3. Description of the Proposed Project/Proposed Action and Alternatives

This chapter describes the three proposed Project action alternatives that are evaluated in this DEIR/EIS. For descriptions of Existing Conditions and the No Project/No Action Alternative, refer to Chapter 2 Alternatives Analysis. For a depiction of the proposed Project facilities included for each of the action alternatives, refer to Figures 1-9A, 1-9B, and 1-9C in Chapter 1 Introduction for Alternatives A, B, and C, respectively.

3.1 Proposed Project Features and Facilities

Provided below are descriptions of the common and unique proposed Project facilities that are components of the three action alternatives. Table 3-1 provides a summary list of proposed Project features for each alternative.

Table 3-1
Proposed Project Features by Action Alternatives

Project Feature	Component of		
	Alternative A	Alternative B	Alternative C
1.27-MAF Sites Reservoir (requires 9 dams total)	Yes	No	No
1.81- MAF Sites Reservoir (requires 11 dams total)	No	Yes	Yes
Golden Gate and Sites Dams	Yes	Yes	Yes
9 Saddle Dams	No	Yes	Yes
7 Saddle Dams	Yes	No	No
Up to 5 Recreation Areas	Yes	Yes	Yes
Road Relocations and South Bridge	Yes	Yes	Yes
Sites Pumping/Generating Plant	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 3,900-cfs pumping capacity; 5,100 cfs generating capacity	Yes; 5,900-cfs pumping capacity; 5,100 cfs generating capacity
Electrical Switchyards	Yes	Yes	Yes
Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Sites Reservoir Inlet/Outlet Structure	Yes	Yes	Yes
Field Office Maintenance Yard	Yes	Yes	Yes
Holthouse Reservoir Complex (includes Holthouse Reservoir and Dam, breached Funks Dam, existing Funks Reservoir Dredging, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, T-C Canal Bypass Pipeline, and Holthouse to T-C Canal Pipeline)	Yes	Yes	Yes
Pump Installation at the Red Bluff Pumping Plant	Yes	Yes	Yes
GCID Canal Facilities Modifications	Yes	Yes	Yes

Table 3-1
Proposed Project Features by Action Alternatives

Project Feature	Component of		
	Alternative A	Alternative B	Alternative C
GCID Canal Connection to the Terminal Regulating Reservoir (TRR)	Yes	Yes	Yes
TRR (includes the TRR to Funks Creek Pipeline and Outlet)	Yes	Yes	Yes
TRR Pumping/Generating Plant	Yes	Yes	Yes
TRR Pipeline (3.5-mile-long pipeline to convey water from the TRR to Holthouse Reservoir) and TRR Pipeline Road	Yes	Yes	Yes
Delevan Transmission Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E[1] Line plus WAPA/PG&E Line to Sacramento River	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line	Yes; Sites Pumping/Generating Plant to WAPA/PG&E Line plus WAPA/PG&E Line to Sacramento River
Delevan Pipeline (2,000 cfs with 2 pipelines)	Yes	Yes	Yes
Delevan Pipeline Intake Facilities (includes fish screen and pumping/generating facilities)	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity	No	Yes; 2,000 cfs diversion capacity; 1,500 cfs release capacity
Delevan Pipeline Discharge Facility	No	Yes; 1,500 cfs release capacity	No
Project Buffer	Yes	Yes	Yes
Potential Acreage of Temporary Land Use Impacts	17,680	19,637	19,636
Potential Acreage of Permanent Land Use Impacts	26,425	26,424	26,425

Note:
MAF = million acre-feet

3.1.1 Proposed Project Facilities Common to all Action Alternatives

Many proposed Project facilities are common to the three action alternatives (Alternatives A, B, and C) evaluated in this draft EIR/EIS.

These proposed Project facilities, all of which are considered integral to the performance of the proposed Project, are identified on Figure 3-1 and include the following features that are common to all action alternatives:

- Sites Reservoir Inundation Area (Section 3.1.1.1)
- Recreation Areas (Section 3.1.1.2)
- Road Relocations and South Bridge (Section 3.1.1.3)
- Sites Pumping/Generating Plant (Section 3.1.1.4)

[1] The proposed Project would connect with either the existing PG&E Transmission Line or the existing WAPA Transmission Line.

- Electrical Switchyards (Section 3.1.1.5)
- Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure (Section 3.1.1.6)
- Sites Reservoir Inlet/Outlet Structure (Section 3.1.1.7)
- Field Office Maintenance Yard (Section 3.1.1.8)
- Holthouse Reservoir Complex (Section 3.1.1.9)
- Pump Installation at the Red Bluff Pumping Plant (Section 3.1.1.10)
- GCID Canal Facilities Modifications (Section 3.1.1.11)
- GCID Canal Connection to Terminal Regulating Reservoir (TRR) (Section 3.1.1.12)
- Terminal Regulating Reservoir (Section 3.1.1.13)
- TRR Pumping/Generating Plant (Section 3.1.1.14)
- TRR Pipeline and TRR Pipeline Road (Section 3.1.1.15)
- Delevan Pipeline (Section 3.1.1.16)
- Project Buffer (Section 3.1.1.17)

The following are Project-related ecosystem enhancement actions common to all action alternatives:

- Ecosystem Enhancement Storage Account—Operational Actions (Section 3.1.2.1)
- Ecosystem Enhancement Fund—Nonoperational Actions (Section 3.1.2.2)

These proposed Project facilities and operational and non-operational ecosystem enhancement actions are discussed in detail in the following sections.

3.1.1.1 Sites Reservoir Inundation Area

The proposed Sites Reservoir would be located in Antelope Valley, approximately 10 miles west of the town of Maxwell (Figure 3-1). The smallest reservoir configuration considered for the action alternatives is 1.27 million acre-feet (MAF), which is discussed in Section 3.1.4.1 and the largest reservoir configuration considered for the action alternatives is 1.81 MAF, which is discussed in Section 3.1.5.1. The inundation area of Sites Reservoir would be created by filling Antelope Valley after the construction of up to 11 dams, depending on the reservoir size. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, and various saddle dams on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (dams are discussed further in Sections 3.1.4.2 and 3.1.5.2).

Construction. Construction information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

Operations. Operations information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

Maintenance. Maintenance information is provided in Section 3.1.4.2 for the 1.27-MAF reservoir and Section 3.1.5.2 for the 1.81-MAF reservoir.

3.1.1.2 Recreation Areas

The development of up to five Recreation Areas at the proposed Sites Reservoir could meet public demand for recreation opportunities. Potential Recreation Areas at Sites Reservoir were screened based on the site topography and the effect of potentially large fluctuations in the water surface levels due to normal reservoir operations. Five locations were determined to be potentially feasible recreation areas:

- **Stone Corral Recreation Area –** The Stone Corral Recreation Area (Figure 3-2A) would be located on the eastern shore of the proposed Sites Reservoir, north of the existing Maxwell Sites Road and proposed Sites Dam. Access would be provided by either the proposed South Bridge or Eastside roads. The maximum proposed size of the Stone Corral Recreation Area is 235 acres.
- **Saddle Dam Recreation Area –** The Saddle Dam Recreation Area (Figure 3-2B) would be located on the northeast side of the proposed Sites Reservoir, along the edges of the proposed Saddle Dams 3, 4, and 5. Access would be provided from the proposed Saddle Dam Road via the proposed North Road. The maximum proposed size of the Saddle Dam Recreation Area is 329 acres.
- **Peninsula Hills Recreation Area –** The Peninsula Hills Recreation Area (Figure 3-2C) would be located on the northwest shore of the proposed Sites Reservoir, to the north of the existing Sites Lodoga Road and across the reservoir from the proposed Saddle Dam Recreation Area. Access would be provided from the proposed Peninsula Road via the existing Sites Lodoga Road. The maximum proposed size of the Peninsula Hills Recreation Area is 373 acres.
- **Antelope Island Recreation Area –** The Antelope Island Recreation Area (Figure 3-2D) would be located in the southwestern portion of the proposed Sites Reservoir. Antelope Island would offer boat-in access only; however, during construction, a temporary road would provide access to the island. The maximum proposed size of the Antelope Island Recreation Area is 49 acres.
- **Lurline Headwaters Recreation Area –** The Lurline Headwaters Recreation Area (Figure 3-2E) would be located near the southeast tip of the proposed Sites Reservoir. Access would occur from the proposed Lurline Road. The maximum proposed size of the Lurline Headwaters Recreation Area is 219 acres.

The proposed Sites Reservoir has the potential to support an average of approximately 410,000 recreation days annually. Collectively, recreation opportunities at the proposed Recreation Areas could provide: boating, camping, picnicking, fishing, swimming, and hiking. Depending on the recreation area, proposed facilities may include boat launch sites, trails, designated swimming and fishing access, picnic tables, shaded canopies, campfire rings/barbeques, vault toilets, and dumpsters. In addition, gravel parking areas would be provided for camp sites, day-use areas, and boat launch facilities. An initial phase of recreation development would be implemented, consistent with a Recreation Plan that would be developed. Some subset of these recreational facilities may be constructed initially based on the environmental analysis included in this DEIR/EIS and Homeland Security guidelines, but all five Recreation Areas could potentially be constructed in the future.

The approximate number of proposed facilities at each proposed recreation area is listed in Table 3-2.

Table 3-2
Approximate Number of Proposed Facilities at the Proposed Recreation Areas

Recreation Areas	Features
Stone Corral Recreation Area	50 campsites (car and recreational vehicle) 10 picnic sites (with parking at each site) 6-lane[a] boat launch site Hiking trails Electricity Potable Water[b] 1 kiosk 10 vault toilets

Table 3-2
Approximate Number of Proposed Facilities at the Proposed Recreation Areas

Recreation Areas	Features
Saddle Dam Recreation Area	10 picnic sites (with parking at each site) Swim area (50 parking stalls) Fishing access parking (20 stalls) Hiking trails 1 kiosk 5 vault toilets
Peninsula Hills Recreation Area	200 campsites (car and recreational vehicle) 1 group camp area[c] 10 picnic sites (with parking at each site) Hiking trails Electricity Potable Water[b] 1 kiosk 19 vault toilets
Antelope Island Recreation Area	12 campsites (boat-in) Hiking trails 1 vault toilet
Lurline Headwaters Recreation Area	50 campsites (car and recreational vehicle) 3 group camp areas 10 picnic sites (with parking at each site) Fishing access parking (10 stalls) Hiking trails Electricity 1 kiosk 8 vault toilets

[a]Reducing the number of boat lanes with increasing water depth.
[b]Treated water from the reservoir will be the source of potable water.
[c]Each group camp area has been sized to accommodate 24 people.

Construction. It is anticipated that all construction activities associated with the five Recreation Areas would occur within the proposed footprints of the recreation areas and the temporary and permanent access road areas. The total construction disturbance area of the five Recreation Areas would be approximately 1,205 acres. However, construction disturbance may be much less because recreational facilities would be designed and constructed to minimize vegetative disturbance, including tree removal.

Anticipated ground-disturbing activities at potential Recreation Areas during construction include:

- Surveying
- Clearing and grubbing
- Excavation
- Backfilling
- Road and parking lot construction
- Utility connections
- Installation of amenities
- Boat ramp construction
- Site revegetation

Operations. It is anticipated that the proposed Recreation Areas would not have onsite staff. A fee collection box and camping information would likely be available at the kiosk near each recreation area's

entrance. It is expected that the majority of use at the proposed facilities would occur between Memorial Day (end of May) and Labor Day (beginning of September) of each year, but that activities such as hiking and fishing may occur year-round.

Maintenance. Maintenance activities would include collection of overnight and day-use fees at the fee collection boxes, road grading, water system maintenance, trash removal at picnic sites and overnight campsites, vegetation maintenance, restroom/vault toilet cleaning and restocking of paper goods, boat ramp debris removal, lake debris control, lake hazard marking, lake boom and barrier maintenance, signage, fence maintenance, fuels management, and law enforcement. During peak recreation use periods, these activities would likely occur on a daily basis, except for road grading, which is expected to occur once per year prior to the start of the recreation season. During the non-peak seasons, the activities other than road grading would likely occur on a weekly basis.

3.1.1.3 Road Relocations and South Bridge

The proposed Sites Reservoir would inundate several roads within Colusa County's jurisdiction. Travel between the towns of Maxwell and Lodoga along the existing Maxwell Sites Road and Sites Lodoga Road would be blocked by the new reservoir. Approximately six miles of the existing Huffmaster Road, a gravel county road, would also be inundated. Huffmaster Road provides access to private properties primarily within the proposed Sites Reservoir footprint and the community of Leesville, southwest of the proposed reservoir. Peterson Road, also a gravel county road that provides access to private property, is located entirely within the proposed reservoir footprint. Existing roads would be rerouted, as necessary, to provide alternate access routes.

Approximately 46 miles of new roads would provide construction and maintenance access to the proposed Project facilities, as well as provide public access to the proposed Recreation Areas. The locations of proposed roads, the proposed South Bridge, and existing roads near the proposed Sites Reservoir that would be affected by Project construction and/or operation are shown in Figures 3-3A and 3-3B.

Five road alternatives were evaluated to determine the best method of connecting the towns of Maxwell and Lodoga. To determine the best road alternative available, weighted criteria were independently assessed for shortest travel time, least total cost, least annual operations and maintenance cost, shortest emergency response time, least impact to wildlife habitat, least impact to wetlands and riparian areas, and least impact to public safety. Of the road alternatives, the South Bridge Alternative had the highest ranking. The portions of Maxwell Sites and Sites Lodoga roads that would be inundated by the proposed reservoir would be replaced by a new bridge (South Bridge Alternative). The road would start approximately one mile east of the proposed Sites Dam on Maxwell Sites Road. The new route would consist of the proposed Eastside Road, Stone Corral Road, the South Bridge, and an approach road west to Sites Lodoga Road. This route would also provide access to the proposed Stone Corral Recreation Area.

The proposed South Bridge would be a two-lane concrete bridge 35.5 feet wide and approximately 1.6 miles long. The top deck elevation would be 45 feet above the proposed Sites Reservoir's maximum normal water surface elevation. For the roads leading up to and away from the bridge, the proposed road right-of-way would be 60 feet wide with a four percent grade. Culverts and minor bridges would be constructed to provide passage for streams and drainage of surrounding areas, including the construction of a culvert where the proposed Eastside Road would cross Funks Creek. Guardrails, signs, striping and

lighting would be installed after the roads are completed pursuant to Caltrans/AASHTO design specifications. Permanent fencing would be installed along both edges of the right-of-way (60 foot width).

The proposed North Road and Saddle Dam Road (both new gravel roads) would provide access to northern portions of the proposed Sites Reservoir, saddle dams, and Saddle Dam Recreation Area. A new road, Eastside Road, would be gravel from the existing County Road 69 to near the proposed Sites Pumping/Generating Plant, and paved south of the plant. The proposed Eastside Road would connect the proposed Stone Corral Road to County Road 69, providing access to the northern portions of the proposed Sites Reservoir, Holthouse Reservoir Complex, Golden Gate Dam and appurtenant structures, and to properties northeast of the proposed Sites Reservoir. Along the west side of the proposed Sites Reservoir, the proposed Peninsula Road would provide access from Sites Lodoga Road to the proposed Peninsula Hills Recreation Area. The proposed Sulphur Gap Road would provide access to southern portions of the proposed Sites Reservoir, the Lurline Headwaters Recreation Area, private property adjacent to the proposed Com Road, and would connect to Huffmaster Road.

The proposed road alignment around the proposed saddle dams on the northern rim would not change for the three alternatives. However, Alternatives B and C would require approximately 1.2 miles of additional roads to access Saddle Dams 1 and 2. Saddle Dams 1 and 2 would not be needed for Alternative A (Alternative A includes a small saddle dam north of Golden Gate Dam, also called Saddle Dam No. 1. This small Saddle Dam No. 1 is different from the Saddle Dam No. 1 included in Alternatives B and C). The access road to Golden Gate Dam would be longer in Alternative A because the dam would be set farther back (approximately 0.25 mile long in Alternatives B and C versus 0.55 mile in Alternative A). Alternatives B and C would require approximately 0.4 mile of additional spur roads to access the saddle dams that would be set back further than Alternative A.

Permanent facility access roads constructed from gravel and asphalt would facilitate operation and maintenance activities. These proposed access roads would require new construction or the relocation of existing public county roads and bridges; these activities would follow Caltrans and AASHTO design standards. During construction, gravel roads would be constructed on the following detour and construction roads: the proposed Sulphur Gap and Lurline roads, and an existing dirt road west of the proposed Lurline Headwaters Recreation Area to Huffmaster Road.

Characteristics of the proposed roadways, South Bridge, and the minor structures, respectively, are listed in Tables 3-3, 3-4, and 3-5.

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Roads that Require Detour				
Huffmaster Road				
Lurline Road to Sites Lodoga Road	3.41			3.41
Lurline Road				
Lurline Headwaters Recreation Area to Huffmaster Road	1.35			1.35
Sulphur Gap Road to Lurline Headwaters Recreation Area	1.85			1.85
Sulphur Gap Road				
Maxwell Sites Road to Lurline Road	3.45			3.45

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Roads that do not Require Detour				
Com Road	**2.95**			**2.95**
Lurline Road to Communication Tower	2.95			2.95
Eastside Road	**5.16**	**4.08**		**9.24**
Field Office Maintenance Yard Access to Sites Pumping/Generating Plant Access		0.93		0.93
Golden Gate Dam/Electrical Switchyard Access Roads to Property North of Golden Gate Dam	1.52			1.52
Maxwell Sites Road to Stone Corral Road		1.12		1.12
Property North of Golden Gate Dam to North Road	3.63			3.63
Sites Pumping/Generating Plant Access to Golden Gate Dam/Electrical Switchyard Access Roads		0.95		0.95
Stone Corral Road to Field Office Maintenance Yard		1.09		1.09
North Road	**6.53**			**6.53**
County Road 69 at T-C Canal to Saddle Dam Road	4.69			4.69
Saddle Dam Road to Saddle Dam 9	1.84			1.84
Peninsula Road	**1.47**			**1.47**
Sites Lodoga Road to Peninsula Hills Recreation Area (East Segment)	0.53			0.53
Sites Lodoga Road to Peninsula Hills Recreation Area (West Segment)	0.94			0.94
Saddle Dam Road	**3.17**			**3.17**
North Road to Saddle Dam 11	3.17			3.17
South Bridge			**1.57**	**1.57**
South Bridge			1.57	1.57
South Bridge East Approach		**0.28**		**0.28**
Stone Corral Road to South Bridge		0.28		0.28
South Bridge West Approach		**2.25**		**2.25**
South Bridge to Sites Lodoga Road		2.25		2.25
Stone Corral Road	**0.26**	**1.39**		**1.65**
Eastside Road to South Bridge East Approach		1.39		1.39
South Bridge East Approach to Stone Corral Recreation Area	0.26			0.26
Sulphur Gap Road	**4.85**			**4.85**
Lurline Road to Huffmaster Road	**4.85**			**4.85**
Private Access	**0.58**	**1.47**		**2.05**
Access Road	**0.58**	**1.47**		**2.05**
Eastside Road to bottom of Golden Gate Dam		0.26		0.26
Eastside Road to Sites Pumping/Generating Plant Electrical Switchyard		0.12		0.12
Eastside Road to Field Office Maintenance Yard		0.04		0.04

Table 3-3
Characteristics of Proposed Roadways and South Bridge Approaches

Road or Segment Name	Gravel Road (miles)	Paved Road (miles)	Paved Bridge (miles)	Total (miles)
Eastside Road to Sites Pumping Generating Plant		0.18		0.18
North Road to Saddle Dam 6	0.28			0.28
Saddle Dam Road to Saddle Dam 2	0.03			0.03
Saddle Dam Road to Saddle Dam 3	0.16			0.16
Saddle Dam Road to Saddle Dam 5	0.11			0.11
South Bridge East Approach to Inlet/Outlet Tower		0.11		0.11
South Bridge East Approach to top of Golden Gate Dam		0.75		0.75
Total	**35.02**	**9.48**	**1.57**	**46.07**

Notes:
Mi = miles
T-C Canal = Tehama-Colusa Canal

Table 3-4
Proposed South Bridge Characteristics

Item	Dimension
Bridge Length	Approximately 8,500 feet (1.6 miles)
Bridge Width	35.5 feet
Bridge Height[a]	Approximately 45 feet
Bridge Depth[b]	20 foot maximum, 8 foot minimum
Spans	400 feet maximum, 260 feet minimum, 22 spans total
Columns – 1.81 MAF Dimensions	18 feet by 14 feet square, hollow, maximum height approximately 300 feet, 21 columns total
Columns – 1.27 MAF Dimensions	18 feet by 14 feet square, hollow, maximum height approximately 260 feet, 21 columns total
Foundations	3-foot-diameter cast-in-place drilled shafts, 8 per footing, 168 total

[a]The bridge height is the distance from the top of the bridge deck to the maximum water surface elevation.
[b]The bridge depth is the distance from the top of the bridge deck to the bottom of the bridge structure that sits atop the columns.

Table 3-5
Characteristics of Proposed Minor Structures*

Item	Typical Dimensions
Culverts (over unnamed streams), 17 total	6 foot diameter by 100 foot length
Minor Bridge (over named streams), 1 total	40 foot width by 80 foot length

*Minor structures would be built using steel pipe or pre-cast pieces.

Construction. The total construction disturbance area would consist of approximately 1,330 acres. It would include the footprint of the proposed roads and stream crossings, the materials and equipment staging areas, the area needed to construct the facilities, and construction access roads. The total

construction disturbance area would also include the footprint of the proposed South Bridge structure, the materials and equipment staging areas, the area needed to construct the facilities, and access roads.

Traffic that is not construction-related would be diverted around Project construction disturbance areas.

If necessary, an asphalt batch plant would be built on-site and outside of the proposed Sites Reservoir footprint. An asphalt batch plant footprint would occupy approximately 15 acres and would be located adjacent to the footprint of the proposed Field Office Maintenance Yard. This location would be centrally located to the proposed Project's paving needs, is relatively flat, and has shallow soils and impervious subsoil that should allow for easy spill containment and site cleanup. Alternatively, the construction contractor may obtain asphalt from regional commercial sources. Concrete bridge construction would include excavation for foundations and abutments; installing cast-in-place concrete formwork; placing reinforcing steel; installing bridge deck expansion joints; pouring and curing concrete; removing concrete forms; installing bridge barriers, bridge railings, bridge lighting, approach roadway guardrails, fences, signs, and reflectors; and painting approach and bridge deck striping.

Anticipated ground-disturbing activities during construction include:

- Surveying and marking
- Clearing and grading the construction workspace
- Preparing the construction materials laydown and equipment staging areas
- Transportation of materials and equipment to the project site
- Building concrete and/or asphalt batch plant
- Road cuts and fills
- Bridge foundation construction
- Bridge column construction
- Bridge span construction
- Installing culverts and minor bridges
- Laying aggregate road base and asphalt
- Installing fences, guardrails, and signs
- Installing roadway striping and reflectors
- Erosion and stormwater management
- BMP implementation
- Site restoration and clean-up

Operations. Not applicable.

Maintenance. Typical road maintenance would consist of chip sealing; patching; grading; crack filling; asphalt overlays; repairing damaged guardrails, fencing, and signage; embankment erosion repair; and vegetation control. Typical culvert and minor bridge maintenance would consist of debris removal, cleaning, and repairing steel pipe corrosion and pre-cast concrete cracks.

Typical bridge maintenance would consist of clearing debris from bridge deck and deck drainage outlets; barrier, railing and light repairs; concrete deck and expansion joint repairs; approach slab and guardrail repairs; and abutment erosion maintenance and repair. In addition, annual safety and maintenance inspections would be conducted pursuant to Caltrans/AASHTO requirements to maintain a bridge condition monitoring record.

3.1.1.4 Sites Pumping/Generating Plant

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill it and to generate electricity during the release of water from Sites Reservoir to Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The Sites Pumping/Generating Plant would lift water from Holthouse Reservoir into Sites Reservoir and would be connected to Holthouse Reservoir by a long excavated approach channel. The existing Funks Reservoir operates in coordination with the T-C Canal between elevations of 203 and 205 feet. However, with the proposed Holthouse Reservoir design which incorporates the existing Funks Reservoir, the Sites Pumping/Generating Plant would operate with tailwater elevations down to elevation 192 feet during pumping to take advantage of the full 6,500 acre-feet active capacity of Holthouse Reservoir. A 30-foot-diameter tunnel would be located on the inlet side of the Sites Pumping/Generating Plant connection to Sites Reservoir.

Water from Holthouse Reservoir would be drawn into the Sites Pumping/Generating Plant by the various pumping and pumping-generating units. The number of units operating would be selected to provide the approximate pumping capacity needed to deliver all water stored in the reservoir on a daily basis during the off-peak pumping period. The Sites Pumping/Generating Plant would be a conventional, indoor-type pumping-generating plant with an in-line arrangement of vertical pumping units. The Sites Pumping/Generating Plant for Alternatives A and C would have a total pumping capacity of approximately 5,900 cfs and a release capacity of 5,100 cfs. The Sites Pumping/Generating Plant for Alternative B would have a total pumping capacity of approximately 3,900 cfs and a release capacity of 5,100 cfs.

A Four Breaker Ring Bus would be required at the Sites Pumping/Generating Plant. The ring bus would be approximately 500 feet by 300 feet. The ring bus breaker would allow the electrical current flowing to each individual pump station to be isolated and interrupted, if required, for maintenance or safety without interrupting the current to the other pump stations.

Construction. Construction information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

Operations. Operations information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

Maintenance. Maintenance information is provided in Section 3.1.4.5 for the 5,900-cfs Sites Pumping/Generating Plant and Section 3.1.5.5 for the 3,900-cfs Sites Pumping/Generating Plant.

3.1.1.5 Electrical Switchyards

Electrical switchyards would be needed to step down the electrical voltage from high voltage lines (used to transmit electricity over long distances) to a lower voltage that can be used by the pumps and other machinery in the proposed pumping/generating plants. An electrical switchyard would be constructed near where the proposed Delevan Transmission Line would cross an existing transmission line (either PG&E 230-kV, WAPA 500-kV, or WAPA 230-kV transmission lines that are aligned north-south); at the proposed Sites Pumping/Generating Plant; and at the proposed TRR Pumping/Generating Plant. The switchyard sites would be graded flat and would have multiple pieces of electrical equipment on concrete pads. The proposed Sites Electrical Switchyard associated with the Sites Pumping/Generating Plant

would be approximately 3.5 acres in size. The proposed TRR Electrical Switchyard associated with the TRR Pumping/Generating Plant would be approximately 100 feet long by 50 feet wide. The proposed Holthouse Reservoir Electrical Switchyard or the Delevan Pipeline Electrical Switchyard associated with a transmission line tie-in to the existing WAPA Transmission Line or PG&E Transmission Line, respectively, would be approximately four acres in size. At each switchyard, one transmission tower (approximately 50 feet tall) would receive the electrical line entering the site. A four breaker ring bus would be required at each switchyard[2]. The ring bus would have multiple metallic poles with heights varying between 15 feet tall and 60 feet tall. The switchyards would be surrounded by a six- to eight-foot-high chain link fence with barb or serpentine wire along the top.

The switchyards and transmission lines connecting the pumping/generating plants to the grid would provide all of the electricity needed by the pumping plants. The switchyards and transmission lines would allow the pumping/generating plants to feed electricity back into the electrical grid during generation activities.

The proposed Sites Electrical Switchyard would be located north of and immediately adjacent to the proposed Sites Pumping/Generating Plant (Figure 3-4). The proposed Holthouse Reservoir Electrical Switchyard connecting to the existing WAPA or PG&E transmission lines would be located within the footprint of the existing Funks Reservoir facilities or within a portion of the surveyed footprint of Holthouse Reservoir (facility not shown in figure). The proposed TRR Electrical Switchyard would be located within the footprint of the TRR Pumping/Generating Plant (Figure 3-5). The proposed Delevan Pipeline Electrical Switchyard connecting to the existing PG&E transmission line would be located within the Delevan Pipeline right-of-way at the location where the source transmission lines cross the pipeline (Figure 3-5). No additional construction disturbance area would be required for this switchyard beyond what would be required for the Delevan Pipeline (discussed in Section 3.1.1.16).

Construction. The total construction disturbance area for the switchyards would include the footprint of each of the proposed switchyards, the materials and equipment staging area, electrical transformer area, and temporary access roads. The construction disturbance areas for the TRR-associated switchyard and the PG&E tie-in switchyard would be located within the Delevan Pipeline construction disturbance area. For the WAPA tie-in switchyard, the construction disturbance area would be located within Holthouse Reservoir Complex disturbance area. The construction disturbance area for the Sites Electrical Switchyard would be located within the Sites Reservoir Inlet/Outlet Structure disturbance area.

Anticipated major construction activities include clearing and grading the construction workspace; placing necessary construction materials at staging areas; and preparing the switchyard pad.

Operations. Operation of the proposed switchyards would be done remotely.

Maintenance. The proposed switchyards and transmission lines would require maintenance once or twice a year. Maintenance activities may include annual washing and cleaning of insulating equipment, preventative maintenance, scans of the switchyard under full load and routinely scheduled testing to meet Western Electricity Coordinating Council (WECC) requirements. Regular maintenance activities would include inspections for damage done by animals and maintaining landscaping.

[2] The ring bus breaker would allow the electrical current flowing to each individual pump station to be isolated and interrupted, if required, for maintenance or safety without interrupting the electrical current to the other pump stations.

3.1.1.6 Tunnel from Sites Pumping/Generating Plant to Sites Inlet/Outlet Structure

The purpose of the proposed tunnel is to transport water between the proposed Sites Pumping/Generating Plant and the proposed Sites Reservoir Inlet/Outlet Structure. The tunnel alignment would be located west of the existing Funks Reservoir and south of the proposed Golden Gate Dam on Funks Creek. The tunnel alignment would fall between the proposed Sites Pumping/Generating Plant location and the proposed Sites Reservoir Inlet/Outlet Structure location, and would be approximately 4,030 feet long (Figure 3-4).

The proposed 30-foot-diameter tunnel size is designed to meet DWR's Division of Safety of Dams' (DSOD) emergency drawdown release criteria. The tunnel would have a maximum discharge capacity of 23,000 cfs with a corresponding tunnel velocity of 32.5 feet per second (fps). Pumping velocities through the tunnel would be approximately 8.35 fps for the 5,900-cfs pumping plant included as part of Alternative A and Alternative C, and 5.51 fps for the 3,900-cfs plant included as part of Alternative B.

The tunnel from the upstream portal would be concrete-lined to prevent rock fallout and to ensure a smooth interior surface, thus reducing head loss and minimizing seepage into the surrounding rock. The tunnel would extend from the inlet to a vertical gate shaft with a fixed wheel gate. Downstream of the gate shaft, the tunnel would continue until the depth of rock cover dictates use of a steel liner. The tunnel would be concrete lined with an additional steel liner in the first 1,000 feet adjacent to the pumping plant.

Construction. The total construction disturbance area would be approximately 3.4 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. There would be no permanent aboveground disturbance area for this facility.

Anticipated ground-disturbing activities during construction include surveying and marking, clearing and grading, building access roads, installing temporary power to site, developing staging and material laydown areas, transporting construction materials and equipment to site, cofferdam and diversion construction at Golden Gate Dam, tunnel excavation, dewatering, concrete and steel liner installation, and site restoration and cleanup.

Operations. The typical operation scenario for the proposed tunnel would be 24 hours per day, seven days per week. Tunnel operation would be conducted remotely. The tunnel would transport flows between the proposed multi-level Sites Reservoir Inlet/Outlet Structure upstream and the Sites Pumping/Generating Plant downstream. During emergency release operations, the tunnel could discharge a maximum flow rate of approximately 23,000 cfs.

Maintenance. Maintenance would likely occur on an annual basis in coordination with maintenance and inspection of the proposed Sites Reservoir Inlet/Outlet Structure and multi-level intake tower upstream, and the proposed Sites Pumping/Generating Plant downstream.

To allow for tunnel inspection maintenance, low-level gate stop logs would be used to shut off flow from the low-level inlet structure to the downstream tunnel section. The stop logs would be lowered from a barge above and dropped into the low-level inlet structure. In addition, the multi-level tower wheel gates would be closed off to completely isolate the tunnel from reservoir flows for inspection and maintenance.

Typical tunnel inspection and maintenance may consist of checking for concrete cracks and leaks and missing or defective steel lining connections (bolts, rivets) at joints between lining sections and around connections with the Sites Pumping/Generating Plant, Sites Reservoir Inlet/Outlet Structure tower gates, and low-level intake structure.

3.1.1.7 Sites Reservoir Inlet/Outlet Structure

The purpose of the proposed Sites Reservoir Inlet/Outlet Structure would be to regulate proposed Sites Reservoir releases through the proposed tunnel to the proposed Sites Pumping/Generating Plant. The structure would be located on the west end of the tunnel and southwest of the proposed Golden Gate Dam (Figure 3-4). The structure would consist of a low level inlet/outlet structure for emergency drawdown releases, a multi-level inlet/outlet tower with two fixed wheel gates, and a tower access bridge.

The low level inlet/outlet structure would be approximately 120 feet from bottom of foundation to the top of trashracks. The rectangular structure dimensions would be approximately 100 feet by 120 feet. The three 30-foot by 30-foot intake openings would be covered by trashracks.

The multi-level inlet/outlet tower would have multiple inlet ports with the capability of drawing water at different levels in the reservoir, and trashracks with port valves (butterfly valves) embedded in the inlet tower tiers with four valves around each tier. The tower would also contain movable fish screens around two tiers for varied operational purposes (6,000 cfs for two tiers). Each port valve could be operated independently or all valves could be operated together in each tier. The tiers would be spaced approximately 20 feet apart down the tower beginning approximately 30 feet below the maximum reservoir water level. The high inlet tower/shaft would also contain two 9-foot by 35-foot fixed wheel gates at the base of the tower to isolate the tower from the main tunnel for inspection and maintenance. The main tower shaft would have an inner diameter of 30 feet and an outer diameter of 39 feet. Cranes would be used to hoist the fish screens, port valves, and gates for necessary inspection and maintenance.

The tower details would be similar for both the proposed 1.27 and 1.81 MAF Sites Reservoir sizes, but the tower elevations and number of inlet ports would be different. Table 3-6 provides a comparison of tower details for the two reservoir sizes under consideration.

Table 3-6
Proposed Sites Reservoir Inlet/Outlet Structure Tower Consideration

	1.81-MAF Reservoir Alternative B and Alternative C	**1.27-MAF Reservoir Alternative A**
Top Elevation	580.0 Feet	540.0 Feet
Bottom Elevation (Top of Bench)	320.0 Feet	320.0 Feet
Inside Diameter	30 Feet	30 Feet
Outside Diameter	39 Feet	39 Feet
Number of Ports	36 (4 Each at 9 Levels)	28 (4 Each at 7 Levels)
Functional Reservoir Release Elevations	520 Feet to 340 Feet	480 Feet to 340 Feet

A bridge would provide access to the multi-level tower from the nearby access road. The bridge length would be approximately 440 feet for the 1.27-MAF Sites Reservoir (Alternative A) and 540 feet for the 1.81-MAF Sites Reservoir (Alternatives B and C). The bridge deck elevation would be approximately equal to the dam crest heights (approximately 500 feet for the 1.27-MAF reservoir and 540 feet for the 1.81-MAF reservoir). The bridge is expected to be a simple welded-plate girder system with a lightweight concrete deck. The girders would be supported by the multi-level inlet/outlet tower, cast-in-place reinforced concrete piers, and a reinforced concrete abutment.

To meet DWR's DSOD's requirements, an emergency release outlet would be constructed to allow water levels behind the dam to be lowered quickly if the integrity of the dam is at risk. The 30-foot diameter

tunnel with a maximum release capacity of 23,000 cfs is designed to meet DSOD's emergency drawdown release criteria. The emergency release would bypass the pump/generator units by passing water through an alternate outlet manifold (called the Emergency Release Bypass Outlet). The Emergency Release Bypass Outlet would be a 26-foot-diameter pipe that splits off from the tunnel/main inlet-outlet manifold. The 26-foot-diameter pipe would split into two 18-foot-diameter pipes, then into four 13-foot-diameter pipes, then into eight 9-foot-diameter pipes that would terminate at fixed cone valves. An Emergency Notification Plan would be developed, and would include a protocol for notifying downstream entities if an emergency release were to occur.

Construction. The total construction disturbance area would be approximately 110 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads.

Anticipated ground-disturbing activities during construction include surveying and marking, clearing and grading, building access roads, installing temporary power to the site, preparing materials laydown and equipment staging areas, transporting construction materials and equipment to the site, tower shaft excavation (separate from tunnel), dewatering, building the multi-level tower base and deck, building the access bridge to the multi-level tower, installing cranes on the tower deck, building the low-level intake structure, and finished grading and site clearing.

Operations. The proposed multi-level inlet/outlet tower and low-level intake structure would be operated remotely. The multi-level tower port valves could be operated independently or by tier. Port valve operations could be adjusted locally or remotely via a supervisory control and data acquisition (SCADA) system. Port valve operations would be changed by adjusting the hydraulic operators.

Maintenance. The stop gates could be raised and lowered between tiers to stop flow by tier if a port valve needed to be cut off from flow for inspection or maintenance. The gates could be raised or lowered by crane on-site or remotely via a SCADA system. Typical maintenance of the proposed inlet/outlet structure is expected to occur annually, and would consist of servicing the hydraulic equipment (hoist cranes, control motors) and fish screen pumps. Hydraulic equipment maintenance service would primarily involve lube and filter replacements.

The emergency stop gate maintenance would be performed annually. Maintenance would involve moving them through a full stroke (open and closed) position. Annual inspections for corrosion and wear would also be performed.

As part of emergency preparedness checks, the gate operation electrical control panel would be tested every six months.

The port valve hydraulic operators are very high maintenance items requiring quarterly inspection and maintenance. Typical port valve maintenance would involve lube and filter replacements along with checking for hydraulic line damage.

The concrete low-level intake structure is considered to be low-maintenance given it has no mechanical component and would be underwater. Annual maintenance typically would occur along with annual tunnel and tower inspections and maintenance. With the stop logs in place (normal operation), typical maintenance would include inspections for excessive leaking and cracks around the connection with the tunnel portal.

3.1.1.8 Field Office Maintenance Yard

Due to the size of the proposed Project area and the number of proposed facilities, a staffed operation and maintenance complex (Field Office Maintenance Yard) would be built on-site (Figure 3-4) to service all proposed Project facilities. An administration building and parking area would be constructed to meet Project needs.

Construction. The total construction disturbance area would be approximately 18 acres, with approximately 12 acres of permanent space for the proposed footprints of the administrative and maintenance buildings. Buildings may include an Administration Building, Plant Maintenance Warehouse, Service and Supply Warehouse, Utility Craft Office, Mechanical Equipment Shop, Heavy Equipment Shop, Project Surveillance Building, and General Maintenance Headquarters.

Construction of the proposed Field Office Maintenance Yard would include the following:

- Transportation of materials to the project site
- Clearing and grading the site for construction
- Placing construction materials at staging areas
- Constructing Administrative and Maintenance buildings
- Constructing ancillary facilities (e.g., leach-field, water treatment, incinerator, lighting, concrete pad for refueling island, aboveground fuel tanks, perimeter fencing)
- Site restoration after construction is complete

Operations. The typical operations scenario for the proposed Field Office Maintenance Yard would be 24 hours per day, seven days per week. The facility would be fully staffed during normal business hours, when scheduled maintenance of Project facilities would occur. Minimum personnel staffing would occur during off-peak hours to respond to emergency situations. Spare parts for mechanical and electrical equipment would be stored in the warehouse along with lubricants, oils, and greases to maintain equipment. Daily operations could include personnel traveling from the Field Office Maintenance Yard to Project facilities and performing scheduled repairs, inspection, and maintenance of Project equipment, observing Project facilities and operations, and as-needed emergency repairs. Equipment repair and overhaul (e.g., pumps, turbines) may take place at the facility. The SCADA system would be operated and monitored remotely from the Administration Building.

Daily operations may include fueling and washing vehicles and equipment, gathering technical data on water quality and project facilities conditions, and maintaining and repairing mechanical equipment.

Maintenance. Periodic maintenance would likely be performed on an as-needed basis including road, building, vegetation, and fence maintenance, as well as debris removal.

3.1.1.9 Holthouse Reservoir Complex

The existing 40-foot-high Funks Dam forms the 2,250 acre-foot Funks Reservoir one mile downstream of the proposed Golden Gate Dam site. This reservoir was constructed by Reclamation and is part of the T-C Canal system. Funks Reservoir serves as a re-regulating reservoir to stabilize flows in the canal downstream of Funks Reservoir as diverters come on line and off line. The existing Funks Reservoir would be expanded to form the proposed Holthouse Reservoir (Figure 3-4) by constructing a new dam

(Holthouse Dam) and reservoir to the east of Funks Reservoir, and breaching the existing Funks Dam so that the new and existing reservoirs would act as one unit with an enlarged active storage capacity of approximately 6,500 acre-feet and a surface area of approximately 450 acres. The proposed Holthouse Reservoir is required to facilitate balancing and regulating the proposed Sites Reservoir inflows and outflows through the proposed Sites Pumping/Generating Plant, and to provide sufficient supplemental storage to allow simultaneous pump back power generation.

The 6,500 acre-foot Holthouse Reservoir would allow the Sites Pumping/Generating Plant to perform a pumped-storage function for up to six hours per day while simultaneously collecting and storing inflows from the Sacramento River through the T-C and GCID canals (all three alternatives), and through the proposed Delevan Pipeline (Alternatives A and C). All water would be pumped into Sites Reservoir from Holthouse Reservoir during off-peak power periods on a daily basis.

The proposed Holthouse Dam would include two sections: a combination concrete and roller compacted concrete (RCC) dam section near the center that would accommodate the inlet/outlet facilities for the proposed Delevan and TRR pipelines, and earth embankments on either side of the concrete dam to close off the valley and form Holthouse Reservoir. The total length of the dam would be approximately 7,800 feet. The RCC dam section would be approximately 400 feet long. Maximum dam heights would be approximately 45 feet. The crest elevation of the dam would be at elevation 214 feet to match the crest of the existing Funks Reservoir Dam and the surrounding topography. A grout curtain would be installed under both dam sections to control underseepage.

Operating levels within Holthouse Reservoir would vary between elevation 206.0 feet and 192.0 feet, which would provide the required active storage capacity of approximately 6,500 acre-feet. Elevation 206.0 feet corresponds to the 2011 normal operating level in existing Funks Reservoir. There would be approximately 1,000 acre-feet of dead storage in Holthouse Reservoir due to topographic elevations near the new Holthouse Dam. This space could be allocated to sediment accumulation, disposal of excess excavated material from the proposed Project, or for disposal of existing sediment.

Pump-back operations would involve the daily procurement of relatively inexpensive power sources (i.e. renewable energy) to pump water from the proposed Holthouse Reservoir up to the proposed Sites Reservoir during off-peak hours of power usage, and release that pumped water from Sites Reservoir to Holthouse Reservoir during peak hours of power usage. Pump-back power production provides flexible generation and would be used to compensate for rapid changes in electric power demand, such as from increased air conditioning use on very hot days, as well as to compensate for changes in power production from variable renewable power sources, such as wind and solar power projects. Although water delivery and power production are given equal weight in the planning goals for the Project, pump-back power operations would likely be secondary to water delivery operations because of the various restrictions on water operations from contracts and from environmental restrictions, but would be optimized within those restrictions to produce the greatest value to users. Pump-back operations from the afterbay to the forebay of each of the two or three (depending upon the chosen alternative) proposed Project pumping/generating facilities would be possible, but only the Sites Pumping/Generating Plant would be used for daily pump-back operations because of the operational limitations placed on the smaller forebays and afterbays of the other Project pumping/generating facilities.

Besides the dam and reservoir, the Holthouse Reservoir Complex would also include the following features:

- **Holthouse Pumping Plant –** The reservoir operating levels could drop down below elevation 198.0 feet, which is the minimum level that could supply water to the downstream T-C Canal by gravity. To supply water to the canal when reservoir elevations are below 198.0 feet, a low head pumping plant would be installed with a capacity of 800 cfs. The pumps would draw water from the inlet/outlet piping. The water would be pumped up to the canal in a buried pipeline (the Holthouse to T-C Canal Pipeline) outside of the downstream toe of the dam. The pipeline would be a single 10-foot-diameter pipe or two 7-foot-diameter pipes. An energy dissipating structure would be provided at the discharge point to the canal.
- **Holthouse Spillway and Stilling Basin and Spillway Bridge –** An emergency spillway with a capacity of 23,000 cfs would be required in the Dam to pass the emergency Sites Reservoir drawdown flows required by DWR's DSOD. The stair-step RCC spillway with confining walls on both sides would be constructed near the center of the RCC dam. The spillway crest length would be approximately 375 feet and the crest would be set at an elevation of 206 feet, which corresponds to the current normal maximum operating level in Funks Reservoir. When passing the maximum design flow, the water depth over the spillway would be approximately seven feet. A stilling basin would be built below the spillway to dissipate the energy of the flowing water from the spillway to prevent erosion downstream of the dam. A 375-foot-long bridge would be built over the spillway to provide access across the dam.
- **Western Area Power Administration Transmission Line Relocation –** Eight Western Area Power Administration (WAPA) transmission line towers are located within the footprint of the proposed Holthouse Reservoir. Based upon preliminary contacts with WAPA, the preferred relocation alternative is one that would move a segment of the line to the west so that it would cross at a narrow spot in the existing Funks Reservoir. The relocated span would be approximately 1,000 feet.
- **Sites Pumping/Generating Plant Approach Channel –** The Sites Pumping/Generating Plant would be connected to Holthouse Reservoir by an earthern approach channel approximately 8,300 feet long. The Channel is expected to have relatively flat slope toward the Sites Pumping/Generating Plant and would be constructed at an elevation below the operating range of the reservoir. The Channel would have a trapezoidal geometry with a bottom width of approximately 200 feet and a top width of 400 to 700 feet. When Holthouse Reservoir is full, the channel would be nearly entirely submerged. This channel would allow water from Holthouse Reservoir to flow by gravity to or from the pumping/generating plant, and would allow upstream Funks Creek flows to enter Holthouse Reservoir via an approach channel spillway.
- **Existing T-C Canal Connections –** The T-C Canal would be modified to enter the Holthouse Reservoir at a point behind the Holthouse Dam. A new baffle block energy dissipating spillway structure (T-C Canal Discharge Dissipater) would be constructed near Holthouse Dam to convey water down into the reservoir regardless of reservoir level. Approximately 0.5 mile of the existing canal beyond the new tie-in point up to the current connection point to Funks Reservoir would be abandoned. A portion of the downstream canal within the Holthouse Reservoir limits would also be abandoned. Because it would be possible to supply water to the downstream canal by gravity at times when the Holthouse Reservoir is high, a new gate-controlled outlet would be provided from the reservoir near the abutment of the Holthouse Dam.

- **T-C Canal Construction Bypass Pipeline –** Installation of a bypass would be required to divert T-C Canal flow before starting modifications to existing Funks Reservoir. The bypass would be maintained as a permanent feature following modification of Funks Reservoir and construction of Holthouse Reservoir, as requested by TCCA. The proposed bypass would consist of a 12-foot-diameter pipeline starting approximately 2,600 feet upstream of the T-C Canal inlet into Funks Reservoir. The bypass would route the required flows around Funks Reservoir during reservoir modification construction. The bypass construction would require installation of two cofferdams on the upstream portions of the T-C Canal to isolate the area of embankment cut and pipe installation. The Funks Reservoir would be dewatered and the existing check structure would be dismantled and reconstructed approximately 3,000 feet upstream. The check structure would consist of two 18-foot by 15.5-foot gates, electrical control, hoists, and concrete supports and reinforcement. The facility would be relocated slightly downstream of the bypass. The bypass would need to be gated or valve controlled to regulate releases downstream, as required by the TCCA.

Construction. The total construction disturbance area would consist of approximately 640 acres. It would include the proposed footprints of Holthouse Reservoir, Holthouse Dam, Holthouse Spillway and Stilling Basin, Holthouse Pumping Plant, T-C Canal Discharge Dissipater, T-C Canal Construction Bypass Pipeline, the Holthouse to T-C Canal Pipeline, and buffer lands adequate for construction staging.

Construction materials for the earth dam would come from required excavations for the proposed Sites Pumping/Generating Plant and the channel connecting the enlarged reservoir with the Sites Pumping/Generating Plant. The material in the existing Funks Dam could also be reused to construct the new dam. Approximately 680,000 cubic yards of core material and 2,200,000 cubic yards of earth and rockfill would be required to construct the dam.

Construction materials for the proposed Holthouse Dam would include imported sands and gravel. Processed rock from Project excavations could also be used if the material is found to be suitable for such use. On-site material sources would be explored in future investigations for the Project. Approximately 150,000 cubic yards of RCC material would be required.

Because the existing Funks Reservoir is an on-stream reservoir, a significant portion of the reservoir active storage has been displaced due to sediment accumulation from Funks Creek. Although topographic data are available for the reservoir from the original construction drawings, there is no current bathymetric data to support an estimate of the amount of sedimentation that has actually accumulated. However, it is believed that the current active capacity could be as low as 1,500 acre-feet. This would mean that approximately 750 acre-feet, or 1.2 million loose cubic yards of sediment has accumulated. A bathymetric survey of the existing reservoir would be performed as part of future design phases of the proposed Project to establish the volume and physical characteristics of the sediment so the material can be properly managed during design and construction.

A large portion of the accumulated sediment would be removed and relocated to construct the new Holthouse Reservoir, in particular the low level flow channel connecting the reservoir with the Sites Reservoir Pumping/Generating Plant. Once a diversion system is installed to route Funks Creek flows around the Holthouse Reservoir work site, the sediment can be dewatered over a period of time by ditching and sumping. Once dry enough to be excavated and moved, the material can be disposed of in the lower elevations of the new Holthouse Reservoir in a dead storage area or in backwater areas around the perimeter of the existing reservoir. The construction schedule for the proposed Project should allow

adequate time to dewater and remove the material without affecting the new dam construction (which is outside the limits of sediment accumulation).

Typical summer releases from Funks Reservoir range from 500 cfs to 800 cfs. Total flows of 50 cfs to 200 cfs for off-peak limited agricultural releases would be needed between November and February, possibly stretching to March, depending on the weather. The proposed bypass consists of a 12-foot-diameter pipeline starting approximately 2,600 feet upstream of the T-C Canal inlet into Funks Reservoir. The bypass would route the required flows around Funks Reservoir during reservoir modification construction.

Operations. Funks Reservoir is operated by TCCA pursuant to a contract with Reclamation. Operation of the proposed Holthouse Reservoir would be coordinated with TCCA, but operated by the designated operator of the proposed Sites Reservoir. During fall and winter months, inflows from the conveyance system and water for power generation would be stored during on-peak power periods. The stored water plus ongoing off-peak inflows from the conveyance systems would then be pumped to Sites Reservoir during the partial-peak/off-peak power period on a daily basis. During the spring and summer months when releases are being made from Sites Reservoir, released water would go through the Sites Pumping/Generating Plant to generate power. Holthouse Dam would maintain releases to Funks Creek of up to 10 cfs year-round based on a recommendation from CDFW staff. This flow is intended to replace the existing seepage flow on Funks Creek below Funks Dam.

Maintenance. Current periodic maintenance required for Funks Reservoir includes road, vegetation, and fence maintenance, as well as debris removal, on an as-needed basis. The reservoir is also drained annually. These maintenance activities are expected to be the same for the proposed Holthouse Reservoir. Periodic maintenance and inspection of Holthouse Reservoir would be coordinated with T-C Canal operators or could be conducted at a centralized maintenance and operation office for the proposed Sites Reservoir.

3.1.1.10 Pump Installation at the Red Bluff Pumping Plant

The TCCA Fish Passage Improvement Project was constructed at the RBDD and completed in 2012. The Fish Passage Improvement Project (Figure 3-6) included a fish screen, a pumping plant at the Mill Site (known as the Red Bluff Pumping Plant), canal, siphon, a forebay, switchyard, and a bridge across Red Bank Creek. The fish screen structure was designed to meet National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA Fisheries) and California Department of Fish and Wildlife (CDFW) criteria for diversion flows of 80 cfs to 2,500 cfs. The 2,500-cfs Red Bluff Pumping Plant includes 11 vertical axial-flow pumps. Nine of the 11 vertical axial-flow pumps (seven 250-cfs and two 125-cfs) were installed in the pumping plant, having a combined total rated capacity of 2,000 cfs. The pumping plant includes two additional pump bays designed for the future installation of two 250-cfs vertical axial-flow pumps.

The proposed Project would require pumping capacity that exceeds the existing total rated capacity of the Red Bluff Pumping Plant. Therefore, the installation of one additional 250-cfs vertical axial-flow pump into an existing concrete pump bay at the pumping plant would be required (Figure 3-6). The proposed Project also includes the operation and maintenance of the proposed additional pump. The proposed additional pump at the pumping plant would allow for a total diversion up to 2,160 cfs for each proposed Project alternative in winter and spring months, including up to 2,100 cfs for diversion to the proposed Sites Reservoir, and an additional 50 to 60 cfs for maintaining existing winter and spring flow operations of the T-C Canal.

Construction. Installation of the 250-cfs vertical axial flow pump unit would require the following major construction activities[3]:

- The pump unit bay includes an existing 84-inch diameter steel pipe embedded in the pumping plant back wall. The existing steel pipe includes a blind flange on the afterbay side of the pumping plant back wall to prevent water from draining back into the forebay. The blind flange would be removed and replaced with an 84-inch butterfly valve. A new 84-inch diameter flanged steel pipe spool (approximately three feet long) would be connected to the butterfly valve and terminate with a new 84-inch flap gate. Permanent supports would be required beneath the butterfly valve and flap gate.
- Dewatering of the afterbay would likely be required. Therefore, installation of the pump should be performed during the non-irrigation season to minimize interruptions to the irrigation delivery system. A mobile crane would be required to install the piping and appurtenances.
- Pumping plant unit bay stoplogs would be installed, using a mobile crane, to accommodate dewatering the pump bay.
- The pump bay would be inspected and all sediment would be removed. Access to the bottom floor of the pumping plant is provided at each bay via 4.5-foot by 7-foot access hatches and ladders.
- Roof hatches over the pump unit bay would be removed using a mobile crane.
- The pump would be installed in accordance with the pump manufacturer's written installation instructions, including constructing the pump pedestal and connecting the pump discharge nozzle to the discharge pipe via a new flexible coupling.
- Electrical conductors and a SCADA system would be installed.

Operations. The Red Bluff Pumping Plant includes a control system to provide remote manual and remote auto control of pumps and associated appurtenances. The pumping plant and associated gravity conveyance system are designed to deliver water to the existing 17-acre settling basin located to the west of the RBDD. Once in the settling basin, water would flow to Check No. 1 on the T-C Canal and the Corning Pumping Plant.

Maintenance. It is anticipated that the following basic preventative measures would be undertaken on a regular basis to maintain the vertical axial-flow pump and its appurtenances that would be installed as part of the proposed Project. These activities would occur as part of the regular maintenance activities for the Red Bluff Pumping Plant:

- Wash down or pressure wash, as necessary
- Check for rust/corrosion, annually; maintain all coatings
- Visually inspect for damage or wear, monthly
- Assess fluids and lubrication; address as necessary
- Inspect pumping plant trashracks daily and remove debris as necessary
- Visually inspect butterfly valves and flap gates, monthly

The proposed additional Project pump would not increase the frequency of maintenance activities required at the pumping plant, nor would it require additional personnel to perform pump maintenance. However, the volume and timing of non-TCCA water diversions, through any of the pumps, could impact

[3] A formal work plan that describes all construction activities would be required prior to the start of construction.

the sediment load distributed to the TCCA system (i.e., the pumping plant forebay and settling basin). Increased sedimentation associated with non-TCCA water diversions may require more frequent dredging within the pumping plant forebay than prior to the Project pump's installation and operation.

3.1.1.11 GCID Canal Facilities Modifications

The GCID Canal is an existing irrigation canal that delivers water from the Sacramento River to water users along its route from its diversion point northwest of Hamilton City to southeast of the City of Williams. The canal is an unlined earthen channel, with capacity varying from 3,000 cfs at the upstream end to 300 cfs at the southern terminus.

The existing canal facilities divert water from the Sacramento River into a forebay where the water is pumped by the Main Pump Station into the GCID Canal. The existing canal facilities include the intake and bypass channels, fish screens, main pump station and forebay, headgates, gradient facility, and the GCID Canal. These facilities are located approximately five miles northwest of Hamilton City. Proposed Project improvements in this area include a new headgate structure and canal lining. A railroad siphon replacement is also proposed near the City of Willows.

For the proposed Project, the existing headgate structure would be left in place to continue to serve as a bridge between County Road 203 and County Road 205. The existing headgate structure would continue to operate during construction of the new headgate structure, and diversion activities would continue throughout construction. The existing headgate would not be adequate for proposed winter season Project operation during high-river flows due to the large head-drop across the structure during high river level conditions. A new headgate structure would be constructed upstream of the existing structure. The new headgate structure would include three automated gates (two vertical roller gates and one radial gate). The new headgate structure would provide the following three main operations:

- Isolate the Main Canal, as needed, for repairs or other purposes, such as the canal reach between the Main Pump Station and Stony Creek, to prevent local flooding during high river levels.
- Control flow when the headworks are under gravity inflow conditions and the pumping plant is shut down, which occur during high river levels.
- Control water elevations downstream of the existing headworks, as necessary, to extend their operating range under higher river levels.

Design consideration for the new headgate includes:

- The structure's invert and crest would be based on matching the existing canal invert and top of bank elevations, respectively.
- The relatively deep channel section in this reach of the canal would result in a structure that is over 30 feet high.
- The design condition for this structure, for sliding and over-turning stability, would occur with maximum water levels on the upstream side (during high river levels), and a drained canal on the downstream side (for emergency shutdown).

The water level and flow control functions would involve operating conditions that would result in water surface drops across the headgate of between three and 15 feet, which would require a set of energy

dissipater blocks immediately below the gates to slow down and stabilize the water discharging under each gate.

The canal reach immediately downstream of the new headgate structure would be lined with concrete for approximately 200 feet to prevent erosion due to the turbulent flow conditions.

The Union Pacific Railroad Siphon at Mile 26.6 does not meet design and operation criteria for the proposed Project and would need to be replaced. The existing Railroad Siphon structure was built in the early 1900s and includes two 6-foot-diameter barrels and five 7.25-foot by 6-foot barrels. At maximum existing flows of approximately 2,000 cfs, the head loss across the Railroad Siphon, due to high flow velocity and poor entrance and exit transitions, reduces upstream canal freeboard to very marginal conditions. Based on the structure's age, hydraulic capacity restrictions, and use as a major transportation link, it should be replaced. The new structure would consist of three prefabricated box culverts. Typical future maximum velocity and head losses would be approximately four fps and 0.2 foot, respectively.

The proposed replacement of the Railroad Siphon would require coordination and planning with railroad operators. Construction restrictions may exist regarding minimizing interference with regular railroad operations. To the extent possible, replacement of the Railroad Siphon would take place during periods of lowest train traffic and railroad shutdown time would be minimized.

Construction. The total construction disturbance area would consist of approximately five acres. It would consist of the existing canal prism, existing operation and maintenance roads, and an additional 50 feet on both sides. The total construction disturbance area would include the footprint of the proposed facilities (new headgate structure, canal lining, and replacement of Railroad Siphon), the materials and equipment staging area, the area needed to construct the facilities, and access roads. All of the construction activities for the new facilities would occur within the existing GCID right-of-way.

Water delivery to the GCID service area would be maintained during the primary irrigation season (early April through mid-October). The GCID Canal is typically out of service each year between January 7th and February 20th for maintenance. Construction activities would be scheduled during this maintenance period whenever possible. If construction activities are required outside of the maintenance period, a temporary bypass channel would be built around the construction site to allow diversion water to flow past and maintain regular canal operation. The temporary bypass channel would be constructed within the existing GCID right-of-way using a combination of excavation, earth embankment, and sheetpile walls to isolate the construction site from the canal. After completion of construction, the temporary bypass would be filled in, earth embankments and sheetpile walls would be removed, and the area would be restored to pre-construction conditions.

Operations. The intake and fish screen facility would operate year-round and would be very similar to existing operations.

GCID is currently adding the SCADA system to the existing GCID Canal system. The new proposed GCID Canal facilities for the proposed Project may need to be incorporated into GCID's SCADA system. The design of new systems would be coordinated with GCID to ensure proper integration.

Use of the canal for conveyance to the proposed Sites Reservoir would require increased automation between the GCID facilities and other proposed Project conveyance systems. The available capacity for winter season operation (October through March) of Project conveyance would range from a minimum of approximately 1,270 cfs during an average November to a maximum of approximately 1,750 cfs during

an average March. There is currently little to no available capacity from April through September. To accommodate the proposed Project flow, flows need to be monitored and controlled consistently. SCADA operations and monitoring could be done remotely and would not require the presence of daily on-site personnel. Instead, daily operation and monitoring would be managed from a central location and would not require additional staff beyond existing personnel.

Maintenance. Required maintenance activities would be very similar to current maintenance. Periodic inspection and maintenance of mechanical systems, such as the screen cleaning system, would be required. Water level monitoring would continue to be done automatically. Additional sediment and debris removal activities may also be required due to increased diversions during high river water levels.

Debris that enters the intake channel, such as large floating trees, can block flows in the channel, get entangled at the face of the fish screen, block the water control structure, or cause other disruptions to proper operating conditions. Typically, the debris builds up during winter season flood flows and is removed at the beginning of the irrigation season in late March to early April. Because of wintertime diversions, a larger debris load is expected at the intake channel, screen structure, and bypass channel. It is expected that debris removal would be required during the winter season to maintain proper operating conditions. It may be necessary to retrofit the mouth of the intake channel with a floating log boom to deflect larger debris and provide increased protection to the fish screens.

The upper one-third of the intake channel is typically dredged once every three years and the entire channel is dredged once every 10 years. The volume of the dredged materials varies from approximately 30,000 to 130,000 cubic yards. The future volume of sediment in the intake channel is expected to increase with increased Project-related wintertime operation and the following assumptions were made regarding future dredging operations:

- A larger dredge with increased capacity and working depth than is currently used would be required. Supporting equipment, such as a high-capacity crane equipped with a grappling hook and clamshell, would be required to assist in debris removal.
- Dredging operation would occur year-round.
- Because dredging would occur year-round, a new U.S. Army Corps of Engineers 404 permit would be needed to allow dredging during the winter season.

Dredged materials would continue to be placed on the 11-acre off-site disposal location to the southwest of the pump station, at sites on Montgomery Island, and along the canal banks.

The new headgate structure would require annual inspection and maintenance including painting and motor control unit inspections, similar to typical check structures along the canal.

Expected periodic maintenance activities for the canal that would require on-site personnel would include:

- Maintaining canal banks to repair sloughing and erosion damage
- Filling in animal burrow holes
- Removing vegetation
- Removing debris from upstream of the check structures
- Maintaining gate operators
- Repairing and repainting gates.

A dedicated maintenance period is required for the canal from January 7th through February 20th every year. During this maintenance period, the canal will be shut down.

3.1.1.12 GCID Canal Connection to the Terminal Regulating Reservoir

The purpose of the proposed connection from the GCID Canal to the TRR would be to reduce the velocity of flows from the GCID Canal to approximately 1 fps to form a stable pool. The stable pool would occur just before the turnout to the connecting channel to the proposed TRR.

The connection from the GCID Canal to the TRR would be located north of the proposed TRR Pipeline between the GCID Canal and the TRR, (Figure 3-5). It would have two features: (1) the GCID Canal energy dissipation bay with check structure, and (2) the TRR inlet channel and inlet control structure. The bay would be located along a reach of the GCID Canal approximately 500 feet long, with a 220-foot bottom width, 20-foot depth and embankment slopes of 1.5 to 1. On the east end of the bay, the reservoir inlet channel would divert flow to the TRR. On the south end of the bay, a new radial-gate check structure would serve two purposes: (1) maintain a water surface elevation in the canal transition section to provide available head for conveyance into the TRR and (2) control flow to the remaining downstream reach of the GCID Canal.

The inlet channel would connect the Main Canal to the TRR. The channel would be a lined trapezoidal cross-section, having a 70-foot bottom width and a length of 400 feet, with embankment slopes of 1.5 to 1. The inflow control structure would be very similar to a standard GCID Canal check structure, with three large radial gates to control flow into the TRR. The structure's top deck width would accommodate vehicle traffic to allow access along the Canal. A transition apron (a large concrete pad) into the reservoir would be located immediately downstream of the control gates. The apron would be 160 feet wide and 100 feet long. The function of the concrete apron would be to provide an erosion-resistant area for energy dissipation as the water enters the TRR.

The earthen embankment for the inlet channel would be approximately 20 feet high. When the radial gates at the check structure open, the gates would be approximately 15 feet above the embankment.

Construction. The total construction disturbance area would consist of approximately seven acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. This construction disturbance area would be within the larger construction disturbance area for the proposed TRR.

Anticipated ground-disturbing activities during construction include:

- Transportation of materials to the proposed Project site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Dewatering and building a temporary bypass channel
- Excavation of canal energy dissipation bay
- Reservoir inlet excavation and embankment construction
- Construction of check structure

It is anticipated that the proposed reservoir inlet from the GCID Canal to the proposed TRR would be constructed by first building a temporary bypass channel to the west of the existing canal alignment. The temporary bypass channel would be approximately 1,000 feet long, and would connect into the GCID Canal upstream and downstream of the construction zone to supply water to the remaining reach of the

Canal downstream of the TRR area. The temporary bypass channel would be constructed using a combination of excavation, earth embankment, and sheetpile walls to isolate the construction site from the diversion canal. Following completion of the new check structure, the temporary bypass would be filled in, earth embankments and sheetpile walls would be removed, and the area would be restored to pre-construction conditions.

Operations. Gate operation of the new GCID Canal Check Structure would normally be controlled automatically, with an option for local or remote manual control. Gate operation would be established either using upstream or downstream water-level controls, depending on the overall operating regime for the future canal system.

Flow into the reservoir would be controlled by the proposed TRR inlet control gates. An integrated SCADA and communication system would be required to coordinate operations between the GCID Pump Station, GCID Canal, and the proposed TRR, TRR Pumping/Generating Plant, and Holthouse Reservoir. SCADA operation and monitoring would be done remotely and would not require the presence of daily on-site personnel. Instead daily operation and monitoring would be managed from a central location.

Maintenance. Maintenance activities would include (1) removing debris that could collect upstream of check structures, (2) maintaining gate operators to provide adequate control of gates, (3) periodically repairing and re-painting the connection, and (4) dredging the dissipation bay and inlet channel for sediment concurrently with the proposed TRR dredging.

3.1.1.13 Terminal Regulating Reservoir

Water conveyed down the GCID Canal would be directed into the proposed TRR (Figure 3-5). A new pump station (the proposed TRR Pumping/Generating Plant) would then convey the water from the TRR via the proposed TRR Pipeline to the proposed Holthouse Reservoir. The TRR would be required to provide operational storage for the TRR Pumping/Generating Plant to balance normal and emergency flow variations between the upstream GCID Canal Pump Station, the 40 miles of connecting canal, and the TRR Pumping/Generating Plant.

The TRR would be constructed on the valley floor adjacent to the GCID Canal by a combination of excavation and embankment. The TRR would be located approximately three miles northeast of Holthouse Reservoir. The TRR would be composed of an earth embankment dam, concrete emergency overflow weir, an outfall standpipe, and an approximately 4,000-foot-long underground 60-inch-diameter outlet pipe to Funks Creek (the TRR to Funks Creek Pipeline). The outlet pipe would be used, as necessary, to drain the reservoir for operation and maintenance and emergency purposes. A15-foot-wide gravel road (the proposed TRR Pipeline Road) would be constructed on top of the embankment to provide access to the facility for operation and maintenance.

The embankment materials would be impervious earthen material compacted to DWR's DSOD standards. The 200-acre TRR would be approximately 15 feet deep with a maximum water depth of 12 feet, leaving three feet of freeboard. The maximum excavation depth of the TRR would be approximately nine feet, and the maximum embankment height would be approximately six feet above existing grade. The total storage volume in the TRR would be divided into three operational components: (1) two feet of dead storage beneath the lower operating limit of the pump station; (2) five feet of normal operational storage; and (3) five feet of emergency storage. The maximum water surface elevation in the TRR could not exceed the water surface elevation in the GCID Canal because it is a gravity flow system. The bottom dimensions of the TRR would be approximately 2,900 feet by 2,900 feet, and the reservoir would have a

maximum storage capacity of 2,000 acre-feet. The TRR capacity is designed to provide normal operating and emergency storage as well as a forebay for the proposed TRR Pumping/Generating Plant.

Major appurtenance features would include a GCID Canal transition bay, a connecting channel from the GCID Canal to the TRR, and a flow control inlet structure.

Construction. The total construction disturbance area would consist of approximately 300 acres. The proposed TRR site is currently in agricultural production (including rice crops, annual row crops, and orchards). The total construction disturbance area would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. This staging area could be the same as, or nearby, the GCID Canal Connection staging area because the construction sites are located adjacent to each other. In addition, the portion of the proposed Delevan Pipeline construction disturbance area that would abut the TRR could also be used for the TRR staging area.

Anticipated major construction activities include transportation of materials to the proposed work site, clearing and grading the construction work space, staging of construction materials, dewatering, constructing fencing around the perimeter, constructing lighting, and excavation and embankment construction.

Operation. In coordination with GCID Canal operation, water would be diverted to the proposed TRR by gravity. Flow into the TRR would be controlled by the TRR inlet control gates. An integrated SCADA and communication system would coordinate operation between the Main Pump Station, GCID Canal, and the proposed TRR, TRR Pumping/Generating Plant, and Holthouse Reservoir. Flow to Holthouse Reservoir and the water surface in the TRR would be regulated by the TRR Pumping/Generating Plant. TRR pump operators would require continuous communication with GCID Main Pump Station and canal operators to coordinate water allocation for both irrigation demands and proposed Sites Reservoir delivery. This coordination would be simpler in the mid-winter season when there is low irrigation demand and most of the flow in the GCID Canal would be conveyed to the TRR. Coordinating water allocation may be more complex during the early to late spring in years when water would be diverted to Sites Reservoir because of high river flows, and irrigation demands increase. TRR operation would likely be controlled remotely and would not require the presence of daily on-site personnel. The reservoir would be designed to allow emergency releases during operation first to the GCID Canal via the GCID Canal Connection to the TRR (when hydrologically feasible), and then to Funks Creek via the proposed TRR to Funks Creek Pipeline. Release flows would be controlled by an energy dissipater and small concrete structure at the terminal end of the pipeline.

Maintenance. Typical maintenance of the proposed TRR would include dredging to remove sediment when it is drained, clearing vegetation from the slopes of the embankments, and maintaining the gravel service road atop the embankment. Draining the TRR for maintenance would be accomplished by a standpipe and drain structure at the invert of the reservoir. Drained water would be conveyed to Funks Creek via the proposed TRR to Funks Creek Pipeline. Draining/dredging of the TRR is likely to be required every seven to 10 years depending on variable sediment transport conditions in the Sacramento River and the surrounding areas. Sediment removed during the dredging activities would be placed on the surrounding levees' embankments.

3.1.1.14 TRR Pumping/Generating Plant

The purpose of the proposed TRR Pumping/Generating Plant would be to pump water from the proposed TRR to the proposed TRR Pipeline, which would convey water to the proposed Holthouse Reservoir. Return flows from the proposed Holthouse Reservoir to the proposed TRR would flow through the TRR Pumping/Generating Plant to generate power.

The TRR Pumping/Generating Plant would pump 1,800 cfs of water from the TRR to Holthouse Reservoir. The TRR Pumping/Generating Plant would generate power from flows released through it with a maximum return flow of 1,500 cfs. The minimum water elevation in Holthouse Reservoir for operation of the TRR Pumping/Generating Plant would be 112 feet, and its maximum water elevation for operation would be 121.5 feet.

The TRR Pumping/Generating Plant would be located adjacent to the TRR on the north side (Figure 3-5), and would be approximately three miles northeast of Holthouse Reservoir. On the north side of the TRR, the TRR Pumping/Generating Plant would connect to the TRR Pipeline. The TRR Pumping/Generating Plant would consist of two 620 cfs and two 325 cfs Francis Vane pumps for pumping and two 750 cfs Kaplan turbines for generating during release flows.

Structures associated with the TRR Pumping/Generating Plant would include the following:

- Mechanical Features
  - 84-inch online Spherical Valve on each discharge line.
  - Air Chambers and Butterfly Valves with Hydraulic Power Units.
  - Compressors
  - Generators
  - Gantry Crane – 100 tons
  - Service air and water system
  - Acoustical flowmeter on each discharge line
- Electrical Features
  - Switchyard Transformers
  - Control system
  - Switchgears
  - Grounding grids
  - Control cabinets
- Refilling Pump Units

The discharge lines may periodically need to be dewatered for inspection and maintenance. These lines would need to be filled at a slow rate to allow the release of air through air and vacuum valves. To accomplish this, one or two 100 cfs pump units would be installed.

Construction. The total construction disturbance area would consist of approximately one acre, and would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, and access roads. The construction disturbance area would fall within the construction disturbance area of the proposed TRR Pipeline (discussed in Section 3.1.1.15).

Excavation would be conducted using temporary slopes of 1.5:1 for the 25 feet deep trench along the pipelines, and a temporary slope of 2:1 for the 40 feet deep foundation of the pump stations. The pump station foundations would be excavated in in-situ materials and no major improvements to the

foundations would be required. During construction, the topsoil material would be excavated, stockpiled separately, and replaced to ensure native grasses and plants would grow.

Anticipated ground-disturbing activities during construction include:

- Transportation of materials to the proposed Project site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Dewatering
- Excavating the forebay (approach channel) and pumping plant
- Construction of the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. An integrated SCADA and communication system would be used for the proposed TRR Pumping/Generating Plant. Flow to the proposed Holthouse Reservoir and the water surface in the proposed TRR would be regulated by the TRR Pumping/Generating Plant. TRR pump operators would require continuous communication with GCID Main Pump Station and canal operators to coordinate water allocation for both irrigation delivery and for proposed Sites Reservoir filling. This coordination would be simpler in the mid-winter season when most flows are conveyed only to the TRR for filling Sites Reservoir. Coordinating water allocation may be more complex during the early to late spring in years when water would be diverted to fill Sites Reservoir and delivered to meet irrigation demands.

Maintenance. Routine maintenance and monitoring would likely be required on a daily basis. Regular maintenance and inspection would have to be done for each pump unit and the related equipment, such as gates, valves, and electrical equipment, with possible additional inspections and maintenance needed after earthquakes or storm or flood events.

3.1.1.15 TRR Pipeline

The 3.5-mile-long proposed TRR Pipeline would convey water from the proposed TRR to the proposed Holthouse Reservoir (Figure 3-5). The TRR Pipeline would be bi-directional, allowing water to be pumped from the TRR to Holthouse Reservoir for storage, and allowing water to flow by gravity from Holthouse Reservoir for release to the TRR/GCID Canal. As water released from Holthouse Reservoir flows through the proposed TRR Pumping/Generating Plant at the end of the TRR Pipeline, it would pass through turbines to generate electricity.

The proposed TRR Pipeline would have a capacity of 1,800 cfs to convey water that is pumped from the TRR to Holthouse Reservoir. The capacity of the TRR Pipeline to convey water by gravity flow from Holthouse Reservoir to the TRR would be 1,500 cfs. The TRR Pipeline would consist of two 12-foot-diameter reinforced concrete pipes. It would be buried a minimum of 10 feet (to top of pipe) below the ground surface. Proposed facilities associated with the TRR Pipeline include blow-off structures and air valve structures.

The proposed alignment of the TRR Pipeline would cross the existing GCID Canal and a main Pacific Gas and Electric (PG&E) natural gas distribution line. At these locations, the bore and jack construction method would be used. Bore and jack construction would entail excavating a large pit on each side of the existing infrastructure (highway, railroad, or canal in this case) and then tunneling horizontally under the structure without disturbing it. Due to the high water table in the area, this construction method may require dewatering the area. All additional work required for bore and jack construction would be

conducted within the construction disturbance area and would not require the disturbance of additional land.

The TRR Pipeline would also cross the easement of the existing PG&E 230-kV line. No permanent aboveground structures associated with the pipeline, other than a 16-foot wide, 2.1 mile-long gravel maintenance road (the proposed TRR Pipeline Road) from the GCID Canal to the proposed Holthouse Reservoir Spillway and Stilling Basin, would be constructed.

Other existing infrastructure that the TRR Pipeline could potentially cross include: gas lines, water lines, sewer lines, and communications lines. The bore and jack construction method would be used at these utility crossings. Disruptions to these utilities would be minimized to the extent possible, and the ground surface would be restored to pre-construction conditions after installation of the TRR Pipeline. Construction activities for the proposed TRR Pipeline would occur within the identified construction disturbance area and would require only slightly more excavation than is required for the pipeline.

Construction. The construction disturbance area for the proposed TRR Pipeline would be approximately 335 feet wide from the TRR to the proposed Holthouse Reservoir (3.5 miles). The total construction disturbance area, which would also include a temporary concrete batch plant, would fall within the construction disturbance area for the proposed Delevan Pipeline discussed in Section 3.1.1.16.

Anticipated major construction activities include:

- Clearing and grading the construction workspace
- Stockpiling topsoil
- Placing necessary construction materials at staging areas
- Transportation of materials to the Project site
- Trenching/excavation of pipeline route
- De-watering
- Bedding preparation
- On-site fabrication of pipe
- Installation of pipe and valves
- Crossings of roads and utilities
- Backfill and compaction of trench
- Replacement of topsoil
- Revegetation and restoration of pipeline route
- Construction of a gravel maintenance road

Operations. Operation of the proposed TRR Pipeline would not require daily workers at the site.

Maintenance. Periodic inspection and maintenance of the proposed TRR Pipeline would likely occur once per year, with possible additional inspections and maintenance needed after storm or flood events. Permanent rights-of-way for the land overlying the pipeline would be maintained to provide future access. The proposed gravel maintenance road would be graded, as needed.

3.1.1.16 Delevan Pipeline

The approximately 13.5-mile-long proposed Delevan Pipeline would convey water from the Sacramento River to the proposed Holthouse Reservoir to fill the proposed Sites Reservoir, and/or convey water from Holthouse Reservoir to the Sacramento River for releases (Figure 3-1). The Delevan Pipeline would

parallel the proposed TRR Pipeline at its western end and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-5).

The Delevan Pipeline would have a 2,000 cfs capacity to convey water from the proposed Delevan Pipeline Intake Facilities (on the Sacramento River) to Holthouse Reservoir. The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. Because of the available head, releases through the Delevan Pipeline could be made to the river by gravity without the need for pumping. The Delevan Pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

From the Sacramento River, the Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would turn southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

Proposed facilities associated with the Delevan Pipeline include blow-off structures, air valve structures, and outlet and energy dissipater structure.

Alternatives A and C would include a bi-directional Delevan Pipeline; further details are provided in Section 3.1.4.4. Alternative B would include a release-only Delevan Pipeline; further details are provided in Section 3.1.5.3.

Construction. Construction information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

Operations. Operations information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

Maintenance. Maintenance information is provided in Section 3.1.4.4 for the proposed bi-directional Delevan Pipeline and Section 3.1.5.3 for the proposed release-only Delevan Pipeline.

3.1.1.17 Project Buffer

The proposed Project Buffer (Figure 3-1) would consist of the total amount of land that would be acquired for the proposed Project beyond the facility footprints, out to the nearest existing parcel boundaries. The proposed Project Buffer would surround the proposed Sites Reservoir, Holthouse Reservoir Complex, and all proposed facilities located between these two facilities; the proposed TRR and associated facilities; and the proposed Delevan Pipeline Intake/Discharge facilities[4]. Because the intent of the Project Buffer is to create a "buffer" around proposed Project facilities, while following existing parcel boundaries, the width of the buffer around proposed Project facilities would vary. The Project Buffer would serve several purposes:

- It would avoid splitting parcels and rendering parcel remnants unusable by existing landowners.
- It would provide a buffer between proposed Project facilities and adjacent existing land uses to avoid potential conflicts in land uses.
- It would prevent shoreline development around the proposed Sites Reservoir.

[4] The proposed Delevan Transmission Line, Delevan Pipeline, TRR Pipeline, and TRR Pipeline Road would not have an associated buffer. These proposed Project facilities would not require additional lands for long-term operation and maintenance. The Delevan and TRR pipelines would be underground features that would have periodic aboveground structures that include blow-off structures, air valve structures, and an outlet and energy dissipater structure. The TRR Pipeline Road would be located above the TRR Pipeline. The Delevan Transmission Line would result in aboveground development only at each transmission tower.

- It would prevent livestock access to the reservoirs, and prevent livestock wastes from entering the proposed reservoirs.

Construction. The lands within the proposed Project Buffer would remain undeveloped; the existing vegetation would be maintained as wildlife habitat and protected from fuelwood harvest, grazing, and other forms of environmental degradation. Existing structures would be demolished and the remaining land would be managed as wildlife habitat. Existing agricultural lands would not be maintained as agriculture but converted and managed as wildlife habitat.

The Project Buffer boundary would be fenced using standard three-strand barbed wire fences with posts, in areas where the parcels are not already fenced, so that the entire Project Buffer boundary would be fenced. A fuelbreak would be constructed around the perimeter of the Project Buffer.

Operations. Not applicable.

Maintenance. Maintenance activities that are proposed to be undertaken within the Project Buffer boundary include fence maintenance and periodic boundary fuelbreak maintenance.

3.1.2 Ecosystem Enhancement Actions

Ecosystem enhancement actions could be undertaken to support the increase fish survival NODOS Project objective. Based upon recommendations from federal and State fish agencies with regulatory authority over the project, Reclamation and DWR propose to provide two types of ecosystem enhancement actions: operational and nonoperational. Conceptually, the operational and non-operational actions might be most effective if implemented concurrently. The operational and nonoperational ecosystem enhancement actions are described in the following sections.

3.1.2.1 Ecosystem Enhancement Storage Account—Operational Actions

The proposed Project would provide a unique opportunity to create the first firm asset ecosystem enhancement storage account (EESA) in California managed by the State and/or the federal government and dedicated to restoration actions beyond regulatory requirements. As part of the CALFED Bay-Delta Program, the Ecosystem Restoration Program (ERP) developed an integrated systems approach based on reversing the fundamental causes of decline in fish and wildlife populations by recognizing the natural processes that created historic habitats and using these processes to help regenerate habitats. The ERP was not designed as mitigation for CALFED projects; instead, it was intended to fulfill the objectives of environmental stewardship and improving ecological processes and increasing the amount and quality of habitat, equal with other program goals related to water supply reliability, water quality, and levee system integrity.

The ERP identified over 600 programmatic actions to improve ecological health. The ERP advocated an adaptive management implementation strategy that supports the flexible use of environmental water. This adaptive approach has been accommodated in Project planning by dedicating proposed Project storage allocation to ERP objectives (an ERP pool or account), and then giving resource managers the ability to adjust priorities based on the monitoring of implemented actions, as well as potential new priorities. The NODOS Project planning team identified ERP objectives that could be supported by implementing a NODOS Project and prioritized actions with input from the Sacramento River Flow Regime Technical Advisory Group. This Technical Advisory Group included environmental advocacy groups, academics, and representatives from federal and California water resource and wildlife agencies (the Technical

Advisory Group is described in more detail in Chapter 36 Consultation and Coordination). The Technical Advisory Group met with the NODOS Project management team from 2002 through 2004. Ultimately, Reclamation and DWR adopted a list of objectives, including both tributary actions and Delta actions, which were incorporated into the proposed operations strategy for the NODOS Project action alternative plans:

- Improve the reliability of coldwater pool storage in Shasta Lake to increase Reclamation's operational flexibility to provide suitable water temperatures in the Sacramento River. This action would operationally translate into the increase of Shasta Lake storage levels in May, and increased coldwater pool in storage, with particular emphasis on Below Normal, Dry, and Critical water year types.
- Provide releases from Shasta Dam of appropriate water temperatures, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and lifestages of anadromous salmonids in the Sacramento River between Keswick Dam and RBDD, with particular emphasis on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types.
- Increase the availability of coldwater pool storage in Folsom Reservoir, by increasing May storage and coldwater pool storage, to allow Reclamation additional operational flexibility to provide suitable water temperatures in the lower American River. This action would utilize additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to maintain mean daily water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during all water year types.
- Stabilize flows in the lower American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce isolation events (specifically, flow increases to greater than or equal to 4,000 cfs with subsequent reduction to less than 4,000 cfs) of juvenile anadromous salmonids, particularly from October through June. Reduce the reliance upon Folsom Reservoir as a "real-time, first response facility" to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the lower American River.
- Provide supplemental Delta outflow during summer and fall months (i.e., May through December) to move X2 location westward, downstream of Collinsville (81 kilometers). X2 is the location of the 2 parts per thousand salinity contour (isohaline), one meter off the bottom of the estuary, as measured from the Golden Gate Bridge. The abundance of several estuarine species, such as delta smelt, longfin smelt, Sacramento splittail, and starry flounder has been correlated with X2 location. There is general consensus among the fisheries agencies that there is larger and higher quality habitat for delta smelt and other species when X2 location is west of the confluence of the Sacramento and San Joaquin rivers.
- Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain mean daily water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run

Chinook salmon spawning in the lower Feather River. Stabilize flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.

- Stabilize flows in the Sacramento River between Keswick Dam and the RBDD to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation lifestage periods extending from October through March), particularly during fall months.
- Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at RBDD (into the T-C Canal) and at Hamilton City (into the GCID Canal), and by providing supplemental flows (at the proposed Delevan Pipeline). This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*) by reducing entrainment, providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.

Conceptually, the EESA would use Project assets, including storage and conveyance, to support modified operations that facilitate habitat enhancement actions. Use of these assets would be limited to supporting ecosystem enhancement actions and could not be used for other Project benefits or non-Project benefits. The EESA is conceptually intended to allow some ability to adaptively manage the list of operational actions supported by the proposed Project. The priority of actions included in the proposed Project action alternatives may change over time. New priorities may arise. Project planners recommend that any changes to the proposed EESA operational actions be subject to a relatively high degree of consensus of a governance board that would be formed to manage the ecosystem enhancement actions. Planning studies, including environmental documentation and permitting, may be required and could be funded by the Ecosystem Enhancement Fund (discussed below) if a modification is supported by the governance board.

3.1.2.2 Ecosystem Enhancement Fund—Nonoperational Actions

The proposed Ecosystem Enhancement Fund (EEF) would be established as an endowment to provide long-term funding for aquatic habitat restoration actions on the Sacramento River and its tributaries that do not necessarily require additional water. Projects funded through the EEF would be in addition to any proposed Project mitigation or CVPIA or OCAP requirements. Projects eligible for EEF funding would include those that would directly benefit anadromous fish, with an emphasis on actions in the Sacramento River (e.g., spawning gravel augmentation; side channel, riparian, or floodplain restoration; and instream aquatic habitat construction downstream from Keswick Dam). Similar to the proposed EESA, the EEF has been included in each proposed Project action alternative. The monetary size of the EEF would be the same in each alternative.

Seed money in the amount of $30 million would be invested into an interest bearing account. Each year, 90 percent of the accrued interest would be allocated by fund managers for fisheries habitat enhancement projects, with an emphasis on projects for the Sacramento River. The remaining 10 percent of the accrued interest would be rolled back into the account to ensure the long-term viability of the funding source. The growth of the fund is intended to allow fund managers to make ongoing contributions to facilitate non-operational actions, as the cost to implement those actions increases over time.

A governance board may be formed to manage the fund, prioritize potential projects, and collaboratively determine funded actions, based upon habitat needs. The fund would support planning and implementation of priority non-operational actions. Planning includes environmental documentation and

permitting, as necessary. Projects funded by the EEF would be subject to environmental documentation and permitting separate from the proposed NODOS Project.

The EEF is currently in the conceptual stage, and is not an activity that may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, for which environmental review is yet required.

3.1.3 Reservoir Operations Common to all Action Alternatives

The operations evaluated in this environmental document represent an operational scenario designed to concurrently maximize achievement of the Project objectives of improving water supply reliability, increasing the survival of anadromous fish, improving Delta water quality, and providing flexible hydropower generation and minimize environmental impacts. One of the key components of the proposed operational scenario is the integration of new Project storage operations with operations of the existing CVP and SWP system and facilities. The integrated storage approach would facilitate a wider range of benefits. The foundational idea behind this approach is that operations of the existing system could be improved. Many of the needs associated with the existing operations strategy are directly related to storage. System storage is a primary driver for many operations decisions of the existing system, including delivery allocations, instream flows, and water quality requirements in the Delta. In addition, maintenance of the cold water pool in existing reservoirs is a storage target that has a certain reliability. The reliability of meeting these storage targets could be improved with new storage that is integrated; the reliability of existing reservoir storage targets could not be improved with new independent storage. Fundamentally, the system is more reliable when there is more water available in storage at any given time. More specifically, reliability could be improved for meeting ecosystem and water quality objectives, as well as for deliveries of agricultural, municipal and industrial, and environmental users. Through integrated operations of new Project storage, all three proposed Project action alternatives would be able to achieve the purpose of the Project and improve the ability to meet Project objectives.

The proposed operational scenario is reflected in the operations simulation modeling that is the primary planning tool to determine many of the proposed Project benefits and impacts. The ability of each proposed Project action alternative to implement the strategy effectively is subject to the proposed Project conveyance options included, the storage capacity of the proposed Sites Reservoir, and the coordinated operation of Sites Reservoir with other existing facilities.

The proposed operational scenario has three components: (1) operating criteria for diversion of flows from the Sacramento River to fill the proposed Sites Reservoir; (2) operating criteria to achieve benefits associated with the proposed Project primary objectives in specific year types (such as drought or driest periods) and other hydrologic conditions; and (3) integrating the operations[5] of Sites Reservoir with the SWP and CVP reservoirs, including Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake.

Each proposed Project action alternative would be operated to divert Sacramento River flows to maximize the filling of the proposed Sites Reservoir as long as those flows were not needed to meet (1) existing CVP and SWP and other water rights diversions, (2) existing regulatory requirements including SWRCB D-1641 (SWRCB, 1999), CVPIA 3406(b)(2), the 2008 USFWS BO (USFWS, 2008), and the 2009 NMFS BO (NMFS, 2009) and other instream flow requirements, and (3) flow conditions to minimize the

[5] For purposes of this discussion, integrated operations means that water from Sites Reservoir can be used, in some cases, as a substitute for water from these other reservoirs. The needs and uses of the CVP and SWP systems could be met from an additional source, Sites Reservoir, by integrating Sites Reservoir operations with those of the other reservoirs.

impact of diversion operations on achieving the primary objectives for anadromous fish survival and Delta water quality. A schedule of flow criteria for Sacramento River flows at Red Bluff, Hamilton City, Wilkins Slough, and Freeport were used to limit the impact of proposed Project diversion operations. An additional set of criteria was used to identify and restrict diversions during potential pulse flow conditions to protect out-migrating anadromous fish.

Each proposed Project action alternative would be operated to achieve benefits associated with the Project's primary objectives in specific year types, including drought (i.e. driest periods) and other hydrologic conditions. For purposes of proposed Sites Reservoir operations, drought conditions are defined as the sequence of years in which the Sacramento Valley water year type[6] in two consecutive years is Critical following Critical, Dry, or Above Normal; Dry following Critical or Dry; or Above Normal following Critical year types. In drought conditions, the priority operations were: (1) cold water pool conservation in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake; (2) regulation of Sacramento River summer flows for best use of cold water for control of temperature conditions adverse to anadromous fish; and (3) increasing Delta export and SWP allocations to improve water supply reliability to South-of-the-Delta municipal and industrial water users. During these drought conditions, the proposed Sites Reservoir stored water would be released into the system as rapidly as possible to meet these needs and achieve these three objectives.

In other hydrologic conditions (non-drought), approximately one third of the proposed Sites Reservoir stored water would be used to (1) manage and improve Delta water quality in the summer and fall at municipal and industrial intakes, (2) improve flows for Delta fisheries habitat based on the X2 location, and (3) stabilize Sacramento River fall flows for improving spawning and rearing success of anadromous fish. Water quality for municipal and industrial users would be improved both by improving Delta water quality at municipal and industrial intakes in non-drought conditions, as well as increasing Delta exports in drought conditions (TDS levels in exports from the Delta are often lower than other supplies, such as from the Colorado River, so there is a blending improvement by increasing deliveries from the Delta).

Each proposed Project action alternative would be operated to integrate and coordinate the proposed releases from Sites Reservoir with releases from Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. Often, and especially in drought (driest periods) hydrologic conditions, proposed releases from Sites Reservoir would allow releases from other reservoirs to be reduced while still meeting requirements for minimum instream flow objectives and Delta salinity control objectives. Through this reduction in releases, storage could be conserved in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake for other uses. This improvement in storage conditions throughout the system of reservoirs would add significantly to the operational flexibility and meet the Project's primary objectives of improving fish survival, Delta water quality, water supply reliability, and supporting renewable integration needs with hydropower in the most effective way possible.

With the increase in operational flexibility described above, recreation opportunities would also be increased. The secondary objectives would be met by accomplishing the Project's purpose and primary objectives.

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6 Sacramento Valley Water Year Type Classification (40-30-30 Index), defined by the State Water Resources Control Board in Water Right Decision 1641 (SWRCB, 1999), classifies Sacramento Valley water year types in five categories: Wet, Above Normal, Below Normal, Dry, and Critical. The classification is determined based on the sum of the unimpaired runoff of four rivers: Sacramento River upstream of Bend Bridge, near Red Bluff; Feather River inflow to Oroville Reservoir; Yuba River at Smartville; and American River inflow to Folsom Reservoir.

For actions associated with hydropower generation, the performance of the proposed Project action alternative would depend on seasonal decisions and the type of hydropower operation. There are three types of hydropower operations that could be supported by proposed Project facilities:

- Seasonal hydropower is determined by the normal water operations of the proposed Project. As the Project pumps or releases water for its normal operation, power would be consumed or generated by the hydropower facilities.
- Daily pump-back hydropower operation is determined by the leftover capacity in the proposed Sites Pumping/Generating Plant and Holthouse Reservoir. When those facilities have extra capacity, the proposed Sites Reservoir would release water through the Sites Pumping/Generating Plant into Holthouse Reservoir during on-peak electrical times to generate high revenue power. During off-peak times, the water would be pumped back into Sites Reservoir.
- Renewable integration hydropower is determined by the need to firm up other renewable power sources, such as wind and solar. The proposed Project could release water through the Sites Pumping/Generating Plant to generate power to firm up those power sources when those types of power sources produce less power. Similarly, power could be consumed by pumping water into Sites Reservoir from Holthouse Reservoir when renewable sources peak and the grid has a surplus of power that can be "saved" for later generation when the renewable peak has diminished.

Offstream hydropower is well suited to provide flexible hydropower generation. Flexible hydropower generation, provided by the proposed Project's offstream reservoirs, could be ramped up or down quickly to complement wind or solar generation to meet electrical demands and support reliable operation of the power grid. Hydropower could also reduce greenhouse gas emissions when paired with solar and wind energy. To ensure that the greenhouse gas emissions from construction activities are mitigated within the first 15 years of operation, the proposed Project would: (1) obtain at least 20 percent of the power used for pumping water from the Sacramento River and the proposed Holthouse Reservoir into the proposed Sites Reservoir from wind and/or solar energy, and (2) use at least 20 percent of the project's generated power and/or served pump load to provide integration services needed to firm up highly variable wind and/or solar generation. The 20 percent integration with wind and/or solar energy goal will be achieved with variable speed pumping-generating units installed at the proposed Project's pumping/generating plants.

A schedule of proposed operations is provided in Table 3-7. Table 3-7 shows which type of beneficiary operation relates to the drought (driest periods) and other hydrologic conditions, and what priority is assumed for each operation within each class of hydrologic conditions. The season in which the operation would occur is also described.

3.1.4 Alternative A—Proposed Facilities Unique to Alternative A

Alternative A would focus on meeting the proposed Project's primary objectives by constructing a 1.27-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion), and the proposed Delevan Pipeline (2,000-cfs diversion/1,500-cfs release), to convey water to and from the reservoir. Alternative A would use the common features described in Section 3.1.1, in addition to the features described below.

3.1.4.1 1.27-MAF Sites Reservoir Inundation Area

The smallest reservoir configuration considered for the action alternatives is 1.27 MAF (Figure 3-1). The proposed 1.27-MAF Sites Reservoir would have a maximum water surface elevation of 480 feet above mean sea level (msl) (the minimum operating water surface would be at elevation 340 feet), and an inundation area of approximately 12,400 acres. The inundation area of the 1.27-MAF Sites Reservoir would be created by filling Antelope Valley after the construction of nine dams. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, one saddle dam near Golden Gate dam, one saddle dam north of Golden Gate Dam, and five saddle dams on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (all dams are discussed further in Section 3.1.4.2).

Many areas within the proposed Sites Reservoir Inundation Area would be used for staging of materials and equipment prior to and during construction of the Sites Reservoir dams.

Construction. The total construction disturbance area would be approximately 13,440 acres, consisting of the proposed inundation area footprint and temporary construction-related disturbance area. Anticipated ground-disturbing activities during construction include:

- **Clearing and Grubbing.** Approximately 94 percent of the reservoir inundation area footprint is composed of annual grasslands; as a result, clearing and grubbing would not be needed in this area. The remaining six percent consists of blue oak woodland, agricultural crops, and other vegetation, which would be cleared.
- **Demolition of Existing Structures.** Twenty-two houses and four detached garages, one mobile home, 26 barns, and 37 other structures (combination of sheds, silos, and a pump house) within the Sites Reservoir Inundation Area would be demolished. Existing septic tanks and other storage tanks would also be removed. In addition, many miles of fencing and asphalt would be removed, erosion protection may be needed for prehistoric midden locations, and elderberry shrubs may need to be removed from their existing location and relocated.
- **Cemetery Relocation**. There are two private cemeteries that will need to be relocated.

Operations. The proposed Sites Reservoir is considered an offstream storage facility because the reservoir would receive very little natural runoff from its own 83-square mile watershed. Average annual natural inflow into the reservoir would be 15,000 acre-feet, which is near one percent of the 1.27-MAF reservoir storage capacity. The reservoir would be filled predominantly by diversions directly or indirectly from the Sacramento River using existing or new conveyances. Specific reservoir operations are discussed in Section 3.1.3.

Maintenance. Maintenance activities for the proposed Sites Reservoir Inundation Area may include law enforcement, garbage removal, and maintenance of signs, culverts, and buoys.

Table 3-7
Description of Proposed Seasonal Schedule for Project Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General Operation															
Conveyance	Diversions at Red Bluff (T-C Canal), at Hamilton City (GCID Canal) and at the proposed Delevan Pipeline (if included) could occur in any month. Diversions of excess Delta flows would only be allowed once SWRCB D-1641, CVPIA 3406(b)(2), 2008 USFWS BO and 2009 NMFS BO requirements were met and SWP Article 21 demands were satisfied, and other excess Delta flow diversions (e.g., Freeport Regional Water Project, Los Vaqueros Reservoir, cities of Fairfield, Vacaville, and Benicia) were satisfied. Diversions would be restricted by Sacramento River bypass criteria at Red Bluff, Hamilton City, Wilkins Slough, and Freeport, and restrictions associated with protecting fish outmigration related pulse flows (7 to 10 days once a month when flow conditions provide). Shading highlights the period in which diversion operations would occur, with the November through March season shaded the heaviest.	n/a	n/a												
Seasonal Storage Operation	Fill Sites Reservoir during excess flow events throughout the winter and spring and drain during peak release periods throughout the summer and fall. The months in which the high and low storage points would occur in the typical seasonal cycle are indicated.	n/a	n/a	Fill Cycle High Point			Drain Cycle Low Point							Fill Cycle	
Water Supply Operations															
SWP Contractors	Increase water supply reliability up to Table A contract amount in years when SWP delivery allocation is below 85 percent. Shading highlights period in which Delta exports would be increased. Table A represents the maximum annual contract amount of water delivery that SWP contractors can receive.	DP-1	BN, D, C												
Level 4 Water Supply for Wildlife Refuges	Determine Level 4 wildlife refuge water supply by replacement of purchases of north-of-the-Delta (3.35 TAF per year maximum) and south-of-the-Delta (101.09 TAF per year maximum) water to supplement refuges supplies up to Level 4 criteria (CVPIA). Shading highlights period in which transfer operations would occur.	AVG-3	AN,BN,D												
CVP Contractors	Determine CVP water supply reliability by reliability increase in any year when water supply availability limits allocations. There would be little effect if Delta export capacity is limiting allocations. Reliability increase would mostly affect agricultural service contractors. Shading highlights the typical agricultural diversion pattern.	AVG-4	AN,BN,D												
Water Quality Operation															
Delta Water Quality	Determine ability to improve water quality conditions at urban/municipal and industrial intakes by ability to augment Delta outflow. Operations would include Delta outflow augmented above base D1641 operations for up to six months with monthly rate varying within 750-cfs, 1,000-cfs and 1,500-cfs tiers; maximum of 450 TAF per period. Shading highlights period in which Delta outflow would be augmented.	AVG-1	AN,BN,D												
Hydropower Operation															
Flexible Hydropower Generation	Include dedicated pump/generation facilities with a dedicated afterbay/forebay of 6,500 acre-feet allowing more than 30 hours per week of uninterrupted operation and generation potential increases with increased head conditions and revenue increases with increased difference in prices between diurnal pumping and generation cycles.	n/a	ALL												
Ecosystem Enhancement Storage Account (EESA) Actions/Operation															
EESA-1: Shasta Coldwater Pool	Improve the reliability of coldwater pool storage in Shasta Lake to increase Reclamation's operational flexibility to provide suitable water temperatures in the Sacramento River. This action would operationally translate into the increase of Shasta Lake May storage levels, and increased coldwater pool in storage, with particular emphasis on Below Normal, Dry, and Critical water year types.	DP-1	BN, D, C												
EESA-2: Sacramento River Flows for Temperature Control	Provide releases from Shasta Dam of appropriate water temperatures, and subsequently from Keswick Dam, to maintain mean daily water temperatures year-round at levels suitable for all species and lifestages of anadromous salmonids in the Sacramento River between Keswick Dam and Red Bluff Diversion Dam, with particular emphasis on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types.	DP-2	BN, D, C												
EESA-3: Folsom Lake Cold Water Pool	Increase the availability of coldwater pool storage in Folsom Lake, by increasing May storage and coldwater pool storage, to allow Reclamation additional operational flexibility to provide suitable water temperatures in the lower American River. This action would use additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to maintain mean daily water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during all water year types.	DP-2	D, C												

Table 3-7
Description of Proposed Seasonal Schedule for Project Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]
EESA-4: Stabilize American River Flows	Stabilize flows in the lower American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce juvenile anadromous salmonids isolation events (specifically, flow increases to 4,000 cfs with subsequent reduction to < 4,000 cfs), particularly from October through June. Reduce the reliance upon Folsom Lake as a "real-time first response facility" to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the lower American River.	DP-2	ALL	
EESA-5: Delta Outflow for Delta Smelt Habitat Improvement (Summer/Fall)	Provide supplemental Delta outflow during summer and fall months (i.e., May through December) to improve X2 (if possible, west of Collinsville 81 km) and increase estuarine habitat, reduce entrainment, and improve food availability for anadromous fishes and other estuarine-dependent species (e.g., delta smelt, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*). Shading highlights period in which Delta outflow would be augmented (operation coordinated with Delta Water Quality action).	AVG-2	ALL	
EESA-6: Lake Oroville Coldwater Pool	Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain mean daily water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River. Stabilize flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.	DP-2	BN, D, C	
EESA-7: Stabilize Sacramento River Fall Flows	Stabilize flows in the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation lifestage periods extending from October through March), particularly during fall months. Avoid abrupt changes. Operations would be limited to not adversely impact coldwater pool operations in dry and critical years. Shading highlights period of greatest effect on stabilization or flows on a daily basis.	AVG-1	AN,BN,D	
EESA-8: Sacramento River Diversion Reduction at Red Bluff and Hamilton City	Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at Red Bluff Diversion Dam (into the T-C Canal) and at Hamilton City (into the GCID Canal), and by providing supplemental flows at the proposed Delevan Pipeline Intake/Discharge Facilities. This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*) by reducing entrainment, providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.	n/a	ALL	

[a]Priority of operation "DP" indicates that the operational priority has a driest period's emphasis and "AVG" indicates an average-to-wet hydrologic emphasis. The number 1-4 indicates priority within the associated hydrologic emphasis. "n/a" indicates that operations are not or cannot be easily defined within the priority structure of the scenario.

[b]Year type most suitable for operation is the D1641 40-30-30 year types that are reflected in operations studies; operations in these year types occur when supplies would be available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

[c]The heavier shaded parts of each bar highlight the months in which conditions would be most suitable to the operations; the lighter shaded parts of each bar highlight the months that would be less suitable to the operations; operations in these months would occur when supplies are available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

Notes:

AN = Above Normal
AVG = Average
BN = Below Normal
C = Critical
D = Dry
DP = Driest periods
GCID = Glenn-Colusa Irrigation District
NMFS = National Marine Fisheries Service
TAF = thousand acre-feet
T-C Canal = Tehama-Colusa Canal
USFWS = U.S. Fish and Wildlife Service

3.1.4.2 Dams for the 1.27-MAF Sites Reservoir

Nine dams would be needed to create the proposed 1.27-MAF Sites Reservoir (Figure 3-1): Golden Gate Dam, Sites Dam, one saddle dam near Golden Gate dam, one saddle dam north of Golden Gate Dam, and five saddle dams along the northern perimeter of the reservoir between the Funks Creek and Hunters Creek watersheds, near the Glenn-Colusa County line. The proposed Golden Gate Dam would be constructed on Funks Creek, approximately one mile west of the existing Funks Reservoir. The proposed Sites Dam would be constructed on Stone Corral Creek, approximately 0.25 mile east of the town of Sites and ten miles west of the town of Maxwell.

The Golden Gate Dam location was selected to optimize material quantities and construction costs with respect to the site topography. For the 1.27-MAF Sites Reservoir, the Golden Gate Dam would be located on the western edge of the ridges that form the east reservoir rim. This damsite is only suitable for reservoir elevations less than approximately 480 feet due to steep and narrow abutment ridges. Construction of an additional small Golden Gate saddle dam would be required. Due to the small size of this proposed saddle dam relative to the main Golden Gate Dam, the saddle dam materials and cost estimates have been included in the estimates for the main Golden Gate Dam.

The seven proposed saddle dams would be constructed as earthfill embankment dams, and are designed to be constructed primarily of on-site materials. Site topography, geology, seismicity, and foundation features were considered when selecting the dam alignments, design, and sections. The dam designs would conform to modern economic construction practices and incorporate conservative design measures. Table 3-8 lists the proposed height and length of the main and saddle dams, as well as the total volume of materials needed to construct the dam embankments.

Table 3-8
Characteristics of Proposed 1.27-MAF Sites Reservoir Dams for Alternative A

Dam	Maximum Height Above Base* (feet)	Crest Length (feet)	Total Embankment Volume (cubic yards)
Golden Gate Dam	270	2,250	5,987,000
Sites Dam	250	850	2,853,000
Saddle Dam No. 1	10	490	1,400
Saddle Dam No. 3	90	3,810	1,365,000
Saddle Dam No. 5	60	2,290	398,000
Saddle Dam No. 6	10	530	9,000
Saddle Dam No. 8a	65	2,990	390,000
Saddle Dam No. 8b	5	340	15,000
Golden Gate Saddle Dam	Included within Golden Gate Dam	Included within Golden Gate Dam	Included within Golden Gate Dam
Total			**11,018,400 cubic yards**

*Base is defined as ground surface elevation.

The crest elevation of all nine dams would be 500 feet, providing 20 feet of freeboard. Sites and Golden Gate dams would have crest widths of 30 feet and embankment slopes of 2.25:1 upstream and 2:1 downstream. The saddle dams would have crest widths of 20 feet and embankment slopes of 3:1 upstream and 2.5:1 downstream.

The nine dams would be constructed of compacted excavated materials (soil and rock). The four zones of the embankment dams are:

- **Zone 1:** Impervious core material comprised of low to medium plasticity clays, with lesser amounts of high plasticity clays and clayey sands.
- **Zone 2:** Filter, drain, and transition materials consisting of fresh rock processed to various sizes to meet filter compatibility and hydraulic conductivity requirements.
- **Zone 3:** Shell material consisting of processed clean rockfill up to 30-inch maximum particle size.
- **Zone 4:** Random material comprised of materials unsuitable for use as clean rockfill.

Material requirements for the Sites Reservoir dams constitute a major component of the overall proposed Project. A preliminary construction materials investigation identified and evaluated material sources for construction of the proposed dams. The construction materials investigation program examined materials available in or near the proposed Sites Reservoir, including alluvial deposits (recent and older alluvium), Venado sandstone of the Cortina Formation (fresh and weathered), and mudstone of the Boxer Formation. These material sources were investigated, tested, and evaluated to examine their suitability for use as the following types of construction materials:

- **Impervious core (Zone 1) –** A large amount of potential impervious material exists within or near the proposed Sites Reservoir area. Previous studies by Reclamation identified four main areas of alluvial deposits in the reservoir area encompassing roughly 36 million cubic yards of material. Additional impervious materials are located within required excavation areas for the appurtenant structures and the proposed Holthouse Reservoir Complex. These required excavation areas would be used to the maximum extent practicable. Additional quantities of impervious materials are located within the reservoir inundation area. The locations of these potential borrow areas are illustrated in Figure 3-7. The impervious materials are suitable for use in the proposed embankment dams, and are generally classified as low to medium plasticity clays, with lesser amounts of high plasticity clays, and clayey sand. If borrow areas inside the reservoir footprint prove inadequate, commercial sources would be used.
- **Filter, drain, and transition materials (Zone 2) –** Filter, drain, and transition materials for the proposed embankment dams would be imported from the closest off-site sand and gravel deposit, identified as an old channel on Stony Creek (between Orland and Willows), if additional testing of the Venado sandstone deposit (located within one mile of Golden Gate and Sites dam sites) indicates that it is not suitable. The Stony Creek deposit is approximately 30 to 35 miles from the Project area, and has an estimated material availability of 160 million cubic yards, which would exceed the Project construction requirement.
- **Rockfill and riprap (Zone 3) –** The best available source of clean rockfill material within the Project area is fresh Venado sandstone. Sandstone quarry areas have been identified within the reservoir inundation area and are presented in Figure 3-7. Sufficient quantities of fresh sandstone for rockfill material could be obtained from these quarries to construct the proposed embankment dams. It is possible that one centrally located quarry would be developed for Golden Gate and Sites dams instead of developing a quarry for each dam.

  Figure 3-7 also shows a proposed sandstone quarry location for construction of the saddle dams. The haul distance from this proposed quarry is approximately three to four miles from the saddle damsites. A

potential alternate source of rockfill and riprap material for construction of the saddle dams is a ridge of conglomerate located within the reservoir area near Saddle Dam 3 (Figure 3-7). This potential rockfill source offers a shorter haul distance to the saddle dams (one to two miles). Development of the Venado sandstone quarry would be required for construction of the saddle dams, unless further testing of the conglomerate determines that it is a suitable material.

- **Random fill (Zone 4) –** It is anticipated that two general types of random materials would be generated during construction, depending upon the source of the material. One type of random material would be comprised of predominately weathered sandstone from the Cortina Formation, and the other type would be predominately mudstone from the Boxer Formation. Mudstone from the Boxer Formation would tend to be "soil like" after excavation and compaction operations because it is a low strength rock and tends to break down when exposed to air and water. The weathered Cortina Formation tends to have more fine materials and have less well-graded rockfill.

  At the Sites and Golden Gate damsites, random embankment material would be comprised of materials unsuitable for use as clean[7] rockfill. It would consist of weathered sandstone, mudstone, and slopewash from excavations for the dam foundations, appurtenant structures, and rockfill quarries. Material from clearing and grubbing operations would not be used in any embankment structure. Random material generated during construction of these dams would have haul distances of less than one mile.

  Random material would be generated from the Boxer Formation during construction of the saddle dams and designated borrow areas. Random material borrow areas for construction of the saddle dams have not been identified, but would be located within the reservoir area with haul distances of less than one mile. Sufficient quantities are available for construction of the saddle dams. Although the Boxer Formation material would function more as an upstream and downstream shell zone in the saddle dams, the term *random* is used for this material zone to be consistent with the terminology used for the design of Sites and Golden Gate dams.

- **Concrete aggregate –** Crushed Venado sandstone and off-site sand and gravel deposits were examined as potential sources of concrete aggregate. Preliminary testing performed on crushed samples of Venado sandstone indicates that it marginally meets concrete aggregate suitability criteria. Verification of the suitability of the Venado sandstone for use as concrete aggregate would be the focus of future investigations. Potential commercial sources of concrete aggregate borrow areas located north of the Primary Study Area, between Willows and Orland, are identified on Figure 3-8. These borrow areas would be used unless the additional testing mentioned above indicates that the Venado sandstone is suitable for concrete aggregate.

For the 1.27-MAF Sites Reservoir, there would be a minimal dam at the Saddle Dam No. 6 site because the ground level of the saddle is approximately at elevation 500 feet, 20 feet above the reservoir maximum operating level. However, it is anticipated that a core trench backfilled with clay would be required across the saddle to control seepage when the water is at or above the maximum operating level. A proposed emergency spillway at the 1.27-MAF Sites Reservoir would be located at Saddle Dam No. 6. The purpose of the spillway would be to release excess water as the result of overpumping after a probable maximum flood[8] (PMF), and to prevent overtopping the dams. If the PMF were to occur when the reservoir was at the normal maximum pool elevation (elevation 480 feet), the water surface elevation

[7] Clean rockfill refers to rockfill that is free from foreign matter.

[8] The probable maximum flood is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that is reasonably possible in the drainage basin being studied.

would rise to 486.25 feet. The dam crest elevation is 500 feet. Therefore; the spillway would be required only in the event that water was still being pumped into the reservoir after the PMF had been stored (an unlikely occurrence). The spillway at this location would include an excavated entry channel, a pipe through the saddle (and core trench), and an energy dissipating structure at the downstream end of the pipeline. The spillway would consist of one seven-foot-diameter concrete pipe sized primarily to accommodate inspection and maintenance activities. The invert of the spillway inlet would be at elevation 486.25 feet, 6.25 feet above the normal maximum pool.

Construction. The total construction disturbance area for the nine proposed dams would be approximately 90 acres. The total construction disturbance area would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, borrow areas, and access roads. The construction disturbance area for the dams would be within the construction disturbance area for the proposed Sites Reservoir Inundation Area.

Anticipated ground-disturbing activities during construction include:

- Surveying
- Setting up staging areas within the Sites Reservoir footprint
- Constructing access roads
- Transporting equipment to the Project site and setting up offices and batch plants
- Clearing and grubbing
- Diverting streams
- Excavation and stockpiling activities
- Grouting of foundations
- Construction of dam embankments
- Installation of monitoring equipment
- Constructing roads and buildings for facility operation and maintenance
- Project area cleanup, removal of equipment, and area restoration

Some of these activities are discussed in greater detail below:

- **Funks Creek and Stone Corral Creek Diversion Construction.** Diversion of Funks and Stone Corral creeks during construction of the proposed Golden Gate and Sites dams, and for the proposed facilities downstream, is anticipated to be accomplished by passing storm flows through a buried corrugated metal pipe or concrete pipe around the two construction areas. A low coffer dam would provide a dead pool large enough to protect the damsites from seasonal stream flows. During construction of Golden Gate and Sites dams, small coffer dams upstream of each damsite would provide protection for an approximately 50-year probability storm. Diversion at the entrance to the inlet/outlet works tunnel would require a coffer dam to approximately elevation 310 feet. Coffer dam installation would involve driving interlocking corrugated sheet piles into the ground. Diversion pipe installation would involve excavation, if necessary, laying of the two pipelines, and backfilling and grading around the pipe, as necessary.

  The upstream random zone of Golden Gate and Sites dams functions as an upstream toe berm, provides a convenient place to put waste materials from foundation excavation work during the initial stages of construction, and would also be used to divert Funks and Stone Corral creeks from the dam footprint.

  Sites Dam and Golden Gate Dam would have low-level outlet works capable of releasing stream maintenance flows of up to 10 cfs from October through May into Stone Corral Creek and Funks Creek

after construction is completed to mimic the ephemeral nature of these streams. These low level outlet works would be incorporated as permanent facilities in the creek diversion systems installed at both damsites to pass winter storm runoff through the construction sites.

- **Obtaining and Stockpiling Borrow Materials.** To expedite dam construction, rockfill, drain, filter materials, and concrete aggregate would be excavated, processed, and stockpiled one year prior to the start of construction. Materials would be stockpiled near rock-processing plants that would be constructed for the proposed Project. It is anticipated that at least one rock-processing plant would be located within the reservoir footprint to service the impervious material borrow areas and the sandstone quarries.

  The rock-processing operation would consist of rock crushers to produce required sizes, shakers and screens to sort material sizes, and conveyor belts to transport sorted material to stockpiles.

  Stockpiled materials would be loaded by bulldozers, loaders, and possibly conveyors into large dump trucks and transported to the dam construction sites.

  Material excavation, processing, and stockpiling are anticipated to occur throughout the dam construction period.

- **Foundation Excavation.** Recent and older alluvium and decomposed and intensely weathered bedrock would be excavated from the entire footprint of the damsites to obtain a moderately weathered bedrock surface. In addition, moderately weathered bedrock would be excavated from the impervious core footprint down to the top of slightly weathered and/or fresh bedrock surface. Additional shaping of the foundations would be done to meet requirements that: (1) no excavation slopes should be steeper than 1:1 and (2) the core foundation should be approximately level in sections transverse to the dam alignment. To meet the second shaping requirement, a maximum transverse slope of 6:1 was adopted for the core foundation. Excavation depths would average approximately 20 feet. Excavation would be performed by the use of heavy equipment, but may require some blasting in the harder sandstone.

- **Foundation Treatment Grouting.** The foundation grouting for the proposed Golden Gate and Sites dams would consist of a two-row grout curtain, with one row of consolidation holes upstream and one row downstream of the curtain holes. The rows would parallel the dam centerline and would be spaced 10 feet apart. In addition, a 40-foot-wide by three-foot-thick grout cap was included in the design to prevent grout surface leakage during grouting of the upper stage. Foundation grouting for the proposed saddle dams would consist of a two-row vertical grout curtain spaced 10 feet apart parallel to the dam centerline. The saddle dam foundation grouting would also include a 20-foot-wide by three-foot-thick grout cap to prevent surface leakage of grout during grouting of the upper stage. Each row of consolidation and curtain grout holes for all dams would consist of mandatory primary and secondary holes spaced at 10 foot centers. Figures 3-9, 3-10, 3-11, and 3-12 show typical grouting at the proposed Golden Gate Dam, Sites Dam, and the saddle dams.

  The grout curtains would be constructed by drilling vertical holes into the bedrock and filling the holes with grout pumped in under pressure.

- **Dam Embankment Construction.** All proposed dams comprising the proposed Sites Reservoir would be constructed as zoned earth rockfill embankment dams, and would be constructed of four types of fill materials. The impervious core materials (finer material known as Zone 1), Zone 3

materials (rockfill and riprap), and Zone 4 materials (random materials) would be hauled in large dump trucks from the borrow sites that would be located within the reservoir footprint, spread by graders or bulldozers, moisture-conditioned with water trucks, and compacted with sheepsfoot rollers or compactors. Zone 2 materials (filter, drain, and transition materials) would be hauled in large dump trucks from commercial sources along the Stony Creek fan.

- **Monitoring Equipment Installation.** Monitoring equipment would be permanently installed at each proposed damsite including strong motion detectors and water pressure monitors.

Operations. Once the proposed dams are constructed and Sites Reservoir is filled, there would be few dam operations required other than release of water from the reservoir during normal or emergency operations.

Maintenance. Typical ongoing dam maintenance would consist of equipment, foundation, and embankment inspections and repairs. Debris and vegetation removal from the embankments and along the roads would be required. In addition, ongoing movement and seepage monitoring would be necessary. Dam security and/or law enforcement staff would patrol the proposed dams and other proposed Project features. Additional security measures may include fences to prevent automobiles and pedestrians from accessing the dams and other Project features, booms to prevent boats from approaching the dams, security gates, 24-hour security patrols, and security cameras.

3.1.4.3 Delevan Pipeline Intake Facilities

The proposed Delevan Pipeline Intake Facilities are a system of structures designed to divert water from the Sacramento River to the proposed Holthouse Reservoir for storage in the proposed Sites Reservoir. The facilities would also minimize harm to fish, safely release water from Sites Reservoir to the Sacramento River, and generate electricity when water is released from Holthouse Reservoir through the proposed Delevan Pipeline to the Sacramento River.

The proposed Delevan Pipeline Intake Facilities would be located on the Sacramento River at River Mile 158.5 in Colusa County (Figure 3-13A). The river intake/outlet would be located immediately downstream of the existing Maxwell Irrigation District intake and across the river from Moulton Weir, approximately 10 miles northeast of the town of Maxwell (Figure 3-13B). The total footprint of the site would be approximately 19 acres including the pumping plant buildings, fish screen, forebay, and afterbay.

Water that passes through the fish screen would be pumped up approximately 150 feet vertically through two 12-foot-diameter concrete pipes to Holthouse Reservoir. Water would also be able to flow back from Holthouse Reservoir, by gravity, to the Sacramento River. Reverse flow water would flow through the turbines to generate electricity. The water would then flow through the forebay and fish screen at a velocity of one foot per second into the Sacramento River. The one fps exit velocity is based on NMFS criteria for adult salmon diffusers to allow the water to exit the screen without extending a false attraction flow to the salmon.

The proposed pumping capacity of the Delevan Pipeline Intake Facilities would be 2,000 cfs when diverting water from the Sacramento River, and 1,500 cfs when releasing water to the Sacramento River (and generating electricity). Total lift capacity of the facility would be approximately 150 feet.

The proposed facilities at this site would include:

- **Flat plate fish screen structure –** The purpose of the fish screen structure would be to exclude fish that are present in the Sacramento River from the water that is being diverted into the pump station. The fish screen would also function as an outlet structure, dissipating the energy of the water being released to the river.

  The fish screen structure would consist of 32 13-feet-tall by 15-feet-wide flat plate screens. The structure would be approximately 560 feet long (the distance created by the 32 screens bays, the additional two blowout bays, and room for the screen cleaning equipment). Panels would be positioned with minimum protrusion into the river channel parallel to river flow. This facility has been designed in compliance with NOAA Fisheries and CDFW fish screen criteria.

- **Forebay, levee tubes, and afterbay –** After water passes through the fish screen it would flow into a 1.3-acre forebay. The forebay would allow fine sediment that is carried in the water to settle out. Water then travels through the levee tubes to pass under the existing Sacramento River levee and into the afterbay. The afterbay is a 2.3-acre concrete lined bay that would store water before it is pumped out by the pumping/generating plant.

  The levee tubes are a means to transfer water from the river through the levee to the pumping/generating plant afterbay. As the water enters the tubes, it would pass through a trash rack and sluice gate. It then would travel through 10 nine-foot-diameter pipes and exit through a trash rack into the afterbay. The tubes would handle a maximum flow of 2,000 cfs and maintain a velocity no greater than three fps during operation. The velocity through the pipes would allow for sediment to pass through without settling, and it would also minimize turbulence. The levee tubes' design would maintain a maximum velocity of three fps at 2,000 cfs during pumping intake and 2.3 fps at 1,500 cfs during discharge.

  A Sediment Spoil Area would be provided on the northeastern end of the afterbay for sediment removal. To remove sediment, a long arm excavator would be required in combination with a suction dredge or a clamshell. The suction dredge or clamshell would be used to remove the additional sediment in the area where the excavator could not reach. The sediment would ultimately be placed on the adjacent levee.

- **Pumping/generating plant –** The Delevan Pipeline Intake Facilities would pump water from the afterbay to Holthouse Reservoir and would also function to release water from Holthouse Reservoir. The Delevan Pipeline Intake Facilities building would be approximately 250 feet long by 80 feet wide and would have multiple stories to accommodate mechanical and electrical equipment. The pumping/generating plant would consist of four 600-cfs pumping/generating units (plus one standby unit) to provide a total pumping capacity of 2,000 cfs. Water would be pumped by the pumping/generating plant 150 feet up over 13.5 miles through the Delevan Pipeline. When water is released from Sites Reservoir and through Holthouse Reservoir, the intake facilities would function in reverse, capturing the energy and generating electricity. Release flows of up to 1,500 cfs could be passed through the pumping/generating plant.

- **Switchyard –** An electrical switchyard would be required adjacent to the pumping/generating plant that would step down the electrical voltage from high voltage lines to a lower voltage that can be used by the pumps and other machinery in the plant. A four breaker ring bus would be required at the switchyard. The ring bus would have multiple metallic poles with heights varying between 15 feet tall and 60 feet tall. The switchyard would be surrounded by a six to eight-foot-high chain link fence with barb or serpentine wire along the top.

- **Maintenance and electrical buildings –** Mechanical control and electrical buildings would also be constructed on the site to house mechanical and electrical equipment needed for the operation of the pumping/generating plant. The mechanical and electrical buildings would be approximately 5,000 square feet each. Facilities would be sited and designed such that electrical equipment would be sealed or placed at an elevation above the 100-year flood stage plus two feet of freeboard (elevation 82 feet).

- **Access Road –** A new on/off ramp from/to State Route 45 (SR 45) would be constructed to provide access to the pumping/generating plant. The width of the access road would be approximately 40 feet. The road would lead to both the pumping/generating plant building and flood gates.

- **Other Mechanical & Electrical Features –** Other miscellaneous features that may be included:
  - Spherical Valves
  - Air Chambers and Butterfly Valves
  - Compressors, Generators, Cranes
  - Service Air and Water Systems
  - Acoustical Flowmeters
  - Governors
  - Transformers
  - Switchgears
  - Grounding Grids
  - Controls Cabinets

The proposed Delevan Pipeline Intake Facilities site would be protected from flood conditions by constructing all of the mechanical and electrical equipment above the 100-year flood elevation (82 feet above msl). Although the forebay and afterbay would be submerged during extreme flood events, they would be designed to withstand these conditions. The site naturally slopes upward away from the river, and a flood protection levee with a height of 90 feet msl exists along the river approximately 275 feet west of the river. A wide berm or ring levee would be constructed behind the flood protection levee to provide additional protection for the equipment and facilities. The berm would encircle the afterbay, and the Delevan Pipeline Intake Facilities would be constructed on top of the berm, as would the mechanical and electrical buildings.

Construction. The total construction disturbance area would be approximately 19 acres. An additional disturbance area around the construction site would be required for staging of materials, equipment, and construction offices. This area is within the construction disturbance area for the proposed Delevan Pipeline. The staging area is estimated to be 1,700 feet by 1,000 feet (a total of 40 acres) located to the north of and adjacent to the facility site.

To isolate the proposed construction area from the Sacramento River, a cellular sheet pile coffer dam would be installed in the river near the location of the fish screen. Approximately 1,200 feet of sheet piles would be required to build the cofferdam. From the river bank at the upstream and downstream ends of the fish screen structure, the cofferdam would extend approximately 40 feet into the water from the river bank. Installation of the coffer dam would involve driving interlocking metal sheet piles into the ground one section after another until the entire length of the intake structure is isolated from the river. The height of the coffer dam would match the height of the surrounding levees. The coffer dam is likely to remain in place throughout the duration of facility construction. The area behind the coffer dam would be

dewatered prior to construction by pumping water out from behind the coffer dam. After construction of the pump station is complete, the coffer dam would be removed by pulling the sheet piles out of the river.

Anticipated major construction activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing necessary construction materials at staging areas
- Construction of a coffer dam within the Sacramento River
- De-watering the work area within the river
- Excavation of the forebay and pumping plant site
- Construction of electrical switchyard
- Construction of the berm/ring levee
- Construction of the pump house and pump bays
- Construction of the forebay structure
- Construction of the fish screens
- Removal of the coffer dam
- Fill and re-grading where needed at site
- Restoration of disturbed areas following the completion of construction

Construction of the proposed Delevan Pipeline Intake Facilities would require relocation of sections of the Maxwell Irrigation District and Tuttle Ranch pipelines that are located within the construction disturbance area. To minimize impacts to the operations of the Maxwell Irrigation District facilities during construction, either a temporary bypass pipeline would be constructed to provide water to Maxwell Irrigation District users, or arrangements will be made for supplemental water to be conveyed into the Colusa Basin Drain (CBD) for the Maxwell Irrigation District to pick up for delivery to its users. A temporary bypass pipeline would be constructed to provide water to Tuttle Ranch to irrigate its orchards.

Operations. Proposed diversion operations would be such that a minimum of 4,000 cfs would remain in the river channel immediately downstream of the diversion point. The assumed associated minimum water surface elevation at this design condition is 51 feet. The invert of the screen structure is set at 38 feet, four feet above the invert of the river, to reduce sediment deposition in front of the screen panels.

- **Intake Mode**: The Intake Mode is when water would be pumped from the Sacramento River to the proposed Sites Reservoir when the largest flows and velocities occur. Flow of water would move through the fish screen into the forebay, through the levee tubes, into the afterbay, through the proposed Delevan Pipeline to the proposed Holthouse Reservoir, and then to Sites Reservoir. During this operation, the screen cleaning mechanism would be working continuously to prevent buildup on the screen panels, the sediment removal system would be operating, the pumps would be operating, and the SCADA system would be monitoring water levels and pressures across the screen.

- **Discharge Mode:** The Discharge Mode is when water from Sites Reservoir would flow back through the pumping plant and into Holthouse Reservoir to generate electricity, is released into Delevan Pipeline and discharged into the afterbay, through the levee tubes, and into the forebay, and then released through the fish screen into the Sacramento River. During this operation, the fish screen cleaning mechanism would not need to operate because it would be located on the river side of the fish screen, the sediment removal system would remain in operation, and the SCADA system would be monitoring water levels and pressures across the screen.

- **Emergency Mode:** When the diversion would operate in intake or discharge mode and a pressure differential greater than 1.5 feet across the fish screen occurs, Emergency Mode would be activated. The pumps would stop operating, and the sluice gates would close to allow the forebay to fill up to match the water surface of the Sacramento River. If the pressure differential grows to above three feet, then the two blowout panels would trigger and release to allow an inflow of river water to allow the water levels to equalize. Additionally, if the river is at a very high water level and the pumps need to turn off, the sluice gates should close at the same rate that the pumps power down to prevent flooding of the afterbay.

A SCADA system would control all of the different operational modes. The system would be located on-site, and would broadcast status information to a manned remote location. The SCADA system provides a means to control the diversion without staffing the on-site facility.

A sediment removal system would be installed within the fish screen bays, moving sediment back into the river channel or into the forebay. Sediment that has settled out into the forebay would be removed mechanically to maintain optimal operational hydraulics. This would likely be an annual operation.

Maintenance. The proposed Delevan Pipeline Intake Facilities would likely be staffed daily to maintain, operate, and monitor the facility. It is anticipated that employees would be on-site during diversion (predominantly in winter) and release (predominantly in summer) activities.

3.1.4.4 Delevan Pipeline – 2,000-cfs Diversion/1,500-cfs Release

The approximately 13.5-mile-long proposed Delevan Pipeline would convey water from the Sacramento River to the proposed Holthouse Reservoir to fill the proposed Sites Reservoir, and would also convey water from Holthouse Reservoir to the Sacramento River for releases (Figure 3-1). The portion of the Delevan Pipeline that would be located to the west of the proposed TRR would parallel the proposed TRR Pipeline from the TRR to Holthouse Reservoir, and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-6).

The Delevan Pipeline would be bi-directional, allowing water to be pumped from the Sacramento River to Holthouse Reservoir for storage, and allowing water to flow by gravity from Holthouse Reservoir for release to the Sacramento River. As water released from Holthouse Reservoir flows through the pump station at the eastern end of the pipeline, it would pass through turbines to generate electricity.

The Delevan Pipeline would have a 2,000 cfs capacity to convey water from the proposed Delevan Pipeline Intake Facilities to Holthouse Reservoir. The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. The Delevan Pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

The Delevan Pipeline would begin at the Delevan Pipeline Intake Facilities near the Sacramento River. The Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would be aligned southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

Proposed facilities associated with the Delevan Pipeline include blow-off structures, air valve structures, and an outlet and energy dissipater structure. Blowoff structures would be provided to clean low points in the pipeline and allow dewatering. Blowoff valves would release water from the pipeline. These valves are located at major water conveyances so that water can be drained directly into the river or canal and carried downstream. Air and vacuum valves would be required to evacuate air within the pipeline during

filling, and supply air during normal dewatering, as well as to release accumulated air. Manholes would be used to access the pipeline for future maintenance or inspections. Aboveground features associated with the Delevan Pipeline are listed in Table 3-9.

Table 3-9
Aboveground Features Associated with the Proposed Delevan Pipeline

Aboveground Feature	Height Above Ground	Color	Appearance	Feature Locations
Manhole and Air Valve	4 feet Maximum, 108 inches Diameter	Gray	Concrete Box	At high points and at a minimum of every 2,500 feet along the pipeline
Manhole and Blowoff Valve	1 foot Maximum, 108 inches Diameter	Gray	Concrete Box	At low points and at the Sacramento River and the GCID Canal Crossing

The proposed alignment of the Delevan Pipeline would require five major crossings (SR 45, SR 99, Interstate-5 (I-5), Union Pacific Railroad, and the GCID Canal). The proposed pipeline route would also cross the easements of the existing PG&E 230-kV electrical transmission line and a major PG&E natural gas pipeline. No permanent aboveground structures, other than a gravel maintenance road (TRR Pipeline Road), would be constructed where the electric utility easements and the pipeline easements would intersect. Other existing infrastructure that the pipeline could potentially cross include: gas lines, water lines, sewer lines, communications lines, and other infrastructure. These major crossings would be accomplished with jack and bore construction.

In addition, the Delevan Pipeline would cross the CBD. The crossing location would be at the northern end of the drain. Construction of this crossing would likely occur during late fall, after the irrigation season ends and before winter rains begin. Portions of the CBD would likely be dewatered so that the pipeline trench could be excavated and the pipeline could be installed. Construction would be staged at this crossing and would occur within one half of the channel while an installed coffer dam bypasses flows on the other half of the channel. After installation, the CBD would be returned to service and would be reconstructed to pre-Project conditions.

Construction. The construction disturbance area of the proposed Delevan Pipeline would be approximately 2,500 acres. The construction disturbance area would include a temporary concrete batch plant (the same plant as used for the proposed TRR Pipeline).

Construction of the Delevan Pipeline would likely be done in three independent and concurrent sections. Two of the sections would likely begin from the same point and move in opposite directions. As pipelines are installed and tested, the trench would be backfilled to minimize the amount of open trenching.

The construction disturbance area for the Delevan Pipeline would be a linear area 13.5 miles long and approximately 300 feet wide from the Sacramento River to the proposed TRR (10 miles) and approximately 335 feet wide from the TRR to the proposed Holthouse Reservoir (3.5 miles). The additional width of the construction disturbance area would be needed to accommodate the additional TRR Pipeline from the TRR to Holthouse Reservoir. An additional construction disturbance area of 20 acres would be required for a concrete batch plant. Construction disturbance area boundaries would be marked with tape, flagging, or fencing. The construction disturbance area would pass through multiple areas close to residences, and would intersect with several roads. The entire Delevan Pipeline construction disturbance area would not be fenced. In high visibility areas or where the construction site requires a

higher degree of protection for security or safety, a six-foot-high chain link fence would be installed around the work site.

- **Trenching/Excavation of Pipeline Route –** Approximately 6.3 million cubic yards of material would be excavated for the Delevan Pipeline trench. Topsoil would be stockpiled separately from other excavated materials. Trench excavation would be approximately 23 feet deep. For the portion of the Delevan Pipeline that would be installed between the Sacramento River and the TRR, the trench would be approximately 120 feet wide. A total of two 12-foot-diameter pipelines would be installed from the Sacramento River to the TRR. Trench excavation for the 3.5 miles from the TRR to Holthouse Reservoir would be approximately 165 feet wide to accommodate both the Delevan and TRR pipelines. A total of four 12-foot-diameter pipes would be installed from the TRR to Holthouse Reservoir. Trench side slopes would be approximately 1:1.5. No shoring would be installed under normal excavation conditions. Special conditions at some locations (unknown at this time) may require additional depth or width, or steeper or flatter side slopes, or shoring to accommodate localized soil conditions.

  The Delevan Pipeline trench would be excavated using trenchers and tracked and/ or wheeled excavators and backhoes, or pushed up using bulldozers. The type of soils encountered would determine the type of equipment used for trenching. Harder soils, such as caliche, would require larger trenchers. In specific areas, vacuum excavation, "pot-holing" with a backhoe or hand digging may be necessary to locate buried utilities.

  Excavation activities similar to the Delevan Pipeline excavation would also be done for electrical transmission pole footings that would be installed within the pipeline right-of-way. These activities would occur simultaneously with the pipeline excavation.

- **Dewatering –** Dewatering of the trench would be necessary in many locations and could be permitted to discharge into local irrigation ditches and drainage canals and/or the CBD after settling of silts. Silts would be disposed of with excavated material. Dewatering would be in accordance with CVRWQCB requirements and California Storm Water Quality Association BMPs for dewatering.

- **Bedding Preparation –** One foot of bedding material would be installed in the trench before installation of the pipeline. Bedding material would likely be sand, consolidated backfill, or cemented controlled density fill. The bedding material would be poured into the trench by dump truck, and spread along the bottom of the trench by a small grader or similar type of equipment.

- **On-Site Fabrication of Pipes –** All pipes would be fabricated on-site at the concrete batch plant. A fabrication and curing area for the pipes would be located within the 20-acre batch plant footprint. Pipes would be fabricated on-site from straight lengths of reinforcing steel.

- **Installation of Pipe and Valves –** The finished sections of the pipes would be transported from the concrete batch plant to the installation location primarily along the pipeline route on flatbed trucks traveling along the construction access roadway (within the construction disturbance area). These trucks would cross public roadways. Pipe sections would be offloaded from flatbed trucks and placed in the excavated pipeline trench by a 50-ton capacity crane. Once in place, the metal joining plates cast into the end of each pipe would be welded together and the joint would be covered with a cement-based sealing compound. At valve locations, pre-fabricated valves would be delivered to the site on flatbed trucks and installed into previously constructed structures within the trench using the same crane.

- **Backfill of Trench –** Approximately five million cubic yards of material would be needed to backfill the trench after the pipes are installed. Excavated material would be re-used to backfill the trench or moved to other Project locations for use, to the extent possible, after placement of pipes. Excess spoils from the excavation (estimated 1.3 million cubic yards) would be spread on adjacent agricultural lands of willing landowners within the 800-yard-wide corridor along the pipeline, used as backfill at the proposed Delevan Pipeline Intake Facilities, or placed in the proposed Sites Reservoir footprint. Excess spoils may also be used to reinforce existing levees in the area as part of a separate program, which would be subject to a separate environmental analysis. Re-use of excavated material may be limited by water content of excavated material and soil compaction requirements.

Operations. Operation of the proposed Delevan Pipeline would not require daily workers at the site.

Maintenance. Periodic inspection and maintenance of the proposed Delevan Pipleine would likely occur once per year, typically in the months of April and May, with possible additional inspections and maintenance needed after earthquakes or storm or flood events. Permanent rights-of-way for the land overlying the pipeline would be maintained to guarantee future access. Disturbed lands would be returned to agricultural production after pipeline construction.

3.1.4.5 Sites Pumping/Generating Plant (5,900-cfs)

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill the reservoir and to generate electricity during the release of water from Sites Reservoir to the Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The Sites Pumping/Generating Plant would have a total pumping capacity of 5,926 cfs and a release capacity of 5,100 cfs. Table 3-10 summarizes the pump and pump/turbine configuration for the 5,900-cfs Plant.

Table 3-10
Proposed Sites Pumping-Generating Plant Configuration for Alternative A

Unit Type	Number of Units	Net Head (ft)	Pumping Capacity (cfs)	Generating Capacity (cfs)	Total Pumping Capacity (cfs)	Total Generating Capacity (cfs)
Pump - Francis Vane (Dual Speed)	2 (+1 standby)	290	870	-	5,926	5,100
		162	870	-		
Pump - Francis Vane (Dual Speed)	2	290	435	-		
		162	435	-		
Pump/Turbine - Reversible Francis (Dual Speed)	4 (+1 standby)	290/270	663	1020		
		162/142	663	1020		
Pump/Turbine - Reversible Francis (Dual Speed)	2	290/270	332	510		
		162/142	332	510		

The Sites Pumping/Generating Plant has been designed as a conventional indoor-type pumping plant. The design includes an in-line arrangement of vertical pumping units with a reinforced concrete substructure and a steel superstructure. The size of each unit bay was determined based on the minimum required

spacing between each unit. Two service bays have been incorporated on either side of the Sites Pumping/Generating Plant and have been sized to allow for two units to be serviced simultaneously while the remainder of the Sites Pumping/Generating Plant continues operation.

The pumps would be connected to a complex intake/outflow manifold. When water is drawn out of Holthouse Reservoir and pumped up to Sites Reservoir, the pumped water would flow through successive pipe connections until all eleven pipes coming from the pump units combine into a single 26-foot-diameter pipe. This pipe would then join the 26-foot-diameter pipe coming from the emergency bypass outlet, and the two pipes would connect to the 30-foot-diameter tunnel.

Additional proposed on-site facilities related to the Sites Pumping/Generating Plant include:

- Approach channel
- Pressure tunnel
- Emergency release bypass outlet
- Electrical switchyard
- Maintenance buildings
- Electrical connection
- Access roads

The Sites Pumping/Generating Plant would be connected to Holthouse Reservoir by an approximately 8,300 foot-long earthen approach channel (discussed in Section 3.1.1.9). On the other side of the Sites Pumping/Generating Plant, connecting the channel to Sites Reservoir, would be a 4,031-foot long, 30-foot-diameter tunnel (the tunnel is discussed in Section 3.1.1.6).An electrical switchyard (Sites Electrical Switchyard) would be required adjacent to the Sites Pumping/Generating Plant that would step down the electrical voltage from high voltage lines to a lower voltage that could be used by the pumps and other machinery in the plant.

Construction. The total site footprint of the proposed Sites Pumping/Generating Plant and approach channel would be approximately 75 acres. An additional 20 acres of land adjacent to the plant would likely be disrupted during construction.

Anticipated ground-disturbing activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Excavating the approach channel and pumping plant
- Dewatering
- Constructing the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. A SCADA system would control all of the different proposed operational modes. The system would be located on-site and would broadcast status information to a manned remote location. Plant operators would require continuous communication with the TRR Pumping/Generating Plant, Delevan Pipeline Intake Facilities, and T-C Canal operators to coordinate flows into and out of the proposed Holthouse Reservoir and Sites Reservoir for filling and releasing.

Maintenance. Routine maintenance and monitoring of the proposed Sites Pumping/Generating Plant would likely be required on a daily basis. Regular maintenance and inspection would have to be done for

each pump unit and the related equipment, such as gates, valves, and electrical equipment. The Sites Pumping/Generating Plant would be equipped with cranes to facilitate operation and maintenance. There would be a 100-ton capacity indoor bridge crane for assembly and maintenance of pumping/generating units and associated equipment. A 50-ton capacity outdoor traveling gantry crane would be installed for assembly and maintenance of butterfly valves. In addition, a 10-ton capacity outdoor traveling gantry crane would be installed to aid in the installation and removal of inlet gates and trashracks.

3.1.4.6 Delevan Transmission Line

The proposed Delevan Transmission Line would carry electricity from an existing power source (PG&E 230-kV, WAPA 500-kV, or WAPA 230-kV transmission lines) to the proposed pumping/generating plants. The proposed electrical switchyard and transmission line that would connect the pumping/generating plants to the grid would provide all of the electricity needed by the pumping plants. The switchyard and transmission line would allow the pumping/generating plants to feed electricity back into the electrical grid during generation activities.

Each of these new pumping/generating plants would be connected to the existing electrical grid by the proposed 230-kilovolt (kV) overhead Delevan Transmission Line. Each pumping/generating plant would have a dedicated switchyard to step the transmission down to usable motor voltage. The Delevan Transmission Line would parallel the proposed Delevan Pipeline route from the proposed Delevan Pipeline Intake facilities to the proposed TRR within a 150-foot-wide permanent transmission line easement 150 feet north of the permanent easement for the proposed Delevan and TRR pipelines[9] (Figure 3-1). From the TRR at about the GCID Canal crossing, the Delevan Transmission Line would travel in a southwesterly direction for a length of approximately 9,600 feet to the proposed T-C Canal Discharge Dissipater at the northeastern tip of the proposed Holthouse Reservoir. From Holthouse Reservoir, the Delevan Transmission Line would travel in a northwesterly direction for approximately 3,600 feet and then travel west for approximately 5,300 feet, at which point the transmission line would cross the proposed Eastside Road. From Eastside Road, the Delevan Transmission line would travel in a southwesterly direction for approximately 1,700 feet to connect to the proposed Sites Electrical Switchyard.

In addition, lower voltage overhead distribution lines would be connected to the proposed Golden Gate Dam, Sites Dam, South Bridge, and Stone Corral, Peninsula Hills, and Lurline Headwaters recreation areas. Electricity provided to Golden Gate Dam would likely come from the Sites Pumping/Generating Plant site through an easement along Funks Creek to the dam. Electricity to Sites Dam, South Bridge, and the three recreation areas would likely come from an existing overhead distribution line that parallels Sites Lodoga Road. The power line would be extended to Sites Dam along the canyon walls, through the Stone Corral Recreation Area (following roads when available), along the new Stone Corral Road to the South Bridge, and along Sites Lodoga Road to the proposed Peninsula Road to the Peninsula Hills Recreation Area. From Sites Dam, the power line would be extended approximately 3.1 miles in a southwesterly direction to the Lurline Headwaters recreation area.

Construction. The proposed Delevan Transmission Line construction disturbance area would be approximately 410 acres. The construction disturbance area for the transmission line would be completely

[9] The transmission line cannot be constructed within the same permanent easement as the pipeline because the footprint of the transmission tower footings would impede access to the pipeline during future maintenance activities.

contained within the permanent easement along the transmission line. The permanent easement would be approximately 150 feet wide along the entire alignment.

A portion of the existing agricultural fields within the transmission line alignment would be fallowed and not watered during construction of tower footings and placement of towers. A corridor approximately 150 feet wide would be needed for construction activities, staging areas, and stockpile areas. Anticipated major construction activities include clearing and grading the construction workspace; placing necessary construction materials at staging areas; excavating and constructing tower footings; erecting the transmission towers; and stringing the conductor.

The transmission line would cross an existing PG&E natural gas pipeline and transmission line. The pipeline crossing would be accomplished by siting the towers away from the pipeline. The crossing of high voltage lines requires special precautions during construction, and has specific design requirements to maintain minimum clearances from each other under conservative line operating conditions. At this crossing location, the proposed transmission line towers would be constructed approximately twelve feet higher than the typical transmission pole or tower height to ensure that minimum design and utility requirements are met.

The transmission line would be an above-ground feature, with the footings of the transmission towers resulting in a permanent change in land use and loss of wildlife habitat. Assuming a worst-case scenario of 70 transmission towers, each with a concrete pad for a base, over the entire length of the transmission line, the total permanent acreage that would change land use and result in habitat loss would be approximately 2.5 acres of a combination of rice and annual grassland habitat.

Operations. Operation of the proposed Delevan Transmission line and associated distribution lines would be an unmanned activity.

Maintenance. The proposed Delevan Transmission Line and associated distribution lines would require only periodic maintenance (once or twice a year), which would include equipment inspections and vegetation maintenance.

3.1.5 Alternative B—Proposed Facilities Unique to Alternative B

Alternative B would focus on meeting the proposed Project's primary objectives by constructing a proposed 1.81-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion) to convey water to the proposed Sites Reservoir, and a proposed release-only Delevan Pipeline (1,500-cfs release) to convey water from the reservoir. Alternative B would use the common features described in Section 3.1.1, in addition to the features described below.

3.1.5.1 1.81-MAF Sites Reservoir Inundation Area

Similar to the proposed 1.27-MAF Sites Reservoir discussed in Section 3.1.4.1, the proposed 1.81-MAF Sites Reservoir would be located approximately 10 miles west of the town of Maxwell (Figure 3-1). This reservoir configuration would have a storage capacity of 1.81 MAF, a maximum water surface elevation of 520 feet above msl (the minimum operating water surface would be at elevation 340 feet), and an inundation area of approximately 14,000 acres. The inundation area of the proposed 1.81-MAF Sites Reservoir would be created by filling Antelope Valley after the construction of 11 dams. The proposed dams include Golden Gate Dam on Funks Creek, Sites Dam on Stone Corral Creek, and nine saddle dams

on the northern end of the reservoir, between the Funks Creek and Hunters Creek watersheds (all dams are discussed further in Section 3.1.5.2).

Many areas within Sites Reservoir Inundation Area would be used for staging of materials and equipment prior to and during construction of other proposed Project components (e.g., the Sites Reservoir dams).

Construction. The total construction disturbance area would be approximately 15,720 acres, consisting of the proposed inundation area footprint and a temporary construction disturbance area. Anticipated ground-disturbing activities during construction include clearing and grubbing, and demolition and removal of existing structures, such as residential dwellings, barns, and miscellaneous structures.

- **Clearing and Grubbing.** Ninety-two percent of the proposed reservoir inundation area footprint is composed of annual grasslands; as a result, clearing and grubbing would not be needed in this area. The remaining eight percent consists of blue oak woodland, agricultural crops, and other vegetation, which would be cleared.
- **Demolition of Existing Structures.** Twenty-two houses and four detached garages, one mobile home, 26 barns, and 37 other structures (combination of sheds, silos, and a pump house) within the proposed Sites Reservoir Inundation Area would be demolished. Existing septic tanks and other storage tanks would also be removed. In addition, many miles of fencing and asphalt would be removed, erosion protection may be needed for midden locations, and elderberry shrubs may need to be removed from their existing location and relocated. Demolition debris would likely be transported and disposed of at a landfill that is permitted to accept such waste.
- Two cemeteries would be relocated.

Operations. Operations of the proposed 1.81-MAF Sites Reservoir are the same as for the proposed 1.27-MAF reservoir (Section 3.1.4.1).

Maintenance. Maintenance of the proposed 1.81-MAF Sites Reservoir is the same as for the proposed 1.27-MAF reservoir (Section 3.1.4.1).

3.1.5.2 Dams for the 1.81-MAF Sites Reservoir

Eleven dams would be needed to create the proposed 1.81-MAF Sites Reservoir (Figure 3-1). The reservoir would be formed by the proposed Golden Gate Dam, Sites Dam, and nine saddle dams along the northern perimeter of the reservoir between the Funks Creek and Hunters Creek watersheds, near the Glenn-Colusa County line. Golden Gate Dam would be constructed on Funks Creek, approximately one mile west of Funks Reservoir. Sites Dam would be constructed on Stone Corral Creek, approximately 0.25 mile east of the town of Sites and ten miles west of the town of Maxwell. Saddle Dam Nos. 1, 2, 4, and 9 are generally characterized as small-sized dams, with heights ranging from approximately 40 to 50 feet. Saddle Dam Nos. 3, 5, 6, 7, and 8 are generally characterized as medium-sized dams, with heights ranging from approximately 70 to 130 feet. Saddle Dam Nos. 3, 5, and 8 are the tallest and largest of the nine proposed saddle dams, with embankment volumes of approximately 3.5, 1.5, and 1.9 million cubic yards, respectively.

The 11 dams would be constructed as zoned earth rockfill embankment dams, and are designed to be constructed primarily of on-site materials. Site topography, geology, seismicity, and foundation features were considered when selecting the dam alignments, design, and sections. The dam designs would conform to modern economic construction practices and incorporate conservative design measures.

Table 3-11 lists the proposed height and length of the 11 dams as well as the total volume of materials needed to construct the dam embankments.

Table 3-11
Characteristics of the Proposed Sites Reservoir Dams for Alternatives B and C

Dam	Maximum Height Above Base* (feet)	Crest Length (feet)	Total Embankment Volume (cubic yards)
Sites Dam	290	850	3,836,000
Golden Gate Dam	310	2,250	10,590,000
Saddle Dam No. 1	50	490	93,000
Saddle Dam No. 2	80	420	86,000
Saddle Dam No. 3	130	3,810	3,577,000
Saddle Dam No. 4	40	270	18,000
Saddle Dam No. 5	100	2,290	1,505,000
Saddle Dam No. 6	70	530	144,000
Saddle Dam No. 7	75	1,040	196,000
Saddle Dam No. 8	105	2,990	1,915,000
Saddle Dam No. 9	45	340	49,000
Total			**22,009,000 cubic yards**

*Base is defined as ground surface elevation.

The crest elevation of all 11 dams would be 540 feet, providing 20 feet of freeboard. Sites and Golden Gate dams would have crest widths of 30 feet and embankment slopes of 2.25:1 upstream and 2:1 downstream. The saddle dams would have crest widths of 20 feet and embankment slopes of 3:1 upstream and 2.5:1 downstream.

Saddle Dams 2, 3, and 5 would have fairly flat slopes on the left abutments[10] which require low dam heights (less than approximately 10 feet high). At these locations, the dam embankments would be strictly providing residual freeboard. Therefore, the typical saddle dam sections would be replaced at these locations with a small homogenous impervious embankment with a bentonite slurry wall for foundation seepage control. The crest elevation and width and slopes of the homogeneous embankment would match that of the saddle dams. Construction of the slurry wall configuration is a more economical option than construction of the typical embankment and excavation section. The slurry wall would be excavated to a depth corresponding to the moderately weathered bedrock surface, with average dimensions estimated at 20 feet deep by five feet wide. At the left abutment of Saddle Dam No. 2, the slurry wall section would also provide a defensive measure to control foundation seepage in the event that displacement occurs along the Salt Lake Fault. At this location, the slurry wall was extended to a depth of 40 feet to minimize the potential of foundation seepage along the fault zone.

The proposed emergency spillway at the proposed 1.81-MAF Sites Reservoir would be located at Saddle Dam No. 6. The purpose of the emergency spillway would be to release excess water as the result of overpumping after a probable maximum flood (PMF), and to prevent overtopping the dams. If the PMF were to occur when the reservoir was at maximum pool (elevation 520.0 feet), the water surface elevation

[10] Abutment direction refers to looking downstream. Therefore, the dam's left abutment would be the abutment on the left side of the dam when looking downstream.

would rise to 525.2 feet (with no reservoir releases). The dam crest elevation would be 540.0 feet. Therefore; the emergency spillway would be required only in the event that water was still being pumped into the reservoir after the PMF had been stored (an unlikely occurrence).

For the proposed 1.81-MAF Sites Reservoir, a proposed morning glory spillway[11] would be provided on a cut bench on the left abutment of the saddle dam. The outlet pipe would be installed under the dam on a cut bench on the dam abutment foundation. On the downstream side of the dam, the pipe would be installed downslope to the creek. An energy dissipating structure would be located at the end of the pipeline to control the discharge of water to the creek. The spillway would consist of one seven-foot-diameter concrete pipe sized primarily for inspection and maintenance activities. The spillway pipe inflow elevation would be set at 525.5 feet, 5.5 feet above normal maximum pool.

The 11 dams would be constructed of compacted excavated materials (soil and rock). The four zones of the embankment dams would be constructed as described for the proposed 1.27-MAF Sites Reservoir (Section 3.1.4.2).

Construction. The total construction disturbance area for the 11 proposed dams would consist of approximately 160 acres. It would include the footprint of the proposed facilities, the materials and equipment staging area, the area needed to construct the facilities, borrow areas, and access roads. The construction disturbance area for the dams would be within the construction disturbance area for the proposed reservoir inundation area.

All other proposed construction activities would be the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

Operations. All proposed operations activities are the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

Maintenance. All proposed maintenance activities are the same as described for the proposed 1.27-MAF Sites Reservoir dams (Section 3.1.4.2).

3.1.5.3 Delevan Pipeline – 1,500-cfs Release Only

The approximately 13.5-mile-long release-only Delevan Pipeline would convey water from the proposed Holthouse Reservoir to the Sacramento River for releases. The portion of the proposed Delevan Pipeline that would be to the west of the proposed TRR would parallel the proposed TRR Pipeline from the TRR to Holthouse Reservoir, and would share a common trench and outlet structure into Holthouse Reservoir (Figure 3-1).

The capacity of the Delevan Pipeline to convey water from Holthouse Reservoir to the Sacramento River would be 1,500 cfs. The pipeline would consist of two 12-foot-diameter reinforced concrete pipes.

The Delevan Pipeline would begin at the proposed Delevan Pipeline Discharge Facility at the Sacramento River. The Delevan Pipeline would be aligned due west until reaching the GCID Canal. At the GCID Canal, the Delevan Pipeline would be aligned southwesterly and would parallel the TRR Pipeline in a shared trench until it reaches the Holthouse Reservoir Complex.

[11] A morning glory spillway is an uncontrolled spillway with a funnel-shaped outlet that allows water to spill into the funnel rather than spilling over the dam.

The proposed alignment of the Delevan Pipeline would require five major crossings (SR 45, SR 99, I-5, Union Pacific Railroad, and the GCID Canal). The proposed pipeline route would also cross the easement for the PG&E 230-kV electrical transmission line and a major PG&E natural gas pipeline. Other existing infrastructure that the Delevan Pipeline could potentially cross include: gas lines, water lines, sewer lines, communications lines, and other infrastructure. These major crossings would be accomplished with the jack and bore construction method.

In addition, the proposed Delevan Pipeline would cross the CBD. The crossing location would be at the northern end of the drain.

Construction. All construction activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

Operations. All operations activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

Maintenance. All maintenance activities would be the same as described for the proposed 2,000-cfs Diversion/1,500-cfs Release Delevan Pipeline (Section 3.1.4.4).

3.1.5.4 Delevan Pipeline Discharge Facility

Because Alternative B does not include the proposed Delevan Pipeline Intake Facilities, a separate release structure would be required at the Sacramento River to make controlled releases to the river. The proposed release structure (Delevan Pipeline Discharge Facility, Figure 3-13C) would be located at the same site as shown for the Delevan Pipeline Intake Facilities (Figure 3-13A). The diameter of the proposed Delevan Pipeline would be reduced in stages from 12-foot diameter to eight foot, then to four foot before reaching the proposed energy dissipating valve house. The valve house would be located just above the design Sacramento River flood level at the site, which is at an approximate elevation of 82 feet.

The energy dissipating valves would be 48-inch-diameter fixed cone valves located in confining vaults to control excessive spray and help dissipate the energy. From the valve structure, released water would flow down a short channel section before reaching a proposed baffle block spillway leading down to the river. The system is designed for a maximum release flow of 1,500 cfs. The baffle block spillway could control the release of water to the river regardless of the river level and provide aeration benefits.

The valve house, channel, and spillway would be located within the current river overbank area so that the facilities do not encroach within the flow area when the river is at its maximum design level. The downstream side of the spillway exposed to the river would be fitted with fish barrier racks to prevent migrating adults fish from entering the spillway chute. The clear spacing of the bars in the rack would be 1.5 inches.

At the maximum design flow, the width of the spillway structure would be designed to maintain the release velocity from the structure at or below two fps at the minimum river design level at an elevation of 51 feet.

The proposed Delevan Pipeline Discharge Facility would be located in a reach of the Sacramento River that is protected by a federal project levee system administered by U.S. Army Corps of Engineers (USACE) and the Central Valley Flood Protection Board. The top of the levee in the proposed Project area is at an elevation of 90 feet. Before the levee is breached and construction begins on the valve house

and spillway, a setback levee would be constructed around the site. The setback levee would tie into the existing levee on the north and south sides of the site so that there is no interruption of flood protection during proposed Project construction. In addition, current levee regulations do not permit piping to pass through or under Project levees. For this reason, the piping would be elevated where it crosses the setback levee so that it is above elevation 90.0.

Construction. The total construction disturbance area would be approximately 7.7 acres. An additional area around the proposed construction site would be required for staging of materials, equipment, and construction offices. This area would be within the construction disturbance area for the proposed Delevan Pipeline. To isolate the construction area from the Sacramento River, a cellular sheet pile coffer dam would be installed in the river near the location of the discharge facility. Approximately 350 feet of sheet piles would be required to build the coffer dam. The coffer dam would extend approximately five to 10 feet into the water from the river bank. Installation of the coffer dam would involve driving interlocking metal sheet piles into the ground one section after another until the entire length of the intake structure is isolated from the river. The height of the coffer dam would match the height of the surrounding levees. The coffer dam is likely to remain in place throughout the duration of facility construction. The area behind the coffer dam would be dewatered prior to construction by pumping water out from behind the coffer dam. After construction of the discharge facility is complete, the coffer dam would be removed by pulling the sheet piles out of the river.

Construction of the proposed Delevan Pipeline Discharge Facility would include the following:

- Constructing the setback levee along with any slurry walls that might be required to control through seepage and under seepage.
- Constructing a coffer dam along the shore of the river to permit spillway construction in dry conditions.
- Excavation of the bank and backfilling of the area to construct the spillway, channel, and valve house. Approximately 6,000 cubic yards of excavation would be required.
- Backfilling around the structures and on the water side of the setback levee, as required.
- Placing rip rap rock slope protection for a minimum of 100 feet upstream and downstream of the spillway to control erosion.
- Site revegetation.

Operations. Proposed release operations would be such that a maximum 1,500 cfs would be discharged to the river channel. A SCADA system would control all of the different operational modes. The system would be located on-site and would broadcast status information to a manned remote location. The SCADA systems provide a means to control the release without staffing the on-site facilities.

Maintenance. The proposed Delevan Pipeline Discharge Facility would likely be staffed daily to maintain, operate, and monitor the facility. It is anticipated that employees would be on-site during release (predominantly in summer) activities.

3.1.5.5 Sites Pumping/Generating Plant (3,900-cfs)

The purpose of the proposed Sites Pumping/Generating Plant would be to pump water from the proposed Holthouse Reservoir to the proposed Sites Reservoir to fill it and to generate electricity during the release

of water from Sites Reservoir to the Holthouse Reservoir. The Sites Pumping/Generating Plant would be located approximately 3,300 feet southeast of the proposed Golden Gate Dam (Figure 3-4).

The proposed Sites Pumping/Generating Plant would have a total pumping capacity of 3,916 cfs and a release capacity of 5,100 cfs. Table 3-12 summarizes the pump and pump/turbine configuration for the 3,900-cfs Plant.

Table 3-12
Proposed Sites Pumping-Generating Plant Configuration for Alternative B

Unit Type	Number of Units	Net Head (Feet)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per unit (cfs)	Total Plant Pumping Capacity (cfs)	Total Plant Generating Capacity (cfs)
Pump – Francis Vane Dual Speed	2 (+1 Standby)	323	300	-	3,916	5,100
		195	300	-		
Pump/Turbine Reversible Francis, Dual Speed	4 (+1 Standby)	323/310	663	1,020		
		195/182	663	1,020		
Pump/Turbine Reversible Francis, Dual Speed	2	323/310	332	510		
		195/182	332	510		

The proposed Sites Pumping/Generating Plant has been designed as a conventional indoor-type pumping plant. The design includes an in-line arrangement of vertical pumping units with a reinforced concrete substructure and a steel superstructure. The size of each unit bay was determined based on the minimum required spacing between each unit. Two service bays have been incorporated on either side of the proposed Sites Pumping/Generating Plant and have been sized to allow for two units to be serviced simultaneously while the remainder of the plant continues operation.

The pumps would be connected to a complex intake/outflow manifold. When water would be drawn out of the proposed Holthouse Reservoir and pumped up to the proposed Sites Reservoir, the pumped water would flow through successive pipe connections until all eleven pipes coming from the pump units combine into a single 26-foot-diameter pipe. This pipe would then join the 26-foot-diameter pipe coming from the emergency bypass outlet, and the two pipes would connect to the 30-foot-diameter tunnel.

Additional proposed on-site facilities related to the proposed Sites Pumping/Generating Plant include:

- Approach channel
- Pressure tunnel
- Emergency release bypass outlet
- Electrical switchyard
- Maintenance buildings
- Electrical connection
- Access roads

The proposed Sites Pumping/Generating Plant would be connected to the proposed Holthouse Reservoir by an approximately 8,300 foot-long earthen approach channel (approach channel is discussed in

Section 3.1.1.9). On the other side of the pumping plant, connecting the channel to the proposed Sites Reservoir, would be an approximately 4,030-foot-long, 30-foot-diameter tunnel (discussed in Section 3.1.1.6).

An electrical switchyard (Sites Electrical Switchyard) would be required adjacent to the proposed Sites Pumping/Generating Plant that would step down the electrical voltage from high voltage lines to a lower voltage that could be used by the pumps and other machinery in the plant.

Construction. The total proposed footprint of the proposed Sites Pumping/Generating Plant and approach channel would be approximately 75 acres. An additional 20 acres of land adjacent to the proposed Sites Pumping/Generating Plant would likely be disrupted during construction.

Anticipated ground-disturbing activities include:

- Transportation of materials to the construction site
- Clearing and grading the construction workspace
- Placing construction materials at staging areas
- Excavating the approach channel and pumping plant
- Dewatering
- Constructing the forebay, pump house, and pump bay
- Site restoration after construction is complete

Operations. All proposed operations activities would be the same as described for the proposed 1.27-MAF Sites Reservoir pumping/generating plant (Section 3.1.4.5).

Maintenance. All proposed operations activities are the same as described for the proposed 1.27 MAF Sites Reservoir pumping/generating plant (Section 3.1.4.5).

3.1.5.6 Delevan Transmission Line

The proposed Delevan Transmission Line would carry electricity from an existing power source (PG&E 230-kV or WAPA 500-kV or WAPA 230-kV power lines) to the proposed Sites and TRR pumping/generating plants. Alternative B does not include a pump station at the Delevan Pipeline Intake. The transmission line would be the same as described in Section 3.1.4.6 for Alternative A, except there would be no transmission line between the proposed Delevan Pipeline Intake Facilities and the proposed TRR. There would be a slight difference in the alignment of the transmission line on the eastern edge of the proposed Sites Reservoir to the northernmost proposed recreation area (Saddle Dam Recreation Area) due to the differences in reservoir size and proposed Golden Gate Dam location between Alternatives A and B.

Construction. Construction of this facility would be the same as described in Section 3.1.4.6. However, the construction disturbance area for the transmission line would be approximately 100 acres because Alternative B does not include a transmission line between the proposed Delevan Pipeline Intake Facilities and the proposed TRR.

The proposed footings of the transmission towers would result in a permanent change in land use and loss of wildlife habitat. Assuming a worst-case scenario of 15 transmission towers, each with a concrete pad for a base for the length of the transmission line, the total permanent acreage that would change land use and result in a habitat loss would be approximately 0.5 acre of annual grassland habitat.

Operations. Operation of this proposed facility would be the same as described in Section 3.1.4.6.

Maintenance. Maintenance of this proposed facility would be the same as described in Section 3.1.4.6.

3.1.6 Alternative C—Proposed Facilities Unique to Alternative C

Alternative C would focus on meeting the proposed Project's primary objectives by constructing a proposed 1.81-MAF Sites Reservoir and relying on the existing T-C Canal (2,100-cfs diversion) and GCID Canal (1,800-cfs diversion), and a proposed Delevan Pipeline (2,000-cfs diversion/1,500-cfs release), to convey water to and from the reservoir. Alternative C would use the common features described in Section 3.1.1, in addition to other features already described for Alternatives A and B.

Alternative C combines several of the unique proposed features of Alternatives A and B, including

- Proposed 1.81-MAF Sites Reservoir Inundation Area – Same as Alternative B (Section 3.1.5.1)
- Proposed 1.81-MAF Sites Reservoir Dams – Same as Alternative B (Section 3.1.5.2)
- Proposed Delevan Pipeline Intake Facilities– Same as Alternative A (Section 3.1.4.3)
- Proposed Delevan Pipeline—2,000-cfs Diversion/1,500-cfs Release – Same as Alternative A (Section 3.1.4.4)
- Proposed Sites Pumping/Generating Plant (5,900-cfs) – Same as Alternative A (Section 3.1.4.5), except for the net head. The maximum water surface elevation for Alternative C would be approximately 40 feet higher than for Alternative A so the net head for the pumps and pump/turbines would be slightly larger compared to Alternative A. Table 3-13 summarizes the pump and pump/turbine configuration for the proposed 5,900-cfs Sites Pumping/Generating Plant.
- Proposed Delevan Transmission Line – The electrical transmission line for Alternative C would be similar to Alternative A (Section 3.1.4.6) with a slight difference in the alignment on the eastern edge of the proposed Sites Reservoir to the northernmost proposed recreation area (Saddle Dam Recreation Area) due to differences in reservoir size and the proposed Golden Gate Dam between Alternatives A and C.

Table 3-13
Proposed Sites Pumping-Generating Plant Configuration for Alternative C

Unit Type	Number of Units	Net Head (Feet)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per unit (cfs)	Total Plant Pumping Capacity (cfs)	Total Plant Generating Capacity (cfs)
Pump – Francis Vane Dual Speed	2 (+1 Standby)	330	870	-	5,926	5,100
		202	870	-		
Pump – Francis Vane Dual Speed	2	330	435	-		
		202	435	-		
Pump/Turbine Reversible Francis, Dual Speed	4 (+1 Standby)	330/310	663	1,020		
		202/182	663	1,020		
Pump/Turbine Reversible Francis, Dual Speed	2	330/310	332	510		
		202/182	332	510		

3.2 Proposed Project Construction

Proposed Project construction is expected to last for more than eight years for any of the action alternatives. Several factors affect this schedule, including funding, environmental compliance, material and equipment availability, labor force constraints, and access road capacity limitations. Additional adjustments to the schedule would be required as the proposed Project moves forward.

At the peak of proposed Project construction, the construction labor force is expected to be approximately 400 workers. Table 3-14 provides a list of the typical construction equipment expected to be present on-site during construction of the major proposed facilities and estimated equipment days.

Construction activities are anticipated to occur between the hours of 6:00 a.m. and 7:00 p.m. Monday through Friday. Nighttime and weekend construction may occur on an as-needed basis. If nighttime construction is determined to be needed, construction lighting consistent with applicable federal, State, and local requirements would be used. Nighttime construction would not be conducted between the hours of 10:00 p.m. and 7:00 a.m. within 1,000 feet of occupied residences. Haul times through residential communities would be limited to the hours of 7:00 a.m. to 10:00 p.m. with air brake restrictions in residential communities.

Construction activities associated with the proposed Project would be confined to designated construction disturbance areas. Construction vehicles and equipment would also be parked within these construction disturbance areas. In addition, construction materials would be stored within the construction disturbance areas. Special or sensitive sites within the construction disturbance areas where construction equipment and materials would not be allowed would be clearly marked and fenced with orange barrier fencing before any construction or surface-disturbing activity begins. Construction personnel would be trained to recognize these markers and understand the equipment movement restrictions involved. Lath, fencing, or flags would be maintained until final cleanup and/or site restoration is completed, after which they would be removed.

3.2.1 Access Routes

Traffic-generating construction activities associated with the proposed Project would include trucks hauling equipment and materials to and from the work sites and the daily arrival and departure of the construction workers. Construction traffic on local roadways would include dump trucks, concrete trucks, 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 trucks would deliver heavy construction equipment, job trailer items, concrete forming materials, piping materials, piles, new facility equipment, and other miscellaneous deliveries.

The following are typical construction access routes to some of the major proposed Project features (routes are illustrated on Figures 3-3A and 3-3B):

3.2.1.1 Sites Reservoir Inundation Area

Central Reservoir Area

- From I-5, travel west on Maxwell Sites Road.

Table 3-14
Estimated Equipment Days for Construction of Proposed Project Features Included in the Action Alternatives

Equipment	Dams and Sites Reservoir Inundation Area	Recreation Areas	Gravel Roads	Paved Roads and Bridges	Sites P/G Plant, Tunnel, and Sites Inlet/Outlet Structure	Funks Reservoir Sediment Removal	Funks Reservoir and Holthouse Reservoir Complex	Pump Installation at the Red Bluff Pumping Plant	GCID Camal Facilities Modifications	TRR	TRR P/G Plant	TRR and Delevan Pipelines	Transmission Lines and Electrical Switchyards	Delevan Pipeline Intake/Discharge Facilities and P/G Plant	Field Office Maintenance Yard
	Equipment Days														
Backfill loader	-	-	-	-	-	-	149	-	-	-	-	934	-	-	-
Batch plant equipment	-	-	-	-	-	-	-	-	-	-	104	-	64	104	-
Bulldozer	17,740	116	279	9,770	1,760	1,336	13,650	-	32	852	1,165	3,086	8	1,165	240
Compactor	15,350	-	156	-	-	-	796	-	159	66	200	934	-	200	160
Concrete material trucks	1,720	-	-	-	-	-	472	-	-	-	-	224	-	-	160
Concrete pump	-	-	-	-	306	-	22	-	-	-	104	-	29	104	80
Concrete trucks	648	66	-	2,246	1,030	-	176	-	156	-	416	83	154	416	-
Crane	-	-	-	1,000	350	-	-	-	-	-	200	1,500	474	200	-
Drilling machine	1,952	-	-	-	-	-	85	-	-	-	-	-	95	-	-
Dump truck	830	474	123	6,775	600	-	8	-	768	-	1,250	8,670	14	1,250	-
Excavator loader	-	-	-	-	-	-	-	-	-	152	-	400	-	-	-
Excavator	-	-	-	26	-	-	-	-	-	-	-	400		-	360
Filter material loader	3,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fork lift	89	121	-	-	510	-	59	40	-	140	400	1,500	82	400	480
Fuel truck	3,548	312	93	1,126	552	167	570	-	335	185	333	967	57	333	-
Generator	81	33	-	500	200	-	22	80	156	-	104	583		104	-
Grader	7,675	28	104	2,104	572	-	398	-	-	33	200	467	40	200	-
Grout pump	1,952	-	-	-	-	-	170	-	-	-	-	-	-	-	-
Highway trucks	45,328	282	-	1,291	1,172	16	4,036	-	680	700	1,760	5,190	810	1,760	720
Jacking equipment	-	-	-	-	-	-	-	-	-	-	-	600	-	-	-

Table 3-14
Estimated Equipment Days for Construction of Proposed Project Features Included in the Action Alternatives

Equipment	Dams and Sites Reservoir Inundation Area	Recreation Areas	Gravel Roads	Paved Roads and Bridges	Sites P/G Plant, Tunnel, and Sites Inlet/Outlet Structure	Funks Reservoir Sediment Removal	Funks Reservoir and Holthouse Reservoir Complex	Pump Installation at the Red Bluff Pumping Plant	GCID Camal Facilities Modifications	TRR	TRR P/G Plant	TRR and Delevan Pipelines	Transmission Lines and Electrical Switchyards	Delevan Pipeline Intake/Discharge Facilities and P/G Plant	Field Office Maintenance Yard
	Equipment Days														
Loader	-	158	41	1,235	400	-	-	-	192	-	125	-	103	125	-
Material trucks	-	-	-	-	2,736	-	-	-	-	-	-	-	-	-	160
Mobile Crane	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-
Off-road trucks	27,840	-	-	4,569	-	-	1,490	-	-	1,520	-	-	-	-	-
Paving machine	-	22	5	80	-	-	-	-	33	20	-	-	-	-	160
Pipe fabrication equipment	-	-	-	-	-	-	-	-	-	-	-	1,000	-	-	-
Pipe transport truck	-	-	-	-	-	-	-	-	-	-	-	1,100	-	-	-
Pull truck	-	-	-	-	-	-	-	-	-	-	-	-	192	-	-
Roller	-	50	10	925	-	-	-	-	66	-	-	-	-	-	-
Scissor lift	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
Scraper	6,800	-	147	8,736	3,090	2,672	11,460	-	138	652	1,165	13,734	-	1,165	-
Tunnel boring machine	-	-	-	-	200	-	-	-	-	-	-	-	-	-	-
Utility trucks	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-
Waste/tree loader	83	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Water trucks	7,096	144	191	2,252	352	334	2,280	-	205	215	466	967	101	466	360
Welding truck	-	-	-	-	294	-	-	-	-	-	-	-	-	-	-

Northern Reservoir Area

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and continue straight on proposed North Road (new permanent).

Southern Reservoir Area

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on Huffmaster Road.
- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent) (this is the detour during construction).

3.2.1.2 Sites Reservoir Dams

Sites Dam

- From I-5, travel west on Maxwell Sites Road.

Golden Gate Dam

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn right on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).

Saddle Dams

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent) for Saddle Dams 7, 8, and 9, or turn left from proposed North Road onto proposed Saddle Dam Road (new permanent) for Saddle Dams 1, 2, 3, 4, and 5, or turn left from proposed North Road onto proposed O&M road (new permanent)for Saddle Dam 6, or turn left from County Road 69 onto proposed Eastside Road (new permanent) and turn right on proposed O&M road (new permanent) for the Golden Gate Saddle Dam.
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent) and turn left on proposed O&M road (new permanent).

3.2.1.3 Recreation Areas

Saddle Dam

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent), and turn left on proposed Saddle Dam Road (new permanent).

Lurline Headwaters

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent, detour during construction).

Antelope Island

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on Huffmaster Road, and turn left on proposed construction road (new temporary).
- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on proposed Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and turn left on proposed construction road (new temporary).

Stone Corral

- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn left on proposed Stone Corral Road (new permanent), and turn left on proposed Stone Corral Recreation Area Road (new permanent).

Peninsula Hills

- From I-5, travel west on Maxwell Sites Road to Sites Lodoga Road, and turn right on proposed Peninsula Road (new permanent campground spur road).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn left on proposed Stone Corral Road (new permanent), across the proposed South Bridge (new permanent) onto Sites Lodoga Road, and turn right on proposed Peninsula Road (new permanent campground spur road).

3.2.1.4 Road Relocations and South Bridge

South Bridge

- From I-5, travel west on Maxwell Sites Road, and turn right on Peterson Road to reach central footings (this route is only available if the bridge is constructed before Sites Dam, which will block access on Maxwell Sites Road).
- From I-5, travel west on Maxwell Sites Road and continue straight on Sites Lodoga Road to reach the western approach/footings.
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), and turn left on proposed Stone Corral Road (new permanent) to reach the eastern approach/footings.

Com Road

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), and turn right on proposed Lurline Road (new permanent, detour during construction), and turn right on proposed Com Road (new permanent).

Eastside Road

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

Sulphur Gap Road

- From I-5, travel west on Maxwell Sites Road, and turn left on proposed Sulphur Gap Road (new permanent).

North Road

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, continue straight on proposed North Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, and turn right on proposed Eastside Road (new permanent) and follow to proposed North Road (new permanent).

3.2.1.5 Sites Pumping/Generating Plant

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.6 Sites Electrical Switchyard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn right on proposed O&M road (new permanent).

3.2.1.7 Tunnel from Sites Pumping/Generating Plant to Sites Reservoir Inlet/Outlet Structure

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), and turn left on proposed O&M road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn right on proposed Eastside Road (new permanent), turn right on proposed O&M road (new permanent).

3.2.1.8 Sites Reservoir Inlet/Outlet Structure

- From I-5, travel west on Maxwell Sites Road, turn left onto proposed Sulphur Gap Road (new permanent), to proposed Lurline Road (new permanent), to Huffmaster Road, to Peterson Road.

3.2.1.9 Field Office Maintenance Yard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.10 Existing Funks Reservoir Dredging

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent).

3.2.1.11 Holthouse Reservoir Complex and Holthouse Reservoir Electrical Switchyard

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, turn left on proposed Eastside Road (new permanent), turn left on access road on south side of Funks Reservoir.
- From I-5, travel west on Maxwell Sites Road and turn right on proposed Eastside Road (new permanent), turn right on access road on south side of Funks Reservoir.

3.2.1.12 Pump Installation at the Red Bluff Pumping Plant

- From I-5, exit South Main Street (in Red Bluff) and travel south (South Main Street becomes Hwy 99W). Turn left onto Altube Avenue; the TCCA office is on the left.

3.2.1.13 GCID Canal Facilities Modifications

Headgate

- From I-5, travel east on SR 32 and turn left on Canal Road.

Railroad Siphon

- From I-5 northbound, exit County Road 53; immediately turn left onto SR 99; proceed 1.13 miles north to the intersection of GCID. Turn right at GCID; the siphon is approximately 200 feet east of SR 99 to the Union Pacific Railroad Siphon.

3.2.1.14 GCID Canal Connection to the Terminal Regulating Reservoir

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.15 Terminal Regulating Reservoir

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.16 Terminal Regulating Reservoir Pumping/Generating Plant and Terminal Regulating Reservoir Electrical Switchyard

- From I-5, travel west on Delevan Road, and turn left on McDermott Road or turn left on Noel Evan Road.

3.2.1.17 Terminal Regulating Reservoir Pipeline, Terminal Regulating Reservoir Pipeline Road, and Delevan Pipeline Electrical Switchyard

- From I-5, travel west on Delevan Road turn left on Sutton Road, McDermott Road or County Road D.

3.2.1.18 Delevan Transmission Line

Eastern End:

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

Central Portion:

- From I-5, travel east on Maxwell Road, and turn left on Four Mile Road or Two Mile Road.
- From I-5, travel east on Delevan Road, and turn right on Four Mile Road or Two Mile Road.

Western Portion:

- From I-5, travel west on Delevan Road, and turn left on Sutton Road, McDermott Road, or County Road D.

3.2.1.19 Delevan Pipeline

Intake Facilities and Eastern End:

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

Central Portion:

- From I-5, travel east on Maxwell Road, and turn left on Four Mile Road or Two Mile Road.
- From I-5, travel east on Delevan Road, and turn right on Four Mile Road or Two Mile Road.

Western Portion:

- From I-5, travel west on Delevan Road, and turn left on Sutton Road, McDermott Road, or County Road D.

Far Western Portion:

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, and turn right on proposed Eastside Road (new permanent).

3.2.1.20 Delevan Pipeline Intake/Discharge Facilities

- From I-5, travel east on Maxwell Road, and turn left on SR 45.
- From I-5, travel east on SR 162, and turn right on SR 45.

3.2.1.21 Borrow Areas (Generally Within the Sites Reservoir Inundation Area or Adjacent on Logan Ridge)

- From I-5, travel west on County Road 68, turn left on County Road D, turn right on County Road 69, and turn left on proposed Eastside Road (new permanent).
- From I-5, travel west on Maxwell Sites Road, turn left on right on proposed Eastside Road (new permanent).

- From I-5, travel west on Maxwell Sites Road, turn left on proposed Sulphur Gap Road (new permanent), turn right on proposed Lurline Road (new permanent, detour during construction), turn right on Huffmaster Road, and travel straight on Peterson Road.
- From I-5, travel west on Maxwell Sites Road.

3.2.2 Environmental Management Program during Proposed Project Construction

Certain preventative measures, plans, and Best Management Practices (BMPs) would be incorporated into the proposed Project to avoid or minimize potential impacts to the environment during construction. These actions are described below.

3.2.2.1 DWR Environmental Site Assessment

All property considered for purchase, transfer, retirement, or sale in fee or easement for the proposed Project by DWR must undergo an environmental site assessment to determine the existence of any hazardous substances. Water Resources Engineering Memorandum (WREM) No. 59a "Policy for Environmental Site Assessment and Remediation of Lands and Improvements for Hazardous Substance Contamination" identifies the requirements for the site assessment. The goals of WREM 59a are to minimize DWR's liability for hazardous substance contamination and remediation, ensure that site assessments and remedial actions are performed in accordance with all applicable federal, State, and local statutes and regulations, as well as accepted industry standards and practices, and ensure the proper storage, handling, transport, and disposal of designated and hazardous waste.

3.2.2.2 Construction Management Plan

A Construction Management Plan would be developed to avoid or minimize potential impacts to public health and safety during proposed Project construction. The Plan would inform contractors and subcontractors of work hours; modes and locations of transportation and parking for construction workers; location of overhead and underground utilities; worker health and safety; truck routes; stockpiling and staging procedures; public access routes; the terms and conditions of all Project permits and approvals; and emergency response services contact information. The Plan would also include construction notification procedures for the Police, Public Works, and Fire departments in the cities and counties where proposed Project construction would be carried out. Construction notices would also be distributed to neighboring property owners.

3.2.2.3 Permit Terms and Conditions

DWR and Reclamation would require contractors and suppliers, general contractors, and all of the general contractors' subcontractors and suppliers to comply with all terms and conditions of all Project permits and approvals, and conditions attached to them. Compliance with applicable laws, policies, and plans for the proposed Project is discussed in Chapter 4 Environmental Compliance and Permit Summary.

3.2.2.4 Stormwater Pollution Prevention Plan

The proposed Project is subject to construction-related stormwater permit requirements of the federal Clean Water Act (CWA) National Pollutant Discharge Elimination System Program. DWR and Reclamation would obtain required permits through the CVRWQCB before any Project-related ground-disturbing construction activity occurs. As required by the stormwater permit, a Stormwater Pollution Prevention Plan (SWPPP) would be prepared and implemented before construction starts and

throughout the proposed Project construction period that identifies BMPs to prevent and minimize the introduction of contaminants into surface waters.

The objectives of the SWPPP would be to (1) identify pollutants and their sources associated with proposed Project construction activities that may impact stormwater quality and identify BMPs to reduce pollutants in stormwater discharges during and after construction, and (2) identify non-stormwater discharges and develop a plan to eliminate, control, or treat all non-stormwater discharges. BMPs would include site management practices (i.e., good "housekeeping"), non-stormwater management; erosion and sediment controls; and an inspection, monitoring, and maintenance program. BMPs for the proposed Project could include, but would not be limited to, silt fencing, straw bale barriers, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrances. The SWPPP would also include development of site-specific structural and operational BMPs to prevent and control impacts on runoff water quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means.

Other plans related to the SWPPP that would be prepared and implemented for the proposed Project include a Spill Prevention and Hazardous Material Management Plan, Erosion and Sediment Control Plan, and a Revegetation Plan.

Spill Prevention and Hazardous Materials Management

As part of the SWPPP, a Spill Prevention and Control Plan would be developed and implemented to minimize effects from spills of hazardous, toxic, or petroleum substances during construction of the proposed Project. The Spill Prevention and Control Plan would include measures to avoid the accidental release of chemicals, fuels, lubricants, and non-stormwater into channels. Spill prevention kits would always be in proximity when hazardous materials would be used (e.g., crew trucks and other logical locations). Feasible measures would be implemented so that hazardous materials would be properly handled by all reasonable means when working in or near any waterway. No fueling would be done within the ordinary highwater mark, immediate floodplain, or full pool inundation area, unless equipment would be provided so that any accidental fuel spill would not be able to enter the water, contaminate sediments that may come into contact with water, or damage wetland or riparian vegetation. Any equipment that was readily moved out of the channel would not be fueled in the channel or immediate floodplain. For all fueling of stationary equipment that is done at the construction sites, containments would be provided to the degree that any spill would not enter the channel or damage wetland or riparian vegetation. Equipment would not be serviced within the ordinary highwater mark or immediate floodplain, unless the equipment stationed in these locations could not be readily relocated (e.g., pumps, generators).

Additional BMPs designed to avoid spills from construction equipment and subsequent contamination of waterways would also be implemented. These may include, but not be limited to, the following:

- Storage of hazardous materials in double containment.
- Disposal of all hazardous and nonhazardous products in a proper manner.
- Monitoring of on-site vehicles for fluid leaks and regular maintenance to reduce the chance of leakage.
- Containment (a prefabricated temporary containment mat, a temporary earthen berm, or other measure can provide containment) of bulk storage tanks having a capacity of more than 55 gallons.

Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan would be prepared and implemented to control short-term and long-term erosion and sedimentation effects, and to restore soils and vegetation in areas affected by proposed Project construction activities. The Plan would include all necessary requirements regarding erosion control, and would implement BMPs for erosion and sediment control, as required. Types of BMPs may include, but would not be limited to, earth dikes and drainage swales, streambank stabilization, and use of silt fencing, sediment basins, fiber rolls, and sandbag barriers.

Revegetation Plan

A Revegetation Plan would be prepared to be implemented in conjunction with other management plans (e.g., the Erosion and Sediment Control Plan). The Plan applies to any area included as part of a proposed Project action alternative that is subject to relocation or mitigation activities. The Plan would include elements to control erosion through using proactive design techniques so that revegetation requirements would be integrated into grading plans to create favorable planting environments that would aid plant establishment and natural regeneration. The Plan would emphasize the use of adapted native plant species that are able to grow and perpetuate without artificial intervention and maintenance. Whenever feasible, local native plant species would be used. The overall objectives of the Plan would be to reestablish native vegetation to control erosion; provide effective ground cover; minimize opportunities for non-native plant species to establish or expand; and provide habitat diversity over time. DWR and Reclamation would work closely with cooperating agencies, private landowners, and revegetation specialists to develop the site-specific planting patterns and species assemblages necessary for a revegetation effort of this magnitude.

3.2.2.5 Fisheries Conservation

The measures discussed below would be implemented to minimize potential Project-related adverse impacts to fish species.

Implement In-Stream Construction Work Windows

All proposed instream Project-related construction work would be timed to occur when sensitive fish species would not be present or are least susceptible to disturbance. DWR and Reclamation would initiate consultation with NMFS, USFWS, and CDFW to identify appropriate instream construction work windows or other methods to minimize impacts to sensitive fish species.

3.2.2.6 Water Quality Protection Measures

The measures discussed below would be implemented to minimize potential Project-related adverse effects to water quality.

Implement Construction Work Windows

All proposed Project construction activities that would occur instream and adjacent to waterways would be conducted during seasonal time periods when erosion and siltation from equipment use are least likely to occur, or are minimal. DWR and Reclamation would initiate consultation with appropriate regulatory agencies to identify appropriate time periods and acquire necessary permits related to water quality protection.

Permits and Regulations and Orders

Proposed Project activities will be conditioned upon compliance with all permits, regulations, and orders related to water quality protection. Relevant permits anticipated to be obtained for the proposed Project include a California Fish and Game Code 1602 Lake and Streambed Alteration Agreement, Regional Water Quality Control Board (RWQCB) Section 401 certification or waiver, and CWA Section 404 compliance through USACE as well as requirements within the NMFS and USFWS Biological Opinions.

Water Quality Best Management Practices

BMPs that would be implemented to avoid and/or minimize potential impacts associated with proposed Project construction are discussed below.

- **Minimize Potential Impacts Associated with Equipment Contaminants.** For proposed in-water work, all equipment would be steamed clean every day to remove hazardous materials before the equipment entered the water.
- **Minimize Potential Impacts Associated with Access and Staging.** Existing access roads would be used to the extent possible. Proposed equipment staging areas would be located outside of the Sacramento River ordinary high water mark and away from sensitive resources.
- **Remove Temporary Fills as Appropriate.** Temporary fill, such as for access, side channel diversions, and/or side channel cofferdams, would be completely removed after completion of proposed construction.
- **Remove Equipment from the Waterbodies Overnight and During High Flows.** The construction contractor would remove all equipment from the water on a daily basis at the end of the work day. The construction contractor would also monitor Reclamation's Central Valley Operations Office website daily for forecasted river flows to determine and anticipate any potential changes in releases. If flows are anticipated to inundate a proposed work area that would normally be dry, the construction contractor would immediately remove all equipment from the work area.

Asphalt Removal

Pursuant to DFG Code 5650 Section (a), all asphalt roadways and parking lots inundated by the proposed Project would be demolished and removed according to local standards. Asphalt would be disposed of at an approved and permitted waste facility or recycled at the proposed Project asphalt plant. Dirt roads inundated by the proposed Project would remain in place.

3.3 Proposed Project Operations and Maintenance

Proposed Project operations and maintenance activities would include any activities that must occur to operate and maintain each proposed facility. Operation activities include those related to the movement of water (such as proposed Sites Reservoir level fluctuations, or the intake or release of water through the proposed Delevan Pipeline Intake or Discharge facility), the generation/transmission of electricity, the use of roads during operations and maintenance activities, and the recreation activities that would be associated with operations of Sites Reservoir.

Maintenance for the proposed Project facilities would consist of activities, such as debris removal, dredging, vegetation control, rodent control, erosion control and protection, routine inspections (dams, tunnels, pipelines, pumping/generating plants, inlet/outlet works, fence, signs, gates), painting, cleaning,

repairs, and other routine tasks to maintain facilities in accordance with design standards after construction and commissioning. Routine visual inspection of the proposed facilities would be conducted to monitor performance and prevent mechanical and structural failures of Project elements. Maintenance activities associated with proposed river intakes could include cleaning, removal of sediments, debris, and biofouling materials. These maintenance actions could require suction dredging or mechanical excavation around intake structures; dewatering; or use of underwater diving crews, boom trucks or rubber wheel cranes, and raft- or barge-mounted equipment.

Proposed operations and maintenance activities could occur on a daily, annually, periodically (as needed), and long-term basis. It is estimated that 60 operations and maintenance workers, working 10-hour days, would be needed to perform operations and maintenance activities.

Table 3-15 shows the estimated equipment and hours of operation for operations and maintenance of the proposed Project facilities for the action alternatives.

3.4 References

California State Water Resources Control Board (SWRCB). 1999. Water Right Decision 1641. December.

National Marine Fisheries Service (NMFS). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. June 4. Southwest Region. Long Beach, CA.

U.S. Fish and Wildlife Service (USFWS). 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). December 15. Region 8. Sacramento, CA.

Table 3-15
Estimated Equipment Hours for Operation and Maintenance of Proposed Project Features Included in the Action Alternatives

Equipment	Reservoirs, Recreation Facilities, Dams, Roads, Bridges		Intake and Outlet Facilities, Pumping and Generating Plants		Electrical Switchyards and Transmission Lines		Tunnels and Pipelines		Estimated Total Hours/Yr of Use per Type of Equipment
	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	
Backhoe	4	520	1	520	1	20	1	10	1,070
Bobcat	1	520	1	520	1	20	1	10	1,070
Bulldozer	2	520	1	520	1	20	1	10	1,070
Crane	0	0	1	40	0	0	0	0	40
Dump Truck	3	1040	1	260	0	0	1	10	1,310
Excavator	1	24	0	0	0	0	0	0	24
Portable Generator	4	100	4	100	0	0	4	100	1,200
Grader	1	16	1	16	0	0	0	0	32
4WD Vehicle	10	1400			2	20	2	20	2,880
4WD Vehicle	10	3650	2	3650	0	0	0	0	14,600
Tractor Mower	2	520	2	520	1	20	1	10	2,110
Motor Boat	3	780	1	520	0	0	1	10	2,090
Boat-Operated Dredge		*		*				*	
ATV	4	200							200
Sedans	4	1000							1,000
Pump truck		150							150
Fork lift	3	500							500
Front End Loader	1	300							300
Air compressor	2	50		50					50

Table 3-15
Estimated Equipment Hours for Operation and Maintenance of Proposed Project Features Included in the Action Alternatives

Equipment	Reservoirs, Recreation Facilities, Dams, Roads, Bridges		Intake and Outlet Facilities, Pumping and Generating Plants		Electrical Switchyards and Transmission Lines		Tunnels and Pipelines		Estimated Total Hours/Yr of Use per Type of Equipment
	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	Average Number of Piece of Equipment	Estimated Hours/Yr of Use per Piece of Equipment	
Water truck	1	250							250
Flatbed/Boom truck	2	250	1	250					500
Portable welders	2	200	1	100			1	100	400
Scissor lift	1	150	1	50					200
Longer Term Maintenance	One dredge and 1 dump truck for 60 hours every 7 -10 years	One dredge, 1 crane, and 1 dump truck for 250 hours every year							250

Figures

Saddle Dams
8a
8
9
7
6
5
4
3
2
1
North Rd
Saddle Dam Rd
Saddle Dam Rec Area
RD 69
RD D
RD F
RD 68
GLENN
COLUSA
Delevan Rd
PG&E 230KV
Peninsula Hills Rec Area
Golden Gate Dam
Golden Gate Saddle Dam
Peterson Rd
SITES ELECTRICAL SWITCHYARD
SITES INLET/ OUTLET STRUCTURE
EXISTING FUNKS RESERVOIR
TERMINAL REGULATING RESERVOIR (TRR)
DELEVAN AND TRR PIPELINES
DELEVAN PIPELINE
DELEVAN TRANSMISSION LINE
DELEVAN PIPELINE INTAKE/ DISCHARGE FACILITIES
ST HWY 45
Delevan Rd
South Bridge Rd
Stone Corral Rec Area
Sites Lodoga Rd
FIELD OFFICE MAINTENANCE YARD
ASPHALT PLANT
HOLTHOUSE RESERVOIR COMPLEX
TEHAMA-COLUSA CANAL BYPASS PIPELINE
Sites
Eastside Rd
Sites Dam
Antelope Island Rec Area
WAPA 500-KV AND 230-KV
Mcdermott Rd
Sutton Rd
Two Mile Rd
Four Mile Rd
Maxwell
Maxwell Sites Rd
Maxwell Rd
Sacramento River
Com Road
Maxwell Sites Rd
Huffmaster Rd
Lurline Rd
Sulphur Gap Rd
Lurline Headwaters Rec Area
Tehama-Colusa Canal
Glenn-Colusa Irrigation District Canal

Legend

- Towns

Proposed Facilities

- WAPA Powerline Adjustment
- Project Roads
- Access Roads
- Dams
- GCID Canal Connection to the TRR
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Areas
- Project Buffer

MAF = Million acre-feet
GCID = Glenn-Colusa Irrigation District
WAPA = Western Area Power Administration

FIGURE 3-1
Proposed Project/ Proposed Action Facilities
North-of-the-Delta Offstream Storage Project

N

0 0.5 1 1.5 2 Miles

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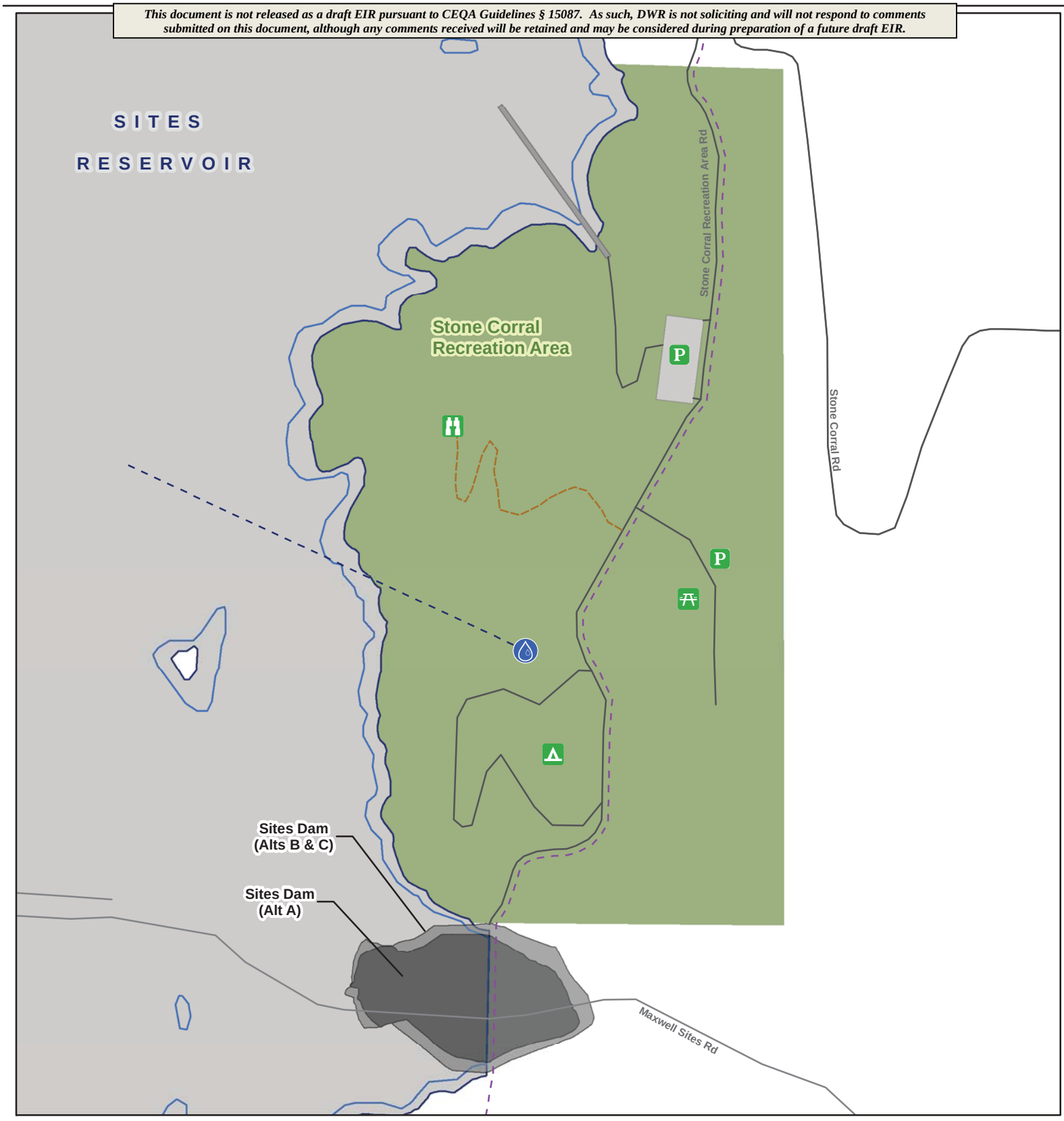

Legend

- Camping/ Group Campsite
- Picnic Area
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- South Bridge New Roads (gravel)
- Access Roads
- Delevan Transmission Line
- Dam - Alt A
- Dam - Alts B & C
- Recreation Area Parking
- Boat Ramps
- Dams
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Area

MAF = Million acre-feet
Alt = Alternative

FIGURE 3-2A
Proposed Stone Corral Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

N

0 250 500 1,000 1,500 2,000 Feet

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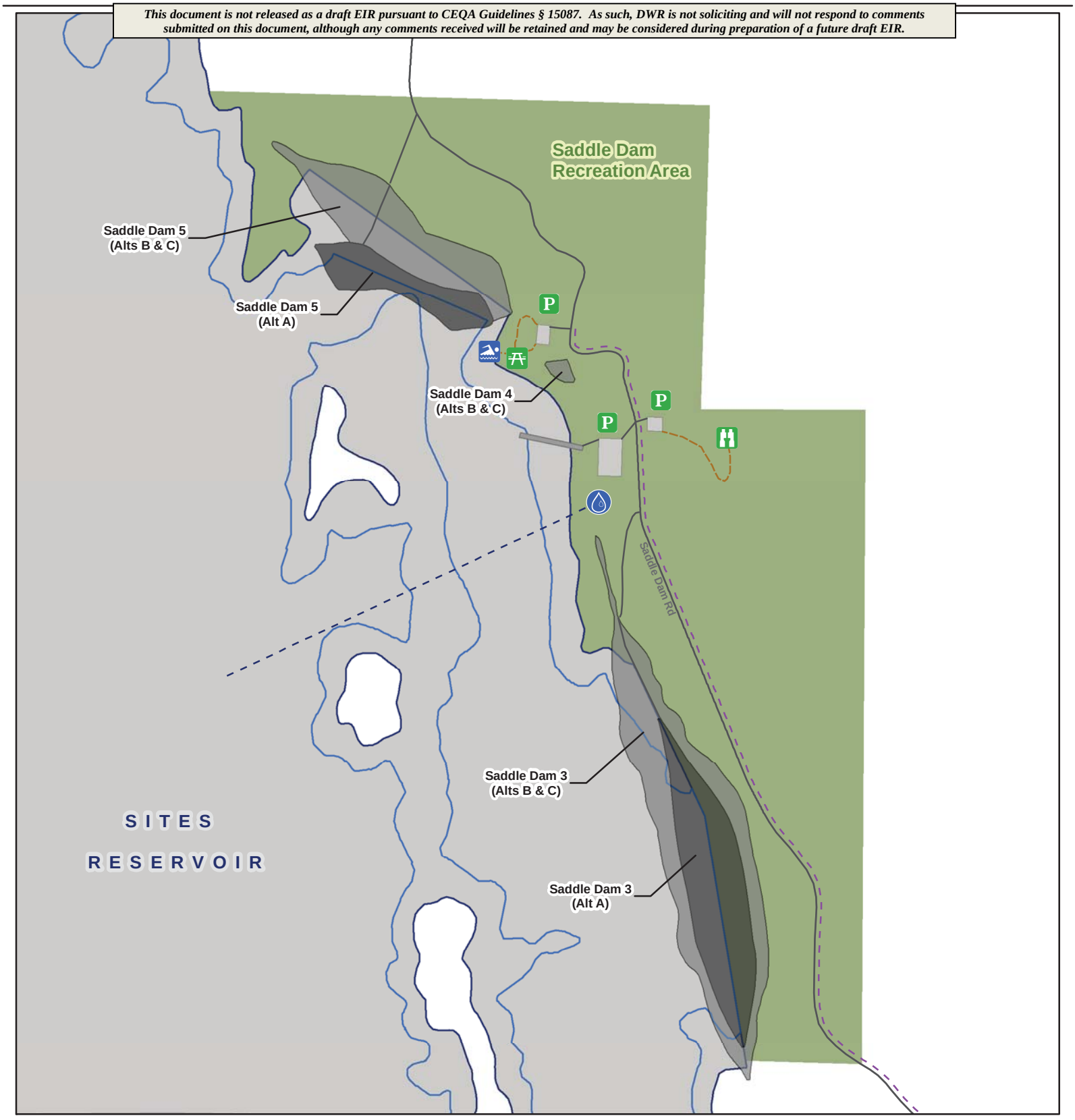

Legend

- Picnic Area
- Swim Beach
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- Delevan Transmission Line
- South Bridge New Roads (gravel)
- Access Roads
- Dam - Alt A
- Dam - Alts B & C
- Recreation Area Parking
- Boat Ramps
- Recreation Area
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir

MAF = Million acre-feet
Alt = Alternative

FIGURE 3-2B
Proposed Saddle Dam Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

N

0 250 500 1,000 1,500 2,000 Feet

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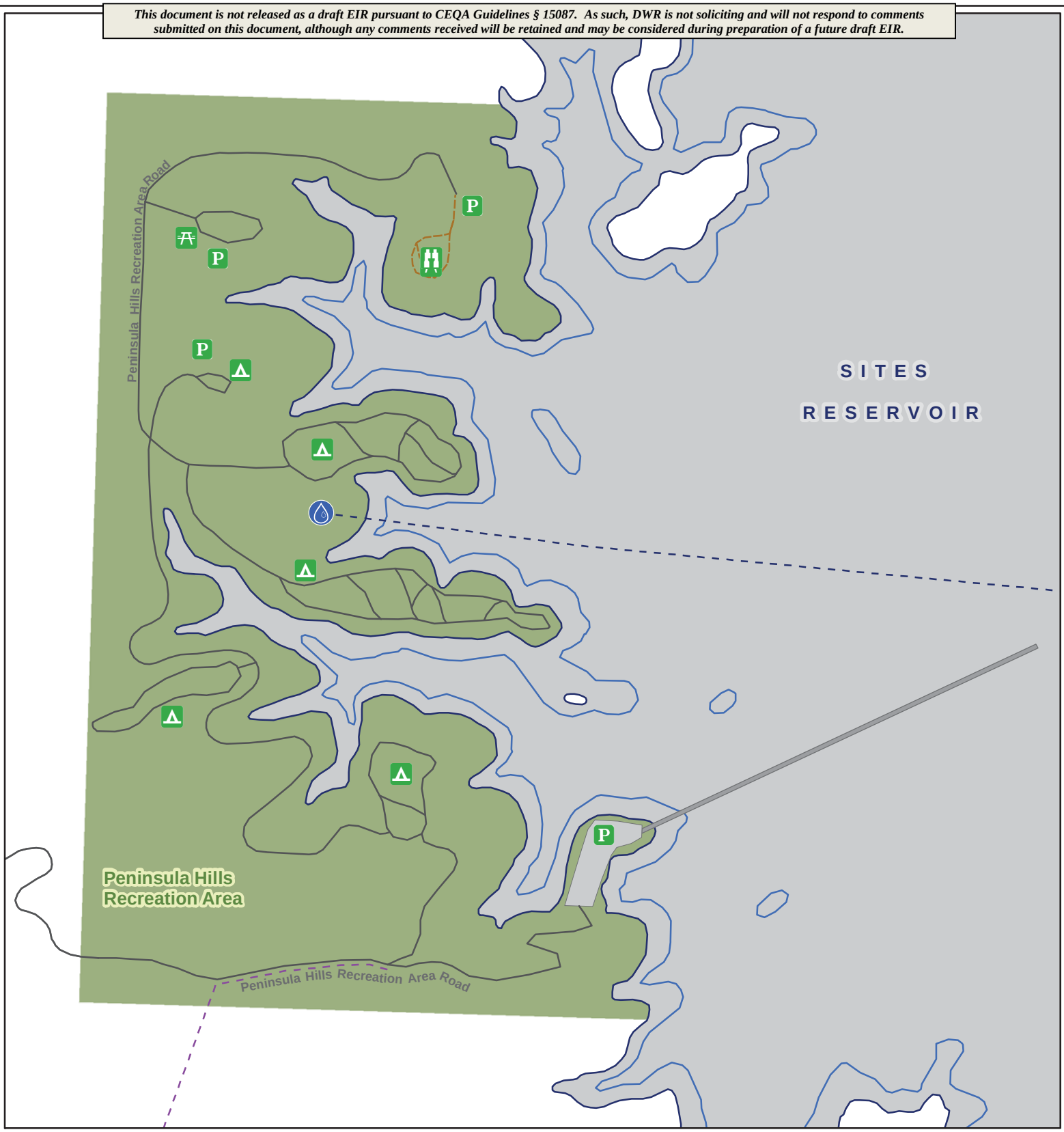

Legend

- Camping/ Group Campsite
- Picnic Area
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- South Bridge New Roads (gravel)
- Access Roads
- Delevan Transmission Line
- Recreation Area Parking
- Boat Ramps
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Area
- MAF = Million acre-feet

FIGURE 3-2C
Proposed Peninsula Hills Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

N

0 250 500 1,000 1,500 2,000 Feet

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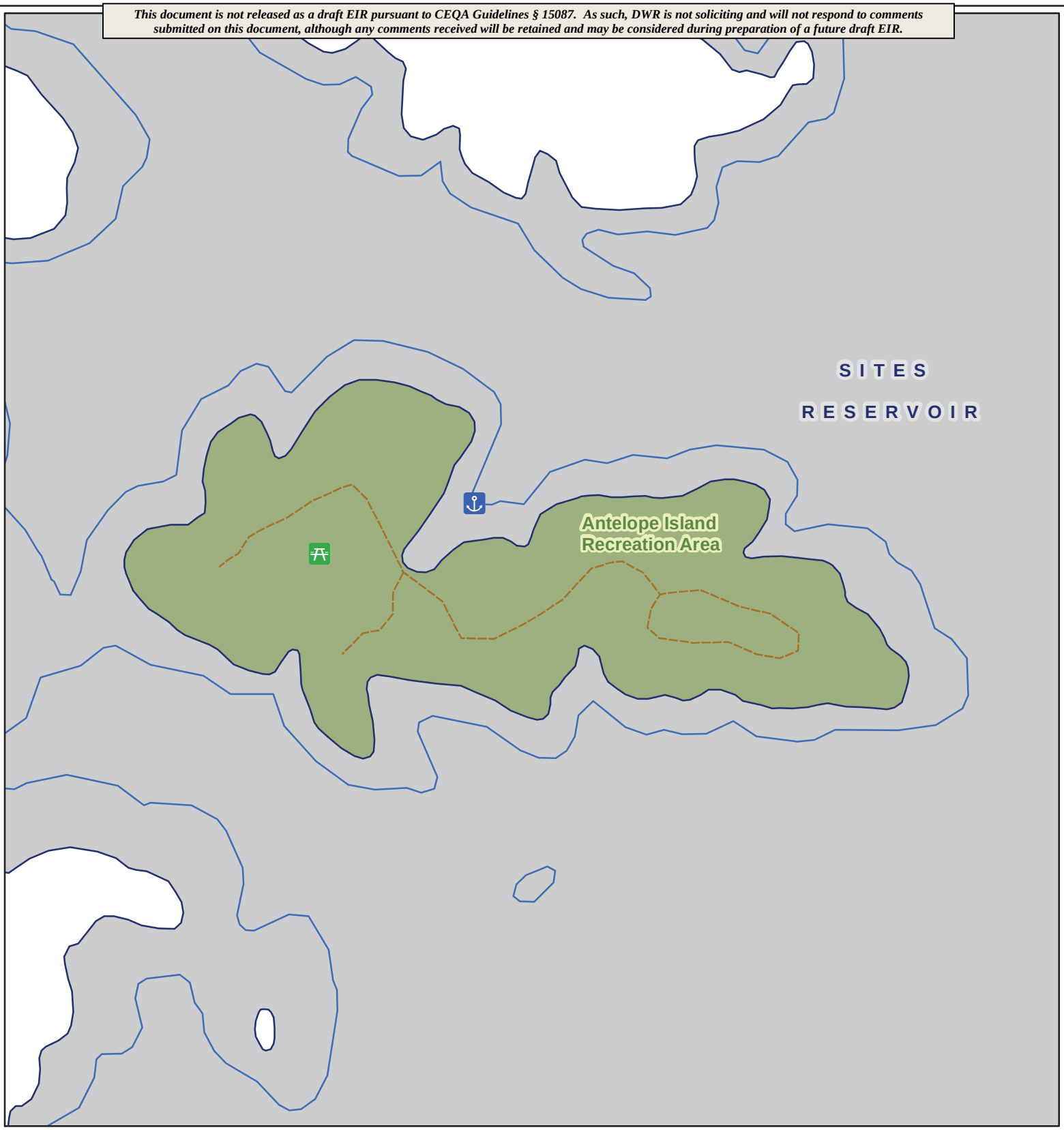

Legend

- Picnic Area
- Undeveloped Mooring
- Recreation Area Trails
- Recreation Area
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir

MAF = Million acre-feet

FIGURE 3-2D
Proposed Antelope Island Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

N

0 125 250 500 750 1,000
Feet

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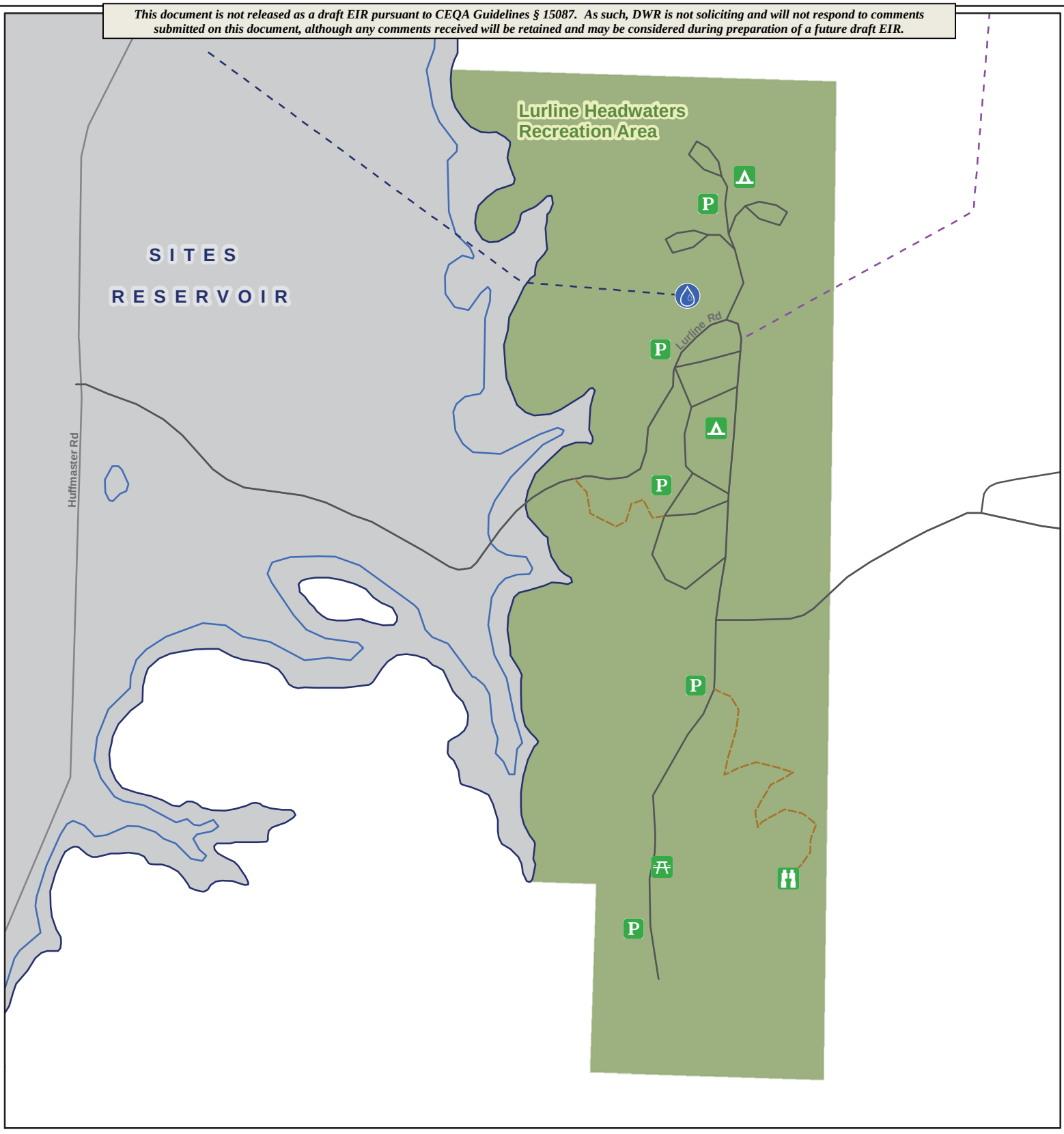

Legend

- Camping/ Group Campsite
- Picnic Area
- Vista Point
- Water Tank
- Parking
- Recreation Area Trails
- Recreation Area Water
- Delevan Transmission Line
- South Bridge New Roads (gravel)
- Access Roads
- Recreation Area Parking
- 1.27 MAF Sites Reservoir
- 1.81 MAF Sites Reservoir
- Recreation Area
- MAF = Million acre-feet

FIGURE 3-2E
Proposed Lurline Headwaters Recreation Area and Facilities
North-of-the-Delta Offstream Storage Project

N

0 250 500 1,000 1,500 2,000 Feet

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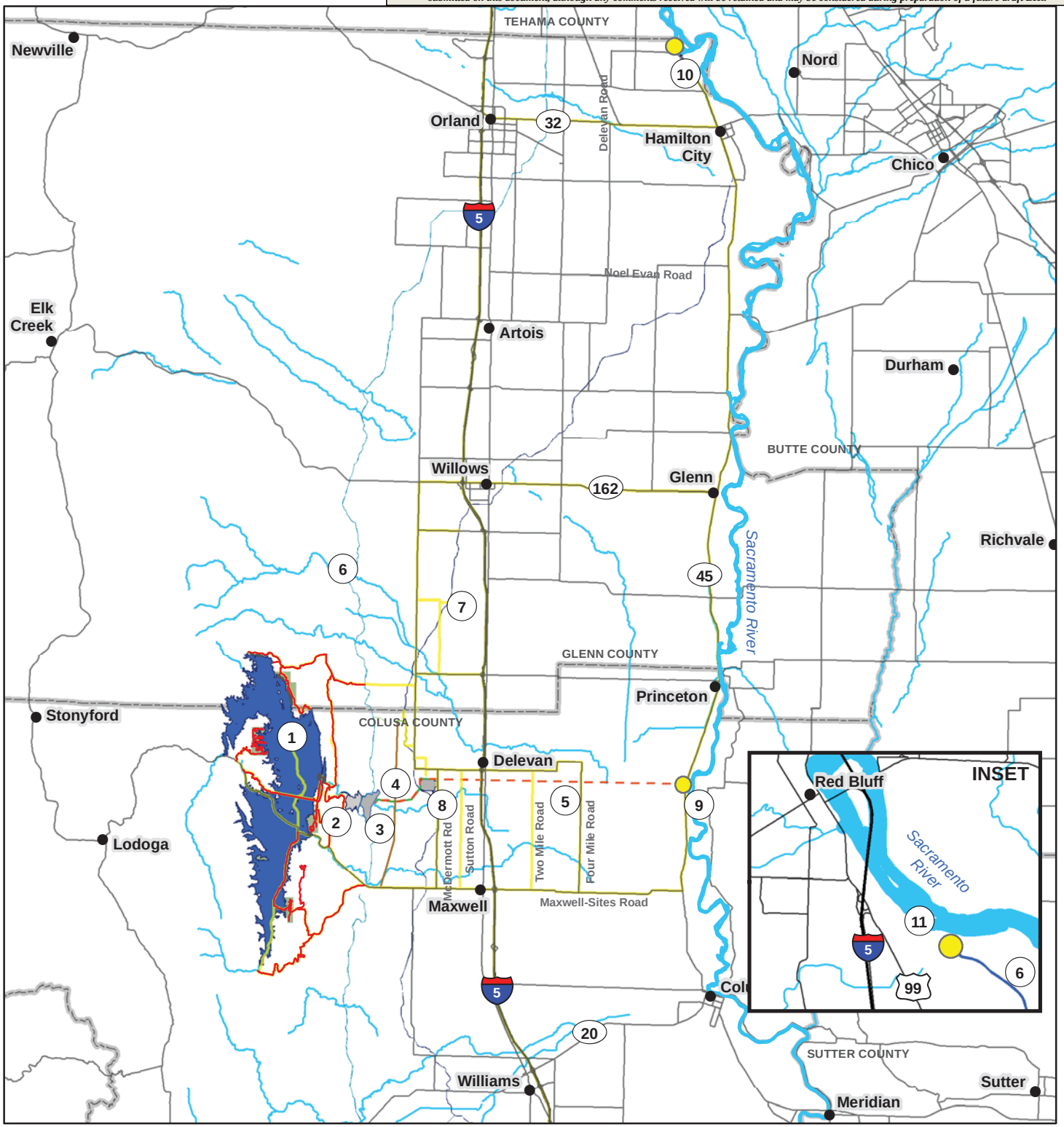

Legend

- Cities and Towns
- Pumping Plant
- Dams
- New or Improved Roads
- Existing Roads
- Access Routes
- Recreation Areas
- Interstates
- Rivers/Creeks
- Counties
- (1) Sites Reservoir (New)
- (2) Funks Reservoir (Existing; Dredged)
- (3) Holthouse Reservoir (New)
- (4) TRR Pipeline (New)
- (5) Delevan Pipeline (New)
- (6) Tehama-Colusa Canal (Existing)
- (7) Glenn-Colusa Irrigation District (GCID) Canal (Existing)
- (8) Terminal Regulating Reservoir (New)
- (9) Delevan Pipeline Intake/Discharge Facilities (New)
- (10) GCID Pumping Plant (Existing)
- (11) Red Bluff Pumping Plant (Existing; Add Pump)

FIGURE 3-3A
Proposed Access Routes to Project Facilities
North-of-the-Delta Offstream Storage Project

N

0 2 4 8 12 Miles

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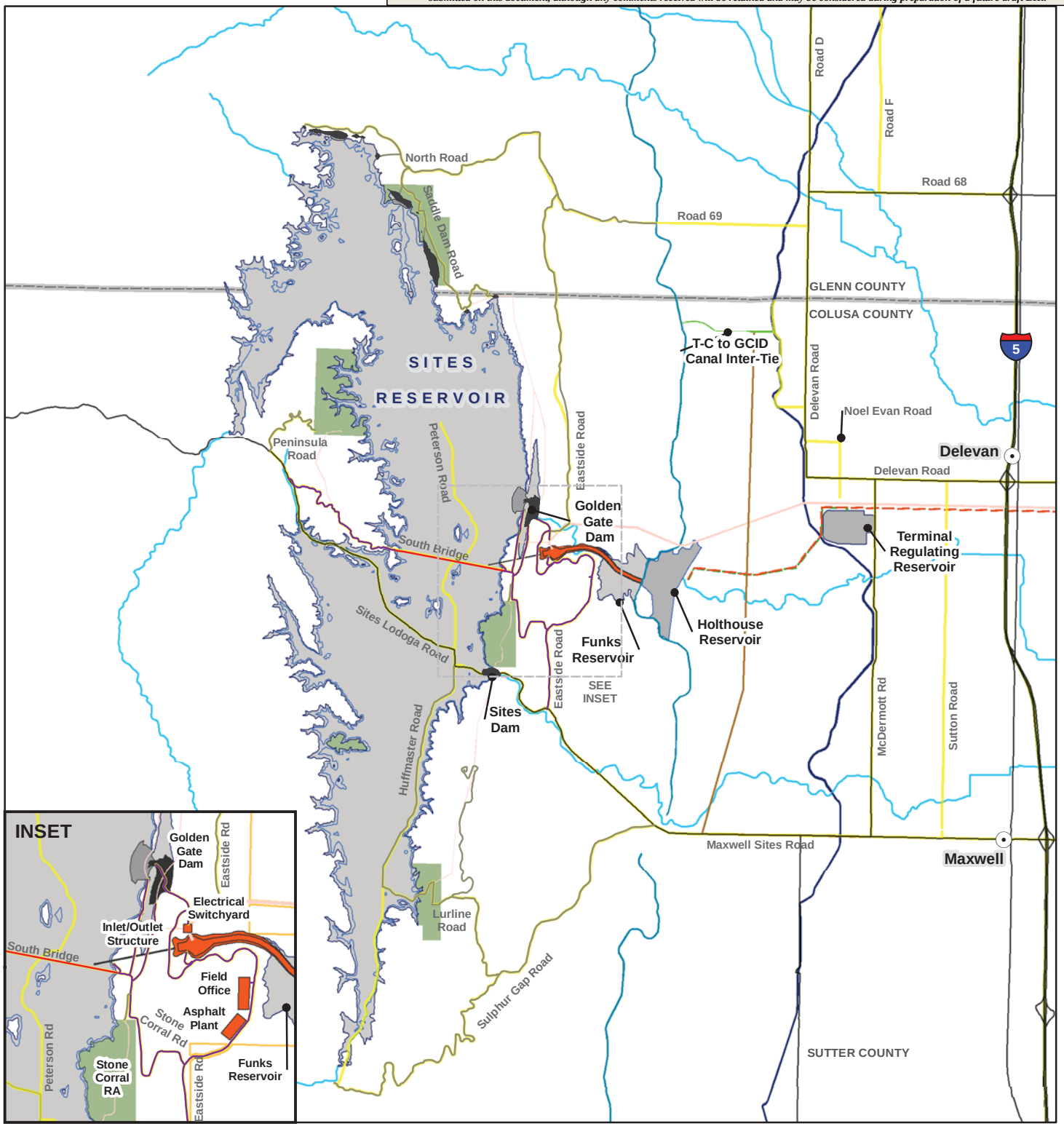

Legend

- 1.27-MAF Sites Reservoir
- 1.81-MAF Sites Reservoir
- Dams (1.27 MAF)
- Dams (1.81 MAF)
- Tehama-Colusa Canal
- Glenn-Colusa Irrigation District Canal
- Recreation Areas
- Transmission Line Easement
- County Line
- Cities
- Creeks
- Delevan Pipeline
- TRR Pipeline
- Existing Roads
- Interstates
- Access Routes

New or Improved Roads

- Gravel
- Paved
- Paved Bridge

FIGURE 3-3B
Proposed Access Routes to Project Facilities

North-of-the-Delta Offstream Storage Project

N

0 0.5 1 2 3 Miles

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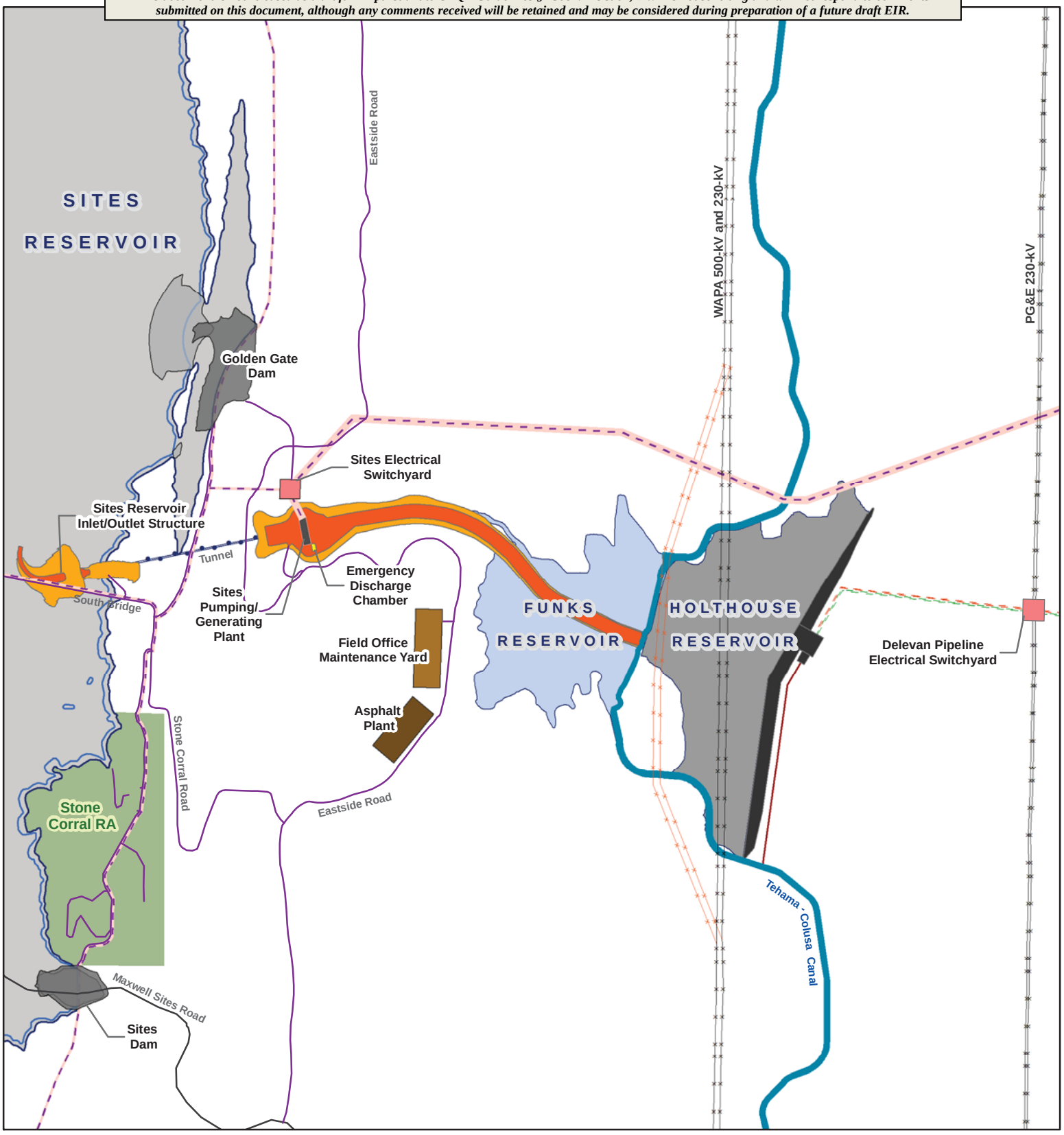

WAPA = Western Area Power Administration; PG&E = Pacific Gas and Electric

Legend

- Sites Reservoir (1.27-MAF)
- Sites Reservoir (1.81-MAF)
- Sites Dams (1.27-MAF)
- Sites Dams (1.81-MAF)
- Holthouse Dam Facilities
- Asphalt Plant
- Field Office Maintenance Yard
- Transmission Line Easement

Sites Reservoir Inlet/Outlet Structure

- Emergency Discharge Chamber
- Inlet/Outlet Concrete Structure
- Inlet/Outlet Excavation Footprint
- Pumping Generating Plant
- Tunnel
- Electrical Switchyard

- Existing Powerline
- WAPA Powerline Adjustment
- Proposed Project Roads
- Existing Access Roads
- Delevan Transmission Line
- Delevan Pipeline
- TRR Pipeline

FIGURE 3-4
Proposed Sites Reservoir Inlet/Outlet Structure, Holthouse Reservoir, and Associated Facilities
North-of-the-Delta Offstream Storage Project

0 750 1,500 3,000 4,500 Feet

N

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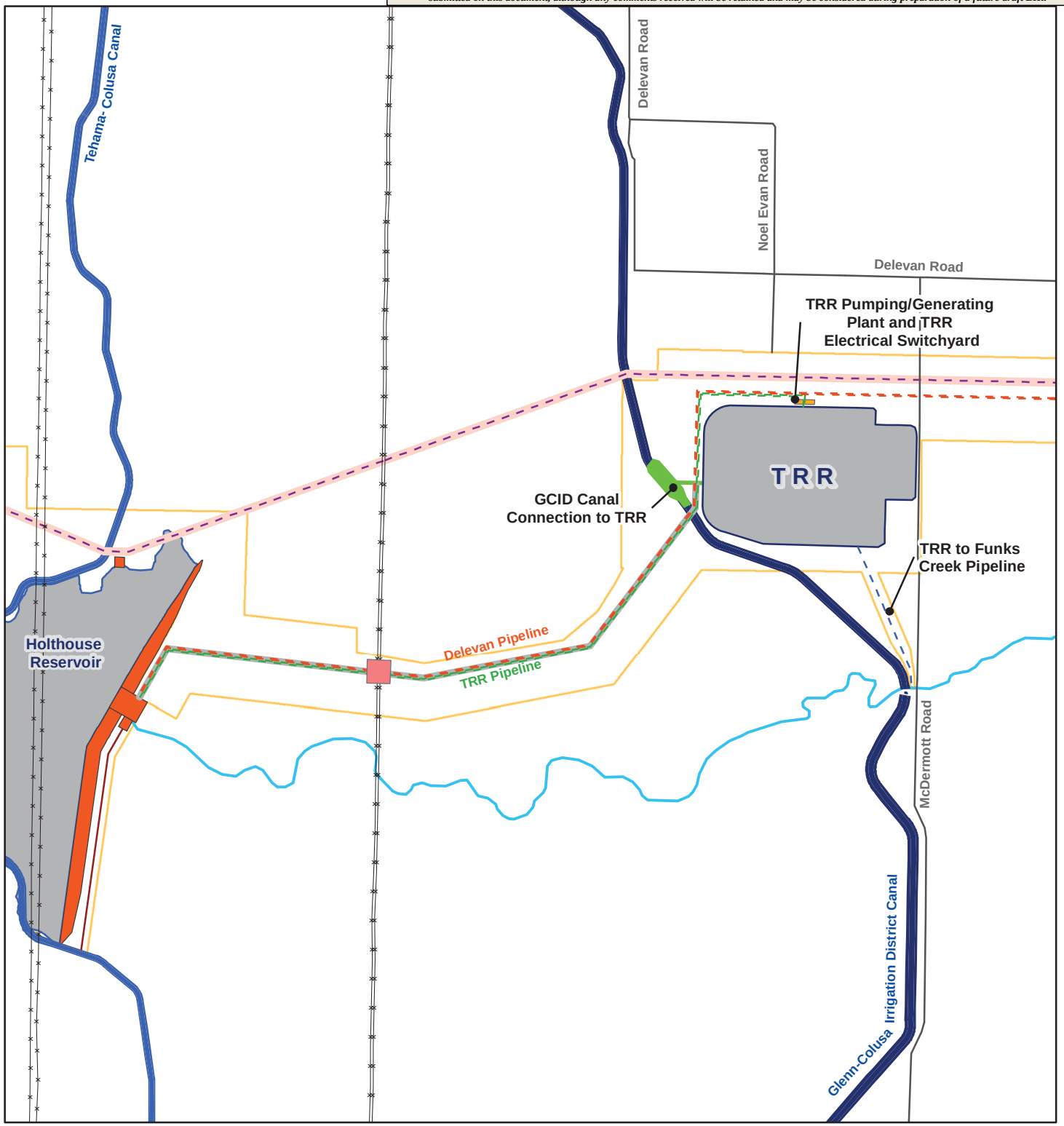

Legend

- Existing Access Roads
- Existing PG&E Transmission Line
- Funks Creek
- TRR Pipeline Road
- Delevan Transmission Line
- Delevan Pipeline
- TRR Pipeline
- TRR to Funks Creek Pipeline
- Delevan Pipeline Electrical Switchyard
- Transmission Line Easement
- Terminal Regulating Reservoir (TRR)
- Glenn-Colusa Irrigation District (GCID) Canal
- GCID Canal Connection to TRR
- TRR Pumping/Generating Plant
- Tehama-Colusa Canal
- Holthouse Dam Facilities
- Holthouse Reservoir
- Construction Disturbance Area

FIGURE 3-5
Proposed Terminal Regulating Reservoir and Associated Facilities
North-of-the-Delta Offstream Storage Project

0 750 1,500 3,000 4,500 Feet

N

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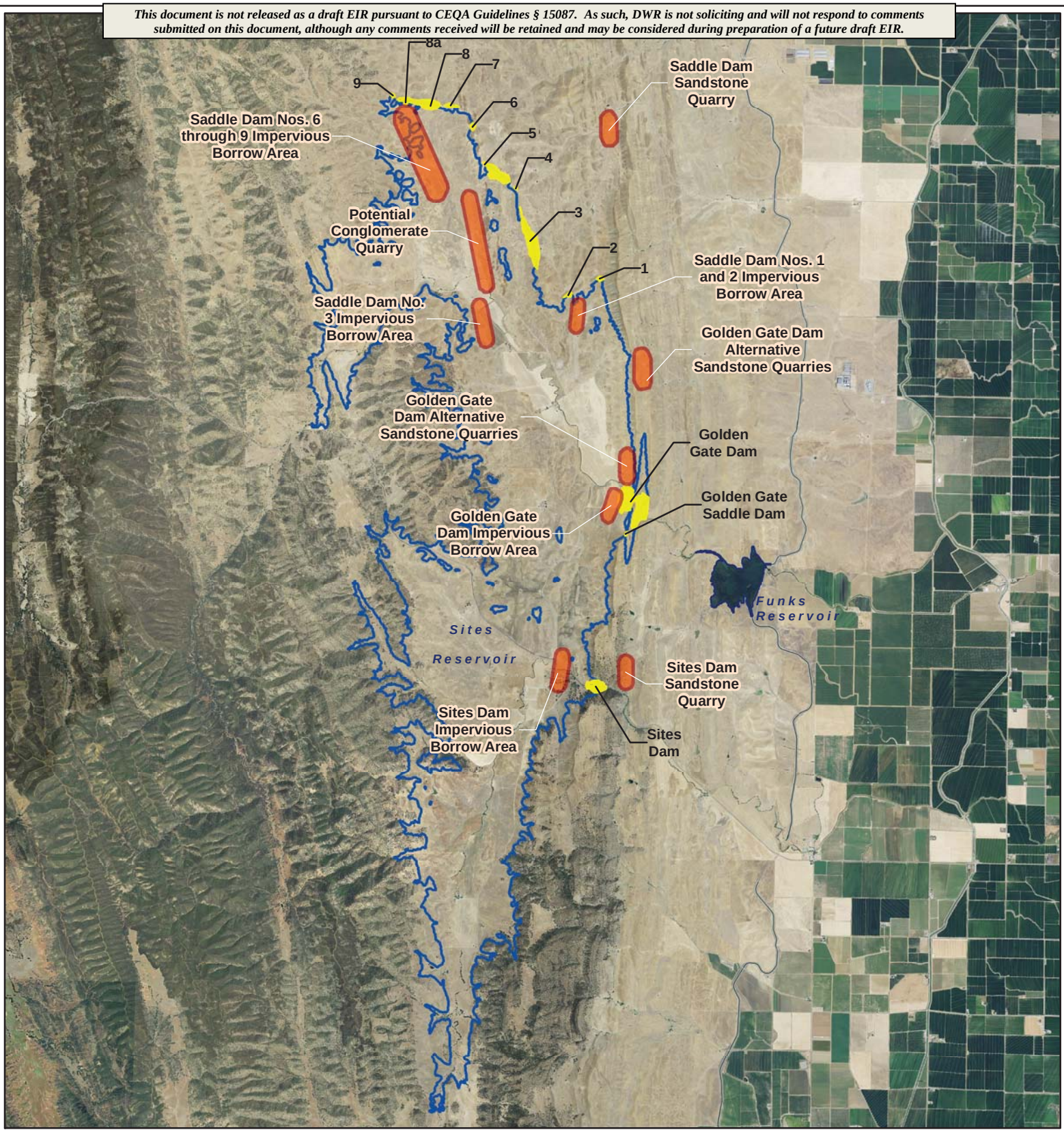
FIGURE 3-6
Location of the Proposed Pump Installation at Red Bluff Pumping Plant
North-of-the Delta Offstream Storage Project



Legend

- BorrowPits
- Dams
- Proposed Sites Reservoir

FIGURE 3-7
Potential Quarry Locations Within and Near the Proposed Sites Reservoir Inundation Area
North-of-the-Delta Offstream Storage Project

N

0 0.5 1 2 3 Miles

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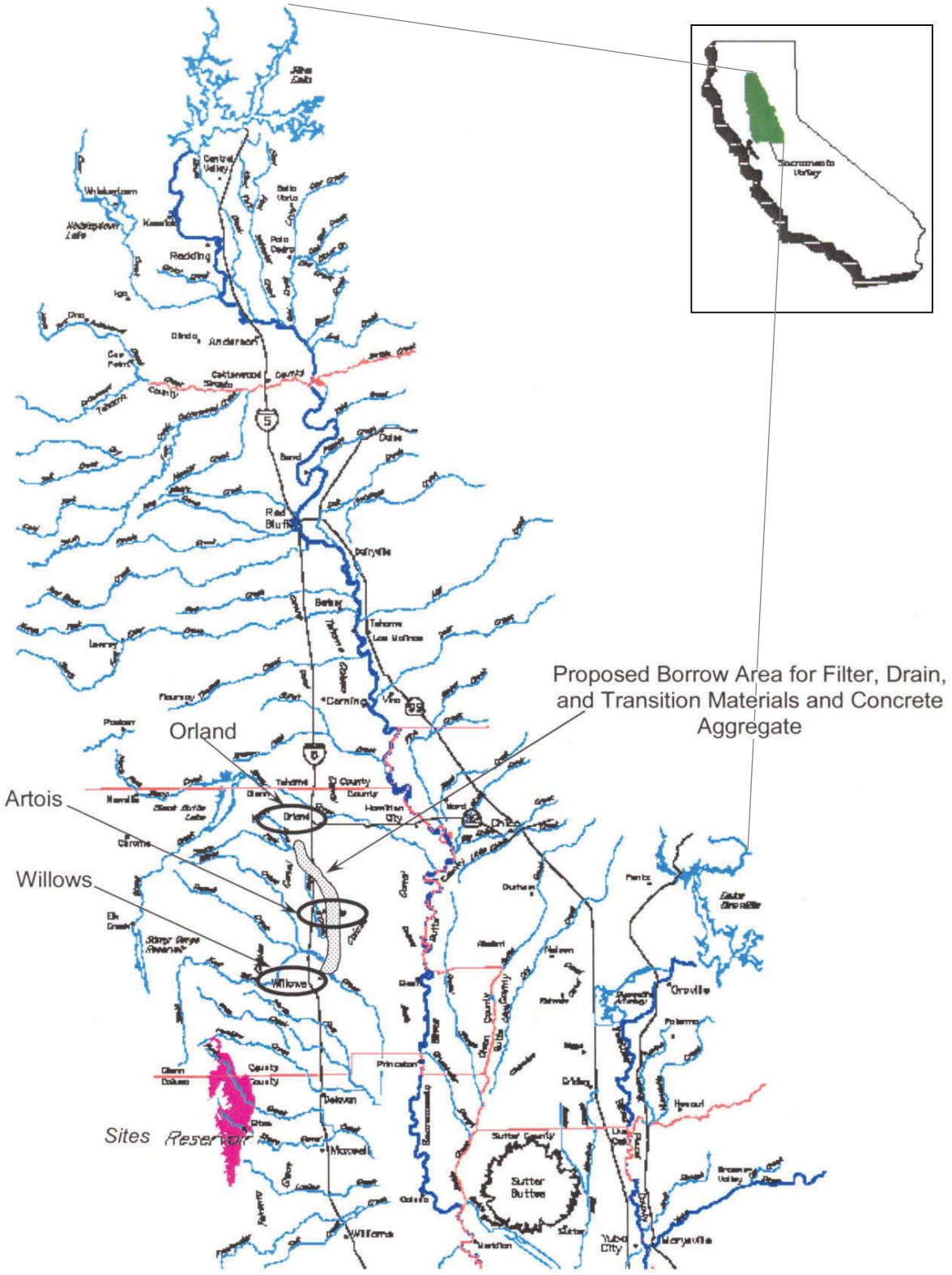
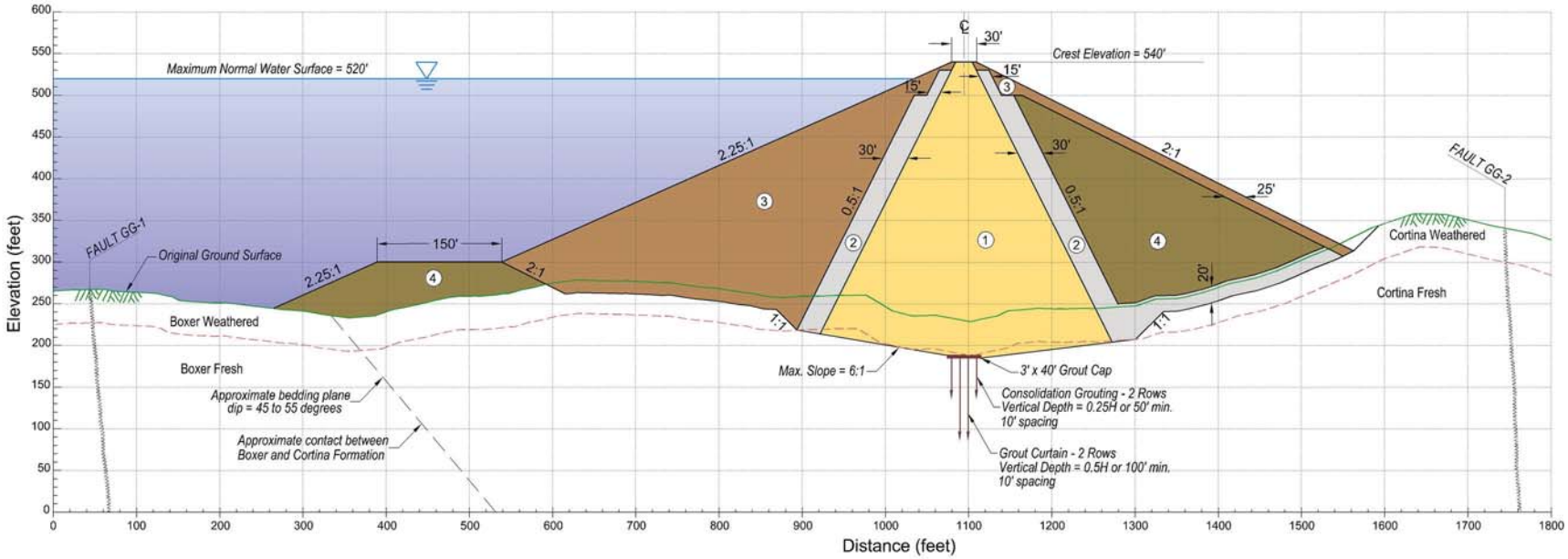


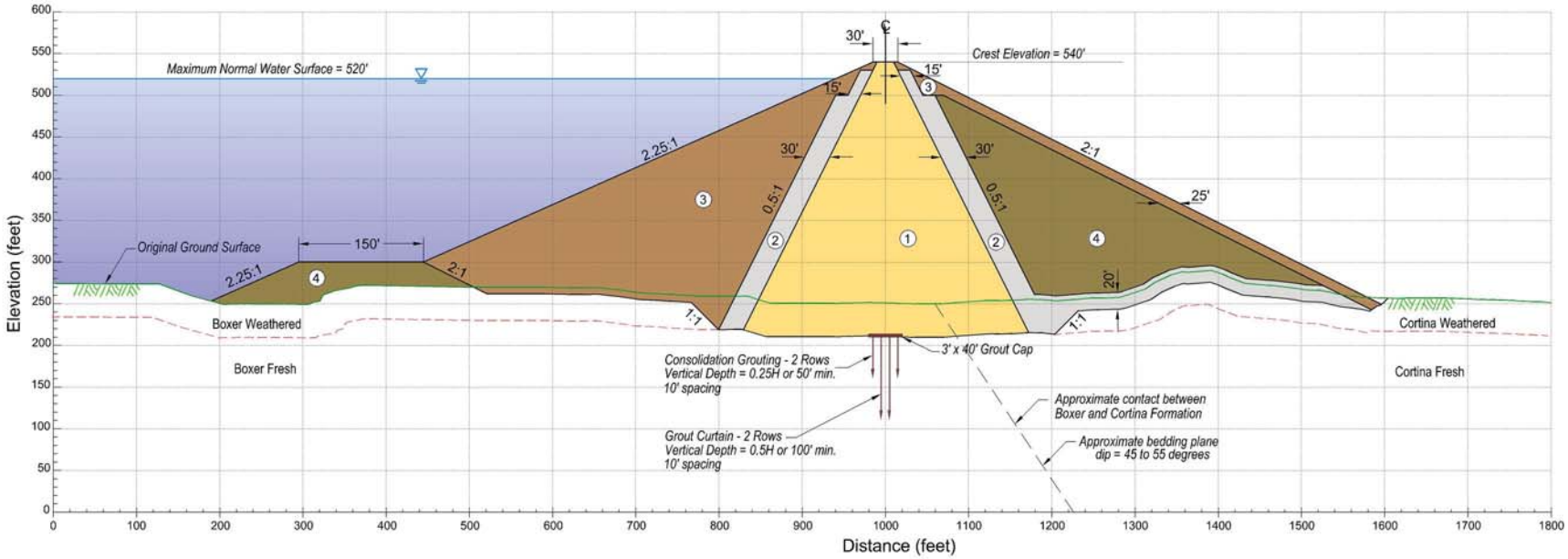
FIGURE 3-8
Potential Regional Quarry Locations
North-of-the-Delta Offstream Storage Project



NOTES

1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.
2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material
3. H = Height of Dam
4. ℄: Centerline
5. GG: Informal name of fault

FIGURE 3-9
Golden Gate Dam Cross Section Showing Grouting
North-of-the-Delta Offstream Storage Project



NOTES

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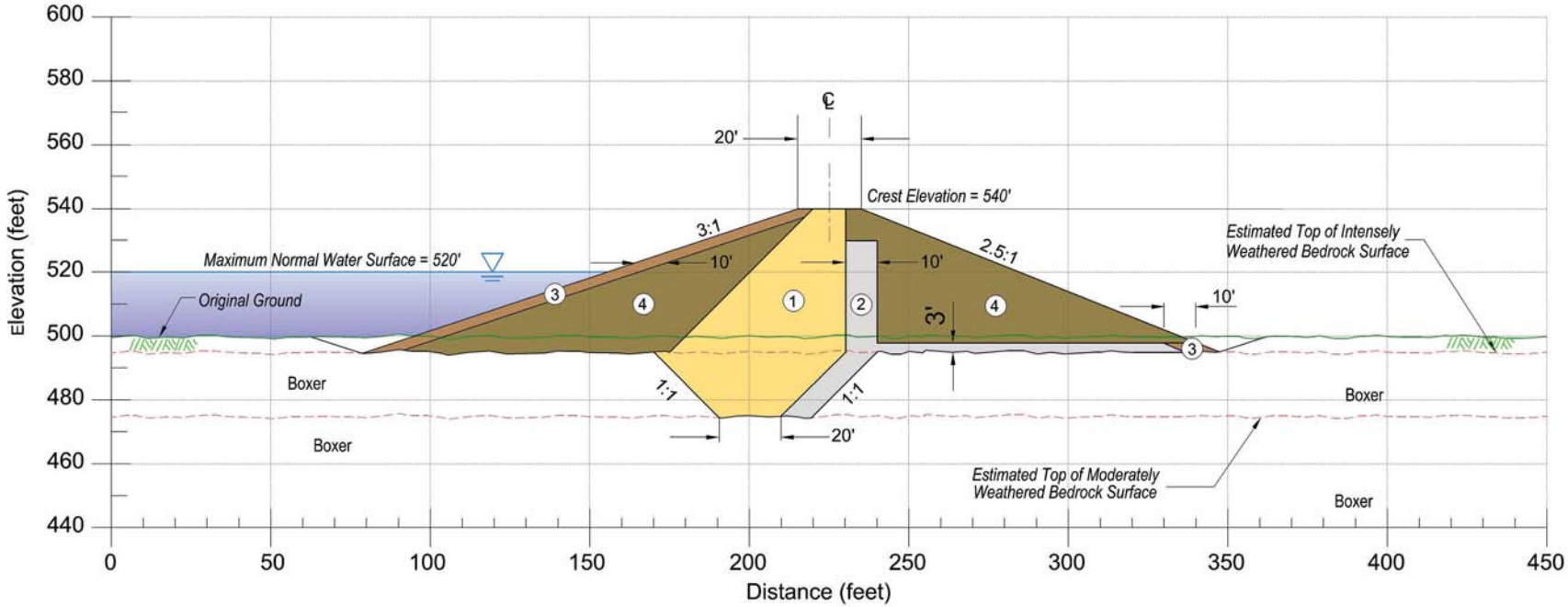
2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material
3. H = Height of Dam
4. ℄: Centerline

FIGURE 3-10
Sites Dam Cross Section Showing Grouting
North-of-the-Delta Offstream Storage Project



NOTES

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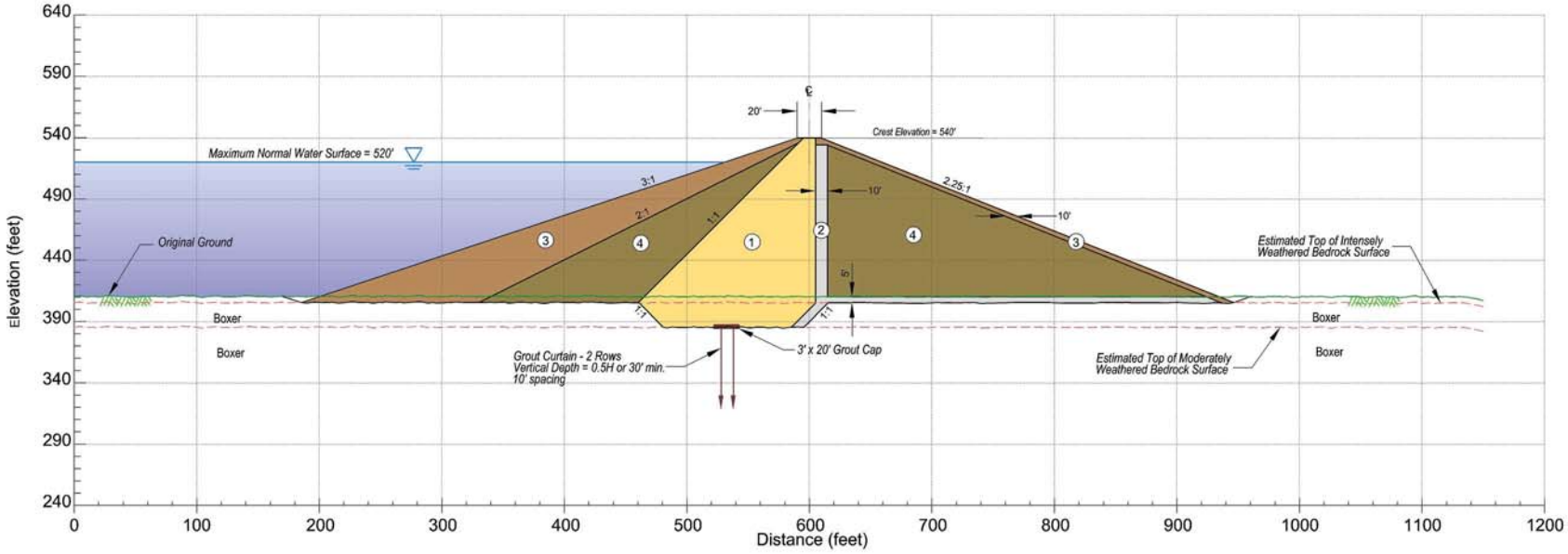
2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material
3. H = Height of Dam
4. ℄: Centerline

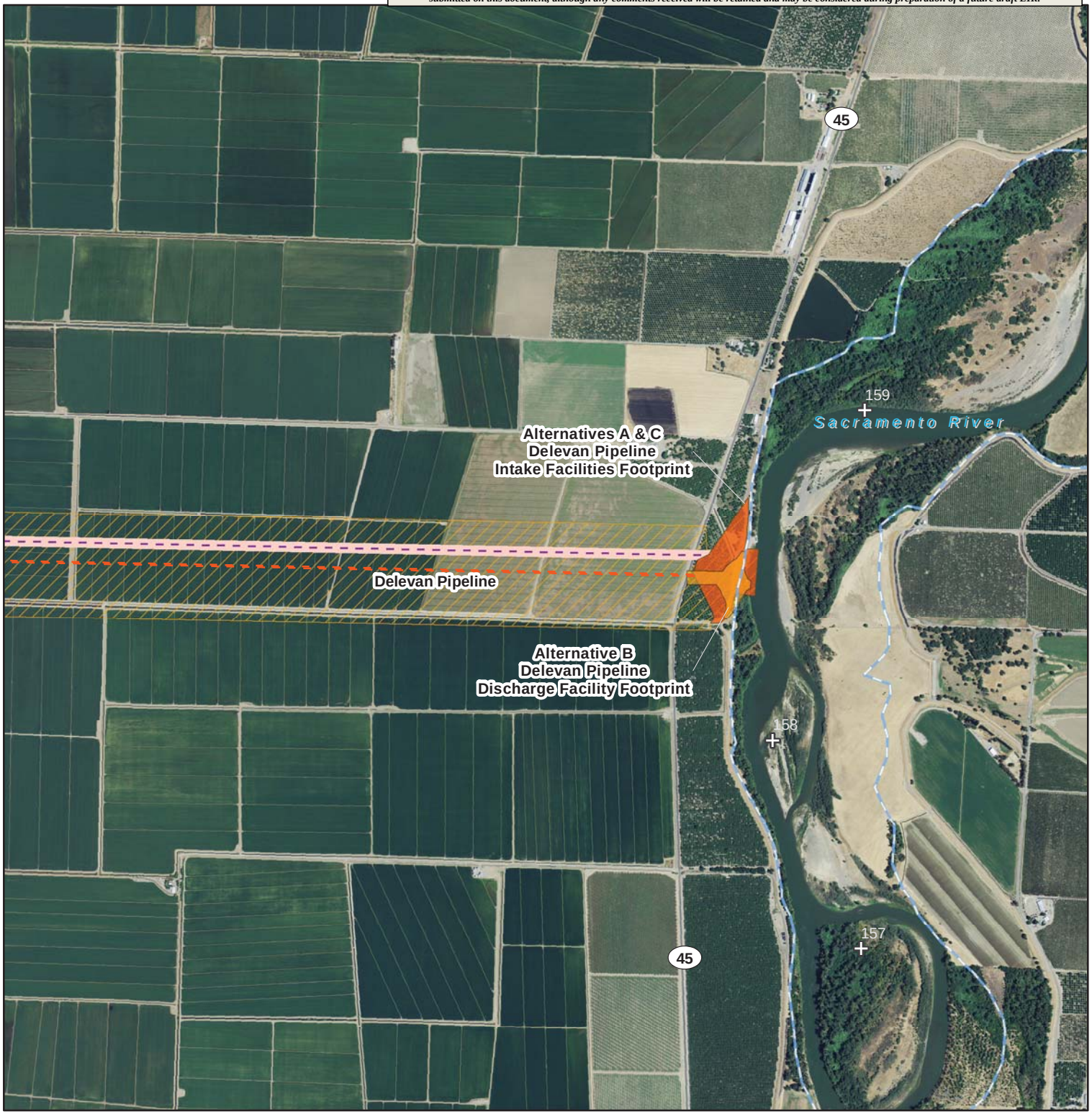
FIGURE 3-11
Saddle Dams 1, 2, 4, and 9 Cross Sections Showing Grouting (Typical)
North-of-the-Delta Offstream Storage Project



NOTES

1. Embankment section presented is preliminary and is based upon feasibility level geologic exploration and materials investigation, testing, and evaluation programs.
2. Embankment zones are as follows:
   - ZONE ① Core
   - ZONE ② Upstream and Downstream Filter, Drain, and Transition
   - ZONE ③ Rockfill and Riprap - Shell material
   - ZONE ④ Random - Shell material
3. H = Height of Dam
4. ℄: Centerline

FIGURE 3-12
Saddle Dams 3, 5, 6, 7, and 8 Cross Sections Showing Grouting (Typical)
North-of-the-Delta Offstream Storage Project



Legend

- River Miles
- Delevan Pipeline
- Delevan Transmission Line
- Sacramento River Reaches
- Transmission Line Easement
- Construction Disturbance Area
- Discharge Facility - Alternative B
- Intake Facilities - Alternatives A & C

FIGURE 3-13A
Delevan Pipeline Intake/ Discharge Facilities
North-of-the-Delta Offstream Storage Project

0 500 1,000 2,000 3,000
Feet

N

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12' DIA PIPES TO AND FROM SITES RESERVOIR (BY DWR)

HWY 45

8' I.D. PIPE

⊗ EL 90.0

32' I.D. SPHERICAL AIR CHAMBER

⊗ EL 90.0

RETAINING WALL

100'x50' CONTROL BUILDING

PUMP/TURBINE STATION (BY DWR)

⊗ EL 72.0

⊗ EL 72.0

⊗ EL 90.0

100'x50' ELECTRICAL BUILDING

⊗ EL 86.0

SHEET PILE WALLS

SHEET PILE WALLS

AFTERBAY

⊗ EL 35.0

WEST

SEDIMENT SPOIL AREA

10 - 9' DIA PIPES

GATES

SEDIMENT SPOIL AREA

⊗ EL 90.0

LEVEE

ROAD

SHEET PILE WALLS, TYP

⊗ EL 68.0

⊗ EL 68.0

⊗ EL 37.0

FOREBAY

⊗ EL 84.0

SHEET PILE WALLS, TYP

⊗ EL 84.0

LOG BOOM

FISH SCREEN (2000 cfs)

MID PUMPING PLANT

MIN DESIGN WATER SURFACE EL 51± (6,000 cfs)

SACRAMENTO RIVER

N

0 80 160 240

Scale in Feet

LEGEND

· = EXISTING SPOT ELEVATION

⊗ = FINISH GRADE ELEVATION

DIA = DIAMETER

EL = ELEVATION

I.D. = INSIDE DIAMETER

TYP = TYPICAL

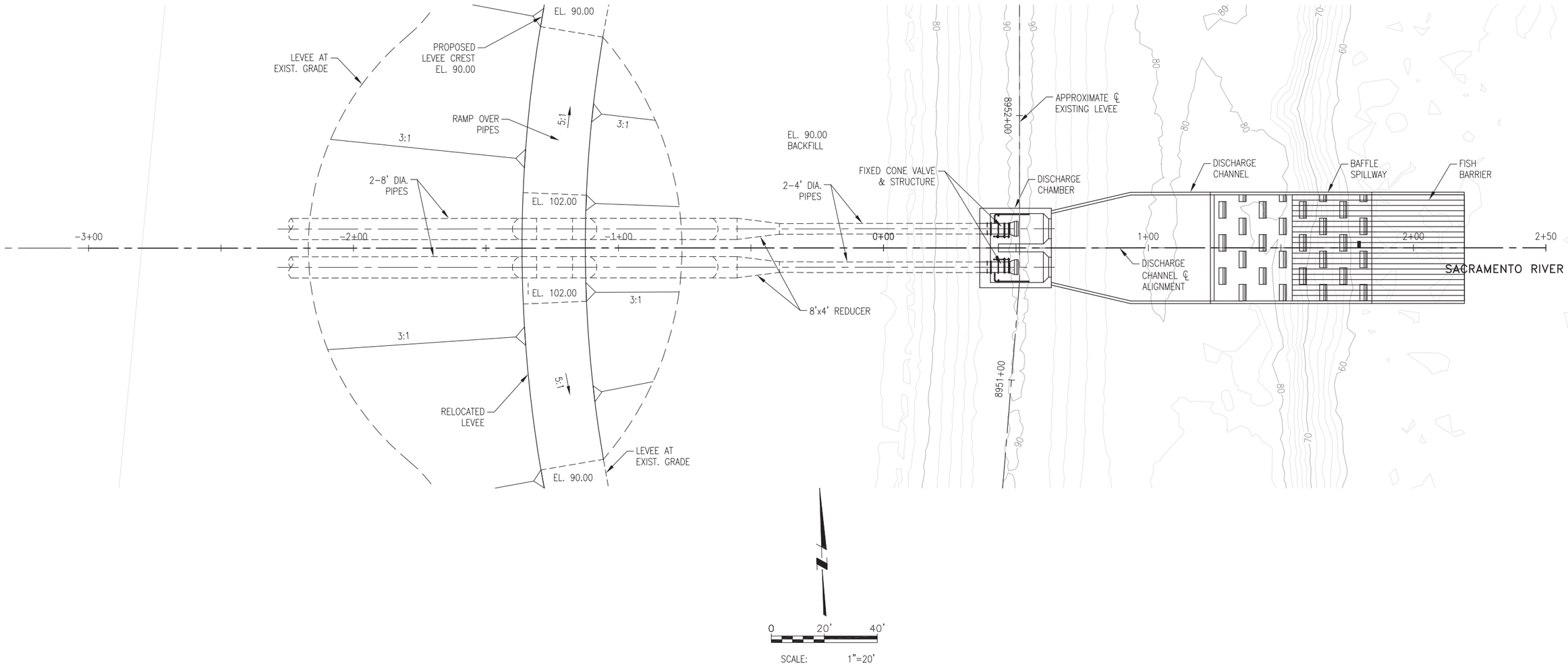
cfs = CUBIC FEET PER SECOND

MIN = MINIMUM

MID = MAXWELL IRRIGATION DISTRICT

DWR = DEPARTMENT OF WATER RESOURCES

FIGURE 3-13B
Proposed Delevan Pipeline Intake Facilities
North-of-the-Delta Offstream Storage Project



LEGEND

DIA = DIAMETER
EL = ELEVATION
℄ = CENTERLINE

Source: URS, 02/18/2011.

FIGURE 3-13C
Proposed Delevan Pipeline Discharge Facility
North-of-the-Delta Offstream Storage Project