Service 2019, National Marine Fisheries Service 2019) and the State ITP (California Department of Fish and Wildlife 2020); and
- There is available capacity at the RBPP and in the TC Canal and GCID facilities to divert and convey water to Sites Reservoir, above the capacity needed for deliveries to existing TC Canal users and within the GCID service area.

The RBPP would serve as the primary diversion location and would divert water from the Sacramento River to Funks Reservoir through the TC Canal and into the Sites Reservoir through the Funks PGP and the I/O Works. Up to 2,100 cfs, plus losses, would be diverted at the RBPP for the Project. The Hamilton City Pump Station would serve as the secondary diversion location and would divert water from the Sacramento River to the new TRR through the GCID Main Canal and into the Sites Reservoir through the TRR PGP and the I/O Works. Up to 1,800 cfs, plus losses, would be diverted at the Hamilton City Pump Station for the Project. Although the RBPP would be the primary diversion point, both diversion facilities would be operated simultaneously when river conditions and capacity are available for a maximum combined diversion rate of 4,200 cfs (3,900 cfs, plus losses).

Estimated total annual diversion of Sacramento River water from both diversion facilities to Sites Reservoir could be up to the full reservoir amount. Based on model simulations, the estimated annual diversions under Alternative 3 would usually range from 40 thousand acre-feet (TAF) per year in Critically Dry Water Years to 450 TAF per year in Wet Water Years, depending on hydrologic conditions, availability of Sacramento River water, and diversion and conveyance facility capacities.

Diversion Criteria

The Project would be operated to meet the diversion criteria summarized in Table 2-5 and described in more detail below. All of these criteria must be met for the Project to divert water to Sites Reservoir.

Table 2-5. Summary of Project Diversion Criteria

Location (Listed from North to South)	Criteria
Bend Bridge Pulse Protection	Protection of all qualified precipitation-generated pulse events (i.e., peaks in river flow rather than scheduled operational events) from October to May based on hydrology and the detection of migrating fish during the beginning of the flow event. A qualified precipitation-generated pulse event is determined based on forecasted flows and pulse protection may cease earlier than 7 days if flows at Bend Bridge exceed 29,000 cfs and Project diversions subtracted from Bend Bridge flows continue to be at least 25,000 cfs.
Minimum Bypass Flows in the Sacramento River at the RBPP	3,250 cfs minimum bypass flow at all times (unless overridden by regulatory requirement for higher flow, e.g., requirements, biological opinions); rate of diversion controlled by fish screen design
Minimum Bypass Flows in the Sacramento River at the Hamilton City Pump Station	4,000 cfs minimum bypass flow at all times; rate of diversion controlled by fish screen design
Minimum Bypass Flows in the Sacramento River at Wilkins Slough	10,700 cfs from October 1 to June 14; 5,000 cfs in September (no diversions to Sites Reservoir from June 15 to August 31)
Freeport, Net Delta Outflow Index, X2, and Delta Water Quality	Operations consistent with all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that diversion occurs

Bend Bridge Pulse Protection

Project implementation would include a pulse flow protection measure to be applied to all qualified precipitation-generated peaks in the hydrograph that originate primarily from tributaries to the Sacramento River that flow into the mainstem Sacramento River downstream of Keswick Dam from October through May. The pulse flow protection measure addresses the survival of migrating juvenile winter-, spring-, fall-, and late fall–run Chinook salmon (*Oncorhynchus tshawytscha*), and steelhead (*Oncorhynchus mykiss*) through the middle reaches of the Sacramento River. Pulse flows during this period would provide flow continuity between the upper and lower Sacramento River (i.e., below Wilkins Slough) and are expected to enhance survival of these migratory fish (Michel et al. 2015, 2021; Notch 2017) as fish movement is thought to occur in response to increased flow, water year type and turbidity associated with the beginning of a precipitation-generated high-flow event (Poytress et al. 2014, Cavallo et al. 2015).

Pulse protection would occur from October through May to address outmigration of juvenile winter-, spring-, fall- and late fall–run Chinook salmon, as well as a portion of the steelhead juvenile outmigration period.

The Project's operations plan would include a fish monitoring program capable of detecting a migratory fish response during the beginning of a precipitation-generated high-flow event. The criterion regarding the detection of a pulse of outmigrating fish will be subject to the Project's Adaptive Management Program with the goal of demonstrating a relationship between flow pulses and fish movement that is detectable, reliable, and sufficiently predictable to serve as a criterion for initiation and termination of pulse protection. Until such a time as a detailed criterion is developed and agreed to by CDFW, NMFS, and USFWS, outmigrating pulse cues would be limited to only the hydrological components of the pulse protection criteria. The program would be developed in cooperation with Reclamation and the fishery resource agencies and would be integrated with previous and existing fish monitoring programs to the extent possible and additional monitoring sites could be included as necessary. For example, the USFWS monitoring program at the Red Bluff Diversion Dam (RBDD), which has since been removed, that was conducted for purposes of estimating fish production indices in the spawning reach above the dam is particularly relevant. Appendix 2D describes the purpose, outcomes, content, and timing of the monitoring, technical studies, and adaptive management. The following criteria define a qualified pulse event:

- Outmigration of anadromous fish is detected based on the Adaptive Management Plan and fish monitoring program (applicable only once a detectable, reliable, and predictable fish detection criterion has been developed and agreed upon with CDFW, NMFS, and USFWS).
- If a 3-day forecasted average of Sacramento River flow at Bend Bridge is projected to exceed 8,000 cfs and the 3-day forecasted average combined tributary flow upstream of Bend Bridge (Cow Creek, Cottonwood Creek, and Battle Creek) is projected to exceed 2,500 cfs, then a pulse protection event is initiated and diversion restrictions would begin when the average hourly flows in the Sacramento River at Bend Bridge exceed 8,000 cfs and the average hourly flows in the tributaries upstream of Bend Bridge (Cow Creek, Cottonwood Creek, and Battle Creek) cumulatively exceed 2,500 cfs, provided that the previous day was not already in a pulse protection event.
- A pulse event terminates 7 days after initiation; or earlier than 7 days after initiation if the average daily Sacramento River flow at Bend Bridge exceeds 29,000 cfs. In the event that Sacramento River flow at Bend Bridge exceeds 29,000 cfs during the 7-day pulse protection event, Project diversions may resume in such way that average daily diversions subtracted from Sacramento River flow at Bend Bridge continue to be at least 25,000 cfs during what would have been the 7-day pulse protection period.
- After completion of a pulse event, the following conditions must occur before another pulse event is triggered: (1) 3-day trailing average of Sacramento River flow at Bend Bridge was less than 7,500 cfs for 7 consecutive days; and (2) 3-day trailing average of tributary flow upstream of Bend Bridge (Cow Creek, Cottonwood Creek, and Battle Creek) was less than 2,500 cfs for 7 consecutive days.

Project diversions from the Sacramento River would not occur during a qualified pulse event. Diversions are otherwise unrestricted by the Bend Bridge Pulse Flow protection criteria.

Minimum Bypass Flows in the Sacramento River at the RBPP

As required by Water Rights Order 90-5, a minimum bypass flow in the Sacramento River at the RBPP of 3,250 cfs would continue to be in place to stabilize flows in the Sacramento River and protect salmon redds. When flow in the Sacramento River is less than 3,250 cfs at the RBPP, the Project would not divert. When flows in the Sacramento River exceed 3,250 cfs at the RBPP, diversions at the RBPP may occur and the rate of diversion at the RBPP would be controlled by and scaled to the fish screen design (Figure 2-36) until the full 2,100 cfs diversion could be achieved at flows of approximately 7,860 cfs in the Sacramento River.

Minimum Bypass Flows in the Sacramento River at the Hamilton City Pump Station

A required minimum bypass flow in the Sacramento River at the Hamilton City Pump Station of 4,000 cfs would continue to be in place at all times to stabilize flows in the Sacramento River and ensure proper function of the fish screen. When flow in the Sacramento River is less than 4,000 cfs at the Hamilton City Pump Station, the Project would not divert. When flows in the Sacramento River exceed 4,000 cfs at the Hamilton City Pump Station, diversion at the Hamilton City Pump Station may occur and the rate of diversion at the Hamilton City Pump Station would be controlled by and scaled to the fish screen design (Figure 2-37) until the full 1,800 cfs diversion could be achieved at flows of about 5,800 cfs in the Sacramento River.

Minimum Bypass Flows in the Sacramento River at Wilkins Slough

In addition to the minimum bypass flows in the Sacramento River at RBPP and the Hamilton City Pump Station, diversions to Sites Reservoir may not cause flow at Wilkins Slough to decline below 10,700 cfs in the Sacramento River at Wilkins Slough from October 1 to June 14 and below 5,000 cfs in September. Sacramento River flows are fully appropriated between June 15 and August 31, during which time there will be no diversion to Sites Reservoir.

Fremont Weir Notch Protections

The Project's diversion criteria have been formulated to avoid impacts on Reclamation's ability to meet its obligations in the 2019 NMFS ROC ON LTO Biological Opinion to implement the Yolo Bypass Restoration Salmonid Habitat Restoration and Fish Passage Implementation Plan and inundate over 17,000 acres in the Yolo Bypass from December to April (National Marine Fisheries Service 2019). The Project would thus operate to avoid effects on the Yolo Bypass Fremont Weir Big Notch Project's (Big Notch) ability to achieve the same level of performance for salmonids and sturgeons in the Sacramento River as it would absent the Project. The Bend Bridge Pulse Protection measure and minimum bypass flows requirement at Wilkins Slough should prevent significant changes to Yolo Bypass spill frequency and duration under Alternatives 1, 2, and 3 comparted to the No Project Alternative. However, as described in Appendix 2D, Section 2D.6.5, *Effects on Fremont Weir Big Notch*, the Adaptive Management Plan for the Project recognized there is uncertainty about the performance of the Big Notch and the effects of the Project on it. Monitoring will be conducted, in cooperation with the State, to determine whether there is an effect and, if so, what the magnitude of that effect would be on entrainment of fish into the Yolo Bypass. If there is an adverse effect, a science-based adaptive management approach will be employed to determine how to adjust diversions 158 river miles upstream of the Big Notch to maintain its efficiency.

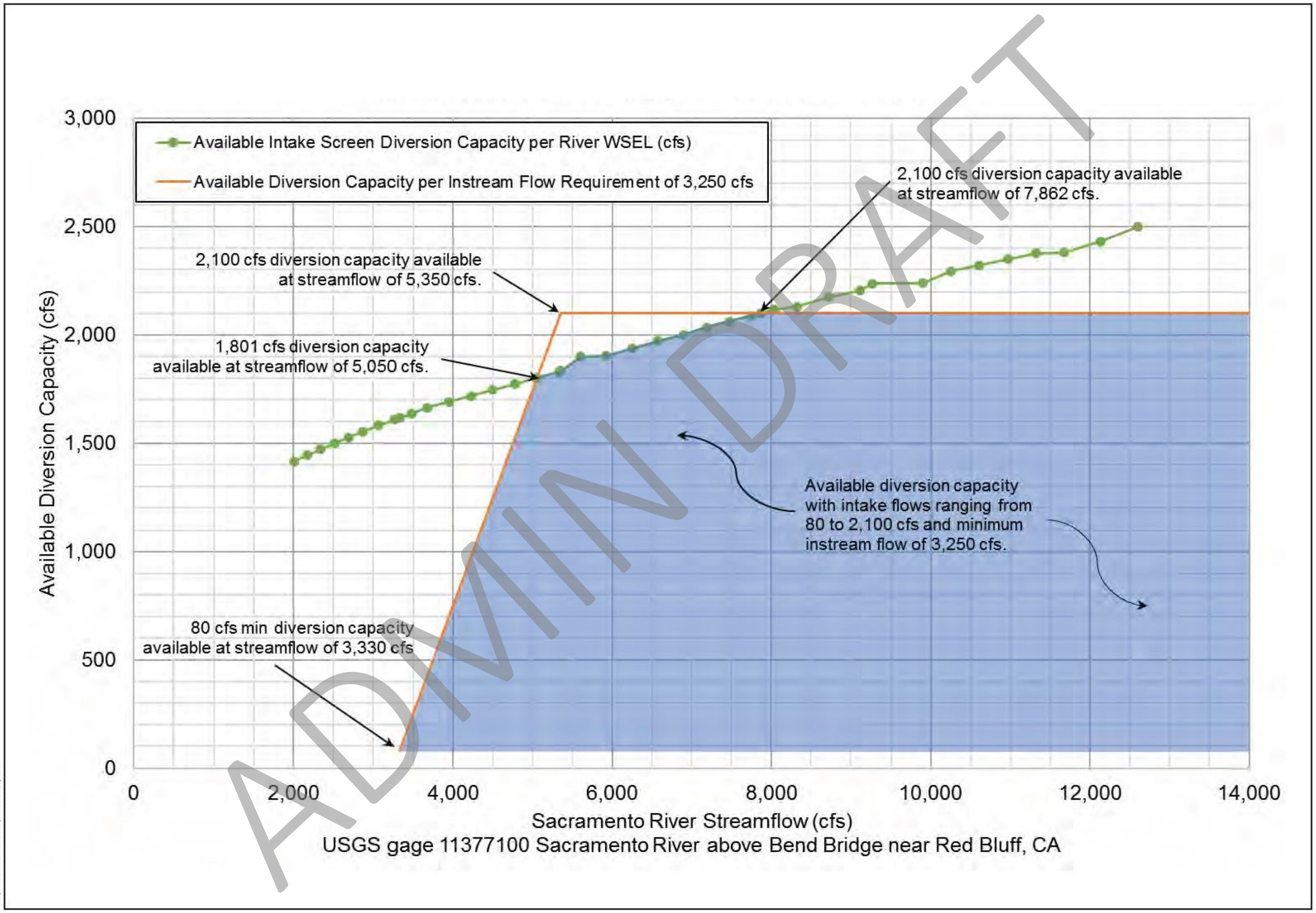


Figure 2-36
Available Diversion Capacity versus Streamflow at Red Bluff Pumping Plant

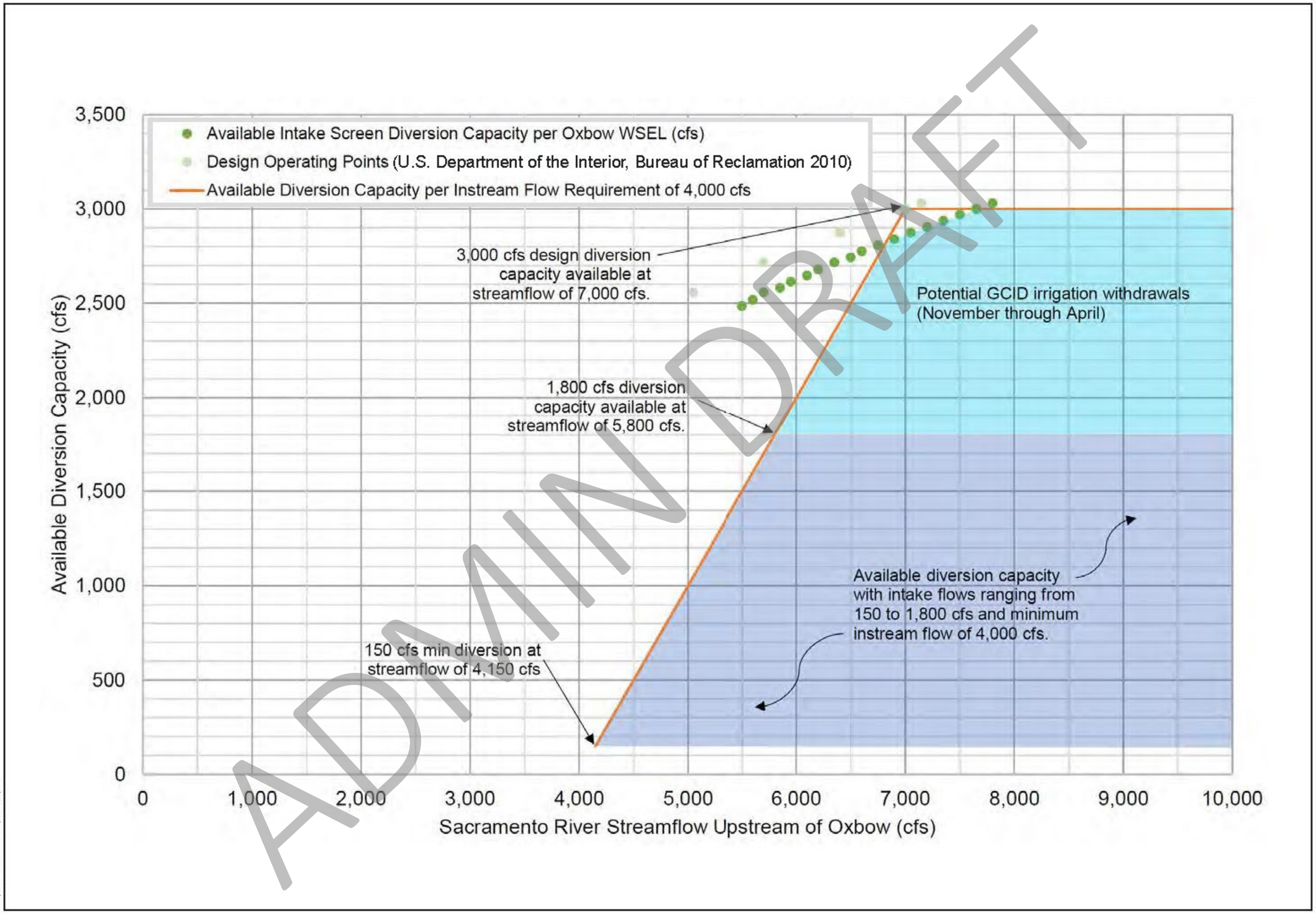


Figure 2-37
Available Diversion Capacity versus Streamflow at the GCID Hamilton City Pump Station

Freeport, Net Delta Outflow Index, X2, and Delta Water Quality

For lower Sacramento River and Delta locations, the Project would operate in a manner that would not adversely affect the ability of others to meet all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that diversion occurs.

Storage in Sites Reservoir

Water would be stored in Sites Reservoir until requested for release by a Storage Partner. The Authority would prepare a Reservoir Management Plan (RMP) that would describe the management of water resources in Sites Reservoir and include a plan for monitoring water quality. Section 2.5.2.4, *Operations and Maintenance Plans*, contains additional information on the RMP.

Releases from Sites Reservoir

Releases from Sites Reservoir would be made in any water year type to meet the needs of the Storage Partners, including the water-supply-related environmental benefits under WSIP. The releases would be made from the I/O Works in Sites Reservoir and conveyed via pipeline to either Funks Reservoir or the TRR. Under normal operating conditions, up to 2,000 cfs could be released from the I/O Works to Funks Reservoir and up to 1,000 cfs could be released from the I/O Works to the TRR. The I/O Works would allow withdrawal of water from Sites Reservoir over a range of depths to manage release water temperatures.

From Funks Reservoir or the TRR, releases would be conveyed as follows:

- **Release for Storage Partners Along the TC Canal and GCID Main Canal –** Releases would be made to Funks Reservoir or the TRR and conveyed to the respective Storage Partner via the existing TC Canal and GCID facilities.
- **Releases for Storage Partners Along the Sacramento River –** Releases for Storage Partners along the Sacramento River would generally be made via exchange as water from Sites Reservoir cannot be physically conveyed to any Storage Partner on the Sacramento River between the Hamilton City Pump Station and Knights Landing. Real-time exchanges, primarily with GCID but also with Reclamation, would be used for these Storage Partners.
- **Releases for Storage Partners Along the CBD, Yolo Bypass, and North Bay Aqueduct –** Releases for Storage Partners, including some of the Proposition 1 water, would be made to Funks Reservoir. This water would then be conveyed down the TC Canal to the new Dunnigan Pipeline and released into the CBD. The water would subsequently be conveyed down the CBD, through the Knights Landing Ridgecut, to the Yolo Bypass/Cache Slough Complex for Proposition 1 benefits. Water destined for Storage Partners who receive water from the North Bay Aqueduct could follow this path, but it is more likely this water would be moved through the Sacramento River as described below.
- **Releases for South-of-Delta Storage Partners –** Releases for Storage Partners who are located south of the Delta, including water for Incremental Level 4 Refuge water supply benefits under WSIP, would be made to Funks Reservoir, conveyed down the TC Canal

to the new Dunnigan Pipeline, and released into the CBD. This water would then be conveyed to the Sacramento River via the Knights Landing Outfall Gates. Once in the Delta, this water could be diverted at any of the South Delta pumping facilities (SWP's Banks Pumping Plant, Reclamation's Jones Pumping Plant, the North Bay Aqueduct, or Contra Costa Water District's pumping plants) and conveyed to the respective Storage Partner using existing conveyance facilities and mechanisms. Releases for Storage Partners who are located south of the Delta, including water for Incremental Level 4 Refuge water benefits under WSIP, may also be made through exchanges with Reclamation and DWR. Releases for south-of-Delta Storage Partners would generally be made during July to November to coincide with available pumping capacity at the South Delta pumping facilities and would be subject to applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that releases occur.

Releases would be coordinated with Reclamation and DWR to ensure there are no conflicts with CVP and SWP operations and no adverse effects to the CVP and SWP. In addition, releases would be coordinated with Reclamation and DWR to ensure that there is available capacity to redivert releases at the South Delta pumping facilities for any releases that would be pumped at these locations. The majority of releases to the Sacramento River would occur when the CVP and SWP are in balanced conditions, which means that releases from upstream reservoirs and unregulated flow are approximately equal to the water supply needed to meet Sacramento Valley in-basin uses and CVP and SWP exports.

Sites Reservoir is currently estimated to have a dead pool of approximately 17,700 AF, below which water cannot physically be removed from the reservoir using the I/O Works. However, the Authority is currently planning to operate to a dead pool of up to 60 TAF under normal conditions. For the RDEIR/SDEIS, Sites Reservoir operational dead pool was assumed and modeled at 120 TAF. However, the reservoir was allowed to be drawn lower than this for TCCA water supply during drought conditions. The Project description and CALSIM II now allow an operational dead pool of 60 TAF, with all Sites Storage Partners sharing storage between 60 TAF and 120 TAF. The operational dead pool amount may be revised and reduced in final design. Sites Reservoir may also be drawn down below the operational dead pool in drought situations.

Coordination with CVP and SWP

Project operations would be coordinated with Reclamation and DWR to benefit portions of CVP and SWP operations, prevent conflicts with the CVP and SWP operations, and avoid additional obligations on the CVP or SWP to meet applicable laws, regulations, biological opinions or incidental take permits (in the case of the SWP), and court orders in place at the time of operations. The Authority is currently working with Reclamation and DWR to establish operating principles with both agencies that would describe the details of the coordination and collaboration that would take place during the operation of the Project.

It is expected that the Project would also be incorporated into existing and future technical and advisory teams in which Reclamation and DWR participate to coordinate the CVP and SWP operations with the regulatory agencies. These teams could include the Sacramento River Temperature Task Group and other groups as applicable. This participation would allow for better and more efficient coordination of the Project's operations, in concert with CVP and SWP operations, with the regulatory agencies. Involvement on the technical and advisory teams would also provide opportunities to work collaboratively to achieve species benefits in the Sacramento Valley and the Delta.

The proposed operation of the Project includes exchanges of water with the CVP and SWP. Exchanges have the potential to assist the CVP and SWP in meeting their regulatory obligations and their authorized purposes including to protect, restore and enhance fish, wildlife, and associated habitats, provide water supply and generate power. The exchanges are expected to primarily occur with Shasta Lake and Lake Oroville. Exchanges are also expected to take place in real-time with local Storage Partners. Exchanges would only be conducted when they would be neutral or net beneficial to CVP and SWP operations and not affect the ability of the CVP or SWP to meet applicable laws, regulations, biological opinions and incidental take permits, contractual deliveries, and court orders in place at the time.

Coordination with CVP:

To help Reclamation achieve operational objectives without additional burden or negative effects on the existing CVP system, the Authority is considering the following actions to coordinate operations with Reclamation towards common goals. These actions would be pursued regardless of Reclamation's investment level; however, it is expected that increased federal benefits would be achieved with increased level of federal investment in the Project.

Shasta Lake Exchanges – Exchanges with Shasta Lake would be formulated to target cold-water pool preservation and anadromous fish benefits. The exchanges would use Storage Partners' share of Sites Reservoir storage, including but not limited to the CVP share of the storage, in a manner to meet CVP deliveries and obligations as much as possible via Sites Reservoir to preserve water stored in Shasta Lake. These coordinated operations would be shaped in a way to minimize effects on Project deliveries to Storage Partners. Water exchanged in Shasta Lake would be released for Storage Partners' diversions north or south of Delta or would be used for in-basin uses. The following outcomes would be targeted:

- Cold-Water Pool Maintenance – Exchanges intended to maintain the cold-water pool in Shasta Lake would occur in years when temperature management would improve if the exchange occurs. Under this exchange, water would be released from Sites Reservoir in the spring and summer to meet CVP needs, including Sacramento River Settlement contract deliveries, CVP water service and/or repayment contracts or Central Valley Project Improvement Act (CVPIA) refuge needs in the Sacramento Valley that could physically receive water from Sites Reservoir and/or Reclamation's Delta obligations. By reducing releases from Shasta Lake in the spring and summer, the storage and cold-water pool in Shasta Lake would be preserved for use later in the year, typically during critical months of the cold-water pool management season (August and September) and into the fall. In late summer and fall (i.e., August through November) of that same calendar year, Reclamation would release an equivalent amount of water from Shasta Lake and/or CVP share of Sites Reservoir for Storage Partners. These releases would be subject to other limitations and regulations including State Water Board actions.
- Fall-Run Redd Maintenance – Exchanges with Shasta Lake may also occur to minimize fall-run Chinook salmon redd dewatering. Under this exchange, water released from

Shasta Lake from the fall through the winter to maintain inundation and prevent fall-run redd dewatering would be used downstream to meet Storage Partners' needs. Sites Reservoir would subsequently release an equivalent amount of water to meet CVP needs in the spring and summer. Fall-run redd maintenance flows could also be achieved by releasing previously exchanged water stored in Shasta Lake similar to the Cold-Water Pool Maintenance action described above. For example, in wet and above normal years, if Shasta Lake storage is high due to exchanged water, Reclamation may choose to meet the Fall X2 requirement by releasing water from Shasta Lake instead of reducing Delta exports. The water that can be pumped instead of what would have been reduced to meet Fall X2 could be delivered to Storage Partners.

- Spring Pulse Assistance – Exchanges with Shasta Lake and/or Project Storage Partners may also assist Reclamation in making spring pulse flows for the benefit of juvenile salmon out-migration in the lower Sacramento River. When Reclamation is implementing a spring pulse release from Shasta Lake and to prevent reduction in the pulse flow, water would be released from Sites Reservoir during the pulse period to meet other CVP needs, such as contractual deliveries to Sacramento Valley settlement and water service contractors. During spring pulse flow times when the Authority may otherwise divert flows from the Sacramento River, Reclamation may transfer water stored in Sites Reservoir to the other Storage Partners in lieu of diversions. Spring pulse flow assistance could also be achieved by releasing previously exchanged water stored in Shasta Lake similar to the Cold-Water Pool Maintenance action described above. CVP needs including deliveries to Sacramento River Settlement Contractors can be made via Sites Reservoir to maintain water in Shasta Lake that might help achieve additional pulse flows (either an additional pulse or increased volume) from March through May.

Coordination with SWP:

Exchanges with Lake Oroville would be done to primarily to increase flexibility and yield of Sites Reservoir while providing environmental benefits. Exchanges with Lake Oroville would be formulated to facilitate Project deliveries to Storage Partners and may also improve cold-water pool conditions at Lake Oroville. Exchanges with Lake Oroville are expected to happen more frequently than Shasta Lake exchanges and would be driven by a variety of factors. Under a Lake Oroville exchange, water would be released from Sites Reservoir primarily in June and July to meet SWP purposes. By reducing releases from Lake Oroville in these months, the storage and cold-water pool in Lake Oroville would be preserved for use later in the year, typically during critical months of the cold-water pool management season (August and September). In late summer and fall (i.e., August through November), DWR would release an equivalent amount of water from Lake Oroville for Storage Partners. All exchange water would be released from Lake Oroville in late summer and fall and no exchanged water would be carried over from year to year.

Real-Time Exchanges or Transfers with Local Storage Partners:

To support timing of releases and deliveries to Storage Partners north and south of the Delta, exchanges or transfers with local Storage Partners may occur. This type of exchange or transfer is most likely to occur with GCID but could also occur with Sacramento River Settlement Contractors and Reclamation. Instead of diverting all or a portion of its water from the Sacramento River, the local Storage Partner would receive a portion of its water from Sites

Reservoir. A portion of the local agencies' supply would be left in the Sacramento River (i.e., not diverted by that contractor or agency) and used for other Storage Partners.

Funks Creek and Stone Corral Creek Releases

The Project has the capacity to make releases from Sites Reservoir into Funks and Stone Corral Creeks should they be necessary to comply with California Fish and Game Code Section 5937[4] and ensure no harm to downstream water right holders on these creeks. Field studies would be conducted once access is obtained and before final designs for Sites Dam and Golden Gate Dam are completed to determine the following:

- Existing fish assemblage in these creeks, including fish species presence and habitat use;
- Characterization of habitats available (e.g., spawning, rearing, foraging, and sheltering habitats) at varying flow levels, including the presence or absence of pools that persist through summer;
- Characterization of flows, including assessing the base flow during the summer months;
- Conducting a fluvial geomorphologic study to characterize habitat condition including substrate compositions and bed load and to document the relationship between flow levels and mobilization;
- Surface Water Ambient Monitoring Program technical study (i.e., bioassessment) that focuses on relationships between physical habitat, water quality, and benthic macroinvertebrates; and
- Hydrological studies to define flow temperature relationships.

Using information from these field studies, along with currently available information, the Authority would prepare a Funks and Stone Corral Creeks flow schedule that would be incorporated into the Reservoir Operations Plan that would identify the approach for releases, including release schedules and volumes. If flows in Stone Corral Creek and Funks Creek are needed to maintain fish in good condition and the habitats on which they depend, consistent with California Fish and Game Code Section 5937, then the Authority would adapt this study program into an operations monitoring plan with a duration of 5 to 10 years to document and adaptively manage the timing and magnitude of flow releases. Releases into these creeks would be made in consideration of the flood control benefits of the Project and would not overtop the stream banks and flood downstream areas. Appendix 2D describes the purpose, objectives, content, and timing of the studies identified above.

Releases into Funks Creek would be made through a pipeline that links the transition manifold to Funks Creek below the dam. This pipeline would carry up to 100 cfs with a release range of 0 to 100 cfs into Funks Creek. Releases into Stone Corral Creek would be made through the

[4] "The owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. During the minimum flow of water in any river or stream, permission may be granted by the department to the owner of any dam to allow sufficient water to pass through a culvert, waste gate, or over or around the dam, to keep in good condition any fish that may be planted or exist below the dam, when, in the judgment of the department, it is impracticable or detrimental to the owner to pass the water through the fishway."

permanent outlet at Sites Dam. This outlet would have a release range of 0 to 100 cfs, with an emergency release capacity of approximately 4,700 cfs.

Flood Control

The Project would provide flood control benefits to the communities of Maxwell and Colusa, local agricultural lands, rural residences, and I-5 by impounding Funks Creek and Stone Corral Creeks. These flood control benefits are inherent in the design of the Project and no specific operational criteria are necessary to achieve these benefits.

Emergency Release

The Project includes the design and operation of facilities to meet DSOD requirements, including:

- Ability to reduce the depth of water in the reservoir by 10% of the reservoir depth within 7 days. Reservoir depth is defined as the elevation difference between the maximum normal operating WSE and the top of dead pool elevation.
- Ability to drain the reservoir to dead pool within 90 to 120 days.

During an emergency release event, the I/O Works and the diversion outlet at Sites Dam would operate simultaneously to release water. The emergency releases would be in accordance with DSOD requirements and would occur as follows:

- The diversion outlet at Sites Dam would release to Stone Corral Creek at a maximum rate of approximately 4,700 cfs.
- The I/O tunnel would release to Funks Creek and the TRR at a rate of 16,000 cfs, with 9,000 cfs being discharged to Funks Reservoir and 7,000 cfs to the TRR with a maximum velocity of 40 feet per second (ft/s) in the conveyance pipelines downstream of the I/O tunnel. The I/O tunnel itself would be sized such that the maximum velocities are 20 ft/s in accordance with Reclamation criteria for reinforced concrete lining. Additional energy dissipation structures at Funks Reservoir and the TRR would be required for the emergency releases.

The RDEIR/SDEIS identified two emergency release structures that were proposed for Alternatives 1 and 3: Emergency Release Structure 1 adjacent to Saddle Dam 3 and Emergency Release Structure 2 adjacent to Saddle Dam 5. These structures have been eliminated, which also eliminates emergency release flows that would occur to Hunters Creek and downstream agricultural lands except during emergency spills from overtopping at Saddle Dam 8B.

2.5.2.2 Energy Generation and Energy Use

The Project would require power to run facilities and pump water, but it would also generate incidental power. The pumping energy requirements and power generation are summarized in Table 2-6 and Table 2-7 for Alternatives 1, 2, and 3.

Table 2-6. Pumping Summary for Alternatives 1, 2, and 3

Site	Net Pumping Power (MW)	Other Auxiliary Loads (MW)	Transformer and T Line Losses (MW)	Total Pumping Power (MW)	Total Pumping Power @ 0.85 PF (MVA)
Funks	67.1	1	0.1	68.2	80.2
TRR	75.4	1	0.1	76.5	90.0
Total	142.5	2	0.2	144.7	170.2

Notes:
MW = megawatts; PF = power factor; MVA = megavolt amperes

Table 2-7. Potential Generating Summary for Alternatives 1, 2, and 3

Site	Potential Net Generating Power (MW)	Other Auxiliary Loads (MW)	Transformer and T Line Losses (MW)	Total Power Generation (MW)	Total Power Generation @ 0.85 PF (MVA)
Funks	48.1	1	0.1	55.3	47.0
TRR	27.4	1	0.1	31.0	26.3
Total	75.5	2	0.2	86.3	73.3

Notes:
MW = megawatts; PF = power factor; MVA = megavolt amperes

Power generation at the Funks PGP and TRR PGP during operation would be limited to 40 MW nameplate capacity per facility and as such, would not require a Federal Energy Regulatory Commission license per the "Qualifying Conduit Hydropower Facility" under the Hydropower Regulatory Efficiency Act of 2013, as amended by America's Water Infrastructure Act of 2018. The Project would include electrical substations at Funks Reservoir and the TRR. These substations would service a net pumping energy demand estimated at 80 megavolt amperes (MVA) at Funks Reservoir and 90 MVA at the TRR (i.e., 170 MVA of demand load total). Because of the size of the pumping units, no backup generation is planned for pumping facilities. The Project would require power to operate in order to divert and convey water to and from Sites Reservoir during the winter months and would generate power when releases from storage are made during the summer and fall months. Project operations would generate power when water is released from Sites Reservoir at the Funks and TRR PGPs. The power generated during this time of the year is when California typically needs more power to satisfy demand because of higher temperatures and thus it is expected Project-generated power would be sold on the market to a willing buyer. The Project would require purchasing power to operate (i.e., power generated by the Project would not be used to operate the Project). The Project has a target of purchasing at least 60% of the Project's operations power needs from renewable, carbon-free sources from the start of operations to 2045. Starting in 2045, the Authority would target purchasing 100% of the Project's operations power needs from renewable, carbon-free sources. This target does not include any operational power needs attributable to Reclamation's participation, including the conveyance and pumping of Incremental Level 4 Refuge water supply.

2.5.2.3 Facility Operations and Maintenance

Operations and maintenance activities for all facilities, including recreation areas, would include debris removal, vegetation management, rodent control, erosion control and protection, routine inspections (dams, tunnels, pipelines, PGPs, I/O Works, fencing, signs, and gates), painting, cleaning, repairs, and other routine tasks to maintain the facilities in accordance with design standards after construction and commissioning. Routine visual inspections of the facilities would be conducted to monitor performance and prevent mechanical and structural failures. The Authority will implement operations and maintenance BMPs that are described in Section 2.5.4.

The RBPP has an established operations and maintenance plan. The two new pumps at the facility would be incorporated into the existing plan and operated and maintained as part of the overall activities at the facility. Improvements to the GCID facilities would likewise be incorporated into GCID's regular operations and maintenance activities.

Operations and maintenance activities unique to the TRR would include daily visual inspections, setting and checking water control structures, annual and 5-year dam safety inspections, quarterly vegetation and weed abatement and rodent control, annual preventative leak location surveys and evaluations of the reservoir liner, instrumentation monitoring and maintenance, and annual debris removal at the spillway outfall to Funks Creek. Replacement of the TRR liner may be needed on an infrequent basis.

Operations and maintenance activities unique to the TRR and Funks PGPs and hydroelectric turbines would involve greasing, painting, oiling, and keeping the pumps in good operating condition. These activities would also include different monthly and annual inspections of pumps, interior coating condition inspection, pump leakage inspections, temperature and pressure checks, and exterior surface cleaning. Repair and replacement of pump components would be needed on a periodic basis. Energy dissipation structures would be visually inspected and lubrication of bearings would be conducted on an as-needed basis.

Operations and maintenance activities unique to the electrical switchgear would include visual and mechanical inspections, moisture and corrosion inspections, general wiring checks, and insulator and barrier checks. A series of tests would be conducted at regular intervals, including but not limited to insulation electrical tests, control wiring electrical tests, circuit breakers and switch tests, system function tests, and surge arrestor tests. Electrical switchgear would be maintained, repaired, or replaced as needed to continue safe and efficient operations.

Pipelines and tunnels would be inspected at least every 5 years and remote operated vehicle (ROV) inspections would be acceptable. ROV inspections would not require dewatering the tunnels or pipelines. If physical inspections of tunnel interiors would be required, the tunnels would be completely shut down. Tunnel inspections may be completed during normally scheduled shutdowns when water is not being conveyed into or out of the reservoir. The tunnel shutdown duration could range from a few days (inspection only) to 2 weeks (if maintenance is required).

Different components of the I/O Works would need to be inspected and maintained at varying frequencies. Any port gate that was not operated in a given year based on reservoir WSE would be functionally tested at least once during that year. In general, pipeline appurtenances (e.g., air/vacuum valves, blowoffs) would be inspected and functionally tested where possible annually. Most of the mechanical components in the multi-level I/O tower could be functionally tested and/or maintained without requiring a shutdown (as there would be multiple tiers from which to draw water).

Maintenance of access roads would include replacing gravel, scraping and filling ruts in gravel roads, or pavement replacement and repair for paved roads. Minor infrastructure maintenance would include repair or replacement of gates, locks, or fencing; painting gates; replacing lost or damaged signage; and lubricating gates.

Maintenance of lands could include grading fire breaks/trails, maintaining vegetation (e.g., grazing, tilling, or disking), and performing limited prescribed/controlled burns.

In general, operations and maintenance activities could occur on a daily, annually, periodically (as needed), and long-term basis. It is estimated that 30 operations and maintenance workers would be needed to perform operations and maintenance activities (based on three shifts per day, 365 days a year).

2.5.2.4 Operations and Management Plans

The Authority would develop and implement a number of operations and management plans to direct the Project operations and maintenance activities.

Reservoir Operations Plan

The Reservoir Operations Plan would describe the management of water operations, including releases into Funks and Stone Corral Creeks. This plan would include the following:

- **Diversions to Sites Reservoir** – Mechanics on how diversions are scheduled and managed, including diversion criteria and operating requirements for diversions.
- **Storage in Sites Reservoir** – How losses and evaporation are accounted for, how exchanges and transfers are managed (both between Storage Partners and with non-Storage Partners), and the process for leasing or sharing storage space.
- **Releases from Sites Reservoir** – When and how water can be released to each facility, how release orders are made and adjusted, and how releases are prioritized when necessary.
- **Flows in Funks and Stone Corral Creeks** – Release operations for releases into Funks and Stone Corral Creeks.
- **Flood Control and Health and Safety Considerations** – Descriptions of how emergencies should be handled and processes for notification in the event of emergencies. Emergency flow releases will be addressed in an Emergency Action Plan.

The Authority has developed Version 1 of a Reservoir Operations Plan in parallel to the development of the RDEIR/SDEIS. The purpose of the Reservoir Operations Plans is to compile operations-related items from other documents in one location. The contents of the Reservoir Operations Plan are primarily pulled from the RDEIR/SDEIS and the Authority’s Principles of Storage. Version 1 of the Reservoir Operations Plan focuses on modeling Alternative 1B as the

Authority's preferred alternative at the time of the RDEIR/SDEIS. Future versions of the Reservoir Operations Plan will be modified as needed based on the final alternative selected and permitting and water rights requirements established as the Project continues to progress. A complete Reservoir Operations Plan would be prepared at least 1 year prior to Project operations being initiated.

Reservoir Management Plan

The RMP would describe the management of water resources within Sites Reservoir. Information regarding the purpose, outcomes, content, and timing of components of this plan are included in Appendix 2D. This plan would include the following:

- **Fisheries Management** – Target fisheries species composition and management activities for Sites Reservoir, including stocking strategies (if any), habitat enhancement measures, and monitoring efforts. Species that may be considered include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), Kokanee salmon (*Oncorhynchus nerka*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), channel catfish (*Ictalurus punctatus*), and brown bullhead (*Ameiurus nebulosus*).
- **Reservoir Water Quality** – Water quality metrics, standards, testing and monitoring protocols (including guidelines for water quality measurements), and the frequency and location of measurements in the reservoir, the source water, and the reservoir discharge. Protocols to respond to emerging water quality concerns, such as protocols for invasive aquatic weed control, potential adjustments to inflow and release volumes, minimum reservoir storage levels, and inlet/outlet port selection. Water quality metrics, standards, testing, and protocols would follow information and guidance available from the Central Valley Regional Water Quality Control Board. More detail regarding water quality management is provided in Chapter 6, *Surface Water Quality.*
- **Vector Management** – Protocols and practices for communicating/coordinating with vector control authorities and determining how vector control would be managed at Sites Reservoir and the TRR.

The RMP would be completed at least 1 year prior to Project operations being initiated.

Traffic Management Plan

The Authority will develop the TMP in coordination with the applicable jurisdictions, including local governments, transit providers, and rail operators for construction. The TMP will describe measures to ensure that Project-related traffic will be managed to avoid conflicts with local traffic. Information regarding the key features, responsible party(ies), timing monitoring and reporting requirements, and regulatory and permitting agency responsibilities, as appropriate, of the TMP are contained in Appendix 2D. As noted elsewhere in this chapter and in Appendix 2D, the TMP would identify specific haul and access routes with all contractors to disperse Project-generated construction traffic to the extent practicable and necessary during concurrent construction of multiple facilities and prohibit construction traffic in the community of Maxwell. Other actions would be identified and developed as needed by the Authority in coordination with the construction manager/resident engineer to ensure that impacts on transportation facilities are minimized.

Land Management Plan

The Land Management Plan would describe the management and maintenance activities on all non-recreation land resources held in fee or easement by the Authority. This plan would include management actions for buffer areas and the specific type and frequency of maintenance activities by location. Land management, maintenance, and monitoring actions for onsite mitigation areas that may be owned and managed by the Authority would also be described. The Land Management Plan would be completed within 1 year of the first fee title acquisition by the Authority and would be amended as needed as additional lands are acquired. Appendix 2D identifies the purpose, outcomes, content, and timing of the Land Management Plan.

Recreation Management Plan

The Recreation Management Plan would describe the types, management, maintenance and monitoring activities on all Project recreation lands and areas. Development of the Recreation Management Plan would be coordinated with the Counties of Colusa and Glenn and the local police, fire, and emergency response entities and organizations. The Recreation Management Plan would be completed at least 1 year prior to the opening of Project recreational facilities. Appendix 2D identifies the purpose, outcomes, content, and timing of the Recreation Management Plan.

Initial Sites Reservoir Fill Plan

The Initial Reservoir Fill Plan would describe the monitoring program for Sites and Golden Gate Dams, saddle dams, saddle dikes, and areas around the reservoir that would be implemented during the initial filling of Sites Reservoir. The Initial Reservoir Fill Plan would be prepared as part of the DSOD approval process and would be completed at least 1 year prior to beginning to fill Sites Reservoir. Appendix 2D identifies the purpose, outcomes, content, and timing of the Initial Sites Reservoir Fill Plan.

Standard Operating Procedures

The Authority would prepare Standard Operating Procedures for all major Project facilities. These Standard Operating Procedures for each facility would include operational guidelines and schedules for inspection, monitoring, and maintenance. The Standard Operating Procedures are expected to be developed as part of the DSOD approval process and would be completed prior to beginning operations of the specific Project facility.

Security Plan

The Authority would prepare a Security Plan for all major Project facilities. Development of the Security Plan would be coordinated with local, state, and federal law enforcement agencies. This approach would ensure a comprehensive security review and assessment and the development of security measures to be implemented for all major Project facilities. The Security Plan is expected to be completed as part of the DSOD approval process and would be completed during final design.

Emergency Action Plan

Consistent with California Water Code Sections 6160, 6161, and 6002.5, an Emergency Action Plan would be prepared and submitted to the Governor's Office of Emergency Services (CalOES). The Emergency Action Plan would comply with California Senate Bill 92 and

CalOES Emergency Action Plan requirements. The Emergency Action Plan would include: (1) a summary of responsibilities; (2) notification procedures and flowchart; (3) emergency response process; (4) preparedness for different emergencies; and (5) potential inundation mapping. The Emergency Action Plan would also identify the frequency for desktop and full exercises to prepare for emergencies. Appendix 2D identifies key features, responsible party(ies), timing, monitoring and reporting requirements, and regulatory or permitting agency responsibility, as appropriate.

2.5.3 Construction Considerations Common to Alternatives 1, 2, and 3

This section summarizes the activities associated with construction of the Project. Appendix 2C provides additional detail regarding the construction means and methods for various facilities that are ultimately incorporated into the impact analyses in Chapters 5 to 30.

2.5.3.1 Geotechnical Investigations

To support the engineering and final design of all facilities, the Authority would undertake preconstruction geologic, geotechnical, and geophysical investigations and testing. These geotechnical investigations and associated testing would also be required to support DSOD permitting processes. The investigations would be implemented in various locations in and around the footprints of the facilities. Geotechnical investigations would be focused in areas where additional or updated data are needed for engineering cost refinement, for design, and to prepare permit applications. Depending on the time of year these investigations would take place, almost all of the geotechnical borings and geophysical work areas would require biological monitoring and/or some pre-activity clearance assessment and/or surveys due to their proximity to sensitive biological resources, particularly because the precise location of each individual investigation within its associated facility footprint has not been determined. The site-specific geotechnical investigations would include surface geologic mapping and surface and subsurface geophysical investigations as described below.

- Surface geologic mapping would generally involve noninvasive evaluation and documentation of geologic features and topography and would consist of soil mapping, walking surveys, and geophysical surveys.
- Surface geophysical investigations would generally involve non- or minimally invasive surface testing, such as seismic, gravitational, magnetic, electrical, and electromagnetic testing, and documentation of surface and subsurface site characteristics.
- Subsurface geotechnical investigations would involve surface and subsurface evaluation and documentation of site characteristics using test pits, borings and cone penetration test (CPT) probes, and fault trenching for different facilities.
    - All subsurface geotechnical investigation techniques would require some degree of ground disturbance, including spot leveling of areas directly below truck leveling jacks and holes measuring 2 to 10 inches in diameter through which augers and sampling equipment would be lowered to collect subsurface data and samples. Some drilling locations would require a bulldozer to create temporary roads for drill rig access. Test pits would be roughly 10 to 12 feet deep, and fault trenching would vary between roughly 10 to 30 feet deep.

- Borehole drilling would be performed using a drill rig that utilizes a combination of pilot bit, hollow stem flight augers, and rotary diamond core drilling. The hollow stem augers would likely have an 8.5-inch outer diameter and a 4.25-inch inner diameter, with a 5-foot-long split tube inner barrel for dry core sample collection. Standard Penetration Test samplers may also be used at 5-foot intervals. All drill cuttings and any drilling fluids would be contained on site in drums or bins and removed from the site to an existing permitted landfill or waste treatment facility. The temporary disturbance area would be approximately 20 by 50 feet (0.025 acre). Once each boring is complete, augers and testing equipment would be removed, the boring grouted and capped with soil, and the area cleared of work items (as required by permit requirements and at a minimum in accordance with California regulations and industry standards [Water Well Standards, DWR 74-81 and 74-90]). The permanent disturbance area would be approximately 1 square foot per borehole, except where a bulldozer created a larger area to access some locations.
- CPTs are minimally invasive and consist of a specialized vehicle that inserts a 1.7-inch-diameter cone (probe) into the ground with a hydraulic direct push system. The temporary disturbance area would be approximately 20 by 50 feet (0.025 acre). Once each test is complete the rod would be retracted, the hole grouted and capped with soil, and the area cleared of work items (as required by permit requirements and at a minimum in accordance with California regulations and industry standards [Water Well Standards, DWR 74-81 and 74-90]). The permanent disturbance area would be approximately 1 square foot per borehole.

- Test fills will be constructed of materials located in proposed borrow areas for the Golden Gate Dam, the Sites Dam, and Saddle Dams areas.
  - Each test fill area will initially be grubbed and scraped, and then ripped to expose highly weathered rock.
  - A specific blasting programs for each borrow area will then be conducted. For each blasting area a series of holes, varying in pattern and depth, will be prepared to receive blasting charges. The charges will be detonated as a means to remove rock. The results of blasting will be evaluated to refine means and measures required for construction.
  - Tests fills will then be constructed of the blasted and processed rock materials, to model construction means and methods. Testing of the constructed fills will then be conducted to determine evaluate water content, density and in-situ permeability of the placed layers.

Activities at most investigation areas would require approximately five personnel, including a driller/operator and one to two assistants, a utility locator, and a geologist/engineer to log the conditions encountered. Biological and cultural monitoring could also be required based on biological and cultural sensitivity and the type of activity being conducted. Each geotechnical investigation site would be active for a period ranging from 1 workday for CPT probes to 10 workdays for deep drill holes. Additional details regarding geotechnical investigations for several of the key facilities are provided below.

I/O Works

The I/O Works are located south of the Golden Gate Dam. They would be used both to fill the Sites Reservoir through conveyance facilities situated to the east and to make releases from the reservoir. The I/O Works would include the following:

- A multi-level intake tower, including a low-level intake
- One 32-foot-inside-diameter I/O tunnel through the ridge on the right abutment of Golden Gate Dam.

The investigation footprint for the I/O Works would encompass the area around the tunnel portal, at the I/O tower, and along the tunnel alignment. Geotechnical work would occur within the footprint of the construction area for these facilities. It is assumed that a boring would be required every 500 feet and that each boring would extend below the tunnel invert approximately 70 feet.

A seismic fault study would map the faults adjacent to the I/O Works and ensure the location of the alignment would minimize fault crossings. The geotechnical investigation footprint for the seismic fault study would encompass the area between the mapped faults and I/O Works.

Current access to the site is limited given the existing topography and lack of access roads. It is assumed that track-mounted drill rigs would be used for the accessible locations and helicopters would be required to transport drill rigs to remote locations.

Dams and Reservoir

The dam foundations and reservoir rim would be the subject of specific geotechnical investigations. The investigations for the dams would involve geologic mapping, geophysics, borings, test pits, test excavations, and fault trenching. In-situ testing would include downhole geophysics (suspension and televiewer), packer testing, and dilatometer use. Piezometers would be installed at select locations to collect data on groundwater depth.

Investigation objectives for the dam foundation and reservoir rim would differ. The objectives of the dam foundation exploration would be to evaluate excavation methods, excavated material use for dam construction, dewatering requirements for foundation excavation, foundation deformability, hydraulic conductivity and strength, foundation treatment, and foundation grouting/cutoff requirements. The dam foundation exploration objectives would also be to confirm fault locations and fault rupture potential. The objective of the exploration of the reservoir rim would be to evaluate seepage and stability. This investigation would use geologic mapping, geophysical investigations, and borings. In-situ testing would include downhole geophysics (televiewer) and packer testing.

Laboratory testing for the dam foundation and reservoir rim may include point load and unconfined compression on rock and index testing of soils. Laboratory testing for the rim of the reservoir may also include testing of remolded joint/shear material for strength evaluation.

Onsite Borrow Areas

The onsite borrow areas would have specific geotechnical investigations. The objectives of the exploration for the borrow areas would be to confirm that the volume of materials available is at least 1.5 times the volume required and to evaluate excavation methods, excavation slopes at borrow locations, dewatering for borrow excavations, volume of materials generated from excavation, material types generated by excavation, requirements for processing of materials, properties of materials when placed and compacted in the dams, use of rock for riprap and aggregates, and types and volumes of materials generated from required excavations (i.e., at locations of dams, structures, and tunnels).

The investigations for the borrow areas would involve geologic mapping, geophysics, borings, test pits, test excavations, test blasting and test fills. In-situ testing would include downhole geophysics (suspension and televiewer) and rippability studies. Laboratory testing would include point load and unconfined compression on rock and index testing of soils. Laboratory testing would also involve testing remolded samples for compaction, strength, permeability, compressibility, and erosion potential. Test fills would be performed on rockfill and random fill materials.

2.5.3.2 Land Acquisition and Resident Relocation Program

Prior to initiation of construction activities, land acquisition or establishment of temporary or permanent easements on private properties would be acquired by the Authority consistent with all applicable law.

2.5.3.3 Additional Biological Surveys

After land acquisition and prior to construction actions, the Authority would complete additional biological surveys to confirm mapped habitat types and the presence/absence of biological resources including, but not limited to, special-status species, state and federal waters, sensitive plant communities and other applicable resources identified as sensitive by state, and/or federal agencies and discussed in Chapter 9, *Vegetation and Wetland Resources*; Chapter 10, *Wildlife Resources*; and Chapter 11, *Aquatic Biological Resources*, of this document. The Authority would use this information regarding occupied habitat to fulfill the permitting and consultation requirements of the federal and state resource agencies (USFWS, CDFW, U.S. Army Corps of Engineers, Central Valley Regional Water Quality Control Board, and State Water Board).

2.5.3.4 Cemetery Relocation

Two private cemeteries in the inundation area would be relocated to a site approved for interment of human remains per requirements of the California Health and Safety Code Sections 7500–7527. The code requires a written order from the local health department or county superior court before human remains in a cemetery may be moved. The disinterment, transportation, and removal of human remains is subject to rules and regulations adopted by the board of health or health officer of the county. The Authority will work with descendants of the individuals interred to determine final disposition.

2.5.3.5 Construction Disturbance Areas and Access

Construction activities would be confined to designated construction disturbance areas. These areas would also be used for construction vehicle and equipment parking and construction material storage. Certain areas may be restricted and construction personnel would be trained to recognize restricted areas and understand the equipment movement exclusions. Marking materials would be maintained until final cleanup and/or site restoration is completed, after which they would be removed. Potential staging areas would be located near each of the facilities. Construction-related traffic and local access routes are described in Section 2.5.1.7.

Demolition

Demolition would take place in the reservoir inundation area once lands are acquired. These activities would include the demolition of 20 houses, 25 barns, and 40 other structures (i.e., sheds, silos, and pump houses); removal of existing septic tanks and other underground storage tanks; and removal of existing roads, fences, and other utilities. Demolition debris would be reused and recycled to the extent possible. Any materials not recyclable would be transported and disposed of at an approved landfill(s). Some minor demolition would be needed for GCID system upgrades along the GCID Main Canal and the TC Canal Intake.

No demolition or relocation would be required for the RBPP, TRR-related facilities, Funks Reservoir-related facilities, Dunnigan Pipeline, or CBD outlet.

Clearing, Grubbing, and Topsoil Preservation

Clearing and grubbing would be required in the inundation area and within the footprints for most new facilities (i.e., dam facilities, I/O Works, Funks Reservoir facilities, TRR facilities, and Dunnigan Pipeline). This work would entail removing and disposing of woody vegetation and is estimated to occur over 3 years. Materials cleared and grubbed would be composted, reused, placed in the inundation area to provide future fish habitat, or recycled to the extent possible.

Prior to construction, measures would be taken to preserve topsoil. In the inundation area where disturbance would occur, the topsoil material would be excavated, stockpiled separately, and used in one of several ways: for restoration of temporary work areas outside the inundation area, for support of native or naturalized plant species around a facility following construction, or for placement in agricultural areas. In the irrigated agricultural areas around the TRR and Dunnigan Pipeline, topsoil would be removed, stored, and replaced in areas of orchards, row crops, and rice fields. The topsoil would be restored so the irrigated agricultural areas would have the same soils composition except in areas that would be covered by permanent maintenance roads. In the rangeland areas between the TRR and Funks Reservoir along the TRR pipeline route, the topsoil would be removed, stored, and replaced. This soil would be used to restore the rangeland to its same soils composition, except in areas that would be covered by permanent maintenance roads. The commercial area between I-5 and Road 99W would be restored to the preconstruction condition (i.e., unpaved large lot).

2.5.3.6 Construction Duration, Timing, and Sequence

Construction may start as early as spring 2024, depending on the timing of funding, design, and permitting. Overall, construction is expected to take approximately 6 years for reservoir facilities and 2 years for conveyance facilities. Construction of the reservoir facilities and the conveyance facilities would be conducted concurrently for a total construction duration of 6 years. Several factors could affect this anticipated schedule. Additional adjustments to the schedule would be addressed as required during Project development and implementation. Initial construction activities would include developing the Sites Reservoir inundation area, constructing the access roads, and realigning/constructing the Sites Lodoga Road or South Road (Alternative 2). Durations of construction were based on production rates associated with the anticipated equipment types needed for construction.

Construction of the Project components would generally be expected to occur in the sequence shown in Table 2-8 and detailed in Appendix 2C. Some construction activities would be concurrent with the road relocations, but the existing Sites Lodoga Road and Huffmaster Road would not be closed until the road realignments were completed.

Table 2-8. General Construction Timing and Sequencing

	Description	2024				2025				2026				2027				2028				2029			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Roads and Bridges	Northern Construction Access Roads			■	■	■	■	■																	
	Southern Construction Access Roads			■	■	■	■	■																	
	Sites Lodoga Road Realignment and Bridge			■	■	■	■	■	■	■	■	■	■	■	■										
	Huffmaster Road Alignment			■	■	■	■	■	■	■	■	■	■	■	■	■									
	Process and Haul Filter Materials to Project					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Dams and Dikes	Golden Gate Dam			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
	Sites Dam							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
	Saddle Dam 3							■	■	■	■	■	■	■	■	■	■	■	■	■					
	Saddle Dam 5								■	■	■	■	■	■	■	■	■	■	■	■	■				
	Minor Saddle Dams (1,2,6,8A)								■	■	■	■	■	■	■	■	■	■	■	■					
	Inlet Outlet Facilities								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Reservoir Site Development	Reservoir Footprint Mitigation Actions							■	■	■	■	■	■	■	■										
	Site Access and Staging Development							■	■	■															
	Demolition and Clearing							■	■	■															
Conveyance to Sacramento River	Dunnigan Pipeline – Alt 1,3			■	■	■	■	■	■	■															
	Dunnigan Pipeline – Alt 2					■	■	■	■	■	■	■	■	■											
Regulating Reservoirs and Conveyance	Funks/TRR East Pipelines – Alt 1,3					■	■	■	■	■	■	■	■	■											
	Funks/TRR West Pipelines – Alt 2											■	■	■	■	■	■								
	Funks Reservoir Improvements						■	■	■	■	■	■	■	■	■	■	■								
	Funks Pumping Generating Plant						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	TRR East Reservoir – Alt 1,3						■	■	■	■	■	■	■	■	■	■	■	■	■						
	TRR West Reservoir – Alt 2						■	■	■	■	■	■	■	■	■	■	■	■	■						
	TRR Pumping Generating Plant						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	TRR East Transmission Powerlines – Alt 1,3						■	■	■	■	■	■	■	■	■	■	■	■	■						
	TRR West Transmission Powerlines – Alt 2												■	■	■	■	■	■	■	■					
	Substations									■	■	■	■	■	■	■	■	■	■	■					
Sacramento River Div./Conv.	Red Bluff Pumping Plant Improvements					■																			
	GCID Improvements						■	■	■	■	■	■	■	■	■	■	■								

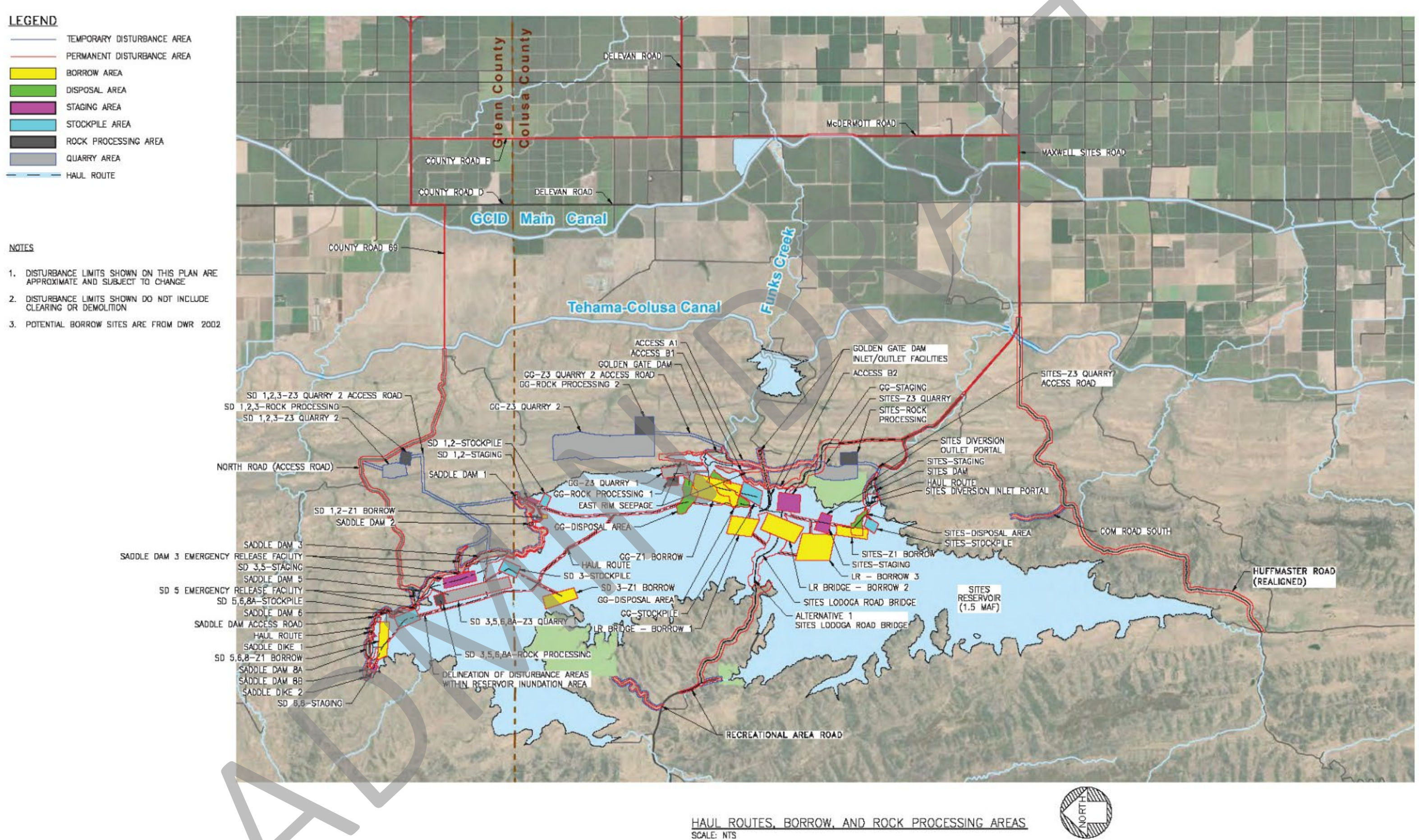
The general sequence of nonroad construction would begin with Golden Gate Dam, the I/O Works, and Dunnigan Pipeline. The next facilities to be constructed would be Sites Dam, the larger saddle dams, regulating reservoirs, and most associated facilities and pipelines. These facilities would be constructed over several years. Construction of the substations would be initiated last in the sequence. The recreation areas would be completed after construction of the main dams and saddle dams and generally concurrently with the regulating reservoirs and conveyance complex for a period of 2 years (expected between 2025 and 2027).

2.5.3.7 Borrow Areas and Quarries

It is anticipated that all earth and rockfill for the reservoir facilities (approximately 80% of materials required) would come from onsite sources (within the Sites Reservoir area or just outside Antelope Valley). Figure 2-38 shows potential onsite sources. Aggregate for dam construction (approximately 20% of material required) would be obtained from offsite commercial sources. There are multiple existing offsite commercial sources that could provide these materials and the Authority's construction contractor(s) would determine the appropriate location in consultation with engineering and the results of onsite geotechnical investigations. Potential sources and locations are described in Appendix 2C, Section 2.3.2, *Offsite Quarries*.

2.5.3.8 Construction Utilities

Approximately 750,000 to 1,000,000 gallons of water per day (500 to 700 gallons per minute) would be needed for constructing the Golden Gate Dam, Sites Dam, saddle dams, saddle dikes, and I/O Works over a period of 4 years. As such, a total of approximately 3,360 acre-feet per year (AFY) to 4,480 AFY would be required over the 4 years. Approximately 350,000–400,000 gallons per day would be required for GCID system upgrades and the regulating reservoirs and conveyance complex over a period of 4.5 years. An additional 20,000–30,000 gallons per day would be needed during construction of the Dunnigan Pipeline over a period of 4.5 years. This water would be obtained from three potential sources: existing surface water from the Storage Partners pursuant to existing water rights agreements and permitted uses; existing groundwater wells in the Sites Reservoir inundation area; and new groundwater wells in the Sites Reservoir inundation area. Water captured during dewatering for the construction of the Dunnigan Pipeline may be reused. Batch water treatment plants would be used to treat water, as necessary, for the intended use. Construction water would be reused to the extent possible. Anticipated construction energy needs are shown in Table 2-9.



Source: AECOM 2021

Figure 2-38
Onsite Borrow Area Details

Table 2-9. Estimated Temporary Construction Power Requirements

Location/Facility	Required Load, 3-Phase, KVA	Annual Use (hours/year)
Golden Gate and Sites Dams		
Contractor's and Owner's Office Complex	300	2,100
Golden Gate Quarry Feeder/Jaw for Rockfill	1,000	1,500
Sites Quarry Feeder/Jaw for Rockfill	1,000	1,500
Golden Gate Concrete Batch Plant	600	1,500
Sites Concrete Batch Plant	600	1,500
Contractor's Shop Complex	300	1,500
Saddle Dams		
Contractor's and Owner's Office Complex	300	2,100
Saddle Dams Quarry Feeder/Jaw for Rockfill	1,000	1,500
Concrete Batch Plant	600	1,500
Contractor's Shop Complex	300	1,500
Inlet-Outlet Facilities		
Contractor's and Owner's Office Complex	300	2,100
Concrete Batch Plant	600	1,500
Contractor's Shop Complex	200	1,500
Roads		
Contractor's and Owner's Office Complex	300	2,100
Asphalt Batch Plant	600	1,500
Contractor's Shop Complex	200	1,500
Conveyance		
Contractor's and Owner's Office Complex (3)	300 each	2,100
Concrete Batch Plant & CDSM Batch Plant	600 each	1,500

2.5.3.9 Batch Plants

For dam construction, batch plants would be established in the inundation area of the Sites Reservoir or in staging areas outside the inundation area near various reservoir facilities. Concrete batch plants would be necessary for the I/O Works, Golden Gate Dam, Sites Dam, creek diversions, saddle dams, and the bridge crossing the reservoir (Alternatives 1 and 3). Asphalt batch plants would be used for paving public access and maintenance roads.

A concrete batch plant is equipment that combines water, admixtures, sand, aggregate, fly ash, and cement to form concrete. In general, the concrete batch plant is anticipated to have the following features: mobile or semi-mobile (modular stationary) plants; capacity of 100 to 500 cubic yards per hour; at least three aggregate feed bins; and computerized batching/proportioning.

An asphalt batch plant is equipment that combines aggregate and asphalt to form asphalt to be used for road construction. In general, the asphalt batch plant is anticipated to have the following features: (1) mobile or semi-mobile (modular stationary) plants; (2) drum-mixer type plant, but could be a weigh-batch type; (3) capacity of 200 to 500 tons per hour, but could be lower for some of the smaller portions; (4) at least four aggregate feed bins; and (5) computerized batching/proportioning.

2.5.3.10 Construction Traffic and Equipment

Under Alternatives 1 and 3, up to 1,657 construction personnel would be working at the peak of construction. Approximately 847 of these personnel would be involved with reservoir facilities and 810 would be working on conveyance facilities. Expected highway truck trips per day associated with construction would range from 4 for installation of the new pumps at the RBPP to 330 estimated trips (each) for the construction of dams, dikes, and other reservoir-related components. Similarly, personnel vehicle trips associated with the same facilities would range from 2 to over 1,600 per day. Trips associated with Alternative 2 would be slightly less for reservoir facilities. Estimated vehicle trips per day for all construction activities are included in Appendix 2C.

Construction workers would likely commute to construction sites from local population centers in Glenn or Colusa Counties such as Maxwell, Willows, Orland, Williams, and Colusa, and from other northern California counties when specialty trades or skillsets are not available regionally.

Daily construction traffic would consist of trucks hauling equipment and materials to and from the worksites and the daily arrival and departure of construction workers. Construction traffic on local roadways would include dump trucks, bottom-dump trucks, concrete trucks, flatbed trucks for delivering construction equipment and permanent Project equipment, pickups, water trucks, equipment maintenance vehicles, and other delivery trucks. Dump trucks would be used for earth moving and clearing, removal of excavated material, and import of other structural and paving materials. Other delivery trucks would deliver construction equipment, job trailer items, concrete-forming materials, reinforcing steel and structural steel, piping materials, foundation piles and sheet piling, sand and gravel from offsite sources, new facility equipment, and other construction-related deliveries. Construction equipment/materials would not be permitted to pass through the community of Maxwell on the Maxwell Sites Road.

2.5.3.11 In-Channel Construction

Coffer dams would be required along Stone Corral and Funks Creeks for construction of Sites Dam and Golden Gate Dam, respectively. The coffer dams would be incorporated into the upstream toe of the embankment dams and would be constructed of material likely derived from the excavation of the dam foundations. The crest of the coffer dams would be set at an elevation of 310 feet (5 feet above highwater during construction). The Sites Dam would require approximately 260,000 cubic yards of Zone 4 Random fill for the coffer dam in Stone Corral Creek, and the Golden Gate Dam would require approximately 800,000 cubic yards of Zone 4 Random fill for the coffer dam in Funks Creek.

Construction of the Funks pipelines would generally skirt Funks Creek and not intersect the channel but two large fills needed for the Funks Pipeline and TRR Pipeline could be placed near the south creek bank. Construction of the TRR pipelines would cross the GCID Main Canal, TC

Canal, and the Funks Reservoir. Trenching of the TRR pipelines under the GCID Main Canal and TC Canal would occur during the 6-week winter shutdown period. If possible, trenching would be scheduled for a time when the canals were dry, such that trenching would result in in-channel construction but not in-water construction. Construction of the TRR pipelines would require in-channel work where they cross Funks Reservoir. An earth and geomembrane liner coffer dam would be constructed to allow work to occur under dry conditions.

Construction of the Dunnigan Pipeline would require installation of water level and flow control gates at the concrete-lined TC Canal intake. The tie-in between the intake and the TC Canal would be done during the winter shutdown period, and a small portion of the TC Canal would be dewatered. In-channel work would be required at the CBD to install the energy dissipation control structure, and a coffer dam would be constructed so that the work would be completed in the dry.

2.5.4 Project Commitments and Best Management Practices

A number of BMPs and Project commitments will be implemented during Project design, construction, operations, and maintenance. The BMPs and Project commitments are part of the Project and discussed in detail in Appendix 2D. Appendix 2D describes key features of each BMP, the timing of the BMP, the responsible party(ies), monitoring requirements, and the responsible regulatory or permitting agency, if applicable. The numbers and titles of the BMPs are listed below:

- BMP-1, Conformance with Applicable Design Standards and Building Codes
- BMP-2, Siting of Recreational Structures
- BMP-3, Completion of Pre-Construction Geotechnical Evaluations and Data Reports
- BMP-4, Verification and/or Relocation of Utilities and Infrastructure
- BMP-5, Decommissioning of Natural Gas Wells
- BMP-6, Decommissioning of Water Wells
- BMP-7, Removal and/or Reuse of Materials from Abandoned Roads
- BMP-8, Performance of Environmental Site Assessments
- BMP-9, Siting and Design of Onsite Wastewater Disposal Systems
- BMP-10, Salvage, Stockpiling, and Replacement of Topsoil and Preparation of a Topsoil Storage and Handling Plan
- BMP-11, Management of Dredged Material
- BMP-12, Development and Implementation of Stormwater Pollution Prevention Plan(s) (SWPPP) and Obtainment of Coverage under Stormwater Construction General Permit (Stormwater and Non-stormwater)
- BMP-13, Development and Implementation of Spill Prevention and Hazardous Materials Management/Accidental Spill Prevention, Containment, and Countermeasure Plans (SPCCPs) and Response Measures

- BMP-14, Obtainment of Permit Coverage and Compliance with Requirements of Central Valley Regional Water Quality Control Board Order R5-2022-0006 (NPDES No. CAG995002 for Limited Threat Discharges to Surface Water) and State Water Resources Control Board Order 2003-0003-003-DWQ (Statewide General Waste Discharge Requirements For Discharges To Land With A Low Threat To Water Quality)
- BMP-15, Performance of Site-Specific Drainage Evaluations, Design, and Implementation
- BMP-16, Development and Implementation of a Construction Equipment, Truck, and Traffic Management Plan (TMP)
- BMP-17, Implementation of Visual/Aesthetic Design, Construction, and Operation Practices
- BMP-18, Development and Implementation of Fire Safety Plans for Prevention and Suppression/Control During Construction and Maintenance
- BMP-19, Development and Implementation of Worker Occupational Health and Safety Plans
- BMP-20, Preparation and Implementation of Blast Plans for Worker Health and Safety
- BMP-21, Performance of Mosquito and Vector Control During Construction
- BMP-22, Development and Implementation of a Construction Noise Abatement Plan
- BMP-23, Development and Implementation of an Underwater Construction Noise Control, Abatement, and Monitoring Plan
- BMP-24, Use of Design Features and Noise Control Practices to Reduce Operation and Maintenance Noise
- BMP-25, Preparation of an Emergency Action Plan for Reservoir Operations
- BMP-26, Preparation and Implementation of an Electrical Power Guidelines and EMF Field Management Plan
- BMP-27, Development and Implementation of a Construction Equipment Exhaust Reduction Plan
- BMP-28, Preparation and Implementation of Fugitive Dust Control Plans
- BMP-29, Minimization of Asphalt and Concrete Batching Odors and GHG Emission
- BMP-30, Development and Implementation of Hazardous Materials Management Plans
- BMP-31, Implementation of Onsite Security Measures and/or Personnel at Construction Sites
- BMP-32, Notification of Construction Activities in Waterways
- BMP-33, Implementation of a Worker Environmental Awareness Program (WEAP)
- BMP-34, Development and Implementation of Fish Rescue and Salvage Plans for Funks Reservoir, Stone Corral Creek, Funks Creek, and CBD for Alternatives 1, 2, and 3; for Sacramento River for Alternative 2

- BMP-35, Development and Implementation of Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities
- BMP-36, Control of Invasive Plant Species During Construction
- BMP-37, Shading of Work Lighting for Nighttime Work (Alternative 2 Discharge Location on Sacramento River)

Appendix 2D also describes the purpose, outcomes, content, and timing for the following plans:

- Initial Sites Reservoir Fill Plan
- RMP
- Stone Corral Creek and Funks Creek Aquatic Study Plan and Adaptive Management
- Sediment Technical Studies Plan and Adaptive Management for Sacramento River
- Fish Monitoring and Technical Studies Plan and Adaptive Management for Diversions
- Land Management Plan
- Recreation Management Plan

2.5.5 Proposition 1 Benefits Common to Alternatives 1, 2, and 3

The Project was conditionally awarded Proposition 1 funding by the CWC to provide public benefits for flood damage reduction, recreation, and ecosystem benefits. Alternatives 1, 2, and 3 include providing these benefits by entering into a contract with DWR for the flood damage reduction and recreation benefits, a contract with CDFW for the ecosystem benefits, and a contract with the CWC for final funding award.

The Project would provide flood damage reduction benefits to portions of Colusa County, including Maxwell and the surrounding agricultural areas. Incidental storage in Sites Reservoir would capture and store flood flows from the Funks Creek and Stone Corral Creek watersheds. These flood damage reduction benefits are inherent to the Project design and would occur regardless of the Project's operations for water supply and water-related environmental benefits. The Project would provide recreation benefits through the recreational facilities described previously in this chapter.

The ecosystem benefits funded by the CWC include providing water for Incremental Level 4 Refuge water needs for CVPIA refuges both north and south of the Delta and providing additional flow into the Yolo Bypass to benefit delta smelt (*Hypomesus transpacificus*). Incremental Level 4 Refuge water deliveries could occur in any water year type and at any time of year. For those refuges located south of the Delta, it is assumed that water would be moved from July to November through the Delta. Additional flows into the Yolo Bypass could occur at any time of year but are assumed to occur during the summer and fall months (August through October) of all water year types. These deliveries increase desirable food sources for delta smelt and other fish species in the late summer and early fall. The Authority envisions that CDFW would take an active role in managing the ecosystem water and would work with CDFW to schedule and adjust releases of ecosystem water to address real-time conditions and needs.

As described in Section 2.5.2, *Operations and Maintenance Common to Alternatives 1, 2, and 3*, additional ecosystem benefits beyond those funded by the CWC may occur via exchanges with Shasta Lake or Lake Oroville.

2.6 Alternative 1 Specific Elements

Alternative 1 was initially identified (see Volume 3, Master Response 2) in the RDEIR/SDEIS as the Authority's preferred alternative and the proposed project under CEQA. Figures 2-1 and 2-2 present plan views of the Alternative 1 features. The features of Alternative 1 include the following:

- Reservoir capacity would be 1.5 MAF;
- A bridge across the reservoir would provide access to the area west of Sites Reservoir; and
- Reclamation investment would range from no investment to up to 7%.

Alternative 1 would impound surface water at the Golden Gate Dam on Funks Creek and Sites Dam on Stone Corral Creek. A series of seven saddle dams along the eastern and northern rims of the reservoir would close off topographic saddles in the surrounding ridges to form Sites Reservoir. The 1.5-MAF reservoir under Alternative 1 would inundate approximately 13,200 acres of Antelope Valley in Colusa County. Alternative 1 would convey water from the Sacramento River through existing or upgraded TC Canal and GCID Main Canal facilities to new and upgraded regulating reservoirs and into the new Sites Reservoir. Existing and new facilities would convey water from Sites Reservoir for uses along the TC Canal, along the GCID Main Canal, and down the TC Canal to the new Dunnigan Pipeline and the CBD for release, and flows would enter the Yolo Bypass or Sacramento River. Construction roads, local roads, and maintenance roads would be developed or realigned to accommodate the reservoir facilities, including the realignment of Sites Lodoga Road with a new bridge over the reservoir. Alternative 1 would involve two primary recreation areas (Peninsula Hills Recreation Area and Stone Corral Creek Recreation Area) and a day-use boat ramp. These areas would provide multiple recreational amenities, including campsites, boat access, horse trails, hiking trails, and vista points.

Releases from Sites Reservoir would be made to meet environmental purposes, such as for the delivery of Incremental Level 4 water to refuges or fall food production in the Yolo Bypass for north Delta fish species. Releases would also be made for Storage Partners based on their requests to meet their respective water supply portfolio needs and any water conveyed south of the Delta would comply with all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time. Under Alternative 1, operational exchanges may also occur with Reclamation in Shasta Lake, and with DWR in Lake Oroville. Alternative 1 includes a range of Reclamation investment in the Project, from no investment to up to an assumed 7% Reclamation investment.

2.6.1 Sites Reservoir and Related Facilities

Sites Reservoir would have a maximum normal WSE of 498 feet above mean sea level and would require I/O Works, seven saddle dams (1, 2, 3, 5, 6, 8A, and 8B), and two saddle dikes (1 and 2). Figure 2-1 depicts the locations of the Sites Reservoir, Golden Gate Dam, saddle dams, and I/O Works under Alternative 1. Table 2-10 provides the general characteristics of the Sites Reservoir under Alternative 1.

Table 2-10. General Reservoir Characteristics of Alternative 1

Key Characteristic	Detail
Nominal Reservoir Gross Storage	1.5 MAF
Maximum Normal Operating Water Elevation	498 feet above mean sea level
Minimum Normal Operating Water Elevation	340 feet above mean sea level
Top of Dead Pool	323 feet above mean sea level
Active Storage Capacity[1]	1.4 MAF

[1] Between minimum normal operating water elevation (elevation 340.0 feet) and maximum normal operating elevation

MAF = million acre-feet

A total of nine dams (Golden Gate Dam, Sites Dam, and seven saddle dams) would create the 1.5-MAF Sites Reservoir under Alternative 1. Two saddle dikes would be required to close off topographic saddles in the ridges near Saddle Dams 8A and 8B. The dam crests would be 30 feet wide and would include asphalt paved or gravel maintenance roads. The nominal crest would be at an elevation of 517 feet for all dams, including Saddle Dam 8B. See Table 2-3 for a summary of the dam heights for Alternative 1.

Preliminary design for Alternative 1 facilities described herein would be refined and modifications may occur as needed as the Project proceeds to final design and the Authority continues with the ongoing value engineering process. Modifications may include reductions in facility footprints or removal of certain facilities described currently herein and analyzed as part of Alternative 1 (e.g., emergency release structures). Any future modifications from Alternative 1 evaluated herein would be reviewed by the Authority and Reclamation to determine appropriate CEQA and NEPA compliance.

2.6.2 TRR East Facilities

The TRR East facilities under Alternative 1 would be located in Colusa County north of the GCID Main Canal and west of McDermott Road. The approximately 150-acre site would be accessed by an asphalt concrete paved road off McDermott Road. The spillway for the TRR East would be located at the southernmost corner of the reservoir and discharge into Funks Creek. Access between the east and west sides of the GCID Main Canal adjacent to the TRR East would be over a new TRR bridge between the TRR embankment near the gate structures and the west side of the GCID Main Canal. The TRR bridge is anticipated to consist of a precast concrete span between the banks of the GCID Main Canal with concrete abutments founded on piles. Figures 2-10a and 2-10b show the locations of the TRR-related facilities.

The TRR East pipelines would parallel the Funks pipelines and Funks Creek and would generally be from 6 feet to 30 feet below ground surface after installation. The pipelines would cross Funks Reservoir, TC Canal, and GCID Main Canal. The pipelines would cross Funks Reservoir, requiring construction of a coffer dam to work in the dry during the non-operational period (i.e., winter). The pipelines would cross the TC Canal using a trenchless method or open cut, depending on construction schedule. East of the TC Canal, the TRR pipelines would run parallel to a drainage canal until they reached the GCID Main Canal where they would cross using a trenchless method or open cut, depending on construction schedule.

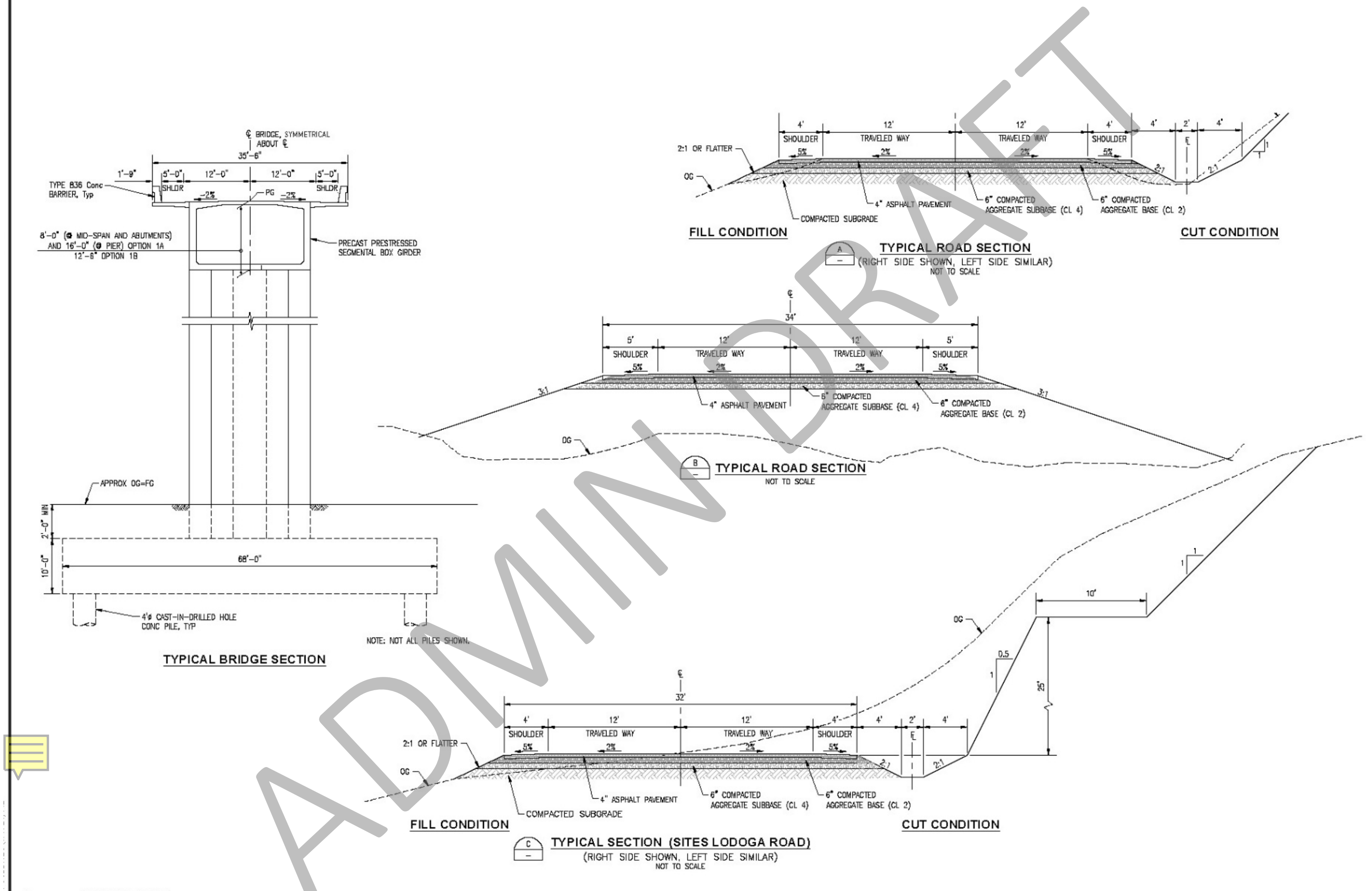
2.6.3 New and Existing Roadways

Sites Lodoga Road is an east-west, two-lane major collector road that extends through the community of Maxwell, which is adjacent to I-5, and provides an important emergency and evacuation route in a limited roadway network to and from the rural communities of Lodoga and Stonyford. Sites Lodoga Road becomes Maxwell Sites Road east of the community of Sites, which is in the inundation area. The Sites Reservoir would eliminate east-west access to I-5 (east of the reservoir) from Stonyford and Lodoga (west of the reservoir) because it would inundate the current alignment of Sites Lodoga Road. Because Sites Dam and the inundation area would eliminate access on Sites Lodoga Road, an alternative method for access west of the reservoir would be needed. Under Alternatives 1 and 3, this access is provided by realigning a segment of Sites Lodoga Road and constructing a bridge over the reservoir. The relocated segment of Sites Lodoga Road would include 5-foot-wide shoulders adjacent to the two 12-foot-wide lanes to accommodate bicycles and would connect to the new bridge.

The realigned Sites Lodoga Road would be placed across the reservoir and extend 7,800 feet; it would necessitate the construction of four fill prisms that would be up to 150 feet tall and would support two shorter bridge segments approximately 3,450 and 4,050 feet long. Figure 2-39 shows a typical cross-section of the road and the bridge that would be needed to cross the reservoir. The roadway and bridge profile would be at 2 feet above the maximum flood plus wave height. The maximum flood plus wave height is set at 10 feet above the normal WSE (elevation 498 feet for the 1.5-MAF reservoir).

The bridge structure would consist of a cast-in-place, prestressed concrete box girder that would have two lanes with a total width of 35.5 feet and 4-foot-wide shoulders. The bridge would have California Department of Transportation-approved edge barriers with small-diameter electrical conduits, a suicide prevention barrier, emergency phone service facilities, deck drains, and an opening for potential utilities. The bridge design does not include sidewalks due to the remote rural nature of this site. The bridge would be exposed to high winds; therefore, high wind advisory facilities, such as static roadside signs or extinguishable message signs that are illuminated when instruments measure high winds, would be installed.

The disturbance area for bridge construction would include the footprint of the bridge structure, the staging areas for materials and equipment, and the area needed to construct the facilities and access roads. Traffic that was not construction-related would be diverted around construction disturbance areas in accordance with a TMP. Initial construction activities would involve establishing staging areas, surveying and marking roadways, clearing, and grading. Bridge construction would consist of constructing the foundation and prisms, including drilled-pier installation; bridge columns; and bridge spans.



Source: AECOM 2020
Drawing No. STS-306-C-7701

Figure 2-39
Sites Lodoga Road Realignment and Bridge

The Huffmaster Road realignment, which is associated with the easterly segment of Sites Lodoga Road realignment, would move the affected segment out of the Sites Reservoir footprint. The realigned Huffmaster Road would be a gravel road to serve the residences currently located at the end of the existing Huffmaster Road.

The Project includes construction of temporary roads. Once construction is completed temporary roads may remain within construction corridors (e.g., along power lines) or would be restored after use. Temporary roads identified for restoration would recontoured to pre-Project elevations and revegetated consistent with BMP-36.

2.6.4 Operations and Maintenance

In addition to the operations and maintenance activities common to Alternatives 1, 2, and 3, operations and maintenance activities under Alternative 1 would include Reclamation as a Storage Partner and maintenance of the bridge as described below.

2.6.4.1 Water Operations

Alternative 1 includes a range of potential investment by Reclamation. For the purposes of modeling, two options have been identified under this alternative. Alternative 1A includes no Reclamation investment and Alternative 1B includes up to 7% Reclamation investment, which equates to about 91,000 AF of storage allocation dedicated to Reclamation in Sites Reservoir. With investment from Reclamation, 7% of Sites Reservoir storage would be managed as a CVP supply under Alternative 1. Reclamation's share of Sites Reservoir water would be flexibly used by Reclamation to meet CVP objectives of providing water for water supply reliability and environmental needs. Increased storage, diversion, and release capacity provides the CVP with additional opportunities to store and release water when it may have been otherwise constrained. Releases for Reclamation would be made for a variety of purposes as identified and directed by Reclamation and would be made in the same manner as described for all Storage Partners.

2.6.4.2 Bridge Maintenance

There are no day-to-day operations of the bridge (i.e., no moving components of the bridge that would be operated on a daily basis). Typical bridge maintenance activities would include replacing damaged or missing signage, replacing or repairing railings, replacing or repairing damage to the bridge deck (road surface), sealing joints, repairing erosion on approaches, unplugging drains and removing debris, and checking for and repairing faulty electrical contacts. The bridge would be periodically inspected on foot to detect any obvious defects, hazards, or potential problems and to also monitor known problems. The bridge would also be periodically inspected by Caltrans to detect any major structural concerns. Repairs and replacements would be made as needed based on these inspections.

2.7 Alternative 2 Specific Elements

The unique features of Alternative 2 include the following:

- Reservoir capacity would be 1.3-MAF;
- A local access road around the southern end of the reservoir would provide access to the area west of Sites Reservoir; and

- Dunnigan Pipeline would extend to and discharge at the Sacramento River with a partial discharge at the CBD.

Figures 2-3 and 2-4 provide plan views of the Alternative 2 features.

Alternative 2 would impound surface water at the Golden Gate Dam on Funks Creek and Sites Dam on Stone Corral Creek. A series of four saddle dams along the eastern and northern rims of reservoir would close off topographic saddles in the surrounding ridges to form Sites Reservoir. The 1.3-MAF reservoir would inundate approximately 12,600 acres (600 acres less than Alternative 1 or 3) and require four saddle dams and three saddle dikes. Alternative 2 also includes a partial release into the CBD, and flows would enter the Yolo Bypass or Sacramento River. Construction roads, local roads, and maintenance roads would be developed or realigned to accommodate the reservoir facilities, including the realignment of Sites Lodoga Road with a new local access road around the southern end of the reservoir. Under Alternative 2, operational exchanges may also occur with Reclamation in Shasta Lake, and with DWR in Lake Oroville. Alternative 2 does not include Reclamation investment.

2.7.1 Sites Reservoir and Related Facilities

Under Alternative 2, the 1.3-MAF reservoir would have a maximum normal WSE of 482 feet above mean sea level (17 feet lower than Alternative 1) and would require I/O Works, four saddle dams (3, 5, 8A, and 8B) and three saddle dikes (1, 2, and 3). Figure 2-3 shows the location of Sites Dam and Golden Gate Dam and the location of the four saddle dams and three saddle dikes under Alternative 2. Table 2-11 provides the general characteristics of the Sites Reservoir under Alternative 2.

Table 2-11. General Reservoir Characteristics of Alternative 2

Key Characteristic	Detail
Nominal Reservoir Gross Storage	1.3 MAF
Maximum Normal Operating Water Elevation	482 feet above mean sea level
Minimum Normal Operating Water Elevation	340 feet above mean sea level
Top of Dead Pool	323 feet above mean sea level
Active Storage Capacity[1]	1.2 MAF

[1] Between minimum normal operating water elevation (El. 340.0 feet) and maximum normal operating elevation

2.7.2 TRR West Facilities

The TRR West facilities under Alternative 2 would be located in Colusa County west of the GCID Main Canal and east of Funks Reservoir. The approximately 150-acre site would be accessed by an all-weather gravel road from the Funks Dam/TC Canal area. The TRR West would encompass 100 acres between the GCID Main Canal and the TC Canal. The new reservoir would be a different configuration than TRR East and would include a main reservoir and an extension reservoir. This bifurcation of the reservoir into two parts would allow avoidance of an existing PG&E transmission right-of-way that contains a pair of underground natural gas pipelines and overhead transmission lines running north to south through the site. The main and extension reservoirs would be hydraulically connected through a tunnel corridor (four 12-foot-diameter pipes) passing under the PG&E transmission right-of-way.

The TRR West PGP would generally be the same as the TRR East PGP except in a different location. The PGP and electrical substation would encompass approximately 7 acres and would be enclosed by a security fence with access gates. The dual 12-foot-diameter TRR West pipelines would be approximately 10,300 feet shorter than the TRR East pipelines. These pipelines would need to cross Funks Reservoir, the TC Canal, and an existing private drainage canal, but not the GCID Main Canal. The TRR West electrical transmission lines would be approximately 8,000 feet shorter than those for TRR East.

The TRR West reservoir would be hydraulically connected to the existing GCID Main Canal and constructed via primarily mass excavation. This connection would occur through the I/O canal facilities located adjacent to and west of the GCID Main Canal. The I/O canal would facilitate flow through several check structures into the main and extension reservoirs to the west. Figures 2-10a and 2-10b show the locations of the TRR-related facilities.

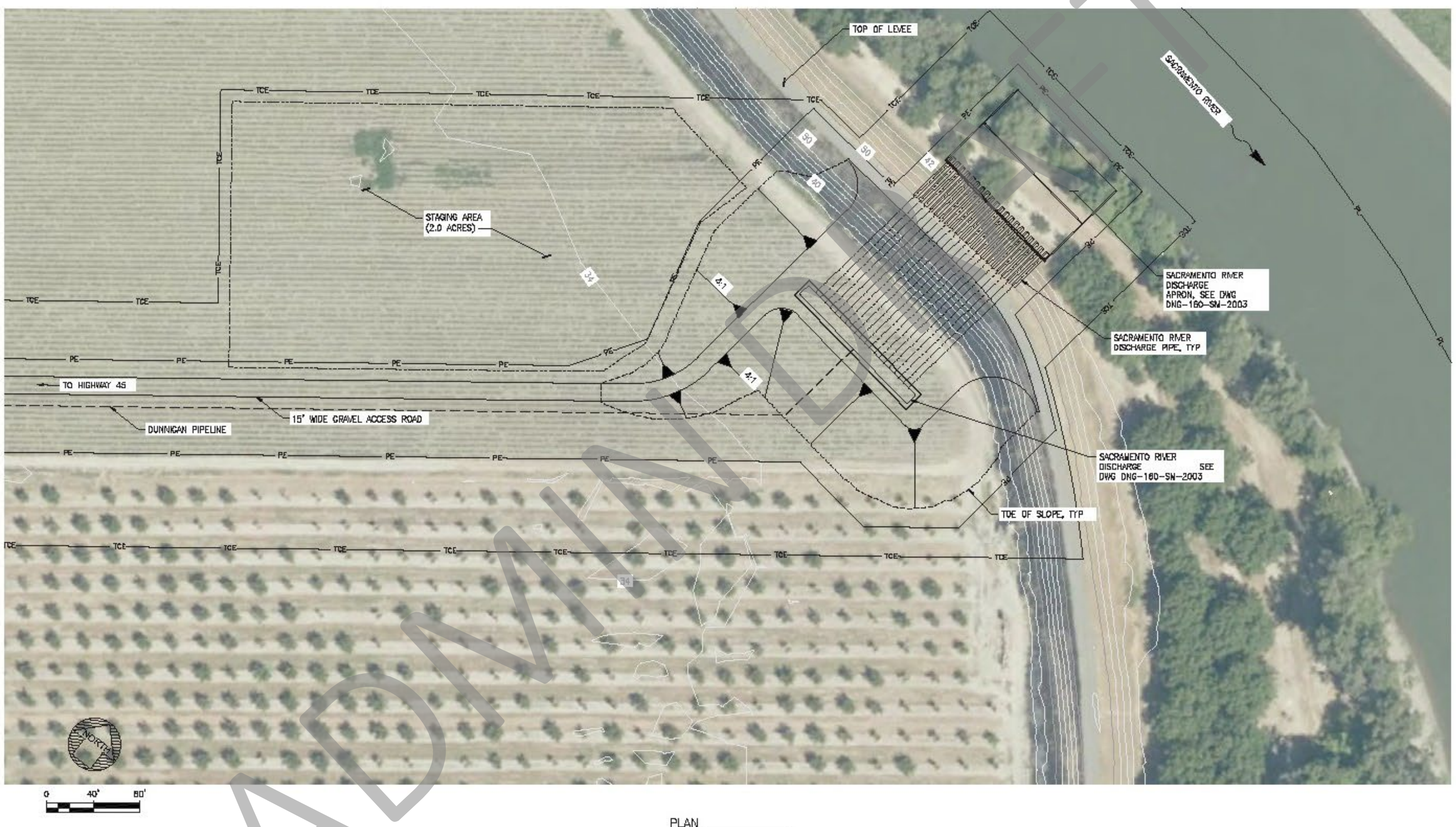
2.7.3 Conveyance to Sacramento River

As with Alternative 1, a portion of the water released from Sites Reservoir would be conveyed using the existing TC Canal, and for south-of-Delta Storage Partners the water would be conveyed using the new Dunnigan Pipeline. The water would flow south approximately 40 miles to near the end of the TC Canal. At this point, flow would be diverted into the Dunnigan Pipeline. A gravity outlet structure from the TC Canal into the Dunnigan Pipeline would be constructed to control the flow in the pipeline. No pumping would be required. Power would be needed for SCADA control and operating the gates to let water into the pipeline and at the discharge point.

Under Alternative 2, the Dunnigan Pipeline would extend 5.6 additional miles, pass through the western levee of the Sacramento River, and discharge into the Sacramento River at approximately RM 100.8 (Figure 2-40). At the CBD, there would also be a discharge structure similar to Alternative 1, but the structure would be smaller and would divert only a portion of the flow, while the remaining flow would continue to the Sacramento River.

The pipeline would have a 10.5-foot-inner diameter with three tunneled crossings (I-5, Road 99W and the railroad, and CBD) that require 12-foot (144-inch) casings. The CBD boring would cross under the levees adjacent to the CBD and under the CBD.

Because groundwater can be within 3 feet below ground surface from near the CBD to the Sacramento River, the Authority’s construction contractor would install dewatering wells every 50 to 100 feet. However, excavating and placing pipes closely (spatially and temporally) would avoid running the dewatering system for long periods. Construction of the Dunnigan Pipeline in this area would require crossing nearly 20 irrigation laterals and drainage canals. Bypass pipes would be used to allow irrigation water to flow down canals and also allow drainage water from irrigation to flow. Boring may be required under SR 45 if open cut is not possible. Multiple access routes would be required through various rural county roads to access the additional 5.6-mile Dunnigan Pipeline between I-5 and SR 45. SR 45 would be used to access the Sacramento River discharge site and the Dunnigan Pipeline east of SR 45.



Source: Jacobs 2020
Drawing No. DNG-030-C-2003

Figure 2-40
Dunnigan Sacramento River Discharge Site Plan

The Sacramento River discharge is intended to accommodate flows of up to 1,000 cfs. The structure would include an exclusion barrier for upstream-migrating salmonids in accordance with NMFS 2018 draft guidelines (National Marine Fisheries Service 2018). It is anticipated that the discharge would operate during the months of April through November. The Sacramento River discharge would include the following components: (1) a 10.5-foot inner-diameter transmission pipeline; (2) a reinforced concrete stilling well; (3) 20 36-inch-diameter discharge pipes crossing the existing levee at minimum cover, and discharging at a reinforced concrete headwall with duckbill-type check valves; (4) a reinforced concrete stilling basin; and (5) a reinforced concrete weir and apron extending to near the edge of the river and tying into the existing bank riprap.

The discharge structure would include a vertical drop exclusion barrier to prevent the passage of anadromous fish into the pipeline. The weir and apron would meet NMFS guidelines for a combination velocity and vertical drop barrier for the exclusion of fish. This includes a minimum hydraulic drop of 3.5 feet at the weir wall, an apron slope of 16H:1V with a maximum water depth of 6 inches, and a 1-foot minimum drop to the high design tailwater in the Sacramento River.

The Sacramento River discharge would be located on the west bank of the river about 1 mile upstream of the Rough and Ready Pumping Plant. As described in Appendix 2D, in-water construction activities in the Sacramento River would occur during the work window of September 1 through October 15. This work would include constructing a coffer dam. Once the coffer dam is completed, work would continue in the dry and could occur outside the in-water work window. Pile driving or a vibration hammer would be used to install piles on the land side of the levee.

2.7.4 New and Existing Roadways

Realignment of Huffmaster Road and construction of the new South Road would occur under Alternative 2 (Figure 2-35). As with Alternative 1, Sites Dam and the inundation area would inundate 4.2 miles of the Sites Lodoga Road and eliminate access on this 13-mile-long collector road. Similar to Alternative 1, the relocated segment of Sites Lodoga Road would include 5-foot-wide shoulders adjacent to the two 12-foot-wide lanes to accommodate bicycles and would provide access to the Stone Corral Creek Recreation Area. Similar to Alternative 1, Huffmaster Road would be realigned for approximately 9 miles. The approximately 20-mile-long South Road would be constructed and connected to the end of the realigned portion of Huffmaster Road. The total length of the realigned portion of Huffmaster Road and the new South Road would be approximately 30 miles, all of which would be paved.

All other permanent access, maintenance, detour, and construction roads would be the same for the reservoir facilities between Alternatives 1 and 2. These roads would be needed regardless of the inundation area size to serve the new facilities and recreation areas.

The bridge described under Alternative 1 would not be built under Alternative 2. The South Road would generally require more excavation and more aggregate when compared to the bridge under Alternative 1. These materials are listed in Table 2C-26 in Appendix 2C.

2.7.5 Operations and Maintenance

Operations and maintenance activities under Alternative 2 would be similar to those described for Alternative 1. In addition to the water operations activities described for Alternative 1, Alternative 2 would include releases directly to the Sacramento River from the extended Dunnigan Pipeline, with a partial release into the CBD, primarily in the late summer and fall months to serve as habitat flow releases.

2.8 Alternative 3 Specific Elements

Alternative 3 facilities and components would be the same as those described for Alternative 1 in Sections 2.5.1, *Facilities*, and 2.6. Operationally, Alternative 3 would include increased Reclamation participation and investment of up to 25%.

Under Alternative 3, Reclamation would have an increased investment in Sites Reservoir of up to 25% compared to up to 7% in Alternative 1. The increased level of Reclamation investment would result in up to 25% of Sites Reservoir storage space being dedicated to Reclamation's use. Reclamation's share of Sites Reservoir water would be flexibly used by Reclamation to meet CVP objectives of providing water for water supply reliability and environmental needs. The increased level of Reclamation investment would also result in increased opportunities for maintaining cold-water pool in Shasta Lake and Lake Oroville as part of the integration of the CVP.

Increased Reclamation investment would require some reduction in local participation for Alternative 3 as compared with Alternative 1. Alternative 3 assumes that Storage Partners which are local agencies would reduce their participation to accommodate the investment by Reclamation. The Proposition 1 funding for ecosystem, flood control, and recreation benefits would not change with the increased Reclamation investment in Alternative 3.

2.9 References

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