Benefit Calculation, Monetization, and Resiliency Tab

Attachment 8: Total Project Cost and Basis of Estimate Report

Attach an estimate of the total project costs that includes construction cost, interest during construction, land acquisition, monitoring, environmental mitigation or compliance obligations, operations and maintenance, repair, and replacement costs during the planning horizon using methods described in TR section 6. If the project costs are located in another attachment, identify the location.

WSIP Application Instructions, March 2017

Response

The project cost estimate for the Sites Project is a Class 4 estimate as defined by the Association for the Advancement of Cost Estimating, International, and includes all of the components required for the WSIP Application. Provided in this attachment are the cost estimates, and the Basis of Estimate Report.

Joseph H. Barnes

Joseph H. Barnes, PE
Civil Engineer, License # 4105

7-28-2017

Date

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SITES RESERVOIR PROJECT

BASIS OF ESTIMATE REPORT
FOR
SITES AUTHORITY PROJECT ALTERNATIVE D

WORKING DRAFT
SUBJECT TO CHANGE

Prepared by
AECOM
for

122 West Old Highway 99
Maxwell, CA 95955
Sacramento, California

June 2017

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APPENDICES

FIGURES

TABLES

Abbreviations and Acronyms

AACE	Association for the Advancement of Cost Estimating, International
Authority	Sites Project Authority
AWWA	American Water Works Association
BOE	Basis of Estimate Report
cfs	cubic feet per second
DEC	Design, Estimate, and Construction
DC	direct current
DWR	California Department of Water Resources
GCID	Glenn-Colusa Irrigation District
ID	inside diameter
IDC	interest during construction
kV	kilovolt
KVA	kilovolt-ampere
MAF	million acre-foot
MCC	motor control center
MVA	megavolt-ampere
MVAR	megavolt-ampere reactive
MW	megawatt
OMRR	operation, maintenance, repair, replacement
NODOS	North-of-the-Delta Offstream Storage
PG&E	Pacific Gas and Electric Company
PGP	Pumping/Generating Plant
psi	pounds per square inch
Reclamation	United States Department of the Interior, Bureau of Reclamation
sf	square feet
SPGP	Sites Pumping/Generating Plant
SRPGP	Sacramento River Pumping/Generating Plant
T-C	Tehama-Colusa
TRR	Terminal Regulating Reservoir
UPS	uninterruptable power supply
VAR	volt-amp reactive
WAPA	Western Area Power Administration
WSIP	Water Storage Investment Program

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EXECUTIVE SUMMARY

E-1 INTRODUCTION

Project Alternative D is being developed by the Sites Project Authority (Authority) to reflect the Authority's preferences and those of the local stakeholders for the Sites Reservoir Project (Project). Alternative D is an addition to three other alternatives (Alternatives A, B, and C) developed by the United States Department of the Interior, Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR).

AECOM Technical Services, Inc. (AECOM) is assisting the Authority to develop and evaluate Alternative D by preparing conceptual plans, feasibility-level cost estimates, a preliminary construction schedule, and other information needed to prepare the Project Feasibility Report and the application for bond funding under the Water Storage Investment Program (WSIP).

This Basis of Estimate (BOE) Report for Alternative D provides brief descriptions for the major project components and supporting information for the Project cost estimate and preliminary construction schedule. Appendices included in this BOE contain the cost estimate and preliminary construction schedule. To support estimating and scheduling, AECOM developed a set of conceptual plans for the Project, which is provided separately.

E-2 Facilities Comprising Project Alternative D

The Authority developed Alternative D by modifying the facilities in Reclamation Alternative C to reflect the Authority's vision for the project. Table E-1 provides a list of the key project facilities that comprise Alternative D, which are briefly described in Section 2. More detailed facility descriptions can be found in the Feasibility Report (Reclamation, 2017). Figure E-1 shows facility locations.

Table E-1. Sites Reservoir Project Facilities - Alternative D

Sites Reservoir (Approximately 1.8 Million Acre-Foot [MAF] Maximum Storage)
Two Main Dams (Sites Dam and Golden Gate Dam)
Nine Saddle Dams (Numbered 1 Through 9)
Sites Reservoir Inlet/Outlet Facility, Including Inlet Tower and Tunnel
Sites Pumping/Generating Plant
Holthouse Reservoir
Holthouse Reservoir Inlet/Outlet Facility and Spillway
Terminal Regulating Reservoir (TRR) and TRR Pumping/Generating Plant
TRR and Delevan Pipelines
Delevan Intake and Pumping/Generating Plant on Sacramento River
Sites Lodoga Road Relocation and South Bridge
Other Temporary and Permanent Project Roads
Substation Interconnections to existing Western Area Power Administration (WAPA) and Pacific Gas and Electric (PG&E) Transmission Lines
Two Recreation Areas and Day-use Boat Ramp

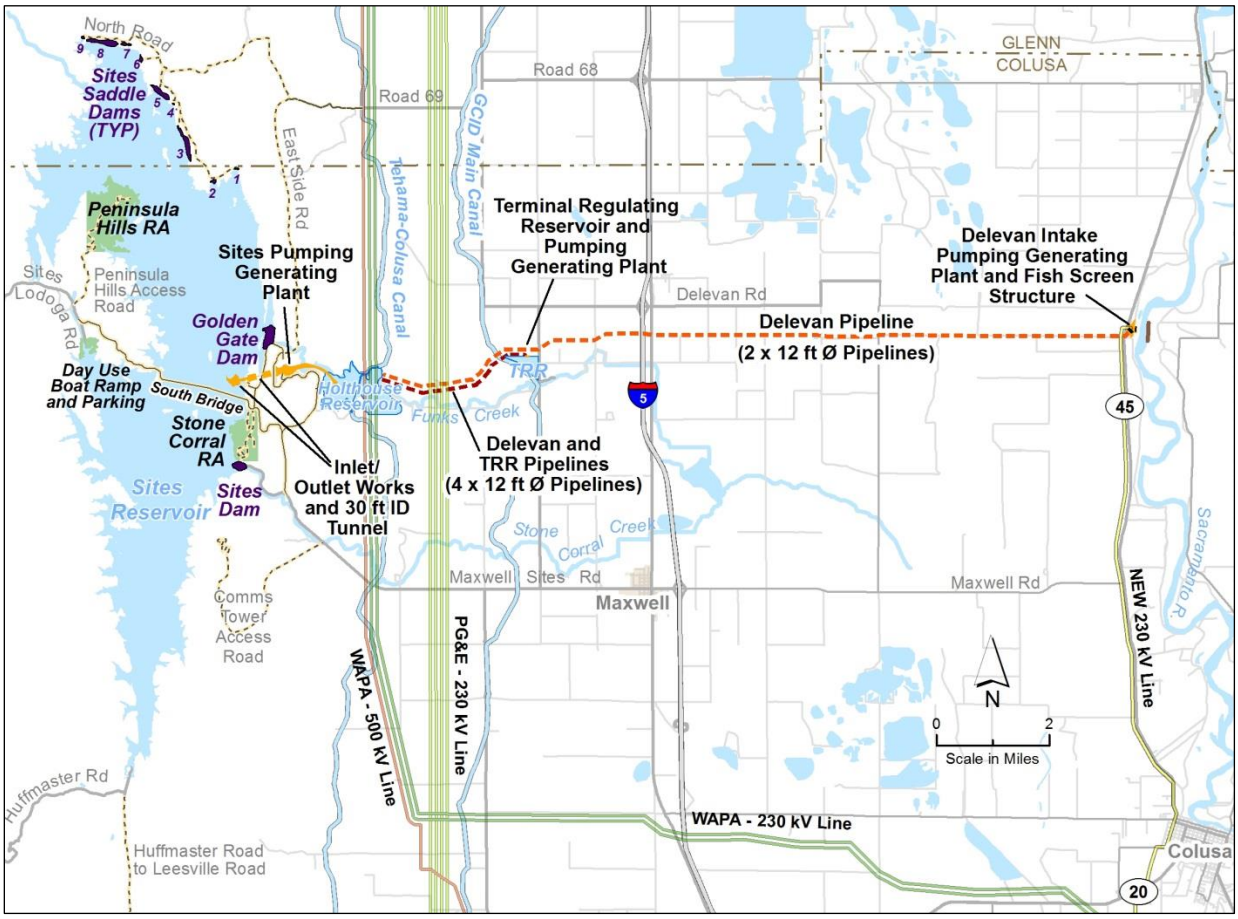

Figure E-1 Project Plan

The more significant modifications made to Reclamation Alternative C to develop Alternative D include the following:

- Delevan Intake and Pumping/Generating Plant site arrangements are modified to make better use of the site and improve constructability of Delevan Pipeline.
- The east-west cross country transmission line between the Terminal Regulating Reservoir (TRR) and the Delevan Intake on the Sacramento River in Alternative C is replaced by a north-south transmission line paralleling Highway 45 from the City of Colusa to the south. The north-south line would begin at a new substation connected to an existing WAPA line.
- The Delevan Pipeline alignment for Alternative D is shifted to the south to address local stakeholder concerns and to incorporate public and local irrigation district easements to reduce private land impacts.
- The TRR Reservoir is downsized from 2,000 acre-feet to approximately 1,200 acre-feet based on information provided by the Glen-Colusa Irrigation District (GCID) regarding the storage volume needed for GCID Canal regulation.

- One of the two generating units in the TRR Pumping/Generating Plant has been removed following consultation with GCID. The GCID system downstream of the TRR can only accommodate a return flow from Holthouse Reservoir of approximately 900 cfs.
- The configuration of Holthouse Reservoir has been adjusted based on additional engineering work that incorporated LiDAR topography. Configuration changes include relocating the concrete dam segment to the left abutment to reduce the risk of encountering poor foundation conditions. The pipeline inlet/outlet and flood control spillway structures are located in the concrete dam section.
- The proposed south bridge alignment across Sites Reservoir has been moved to avoid potential construction conflict with the Inlet/Outlet Structure for Sites Reservoir.
- The design of the south bridge has been modified based on additional design work to better reflect anticipated foundation conditions and take advantage of more cost effective construction methods for the superstructure.
- A new temporary public bypass road has been added across the north end of the reservoir to replace the section of Sites Lodoga Road that must be taken out of service to construct Sites Dam and the reservoir. This bypass facilitates an earlier construction start date and relieves schedule pressure for the completion of the south bridge.
- Only two recreation areas and a day-use boat launch ramp are being provided for Alternative D.

E-3 FEASIBILITY-LEVEL COST ESTIMATE

E-3.1 WSIP Requirements and Cost Estimate Class

The feasibility-level cost estimate presented in this BOE fully reflects the directions and recommendations on estimating project costs for economic analysis presented in Technical Reference Section 6 for the WSIP application (Water Commission, 2016).

As stated in the WSIP Technical Reference, the Project cost estimate must be a Class 4 estimate or better as defined by the Association for the Advancement of Cost Estimating (AACE), International. Overall, the Project cost estimate presented in this BOE represents a mid-range Class 4 estimate. The current level of design for the various project features varies. Some of the more costly facilities (like the dams and portions of the pipelines) are at a level of geotechnical investigation and design that would support a higher Class 3 estimate. The design for other facilities is less advanced, but still well enough defined to support preparing Class 4 estimates.

E-3.2 Estimate Development and Type

The cost estimate for Alternative D was prepared using the Reclamation estimating forms and following Reclamation's estimating guidelines to be consistent with other estimates prepared for Alternatives A, B, and C. Guidelines used include Reclamation's Cost Estimating Handbook (Reclamation, 1989), FAC-09-01 (Reclamation, 2007a), and FAC-09-02 (Reclamation, 2007b).

The Reclamation plant account numbering system was used and Reclamation's cost rounding guidelines were followed.

The cost estimate is characterized as a unit price estimate. Unit prices were developed using a combination of techniques, including detailed analyses of equipment, material, and manpower costs; vendor catalogs and quotes; recent bid results; and corporate experience on projects with similar facilities.

E-3.3 Project Cost Summary

E-3.3.1 Capital Cost Summary

Table E-2 summarizes the estimated feasibility-level capital cost summary for Alternative D in October 2015 dollars. Detailed cost estimate worksheets supporting Table E-2 are provided in Appendix A. The costs in Table E-2 reflect:

- All construction costs, including, but not limited to, mobilization and demobilization, labor, construction equipment, supply and installation of permanent materials and equipment with an expected useful life of 2 years or more, contractor indirect and overhead costs and profit, and bonds and insurance.
- Initial environmental mitigation or compliance obligations.
- Land acquisition, including legal, administrative, and relocation costs.
- Modifications to existing canal headworks structures to be able to reliably supply water to the Project.
- Contingencies for engineering (10 percent) and construction (15 percent), and a non-contract cost allowance (17 percent).

Incidental costs are covered by applying the non-contract cost allowance of 17 percent to the construction cost. Incidental costs directly related to construction or acquisitions, including planning, geotechnical site investigations, engineering and design, construction management, environmental mitigation and compliance, permitting, and other Authority costs directly related to project construction.

E-3.3.2 Total Project Cost Summary

Table E-3 summarizes the total project cost estimate for Alternative D in October 2015 dollars. Total project cost includes the capital cost; finance costs (interest during construction); operation, maintenance repairs, and replacements; and ongoing mitigation and water quality monitoring costs. The estimated annual operation and maintenance, repair and replacement costs, and the mitigation costs (totaling approximately $26.6 million) were applied over a 93-year operating period beginning in 2030. The net present value was then estimated in October 2015 dollars using the WSIP required discount rate (3.5 percent).

E-3.3.3 Other Potential Costs

The estimates presented in Table E-2 and Table E-3 may not be a complete tabulation of all potential Authority costs to implement the project. An example of other costs might include electric utility owner costs for system improvements to provide power to the project or accept power from project generation. Further PG&E and WAPA system connection studies and discussions with these utilities would be part of future Project design activities that would identify if such costs would be incurred.

Table E-2. Capital Cost Summary

Facility	Field Cost ($ Million)	Non-Contract Cost ($ Million)	Construction Cost ($ Million)
Develop Sites Reservoir	310	50	360
Main Dams	520	90	610
Saddle Dams	230	40	270
Holthouse Dam	160	30	190
Terminal Regulating Reservoir	33	6	39
Inlet/Outlet Structure and Tunnel	180	30	210
Sites Pumping/Generating Plant	680	120	800
Terminal Regulating Reservoir Pumping/Generating Plant	135	25	160
Sacramento River Pumping/Generating Plant	220	40	260
Sacramento River Fish Screen Structure	47	8	55
Red Bluff Addition	3	1	4
Sites Pumping/Generating Plant Conveyance Channel	42	7	49
Delevan Pipeline	560	100	660
Terminal Regulating Reservoir Pipeline	300	50	350
Utility Transmission Line Interconnections	160	30	190
General Property	26	4	30
Land Acquisition and Rights	100	10	110
Environmental Mitigation/Monitoring	340	10	350
Subtotals	4,046	651	4,697
Capital Cost	-	-	**4,697**

Note: All costs are October 2015 costs

Table E-3. Total Project Cost Summary

Item	Construction Cost[1] ($ Million)
Capital Cost	4,697
Interest During Construction	789
Operation, Maintenance, Repairs, Replacement (Note 2)	554
Ongoing Water Quality and Mitigation Monitoring Costs (Note 2)	175
Allowance for Utility Systems	50
Total Project Cost	6,265

Note: 1. All costs are October 2015 costs
2. Net present value of annual costs for assumed 100 year operating period beginning in 2030

E-4 PRELIMINARY CONSTRUCTION SCHEDULE

Appendix B provides a preliminary construction schedule for Alternative D developed by AECOM to support the feasibility-level cost estimate. The construction schedule presents a reasonable approach to construct the project that accounts for the logical sequencing of the work, procurement of equipment, and reasonable durations to complete construction activities. Durations reflect the estimated labor and equipment spreads needed to complete activities, including earthwork, balancing the movement of excavated soil and rock to placement sites, supplying and placing all materials, erecting structures, and installing major equipment. Labor and equipment costs are reflected in the cost estimate.

The schedule presents construction activities with an assumed construction start date in late March 2022. Completing the Delevan Intake on the Sacramento River and the Sites Pumping/Generating Plants in early 2030 are the final critical activities to achieve project construction completion and begin pumping operations. It may be possible to begin filling the reservoir using natural runoff from Stone Corral and Funks Creek beginning with the 2028 and 2029 wet season as the dams will have been completed by then.

Activities such as design, permitting, packaging the work, and bidding the construction packages are not included because of the uncertainty in scheduling these activities between now and 2022. With hydroelectric generation being a part of the project, the FERC permitting process may also affect the actual start date.

1. INTRODUCTION

The Sites Project Authority (Authority) is developing a locally preferred plan for the Sites Reservoir Project (Project) that incorporates the Authority's preferences and those of the local stakeholders. This plan, identified as Project Alternative D, is an addition to three other plans being evaluated by the U. S. Bureau of Reclamation (Reclamation), which are identified as Alternatives A, B, and C. AECOM Technical Services, Inc. (AECOM) is providing support to the Authority to develop the feasibility-level cost estimate and preliminary implementation schedule for Alternative D. This Basis of Estimate (BOE) Report for Alternative D contains a brief description of the major project components and provides supporting information for the feasibility-level cost estimate and preliminary construction schedule. The cost estimate worksheets and construction schedule are included herein in Appendices A and B.

The feasibility-level cost estimate and this Basis for Estimate (BOE) Report were prepared in accordance with Task 6, *Refine Engineering, Cost Estimate, and Schedule*, in the August 28, 2015 *Scope of Work Sites Reservoir Feasibility Study*. The estimating methodology is consistent with the requirements in Section 6 of the *Draft Technical Reference* (November 2016) published for the Water Storage Investment Program by the California Water Commission. Unit prices for labor, materials, land, and other inputs reflect an October 2015 pricing basis.

The feasibility-level cost estimate incorporates alignment refinements and additional design information for the south bridge and the Delevan and Terminal Regulating Reservoir (TRR) Pipelines to address stakeholder comments provided on Reclamation alternatives. The bridge and pipelines refinements were prepared in accordance with Task 7, *Roadway, Bridge, and Pipeline Alignment Modifications*. The engineering refinements for the bridge and pipelines, and for other facilities, are reflected in the set of Plans for Project Alternative D that accompanies the Basis of Estimate Report in a separate volume.

To support feasibility-level cost estimating, a preliminary construction schedule was developed for Alternative D in accordance with Task 6. The assumed schedule is based on a construction start day in spring or summer of 2022, and implementation of the project construction by the Authority. The schedule is discussed further in Section 5.

For consistency with previous estimates prepared for Reclamation Alternatives A, B, and C, the feasibility-level cost estimate for Alternative D also follows the Reclamation format and guidelines. This provides a common base for economic comparisons and facilitates incorporating all four estimates into the Federal Feasibility Report being prepared for the project.

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2. WATER SUPPLY AND DELIVERY, HYDROELECTRIC GENERATION

The water supply to fill Sites Reservoir will come from three conveyance facilities that draw water from the Sacramento River. Two of the conveyance facilities are existing canals; the Tehama Colusa (TC) Canal with its intake at Red Bluff and the Glen Colusa Irrigation District (GCID) Canal with its intake near Hamilton City. The third facility is the planned new Delevan Intake located on the Sacramento River. Figure 2-1shows the two existing canals and the new intake. Diversions to the reservoir from the three Sacramento River sources would occur during the winter and spring seasons governed by permit requirements and mitigation measures being developed for the Project.

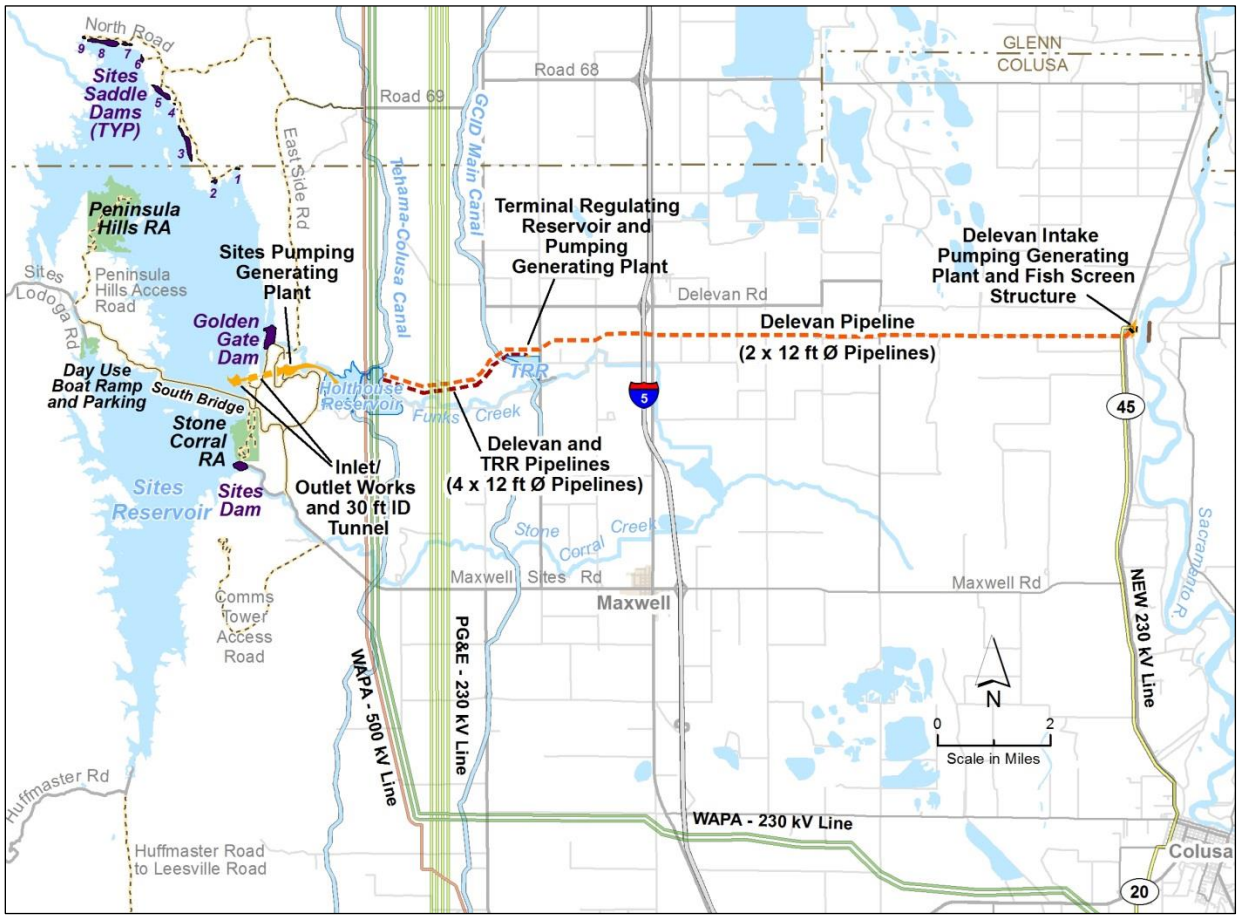

Figure 2-1 Project Plan

Water would be released from Sites Reservoir during the summer and fall back to the canals to meet irrigation demands and back to the Sacramento River to meet downstream demands and environmental commitments. Table 2-1 summarizes the maximum diversion and release flows planned for Alternative D.

Table 2-1 Maximum Planned Water Diversions and Releases

Conveyance	Diversions to Sites Reservoir	Release from Sites Reservoir
T-C Canal	2,100 cfs	2,000 cfs
GCID Canal	1,800 cfs	900 cfs
Sacramento River	2,000 cfs	1,500 cfs
Total	5,900 cfs	4,400 cfs

As shown on Figure 2-1, Holthouse Reservoir would be the collection and release point for all water moving into and out of Sites Reservoir through the Sites Pumping/Generating Plant. Because the TC Canal connects directly to Holthouse Reservoir, TC Canal water diversions and releases would be managed within Holthouse Reservoir. Diversions and releases for the GCID Canal would be managed in the Terminal Regulating Reservoir (TRR) using the TRR Pumping/Generating Plant connected to Holthouse Reservoir by the TRR Pipeline. Water diversions and releases for the Sacramento River would be managed at the Delevan Intake using the Sacramento River-Pumping/Generating Plant connected to Holthouse Reservoir by the Delevan Pipeline.

Releases to Holthouse Reservoir from Sites Reservoir would be used for hydroelectric power generation using pump-turbines located in the Sites Pumping/Generating Plant. Holthouse Reservoir is sized to allow the Sites Pumping/Generating Plant to operate as a pumped-storage facility to enhance renewable energy generation. Releases to the GCID Canal and the Sacramento River would also be used for power generation on release only (no pumped-storage) using dedicated turbines in the TRR and Sacramento River Pumping/Generating Plants.

Note that the planned 900 cfs release flow from Sites Reservoir to the GCID Canal shown in Table 2-1 is less than the 1,800 cfs used for other alternatives. The lower release was provided by GCID based on their canal and distribution system capacities downstream from the TRR. Currently, GCID has no plan to increase these capacities.

3. PROJECT DESCRIPTION

This section presents a brief overview of the main project features for Alternative D shown on Figure 2-1. Alternative D resembles Reclamation Alternative C, but reflects Authority and local stakeholder refinements and preferences.

3.1. Sites Reservoir

3.1.1. RESERVOIR PARAMETERS

Table 3-1 summarizes the reservoir parameters for Alternative D.

Table 3-1 Sites Reservoir Parameters

Approximate Total Storage Capacity (With Dead Storage)	1.81 MAF
Approximate Useable Active Storage	1.65 MAF
Maximum Operating Water Elevation	520.0 feet
Minimum Operating Water Elevation	340.0 feet
Top of Dead Pool Elevation	300.0 feet
Approximate Inundation Area (at elevation 520.0 feet)	14,200 acres

The reservoir area is characterized as open grazing lands with limited tree. Demolition of the small town of Sites, several ranches, and associated infrastructure located within the reservoir inundation area will be required. Fencing and asphalt concrete paving will be removed, abandoned gas wells within the reservoir will be checked for proper abandonment, and several small salt springs identified within the reservoir will be capped.

3.1.2. DAMS FORMING SITES RESERVOIR

The Sites Reservoir Dams and Saddle Dams for Project Alternative D are at the same locations and have similar design details as the corresponding dams used for other Project alternatives. Embankment locations are shown on Figure 2-1. To form Sites Reservoir, Golden Gate Dam would be constructed on Funks Creek and Sites Dam would be constructed on Stone Corral Creek. In addition, nine saddle dams of varying sizes would be constructed to close off topographic low point saddles around the eastern rim of the reservoir between Funks Creek and the north end of the reservoir.

The main dams and saddle dams would be zoned earth and rockfill embankments. This type of construction is suitable for the Project area considering the current understanding of geotechnical, geological, and seismologic conditions existing in the reservoir area. The earth and rockfill zoning also make best use of soils and rock materials from borrow areas within the reservoir area and from mandatory excavations required to construct other project facilities. Table 3-2 summarizes embankment parameters and earthwork volumes for each dam. Earthwork volumes were originally estimated by DWR and have been verified by AECOM using available topographic information at the dam sites.

Table 3-2 Parameters for Main Dams and Saddle Dams

Dam	Height Above Streambed (feet)	Crest Length (feet)	Embankment Volume (cubic yards)
Golden Gate Dam	310	2,250	10,590,000
Sites Dam	290	850	3,836,000
Saddle Dam 1	50	490	93,000
Saddle Dam 2	80	420	86,000
Saddle Dam 3	130	3,810	3,577,000
Saddle Dam 4	40	270	18,000
Saddle Dam 5	100	2,290	1,505,000
Saddle Dam 6	70	530	144,000
Saddle Dam 7	75	1,040	196,000
Saddle Dam 8	105	2,990	1,915,000
Saddle Dam 9	45	340	49,000
Total			**22,009,000**

3.1.3. RESERVOIR RIM GROUTING

Narrow reservoir rim areas between Golden Gate Dam and the northern most saddle dam could provide a potential for through seepage when the reservoir water level is high. For the current study, rim seepage is addressed by installing a grout curtain down into relatively tight rock. AECOM performed a preliminary evaluation of the rim grouting requirement and determined that approximately 6,000 feet of additional curtain measured along the ridge would be require (primary, secondary, and some tertiary grouting). The curtain would be an extension of the embankment foundation grout curtain for Golden Gate Dam and the saddle dams extending out into the adjacent narrow areas. This cost for additional single line rim grouting has been included in the estimate for Alternative D. The average depth of grout treatment would be approximately 60 feet, which represents the estimated distance from the design dam crest elevation (540.0 feet) down to competent rock. The section of drill holes from grade down to elevation 540.0 feet would be backfilled with cement after the lower portion of the hole is pressure grouted. Additional geotechnical investigations would be needed during future phases of the project to further evaluate the seepage risk and confirm the amount of grouting needed.

3.1.4. RESERVOIR SPILLWAY

Sites Reservoir is an off-stream reservoir with a small drainage area relative to reservoir storage. The freeboard provided for the main dams and saddle dams (20 feet above normal maximum pool) allows for the full storage of runoff from the probable maximum flood (PMF) while leaving approximately 15 feet of residual freeboard. Because the reservoir can fully store the PMF above the normal maximum water level with adequate remaining freeboard, there is no flood control spillway. However, a small signal spillway is provided at Saddle Dam 6 to alarm

facility operators in the event the water level ever exceeds the PMF storage level due to over-pumping.

3.1.5. CREEK DIVERSION DURING CONSTRUCTION

Storm water runoff from Funks and Golden Corral creeks must be routed around construction sites. Funks Creek is of particular concern because this creek runs through the Golden Gate Dam site and potentially affects downstream work at the Sites Pumping/Generating Plant, the channel from the plant to Holthouse Reservoir, Funks Reservoir, Holthouse Dam Construction, and other activities, many of which fall on the critical path. Construction of these facilities will cover multiple years on the schedule and Funks Creek can produce significant creek flows during the winter seasons. To minimize impact to the large construction area downstream of Golden Gate Dam, AECOM has identified a construction diversion plan for the reservoir that would collect water from Funks Creek in the reservoir area and rechannel it south through a low ridge to Stone Corral Creek, which flows through the Sites Dam site. The volume of material that must be excavated to construct the channel connecting the two creek drainages would be stockpiled and reused in permanent construction for the dams and cofferdams. At the Sites Dam site, a diversion tunnel would be constructed through one abutment of the dam to pass all flood flows. The diversion tunnel would work in combination with upstream cofferdams at the two dam sites and channels in the reservoir to control and direct water.

The drainage area is approximately 84 square miles. Based on National Oceanic and Atmospheric Administration data for a 100-year storm event, the estimated design rainfall depth is 5.2 inches in 24 hours. The resulting design runoff flow routed through the tunnel would be approximately 4,500 cfs. The maximum upstream water level during flood routing would reach approximate Elevation 295.0, which is below the assumed top of cofferdam level at Elevation 300.0. For estimating, the tunnel is sized at 20 feet in diameter finished to 18 feet. It is estimated that this tunnel will have to be approximately 3,000 feet long to avoid conflict with the Sites Dam construction. Tunnel would be constructed using drill and blast methods and using steel sets, lagging, and rock bolts for support. The inside perimeter would be shotcrete lined. Heavy riprap will be used for energy dissipation at the discharge area in Stone Corral Creek.

The inlet to the diversion tunnel at Sites Dam will be plugged at the upstream end to begin initial filling of the reservoir. A 24-inch-diameter outlet pipe will run through the plug to the downstream end of the tunnel. A shutoff valve will be provided at the downstream end of the tunnel plug and an energy dissipation valve will be provided on the pipe at the downstream end of the tunnel. The pipe will be used to make environmental releases to Stone Corral Creek after construction of Sites Dam.

3.2. Sites Reservoir Inlet/Outlet facility

The Sites Reservoir Inlet/Outlet Facilities are shown on Figure 2-1 and include the following components:

- The 4,000-foot long pressure tunnel through the ridge
- The vertical Inlet/Outlet tower with control gates located in the reservoir, and
- The low level Inlet/Outlet structure on the bottom of the reservoir at the upstream end of the pressure tunnel.
- The emergency drawdown release facility.

The current design details and estimated cost for these facilities will be further evaluated in future phases of the project. Based on the current understanding of site seismicity, it is possible that the vertical intake tower described below would be converted to a sloping intake configuration firmly anchored to the reservoir slope. This reconfiguration would also eliminate the need for an access bridge to the tower and improve operation and maintenance flexibility.

3.2.1. I/O PRESSURE TUNNEL

The pressure tunnel is approximately 4,000 feet long. It would be constructed using drill and blast methods after the upstream and downstream portals are excavated and developed. The neat line excavated diameter would be approximately 36 feet and the internal diameter after lining would be 30 feet. The geology along the tunnel alignment consists of sandstones and mudstones of the Boxer and Cortina Formations and the alignment was selected to avoid faults and shears identified from currently available geological mapping. Rock bolting and steel sets and lagging should be adequate for tunnel support.

The tunnel would be reinforced concrete lined for the full length. At the lower end, a steel liner would be incorporated into the concrete lining where the depth-of-rock cover over the tunnel is inadequate to provide sufficient confinement for the internal design pressure.

The tunnel is sized to meet the Division of Safety of Dams (DSOD) emergency reservoir drawdown guidelines, which requires the outlet facilities have a flow capacity to reduce the maximum reservoir storage depth by 10 percent within 10 days. For Sites Reservoir, this correlates to drawing down the reservoir by 22 feet from maximum pool by releasing approximately 300,000 AF of water in 10 days. The average tunnel outflow over ten days would be approximately 15,100 cfs and the corresponding average tunnel velocity would be approximately 21.5 fps. This design case far exceeds the maximum normal operating case (5,900 cfs pumping flow and velocity of 8.3 fps).

3.2.2. INLET/OUTLET TOWER

The multi-level inlet/outlet tower provides the capability to move water in and out of Sites Reservoir. The tower extends up through the reservoir from its base connection to the pressure tunnel. Four ports with butterfly valves spaced around the tower at nine levels move water in and out of the reservoir. Valves on any tier can be operated independently or all valves can be operated together. Movable fish screens would be provided to cover operating ports when releases are being made. Table 3-3 provides a summary of key Inlet/Outlet Tower parameters.

Table 3-3 Sites Reservoir Inlet/Outlet Tower

Top Elevation	580.0 feet
Bottom Elevation (Top of Bench)	320.0 feet
Inside Diameter	32 feet
Outside Diameter	39 feet
Number of Ports	36 (4 each at 9 levels)
Functional Reservoir Release Elevations	520 feet to 340 feet

The intake tower would also house fixed wheel gates and associated operating equipment that would be used to isolate the tunnel from the tower intersection downstream for inspection and maintenance of the tower and tunnel. These gates also serve as an emergency shutoff device.

A multi-span bridge provides access to the Inlet/Outlet tower from the nearby access road. As mentioned above, the bridge may be eliminated if a sloping intake arrangement is adopted in future design phases of the project.

3.2.3. EMERGENCY RELEASE FACILITY

To control the emergency reservoir drawdown release described in Paragraph 3.2.1 above, four 102-inch diameter fixed-cone (Howell Bunger) dispersion valves would be located in a reinforced-concrete energy dissipation valve chamber located adjacent to the Sites Pumping/Generating Plant. Isolation valves would be located upstream of the energy dissipation valves. The valves would connect back to the pressure tunnel downstream portal through a dedicated buried penstock system branching off of the main buried penstock that connects the tunnel to the Sites Pumping/Generating Plant. The fixed-cone valve discharge would be conveyed downstream in the channel connecting the Sites Pumping/Generating Plant with Holthouse Reservoir.

3.3. Sites Pumping/Generating Plant

3.3.1. PENSTOCKS AND MANIFOLDS

A system of buried steel penstocks and manifolds would connect the pumping and pumping/generating units in the Sites Pumping/Generating Plant with the downstream tunnel portal. The manifold lines are sized for flow velocities of 10 fps or less. All buried penstocks and manifolds would be concrete-encased, with concrete anchor blocks to resist the thrust forces on bends, reduction bifurcations and branches. Penstocks steel thicknesses for cost estimating have been selected considering a pressure equivalent to the maximum pumping head at full reservoir elevation, plus surge allowance, plus an additional 10 percent.

3.3.2. PUMPING/GENERATING PLANT

The Sites Pumping/Generating Plant lifts water from Holthouse Reservoir into Sites Reservoir (refer to Figure 2-1). The SPGP is connected to Holthouse Reservoir by an unlined excavated approach channel. The channel is sized so that flow velocity under all conditions does not exceed approximately 2 fps.

Table 3-4 provides a summary of the SPGP equipment included with Alternative D.

Table 3-4 Sites Pumping/Generating Plant Equipment

Unit Type	Number of Units	Net Head (feet) (Pump/Gen)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per Unit (cfs)	Motor Power Total (MW)[1]	Generating Power Total (MW)[1]
Pump Francis Vane Dual-Speed	2 and 1 Spare	330	870	None	58.9	None
		202	870	None	36.0	None
Pump Francis Vane Dual-Speed	2	330	435	None	29.5	None
		202	435	None	18.0	None
Pump/Turbine Reversible Francis, Dual-Speed	4 and 1 Spare	330/310	663	1,020	89.8	88.3
		202/182	663	1,020	55.0	51.9
Pump/Turbine Reversible Francis, Dual-Speed	2	330/310	332	510	22.5	22.0
		202/182	332	510	13.8	12.9
Totals	10 and 2 Spares	-	5,926 (Max Combined)	5,100 (Max Combined)	200.7 (Max)	110.3 (Max)

1. Motor power and generation based on 82.5% combined efficiency (unit and transformer), no power factor adjustment, higher efficiencies are likely.

The units selected would be dual-speed units to accommodate the wide variations in water levels that can be expected in Sites Reservoir. The head difference on the units between pumping and generating modes is within a range that permits some of the units to be pump-turbines to provide the needed generating capability when releases are being made. Generation water not needed to meet downstream needs would be stored in Holthouse Reservoir. The number of pumping units selected to operate on a daily basis would provide the capacity to pump all water delivered to Holthouse Reservoir up to Sites Reservoir during the off-peak pumping period. Water delivered to Holthouse Reservoir would include generation water plus inflows from the canals and the Sacramento River. The pumping plant would be a conventional, indoor-type pumping/generating plant with an in-line arrangement of vertical units. The SPGP would have a reinforced concrete substructure and a steel superstructure.

Adding variable frequency drive (VFD) capability to the pumping and generating units could help to maximize pumping and generating efficiencies, and improve the generation response to

changes in the power grid demand. The benefits of adding VFD capability will be further evaluated in future design phases.

3.3.3. INTAKE AND DISCHARGE CHANNEL TO HOLTHOUSE RESERVOIR

An excavated intake and discharge channel connects the Sites Pumping/Generating Plant with Holthouse Reservoir (described in the next section). The channel would have a bottom width of 100 feet, 2-horizintal to 1-vertical side slopes, and would require excavating approximately 4.0 million cubic yards of soil and rock. Excavated material is assumed to be suitable for use in dam construction and for other site grading needs. Road benches would be provided in the excavation above the maximum water level for inspection and maintenance.

The channel is capable of providing pumping flows to the Sites Pumping/Generating Plant (up to 5,900 cfs) from Holthouse Reservoir when the water level in the Reservoir is at its planned minimum operating level (elevation 190.0 feet). Flow velocity in the channel under this condition would be approximately 2 feet per second. Under emergency release flows (approximately 15,000 cfs) with Holthouse Reservoir at approximate elevation 206.0 feet, the velocity would still be approximately 2 fps. No riprap or other lining is provided for the channel. Some of the accumulated sediment in the existing Funks Reservoir would need to be removed before excavating the channel. Excavated sediment can be disposed of in Holthouse Reservoir below the minimum operating level.

3.4. Holthouse Reservoir

3.4.1. SIZING

The required active storage in Holthouse Reservoir should be approximately 6,500 acre-feet to permit the Sites Pumping/Generating Plant to operate as a pumped-storage facility. This volume provides for storage of the generating flows (up to 5,900 cfs) during on-peak periods and storage of inflows to the reservoir that might be occurring in spring or fall from the TC and GCID Canals and Sacramento River. The collected volume of water would then be pumped up into Sites Reservoir during off-peak and partial-peak periods as necessary on a daily cycle. Diversion flows were estimated from available CalSIM modeling. Note that additional operational studies should be performed in future phases of the project to confirm optimal reservoir size for pumped-storage operation.

The current active storage capacity of Funks Reservoir is estimated to be approximately 2,100 acre-feet after removing sediment that has accumulated in the reservoir since it was commissioned. To provide 6,500 acre-feet of storage, the new Holthouse Dam would be constructed downstream of the existing Funks Dam to extend the reservoir limits. Holthouse dam would have the same crest elevation as the existing Funks Dam (El. 214.0). The required active storage would be located between elevation 206.0 feet and elevation 190.0 feet and would be the sum of the storage provided in the expanded reservoir, Funks Reservoir and the channel connecting the reservoir with the Sites Pumping/Generating Plant.

3.4.2. HOLTHOUSE DAM

Except at the left abutment, Holthouse dam would be a zoned embankment similar to Funks Dam with a maximum height of approximately 48 feet. The dam will be approximately 8,500 feet long. Because a deep soil layer could potentially exist along the dam alignment, the central core zone would extend down to suitable foundation in dense soils. To control seepage under the core section, a slurry cutoff wall would be constructed down through the dense soils to refusal in weathered rock. A grout curtain line would then be installed adjacent to the cutoff wall on both sides to fresh rock to treat remaining weathered rock below the refusal level for the cutoff wall.

On the left abutment, a concrete gravity dam section would be provided that will incorporate the inlet/outlet facilities for the four 12-foot diameter pipes that comprise the Delevan and TRR pipelines (two pipes each), and the emergency spillway for Holthouse Reservoir. The gravity structure has been located on the abutment to position it far enough into the hillside to minimize the risk of encountering unsuitable foundation conditions for the concrete structure. Foundation conditions would be further investigated in future phases of the project.

The inlet/outlet facility for the Delevan and TRR pipelines will incorporate formed concrete transitions for hydraulic efficiency, roller gates to shut off flow in each pipe for dewatering, stop log guides upstream of the roller gates, and a bar rack structure to prevent entry of large debris. The transition entrance for each pipe is sized to limit inlet and outlet flows to approximately 2 fps.

3.4.3. SPILLWAY AND LOW LEVEL RELEASE

The spillway located in the gravity structure will be similar to the existing Funks Dam spillway and will incorporate three motor driven cable operated radial gates with a total bypass capacity of approximately 15,200 cfs, which matches the emergency release requirement for Sites Reservoir discussed previously.

The gravity section would also include an outlet pipe with energy dissipating valve that would provide water to Funks Creek for stream maintenance and facilitate draining the reservoir to permit inspections of the inlet facilitates. The design capacity at maximum head would be approximately 500 cfs.

3.5. Terminal Regulating Reservoir and Pumping/Generating Plant

The TRR is the collection point for water being conveyed down the GCID Canal for ultimate delivery to Sites Reservoir. The TRR Pumping/Generating Plant located within TRR then moves the water to Holthouse Reservoir through the TRR Pipeline. The TRR Pipeline also returns irrigation releases back to the TRR from which the water is directed into the GCID Canal or other local irrigation canals. The return flows pass through a turbine generating unit located in the TRR Pumping/Generating Plant.

3.5.1. TERMINAL REGULATING RESERVOIR

In addition to receiving project water, the TRR provides operational storage for GCID to balance out flow variations in the canal, to distribute releases to their system downstream of the reservoir, and to support operation of the pumping plant. Operational storage in the reservoir is 1,200 acre-feet for Alternative D compared with 2,000 acre-feet assumed for other alternatives. GCID indicates the reduced size is adequate for canal regulation based on their operating experience.

The reservoir would be constructed partially above and below grade by a cut and fill operation. The levee portion around the reservoir perimeter would average approximately 6 feet high and the top elevation would match the existing levees for the GCID Canal at the tie-in point. The excavated portion would be limited to 6 to 10 feet below grade to minimize groundwater issues. The pond would be plastic lined to minimize seepage loss from the pond.

Regulation of flow into and out of the reservoir would be controlled by the existing control gate structure on the GCID Canal just upstream of Funks Creek and a new control gate structure parallel to the canal at the reservoir connection point. Other facilities associated with TRR are a spillway sized for approximately 500 cfs and a release pipe and control valve with a capacity of 100 cfs to 150 cfs to supply local irrigation canals. Spillway flows would be conveyed to the south to Funks Creek in an upgraded existing canal and pipe with the required capacity.

3.5.2. TRR PUMPING/GENERATING PLANT

The pumping and generating equipment provided in the plant is summarized in Table. The structural building for the TRR Pumping/Generating Plant would be similar to that described below for the Sacramento River Pumping/Generating Plant.

Table 3-5 TRR Pumping/Generating Plant Equipment

Unit Type	Number of Units	Net Head (feet) (Pump/Gen)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per Unit (cfs)	Motor Power Total (MW)[1]	Generating Power Total (MW)[1]
Pump Francis	2 (+1 standby)	114	620	-	14.5	-
Pump Francis	2	98	325	-	6.5	-
Turbine Kaplan	1	84	-	750	-	4.4
Totals	5 and 1 Spares	-	945 (Max Combined)	750 (Max Combined)	21.0 (Max)	4.4

1. Motor power and generation based on 82.5% combined efficiency (unit and transformer), no power factor adjustment, higher efficiencies are likely.

In addition, the following equipment would also be included with the plant:

- 32-foot-diameter spherical air chambers to control surge pressures in the TRR pipeline.

- Bypass and shutoff valves, manifold piping, mechanical systems, electrical and control systems, switchyard facility.

The switchyard for the TRR Pumping/Generating Plant will be tied back to the main switchyard at the Sites Pumping/Generating Plant by overhead transmission line.

3.6. DELEVAN INTAKE AND PUMPING/GENERATING PLANT

3.6.1. SITE DEVELOPMENT

Site arrangements for Alternative D differ in some respects from the arrangements used for the other alternatives. The Pumping/Generating Plant orientation was rotated toward the south to provide more working room between the plant and Highway 45 to facilitate pipeline construction. The forebay pond was also modified for Project Alternative D to remove the levee earthwork and culverts connecting the fish screen structure afterbay with the pump station forebay. Based on a preliminary discussion with the U. S Army Corps of Engineers, the fill and culverts included with the other alternatives can be removed as long as the earthwork to construct the pumping plant grade is above the 100-year flood level, fill materials conform to the fill requirements for levee construction, and fill is integrally tied to the existing flood control levees along the Sacramento River. In addition, based on current understanding of seepage issues through and under the existing river levee system, it is likely that a suitable slurry cutoff wall (or other cutoff method) would be required under the pump station fill around the forebay pond area to control underseepage.

3.6.2. PUMPING/GENERATING PLANT

The SRPGP would be constructed with a pumping capacity of 2,000 cfs, an intake and fish screen structure at the Sacramento River, and the Delevan Pipeline from the SRPGP to the Holthouse Reservoir. The conveyance system would also be capable of releasing up to 1,500 cfs from Holthouse Reservoir back to the Sacramento River. The return flow would be used to generate hydroelectric energy.

The pumping/generating plant would involve the construction of (1) a pumping/generating plant, (2) forebay/afterbay pond, (3) four air chambers for surge control, (4) manifold piping to connect the pumping and generating units to the Delevan Pipeline (6) a control building, (7) an electrical switchyard, and (8) fish screening facilities on the Sacramento River.

Table 3-6 summarizes the pumping and generating equipment provided in the plant. The pumping/generating plant would also consist of pipelines, mechanical and electrical equipment, aboveground control and O&M buildings, and related equipment. The overall dimension of the plant building is approximately 300 feet long by 80 feet wide with multiple story structure to provide spaces for mechanical and electrical equipment. A gantry crane would be installed on the finish floor of the plant for moving pumps, generators, motors and turbines, valves, and electrical/mechanical equipment.

Table 3-6 Sacramento River Pumping/Generating Plant

Unit Type	Number of Units	Net Head (feet) (Pump/Gen)	Pumping Capacity Per Unit (cfs)	Generating Capacity Per Unit (cfs)	Motor Power Total (MW)[1]	Generating Power Total (MW)[1]
Pump Francis	4 (+1 standby)	282	600	-	14.5	-
Turbine Kaplan	2	94	-	750	-	4.4
Totals	6 (+1 Standby)	-	2,400 (Max Combined)	750 (Max Combined)	21.0 (Max)	4.4

1. Motor power and generation based on 82.5% combined efficiency (unit and transformer), no power factor adjustment, higher efficiencies are likely.

3.6.3. FISH SCREEN STRUCTURE

The fish screen facilities are located on the west side of the Sacramento River, slightly downstream of RM 158.5 and east side of Highway 45. The fish screen structure is designed for a flow of 2,000-cfs and includes thirty-two 13-foot by 15-foot flat plate screens, two blowout bays, two fish screen brush cleaners, a sediment removal system, and tuning baffles. Each item is necessary for the proper function of the proposed fish screen. Construction of the screening facility will require a temporary cofferdam in the river.

3.7. Delevan and Terminal Regulating Reservoir Pipelines

Except for the alignment, the Delevan and TRR Pipeline design arrangements for Project Alternative D are the same as used for the other alternatives. The alignments have been shifted to address stakeholder feedback on previous alignments and make better use of existing County and MID easements, particularly between the Sacramento River and the Colusa Basin Drain.

The Delevan Pipeline runs from the Sacramento River Pumping/Generating Plant to Holthouse Reservoir and includes two adjacent 12-foot-diameter pipelines. Delevan Pipeline is approximately 13.5-mile-long. The TRR Pipeline runs from the TRR Pumping/Generating Plant to Holthouse Reservoir and also includes two adjacent 12-foot diameter pipelines. TRR Pipeline is approximately 3.5-mile-long. There is no interconnection of the Delevan and TRR Pipelines.

The pipelines will be American Water Works Association (AWWA) C-300 Pipe with 12-foot inside diameter (ID). Pipe design will be in accordance with AWWA *Manual M9* (AWWA, 1995). Design internal pressure for the pipelines is taken to be the hydraulic grade line for pumping with a 40 percent additional allowance for surge pressures. All pipe will have Carnegie-style bell and spigot joints with O-ring gaskets. Controlled low-strength material will be used for pipe bedding. Note that trench and bedding details were reviewed by Hanson Pipe (Hanson) and Ameron Pipe (Ameron).

Typically, the Delevan and TRR Pipelines would be constructed in a cut and fill trench along the alignment. Between the TRR Reservoir and Holthouse Reservoir the four 12-foot diameter

pipelines would be located in a common trench. Placing the pipelines in a common trench is considered the practical approach under the current design since the likelihood of having to re-excavate a pipe in the future is very low. Placing pipes in individual trenches would also increase real estate needs.

Approximately 10 feet of cover over the top of the pipe is planned to permit ongoing rice and row crop production. This cover also facilitates going under an extensive network of water supply and drainage channels without vertical alignment changes. To facilitate a return to agricultural production after pipeline construction, topsoil will be removed an stockpiled for reuse over backfilled pipe trenches

Dewatering of pipe trench excavations will be required along the pipeline alignments, particularly across the Colusa Basin Drain. The cost estimate includes a series of dewatering wells and associated water collection and sediment control facilities to manage water, which will be discharged to local channels along the alignment. The dewatering wells will be removed as the trench is backfilled and advanced to locations ahead of the excavation as the pipeline installation progresses.

To construct pipelines under major infrastructure facilities, bore/jack construction methods would be used at road crossings (I-5, I-99, and Highway 45); railroad crossings, the crossing under the Colusa Basin Drain, gas transmission line crossings, and the crossing under the GCID Canal.

Facilities associated with both the Delevan and TRR pipelines include:

- Blowoff structures
- Air and vacuum valve assembly structures, access manholes
- Cathodic protection systems

3.8. Red Bluff Pump Addition

The existing Red Bluff Diversion on the Sacramento River includes a fish screen facility and pumping station that supplies water to the T-C Canal. Two spare pump bays were provided in the facility at the time of construction. As part of the Sites reservoir Project, new pumps would be installed in the spare bays. The pumps would be 250 cfs capacity matching the larger pumps already installed and operating. For each pump, 84-inch diameter motor operated butterfly valve and discharge flap gates will be provided along with a pump flange coupling (similar to those installed on the operating units). Electrical connections and control connections to existing systems would also be provided along with start-up support from equipment manufacturers.

3.9. Transmission Lines

For Alternative D, the Sites and TRR Pumping/Generating Plants and other facilities west of TRR would be serviced from existing PG&E or WAPA transmissions located close by. A new substation and short section of new transmission line would be provided to make the necessary

connection to the selected utility. To supply power to the Sacramento River Intake and Pumping/Generating Plant, a new transmission line would be added that runs north from an existing WAPA transmission line near Colusa along Highway 45 to the intake. WAPA was selected for service because PG&E does not have existing line capacity in the area. A new substation would be provided at the connection point near Colusa. The transmission line along Highway 45 included in Alternative D replaces the east-west line included in other alternatives, which addresses local stakeholder concerns regarding the impact of the cross country transmission line on farming operations and wildlife.

3.10. ROADS

3.10.1. SITES LODOGA ROAD REPLACEMENT WITH SOUTH BRIDGE

The Sites Lodoga Road realignment with the new South Bridge over the reservoir replaces the current Sites Lodoga road segment that will be inundated when the reservoir is filled. The road and bridge provide for single lane traffic in each direction. Road and bridge designs follow County rural road and CALTRANS standards. Additional engineering work has been performed to refine the selection of span lengths and further define foundation requirements to improve the accuracy of the cost estimate. The span lengths currently being considered permit deck construction using the balanced cantilever construction method with precast units, which was determined to be less costly than cast-in-place methods.

3.10.2. NORTH TEMPORARY BYPASS ROAD.

A new temporary bypass road at the north end of Sites Reservoir is provided to help expedite close of Sites Lodoga Road in the project area. The new bypass road would begin on the east where existing Road 69 intersects the TC Canal. From there, the planned access road would follow existing ranch roads and trails and connect back to Sites Lodoga Road on the west side of the proposed reservoir outside the inundation area. Access to Road 69 would be from Highway 5 at the Road 68 interchange, then west along Road 68 to Road D and Road 69. The bypass road would be paved for public use. No additional environmental impacts would be anticipated since the route follows existing County roads, roads already planned for the project, and new segment that is located within the reservoir footprint.

3.10.3. OTHER PROJECT ROADS

Table 3-7 provides a list of the significant public and private roads that will be constructed as part of the project. These new roads and road relocations are reflected in the cost estimate for the project.

Table 3-7 Project Roadways and South Bridge

Road or Segment Name	Gravel (miles)	Paved (miles)	Bridge (miles)	Total (miles)
Lurline Road				
Maxwell-Sites Road to Com Road	5.05			5.05
Lurline Rd. to Lurline Headwaters Recreation Area	0.21			0.21
Com Road	**2.95**			**2.95**
Eastside Road				
Field Office Maintenance Yard Access to Sites PGP 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				
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				
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
North Road to Saddle Dam 1	3.17			3.17
South Bridge			**1.57**	**1.57**
South Bridge East Approach		**0.28**		**0.28**
South Bridge West Approach		**2.25**		**2.25**
Stone Corral Road				
Eastside Road to South Bridge East Approach		1.39		1.39
South Bridge East Approach to Stone Corral Recreation Area	0.26			0.26
Private Access				
Eastside Road to bottom of Golden Gate Dam		0.25		0.25
Eastside Road to Sites Pumping/Generating Plant Electrical Switchyard		0.12		0.12
Eastside Road to Field Office Maintenance Yard		0.04		0.04
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 1	3.17			3.17
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
Leesville Connector Road	5.5			5.5

3.11. Recreation Areas

Alternative D includes two recreation areas, Stone Corral and Peninsula Hills. In addition, a day use boat ramp facility would be provided on the west side of the reservoir near where the existing Sites Lodoga Road leaves the inundation area. Fewer recreation facilities are provided in Alternative D compared with other alternatives because recent reevaluation of recreational

needs, which included Colusa County, indicate a lower recreational demand than previously envisioned.

3.12. Other Ancillary Facilities

The cost estimate includes costs for an operation and maintenance complex to be located near the Sites Pumping/generating Plant. In addition to the control room, the facility would include offices, vehicle maintenance and fueling facilities, warehousing space, package water and sewage treatment facilities, emergency generator, and parking. Note that local operation of the Project is assumed via SCADA systems from the operation and maintenance facility. Discussions of project operation and integration between the Authority and Federal and State agencies will be ongoing as project development continues. Integration of the Project with other Federal and State facilities could change the criteria for the operation and maintenance complex.

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4. ESTIMATING APPROACH

4.1. Format

The estimate for Project Alternative D was prepared using the same Bureau *Estimate Summary and Estimate Worksheet* templates used to prepare costs for other alternatives. AECOM also followed the estimating instructions contained in Reclamation's *Cost Estimating Handbook* (Reclamation, 1989) and Reclamation's Manual, *Directives and Standards*, FAC 09-01, FAC 09-02, and FAC 09-03. Rounding of estimated costs at the facility summary level and above was performed following the guidelines in the *Cost Estimating Handbook*. Project features were identified in the estimate in accordance with the property classes and plant account codes identified in the *Cost Estimating Handbook*.

4.2. Definitions

The terminology used in this report and on the various estimating worksheets follows Reclamation and WSIP conventions wherever possible. The following terms are used:

Contract Cost (Reclamation): The contract cost is the cost to construct the project by the general contractor, including mobilization/demobilization, all subcontractors, direct and indirect costs, labor, equipment, bonds and insurance, profit and an allowance for potential design modifications unrelated to the contractor's activities. This contract cost would be equivalent to the bid price.

Field Cost (Reclamation): The field cost is the contract cost with an appropriate allowance for construction contingency. The field cost is the cost the Authority would plan for to cover the bid price and potential change orders or other modifications to the contract during construction.

Construction Cost (Reclamation): The construction cost is the field cost adjusted for non-contract costs. Non-contract costs are project-related expenses that the Authority must also plan for that are over and above the field cost, including Authority expenses, program management, site investigations, engineering and design, construction management, and the like. Non-contract costs are presented as a percentage of the construction cost. The non-contract cost allowance can also include real estate acquisition and environmental mitigation. However, these costs are not part of the non-contract cost allowance because they have been estimated and are included in the cost estimate on estimate worksheets.

Escalation (Reclamation): The construction cost is escalated from the base estimate date to the anticipated start of construction date. The base date for the cost estimate is October 2015. Start of construction is planned for the spring/summer of 2022. This represents approximately 7 years of escalation.

Capital Cost (WSIP): Capital costs are the costs of construction or acquisition of a tangible physical property with an expected useful life of 15 years or more. Capital costs include: 1) construction, initial environmental mitigation or compliance obligations, and land acquisition, 2) equipment with an expected useful life of 2 years or more, and 3) costs incidentally but directly related to construction or acquisition, including planning, engineering, construction management, architectural and other design work, environmental impact reports and assessments, environmental mitigation or compliance obligation expenses, permitting, appraisals, legal expenses, site acquisitions, and easements. Financing costs such as interest during construction are not included in capital costs.

Total Project Cost (WSIP): The total project cost includes the capital costs, interest during construction, environmental mitigation or compliance obligations after completion of construction, and O&M, repair, and replacement costs during the planning horizon.

The contract cost, field cost, construction cost and escalated construction cost are tabulated on separate lines on each estimate summary worksheet form for each facility. Capital Cost and Total Project Cost are tabulated separately from the estimate worksheets and presented in tables.

4.3. Allowances and Contingencies

Table 4-1 presents the allowances and contingency percentages that have been adopted and applied to the feasibility-level cost estimate for Project Alternatives D. Each is briefly discussed in the following paragraphs

Table 4-1 Allowances and Contingencies

Mobilization	5 percent
Design Contingency	10 percent
Construction Contingency	10 percent
Non-Contract Costs	17 percent

4.3.1. MOBILIZATION

As defined in the Public Contract Code, mobilization includes preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site, for the establishment of all offices, buildings and other facilities necessary for work on the project, and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site. Mobilization is covered in the estimate by increasing the direct construction cost by approximately 5 percent for each facility.

4.3.2. DESIGN CONTINGENCY

Design contingencies are intended to account for uncertainties as the project progresses from the planning phase to the final design phase. These uncertainties include unlisted items, design and scope changes, and cost estimating refinements. Design contingencies are listed as a separate line item in the cost estimate summary work sheets. For the estimates provided in this BOE, 10 percent of the direct construction cost has been used for each facility.

4.3.3. CONSTRUCTION CONTINGENCY

Construction contingencies represent the dollar values of the uncertainties in the estimates to compensate for unforeseen or changed site conditions, minor changes in plans, quantity overruns, and other uncertainties. The percentage allowance used should be based on engineering judgment of the major pay items in the cost estimate, reliability of the data, adequacy of the projected quantities, and general knowledge of site conditions and level of uncertainty. The allowance amount for contingencies varies inversely with the certainty of the engineering and geological information and data. The level of data available to support cost estimating varies from facility to facility for the Project. Overall, the construction contingency has been set at 15 percent for the cost estimates provided in this BOE.

4.3.4. NON-CONTRACT COSTS

Non-contract costs are incidental but directly related to construction or acquisition, including planning, engineering, construction management, architectural and other design work, environmental impact reports and assessments, environmental mitigation or compliance obligation expenses, permitting, appraisals, legal expenses, site acquisitions, and easements, and the like. The cost estimates provided in this BOE include estimates developed for land acquisition and environmental mitigation that are normally covered in the non-contract cost allowance.

Since land development and mitigation are estimated separately, 17 percent has been used to cover the allowance for other non-contract costs in this BOE. The non-contract cost percentage reflects the assumption that the Project would be implemented by the Authority, not Reclamation or the State. It does, however, include an allowance for some costs for Reclamation involvement in the project because Reclamation owns the existing Funks Reservoir and the T-C Canal that will require some modification/upgrade. Future phases of the project will evaluate various alternative contracting strategies to implement the project, which could affect the non-contract costs. Table 4-2 presents the breakdown of cost allocations to non-contract costs.

Table 4-2 Non-Contract Cost Allowances

Authority Program Management and Administration	4.5 percent
Site Investigations, Surveys, Planning, Design, etc.	6.5 percent
Construction Management Services and Related Expenses	6.0 percent
Total	17 percent

4.4. Estimate Base and Escalation

Escalation of construction costs from October 2015 to an assumed notice to proceed date in mid-2022 has been included on the estimate worksheets for information. Escalation was evaluated using various sources, including USACE CPI and the Consumer Price Index. Results varied from 15.3 percent to 15.8 percent over the escalation period. For Project Alternative D, 15 percent has been applied. Escalation is assumed to follow projected inflation trends. Escalation does not represent material or equipment price increases above the normal inflation rate.

4.5. Quantities

Quantities used to prepare the cost estimate for Project Alternative D were taken from the previous estimate for Alternative C where facilitates were identical, or were developed from the plans for new or modified facilities.

4.6. Labor Rates

Wages and benefits for labor were determined from the *General Prevailing Wage Determinations for Colusa County, Northern California*, as provided by the State of California Department of Industrial Relations on their website.

4.7. Construction Equipment Rates

Construction equipment operating costs were developed from recent AECOM experience or using data published in the current State of California Department of Transportation publication titled *Labor Surcharge and Equipment Rental Rates*.

4.8. Mechanical and Electrical Equipment Costs

Mechanical and electrical equipment costs developed for Alternative C have been updated to for use in Alternative D. Updating included vendor contacts. These costs include the turbine, motor or generator, exciter units, and unit installation. Motor control centers were allocated with two per large unit and one per smaller unit. Two direct current (DC) systems and two uninterruptable power supply (UPS) systems were estimated for use at all three pumping/generating plants for redundancy and greater reliability.

4.9. Pipeline Fabrication Costs

Pipeline fabrication costs were obtained previously for Alternative C and have been verified with potential suppliers for the current estimating exercise.

4.10. Miscellaneous Costs

Costs for miscellaneous items were developed from recent AECOM experience, or by referencing estimating data books like *RS Means Heavy Construction Cost Data*.

4.11. References

Section 9 provides a list of important references that are applicable for the project.

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5. BASIS OF ESTIMATE AND ESTIMATING ASSUMPTIONS

5.1. Sites Reservoir (Property Class 01)

5.1.1. LAND AND RIGHTS

Appendix D, Real Estate, in the Feasibility Report for the North of the Delta Offstream Storage Project documents the evaluation of acquisition and administrative costs that would be incurred to acquire land in fee and for temporary/permanent easements to develop the project. These costs are included in the project cost estimate as land and rights costs.

5.1.2. PUBLIC AND PRIVATE ROADS

Construction of Site Reservoir and adjoining facilities will require replacement of public roads that will be inundated by the reservoir, temporary public bypass roads during construction, and the construction of new public and private roads to support project operation and access to recreation areas. These costs are included in the project cost estimate as part of the reservoir development costs.

5.1.3. SOUTH BRIDGE

The Project includes a major reservoir bridge crossing referred to as the South Bridge. Estimating assumptions for the bridge include the following:

- The estimate is based on precast concrete deck construction using the balanced cantilever method.
- Pier footings/caps are estimated at 64 feet square and 10 feet thick.
- Based on preliminary designs and assumed depths to fresh rock, bridge pier foundations will be founded on reinforced cast-in-place drilled hole (CIDH) piles socketed into fresh rock. Pile length is approximately 40 feet measured from the underside of the footing mat.
- Thirty six 3-foot diameter CIDH piles are provided under each footing.
- The bridge is broken into two spans by a small hill near mid-span. The short section of road between the two spans on the island is a short causeway formed using mechanically stabilized earth (MSE) walls.
- Bridge deck rails are assumed to be 3-foot-high concrete with a top pipe rail.

5.1.4. RESERVOIR CLEARING AND DEMOLITION

Based on a search of the California Division of Oil, Gas, and Geothermal Resources on-line database, there are many abandoned gas wells in the reservoir area and along the Delevan Pipeline alignment. The cost estimate assumes that some of these abandoned wells may require replugging if disturbed by excavation or other construction-related activities.

Estimating assumptions for clearing and demolition include the following:

- The land area for woodlands is estimated at 700 acres.
- Gas wells exist in the valley. Cost estimate includes an allowance for replugging approximately 20 percent of the existing wells in the reservoir area.
- In accordance with anticipated environmental requirements, demolition includes removal of all structures, metal fencing, barbed wire, fence posts, and asphalt concrete paving.
- Septic tanks and water wells will be abandoned in accordance with Colusa County standards.
- Septic tank waste, septic tanks, buried fuel/oil tanks, waste from building demolition, and other waste will be disposed of offsite in licensed dumps that can receive the material.
- No allowances are made in the estimate for salvage.

5.1.5. SIGNAL SPILLWAY

Saddle Dam 6 incorporates the signal spillway for Sites Reservoir (refer to Paragraph 3.1.4 for description).

5.2. Creek Diversion During Construction

Diversion of Funks Creek and Stone Corral Creek to construct Golden Gate and Sites Dams is described in Paragraph 3.1.5. Estimating assumptions for creek diversion during construction include the following:

- Funks Creek to be diverted south in excavated channel to Stone Corral Creek. Combined creek flows to be discharged through diversion tunnel around the Sites Dam construction site.
- The base of the diversion channel connecting Funks Creek and Stone Corral Creek will be 300 feet wide with 1:1 slopes on both sides and bottom at elevation 290.0 feet.
- Temporary cofferdams to elevation 300.0 feet at the upstream toes of Golden Gate Dam and Sites Dam will contain flood flows and prevent flooding of dam construction sites. The cofferdams will be surfaced with riprap on the waterside slope to prevent erosion.
- The diversion tunnel will be approximately 3,000 feet long, 20 feet in outside diameter, finished to inside diameter of 18 feet. Construction by drill and blast methods using steel sets, lagging, and rock bolts for support. The inside perimeter would be shotcrete lined.
- Riprap will be used for energy dissipation at the point of diversion of Stone Corral Creek downstream of Sites Dam.

5.3. Main Dams (Property Class 01)

5.3.1. AGGREGATE FOR FILTER AND DRAIN ZONES

Sand and aggregate for filter and drain zones in the dams (and for concrete aggregate) would come from alluvial deposits in borrow areas about 35 miles from the project site. On-site

sandstone is not suitable for processing and use in filters and drains, or in structural concrete, because of marginal durability based on available testing. Future design phases of the project will further investigate if suitable sources can be found closer to the project site.

5.3.2. SITES DAM

Table 5-1 provides a summary of the major estimated quantities for Sites Dam.

Table 5-1 Summary of Major Quantities for Sites Dam

Item	Quantity
Strip Foundation Areas	30 acres
Foundation Excavation	793,500 cy
Core Zone	1,070,000 cy
Filter Drain and Transition Zones (35 Mile Haul)	852,400 ton
Rock Fill Zones (1 mile haul)	1,180,500 cy
Random Fill Zones (1 mile haul)	1,085,000 cy
Drill Curtain Grout Holes	84,805 lf

Estimating assumptions for Sites Dam include the following:

- Materials for dam construction (other than aggregates) will come from borrow areas identified by DWR within the reservoir and from sandstone rock quarries along the eastern ridge of the reservoir. Material will also come from mandatory excavations for other project facilities located within a reasonable distance from the dam.
- Sand and gravel for filter and drain zones will be processed and hauled from off-site borrow areas approximately 30 to 35 miles from the site.
- Suitable material from the in reservoir stream diversion, tunnels, and other mandatory excavations for construction can be used for dam construction.
- Construction of this dam will not start until the north bypass road is completed to replace Sites-Ladoga Road through construction areas.
- Suitable core material will be available within 1 mile of the project.
- Foundation grouting quantities are based on a grout take of approximately 0.75 sacks per foot for all holes.
- Estimated drilling and grouting quantities from grouting profiles were increased by 25 percent to cover stitch grouting at faults and other field contingencies.
- Excavated material not suitable for use in the dam will be deposited within the reservoir dead pool below elevation 300 feet.
- Instrumentation would include piezometers, settlement points, seepage weirs, and seismic monitors.

5.3.3. GOLDEN GATE DAM

Table 5-2 provides a summary of the major estimated quantities for Golden Gate Dam.

Table 5-2 Summary of Major Quantities for Golden Gate Dam

Item	Quantity
Strip Foundation Areas	50 acres
Foundation Excavation	2,910,000 cy
Core Zone	3,460,000 cy
Filter Drain and Transition Zones (35 Mile Haul)	2,494,000 ton
Rock Fill Zones (1 mile haul)	2,870,000 cy
Random Fill Zones (1 mile haul)	1,470,000 cy
Drill Curtain Grout Holes	185,600 lf

Estimating assumptions for Golden Dam are similar to those for Sites Dam and include the following:

- Materials for dam construction (other than aggregates) will come from borrow areas identified by DWR within the reservoir and from sandstone rock quarries along the eastern ridge of the reservoir. Material will also come from mandatory excavations for other project facilities located within a reasonable distance from the dam.
- Sand and gravel for filter and drain zones will be processed and hauled from off-site borrow areas approximately 30 to 35 miles from the site.
- Suitable material from the in reservoir stream diversion, tunnels, and other mandatory excavations for construction can be used for dam construction.
- Construction of this dam will not start until the north bypass road is completed to replace Sites-Ladoga Road through construction areas.
- Suitable core material will be available within 1 mile of the project.
- Foundation grouting quantities based on a grout take of approximately 0.75 sacks per foot for all holes.
- Estimated drilling and grouting quantities from grouting profiles increased by 25 percent to cover stitch grouting at faults and other field contingencies.
- Excavated material not suitable for use in the dam will be deposited within the reservoir dead pool below elevation 300 feet.
- Instrumentation would include piezometers, settlement points, seepage weirs, and seismic monitors.

5.4. Saddle Dams (Property Class 01)

Table 5-3 provides a summary of the major estimated quantities for Golden Gate Dam.

Estimating assumptions for saddle dams include the following:

- Materials for dam construction (other than aggregates) will come from borrow areas identified by DWR within the reservoir and from sandstone rock quarries along the eastern ridge of the reservoir. Material will also come from mandatory excavations for other project facilities located within a reasonable distance from the dam.

- Sand and gravel for filter and drain zones will be processed and hauled from off-site borrow areas approximately 30 to 35 miles from the site.
- Suitable core material will be available within 1 mile of the project.
- Excavated material that is not suitable for use in the dam will be deposited within the reservoir dead pool below elevation 300 feet.
- Instrumentation for the larger dams (numbers 3, 5, and 8) would include piezometers, settlement points, seepage weirs, and seismic monitors.

Table 5-3 Summary of Major Quantities for Saddle Dams

Item	Saddle Dam Number								
	1	2	3	4	5	6	7	8	9
Strip Foundation (cy)	2.0	2.0	40.0	1.0	20.0	3.0	5.0	30.0	2.0
Foundation Ex (cy)	26,000	26,300	512,000	7,100	270,000	40,200	67,000	373,000	19,000
Core Zone (cy)	27,600	25,300	832,000	7,700	378,000	39,000	60,500	542,000	16,600
Filter, Drain, Transition (ton)	44,300	39,200	1,532,000	6,700	557,000	50,000	41,000	706,000	20,500
Rock Fill Zones (cy)	7,000	10,000	1,014,000	900	445,000	13,100	61,000	504,000	3,500
Random Fill Zones (cy)	13,900	11,300	340,000	3,000	214,000		57,800	282,000	8,200
Drill Curtain Grout Holes (ft)	None	None	86,500	None	42,400	5,500	10,100	49,200	None
Slurry Cutoff Wall (cy)	None	2,000	2,300	None	2,300	None	None	None	None

5.5. Holthouse Reservoir (Property Class 01)

Table 5-4 provides a summary of the major estimated quantities for Holthouse Dam.

Table 5-4 Summary of Major Quantities for Holthouse Dam

Item	Quantity
Strip Foundation Areas	50 acres
Foundation Excavation	463,550 cy
Core Zone	883,500 cy
Filter Drain and Transition Zones (35 Mile Haul)	255,000 ton
Shell Zones (1 mile haul)	822,000 cy
Rock Fill Zones (1 mile haul)	109,500 cy
Gravity Section Concrete	42,500 cy
Drill Curtain Grout Holes	185,600 lf
Soil/Bentonite Slurry Cutoff Wall	265,500 sf
Spillway Chute, Stilling Basin, and Walls	3,500 cy
Pipeline Inlet/Outlet Structure Concrete	1,560 cy

5.5.1. RELOCATIONS

There are a number of relocations required to construct Holthouse Reservoir.

- The existing Western Area Power Authority (WAPA) transmission lines currently pass through the expanded Holthouse Reservoir area. A relocation of the segment in the

reservoir area would be required to be able to span the new reservoir without a tower in the inundation area.

- A temporary bypass pipeline for the T-C Canal will be needed to maintain canal operation during construction. The current plan is to leave the bypass in place after construction. This bypass would be a backup conveyance to supply water to the canal downstream of Holthouse Reservoir if the level in Holthouse Reservoir is too low to supply the canal by gravity or if the reservoir is drained down for maintenance. For estimating, it is assumed that a bypass pipeline will be buried under the bottom of the new Holthouse Reservoir.

Estimating assumptions for Holthouse Dam include the following:

- Materials for dam construction (other than aggregates) will come from borrow areas within the expanded reservoir area, excavations for the concrete dam section on the left abutment, and surplus suitable material from Delevan and TRR pipeline trenches.
- Sand and gravel for filter and drain zones will be processed and hauled from off-site borrow areas approximately 30 to 35 miles from the site.
- Sandstone rock for rip rap would come from rock quarries developed for the main dams.
- The core section would extend down to dense soils. Below the core, a slurry cutoff wall would extend through remaining dense soils to refusal in weathered rock. The cutoff wall would be embedded into the core on top. Below the bottom of the cutoff wall, pressure grout holes would extend from weathered rock down into moderately fresh rock.
- Foundation grouting would be performed under the concrete dam section to control seepage. This grouting would be continuous with the grouting under the earth dam section.
- Construction of the dam would follow installation of the bypass pipeline for the TC Canal.
- Instrumentation would include piezometers, settlement points, seepage weirs, and seismic monitors.

5.5.2. T-C CANAL CONNECTION TO HOLTHOUSE RESERVOIR

Estimating assumptions for the TC Canal connection to Holthouse Reservoir include the following:

- The T-C Canal will enter the new Holthouse Reservoir at its current location in existing Funks Reservoir.
- A baffle block energy dissipating spillway structure would be provided at the discharge point to allow canal discharges to enter the reservoir in a controlled fashion over the full range of reservoir operation. The spillway would be sized for 2.000 cfs.

5.5.3. FUNKS HOLTHOUSE CONNECTION

Estimating assumptions for the Funks Reservoir – Holthouse Reservoir connection include the following:

- The existing Funks and the new Holthouse Reservoir pools would be connected by demolishing and removing the existing Funks three-gate spillway structure.
- If required to enlarge the gap for hydraulic reasons, a portion of the adjacent Funks Dam could also be removed.

5.6. TRR Reservoir (Property Class 01)

Refer to Section 3.5.1for a description of the facility. Estimating assumptions for the TRR Reservoir include the following:

- Soils for embankment construction would come from the excavated portion of the basin below grade. Soil could also come from surplus pipeline excavated material.
- The TRR liner is assumed to be 60 mil UV-resistant PVC or HDPE.
- A drain pipe and spillway would be provided. Flows would be routed to Funks Creek. Spillway would be sized to accommodate the return flow (up to 900 cfs).

5.7. Pumping and Generating Plants (Property Class 03)

5.7.1. I/O PRESSURE TUNNEL

Refer to Section 3.2.1 for a description of the facility. Estimating assumptions for the I/O Pressure Tunnel include the following:

- The I/O tunnel is a lined tunnel with finished inside diameter of 30 feet.
- For the last 1,000 feet of tunnel at the downstream end, the tunnel includes a 1-inch-thick steel liner with concrete backfill due to shallow rock cover conditions.
- Upstream of the liner, a reinforced concrete liner is used.
- Tunnel is sized for the California Division of Safety of Dams emergency reservoir drawdown criteria.
- Tunnel is constructed using drill and blast methods.
- Tunnel support using rock bolting, steel sets, and lagging.
- Tunnel seepage handled by sumping and pumping.
- No allowance for gassy tunnel conditions.

5.7.2. SITES PUMPING/GENERATING PLANT

Estimating assumptions for SRPGP include the following:

- One 2,500 kilovolt ampere (kVA) double-ended unit switchyard (fed from two 2,500 kVA transformers) will be required.

- Two DC systems and two UPS systems will be used for redundancy.
- Circuit breakers for the 38,280 horsepower pumps will be 2000 amperes (A).
- 250 kW standby generator is assumed for SPGP.
- Main transformers at the Sites Switchyard are rated 100 MVA.
- All 13.8 kV circuits are assumed to be connected via MV-105 shielded cable.
- Main 13.8 kV circuits are assumed to be in duct banks with average length of 2,000 feet.
- All 13.8 kV connections to machines are assumed to be in cable tray or exposed conduit.
- Machine connections at SPGP are assumed to average 600 feet long.
- One motor control center (MCC) is assumed per machine.
- Equipment labeled as standby is not included in the estimate.

5.7.3. TRR PUMPING/GENERATING PLANT

Estimating assumptions for TRR PGP include the following:

- One 2,000 kVA double ended unit switchyard (fed from two 2,000 kVA transformers) will be required.
- Two DC systems and two UPS systems will be used for redundancy.
- Main transformers at the TRR Switchyard match the one-line drawing requirements.
- All 13.8 kV circuits are assumed to be connected via MV-105 shielded cable.
- Main transformer 13.8 kV circuits are assumed to be in duct banks with average length of 500 feet.
- All 13.8 kV connections to machines are assumed to be in cable tray or exposed conduit.
- Machine connections at the TRR are assumed to average 200 feet long.
- One MCC is assumed per machine.
- Equipment labeled as standby is not included in the estimate.

5.7.4. SACRAMENTO RIVER PUMPING/GENERATING PLANT

Estimating assumptions for Sacramento River Pumping/Generating Plant include the following:

- One 2,500kVA double ended unit switchyard (fed from two 2,500 kVA transformers) will be required.
- Two DC systems and two UPS systems will be used for redundancy.
- Main transformers at the SRPGP Switchyard match the one-line drawing’s requirements.
- All 13.8 kV circuits are assumed to be connected via MV-105 shielded cable.
- Main transformer 13.8 kV circuits are assumed to be in duct banks with average length of 750 feet.
- All 13.8 kV connections to machines are assumed to be in cable tray or exposed conduit.
- Machine connections at the SRPGP are assumed to average 300 feet long.

- One MCC is assumed per machine.
- Equipment labeled as standby is not included in the estimate.

5.7.5. FISH SCREEN STRUCTURE

Refer to Section 3.6.3 for a description of the facility. Estimating assumptions for the I/O Pressure Tunnel include the following:

- Construction in the river within a steel sheet pile braced cofferdam.
- Foundation piles driven to required capacity after initial excavation within cofferdam in the wet.
- Tremie seal mat placed in bottom of cofferdam after pile driving. Cofferdam dewater after seal mat is placed, structure constructed.
- Fish screen and solid metal closure panels to be stainless steel.
- Screens cleaned using conventional brush cleaning mechanisms (assume two provided).
- Fish screen structure length is taken as 560 feet based on preliminary design.

5.7.6. RED BLUFF PUMP ADDITION

Refer to Section 3.8 for a description of the facility. Estimating assumptions for the pump additions include the following:

- Two pumps would be procured and installed. The pumps would be 250 cfs capacity matching the larger pumps already installed and operating.
- For each pump, 84-inch diameter motor operated butterfly valve and discharge flap gates will be provided along with a pump flange coupling (similar to those installed on the operating units).
- Estimate includes pump, electrical connections and control connections to existing systems.
- Cost is included for manufacturer’s representation assistance during installation and start-up of equipment.

5.8. Canals and Conduits (Property Class 05)

5.8.1. HOLTHOUSE CHANNEL

Refer to Section 3.3.3 for a description of the facility. Estimating assumptions for the channel include the following:

- Excavation would be performed using bull dozers with rippers and scrapers, with minimal blasting required.
- Dewatering will be accomplished by ditching, sumping, and pumping.

- Suitable material from this excavation may be used for Golden Gate Dam or Holthouse Dam construction, or to meet other site grading requirements.
- Unsuitable material and sediment removed from Funks Reservoir to build the channel would be deposited within the Sites Reservoir dead pool area below elevation 300 feet.
- The schedule allows adequate time for dewatering the sediment after Funks Reservoir is dewatered so that the material can be loaded and hauled without the need for dredging.
- No rip rap or concrete lining for the channel.

5.8.2. DELEVAN PIPELINE AND TRR PIPELINE

Refer to Section 3.7 for a description of the Pipelines. Since these pipelines represent a significant cost to the project, AECOM worked with Hanson, Sacramento, to prepare a detailed evaluation of pipe fabrication and installation costs and schedule. Hanson evaluated setting up and fabricating on-site fabrication versus fabrication at an existing plant with ground transportation to the site. On-site fabrication proved to the preferred alternative, but not by a significant margin. Hanson also prepared feasibility level designs for three pipe classes based on the hydraulic grade lines for the project (with surge allowances) and prepared cost estimates to set up fabrication facilities and fabricate the pipe on site. AECOM used these costs to price the pipeline supply. Hanson also confirmed the planned bedding details for the pipe shown on the drawings, and provided estimates of typical production and installation rates for similar pipe on other projects. The production and installation rates were factored into the required manpower and equipment spreads used in the estimates.

Estimating assumptions for the pipelines include the following:

- The estimate is based upon the pipeline plan and profile details developed for the project.
- Dewatering is based on preliminary construction dewatering estimate developed from available data.
- 144-inch AWWA C300 pipe material estimate is based on updated Hansen information.
- 22 access manholes with air/vacuum relief at 5,000-foot spacing and four blowoff valves for the Delevan Pipeline segment.
- 12 access manholes with air/vacuum relief at 5,000 spacing and four blowoff valves for the TRR Pipeline segment.
- Costs are based on an installation rate of approximately 128 feet of pipe per day (total sum of pipe installed daily all active headings).
- Primary installation is assumed to be cut-and-cover with the top of pipe approximately 10 feet below the surface.
- Pricing includes jacked sections under Highway 5, Highway 45, the railroad, the Colusa Basin Drain, and the GCID Canal.

5.9. Transmission and Interconnection (Property Class 13)

5.9.1. SITES SUBSTATION

The substation configuration assumes a connection to the existing WAPA 230 kV Keswick-O'Banion transmission line based upon a WAPA *System Impact Study* (WAPA, 2013). This substation would service the western facilities (SPGP and TRR). Note that the cross country transmission line running to the Sacramento River Pumping/Generating Plant has been eliminated for Project Alternative D. Rather the Sacramento River Pumping/Generating Plant would be supplied through a new transmission line from a new substation north of Colusa connected to the WAPA line. The transmission line would run north from the new substation roughly paralleling Highway 45.

In addition to the information provided above, estimating assumptions include the following:

- Estimates are based on the *System Impact Study* (WAPA, 2013), Option 1, dated February 2013.
- Substation general arrangement and ratings are based on the one-line diagrams prepared for the project.
- All 230 kV substation equipment is rated at 1,200 A and transformer ratings are as shown on the one line diagrams.
- Survey of substation sites and associated geotechnical investigation is included in engineering allowances and contingencies.
- Communication requirements for the substation sites are by others and are not included in the estimate.
- The *System Impact Study* (WAPA, 2013) mentions the needs for VAR support. This equipment is not shown on the one-line diagrams at this time. A 230 kV, 65 MVAR series capacitor bank has an estimated cost of $300,000 plus auxiliary equipment for a total estimated cost of $450,000. This cost has been included in the Sites Substation cost estimate.

5.9.2. TRR PUMPING/GENERATING PLANT

Switchyard costs developed from the single-line diagram details for the TRR Pumping/Generating Plant Switchyard.

5.9.3. SACRAMENTO RIVER PUMPING/GENERATING PLANT SWITCHYARD

Switchyard costs developed from the single-line diagram details for the Sacramento River Pumping/Generating Plant.

5.9.4. TRANSMISSION LINES

Estimating assumptions include the following:

- The transmission line estimate is based on a single 2156 Aluminum Conductor Steel-Reinforced Bluebird for each circuit, with line construction consisting of double-circuit lattice towers or single-circuit tubular poles (monopoles).
- The transmission line estimate is based on 700-foot ruling span.

5.10. General Property (Property Class 15)

5.10.1. RECREATION AREAS

Estimating assumptions include the following:

- Alternative D includes Stone Corral Creek and Peninsula Hills recreation areas and a boat launch facility located on the west side of the reservoir where the current Sites Lodoga Road exits the reservoir near elevation 520.0 feet. All camping and picnic area equipment is assumed to be anchored in concrete.
- Camping and picnic equipment listed on component cost page.
- All boat ramps are assumed to be 50 feet wide built with 6-inch reinforced concrete for durability.

5.10.2. OPERATIONS AND MAINTENANCE FACILITY

Estimating assumptions include the following:

- The field office is assumed to be 10,000 square feet, including 8,000 square feet of shop space.
- The entire site, including paving, is assumed to be 100,000 square feet.
- The entire site is to be fenced with 6-foot chain link.
- A pre-fabricated metal building shell is assumed.
- Tenant improvements are allowed for space development for offices and shops.
- Water well and septic system are provided.
- Vehicle fueling island is provided.

5.11. Mitigation Costs

AECOM has developed planning-level mitigation cost suitable for Sites Reservoir Alternative C for the Authority that is also applicable to Alternative D. AECOM held a series of mitigation workshops in May 2016 with the Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) Team comprised of DWR, Reclamation and CH2M HILL staff.

During the mitigation workshops, a total of 155 mitigation measures from the NODOS Preliminary Administrative Draft EIR were reviewed. Revised mitigation cost assumptions, schedule impacts associated with mitigation measures and modifications to mitigation that could potentially reduce project costs were discussed during the workshops. The 2013 mitigation cost estimate was also reviewed. Mitigation cost assumptions developed during the mitigation

workshops were then used to update mitigation costs, as well as inform construction and operation and maintenance costs, where appropriate.

5.12. Interest During Construction

AECOM developed an estimate for interest during constriction (IDC) based on the construction schedule presented in Section 7. As shown in **Error! Reference source not found.**, project design, real estate procurement, and construction costs (in 2015 dollars) were distributed over the construction period and IDC (in 2015 dollars) was calculated using an interest rate of 3.5 percent.

Table 5-5 Annual Construction Spending and IDC (2020 - 2030)

No IDC Adjustment from Federal or WSIP Construction Funding

Year	Milestone	Construction		IDC	Total
		% Complete	Cost ($M)	-3.50%	
2020	Design	2.5%	$ 117.40	$ 2.00	$ 119.50
2021	Design	2.5%	$ 117.40	$ 6.20	$ 123.60
2022	Land Acquisition	0.3%	$ 133.20	$ 10.80	$ 144.00
2023	Construction	14.7%	$ 691.90	$ 25.60	$ 717.50
2024	Construction	17.4%	$ 819.10	$ 52.90	$ 872.00
2025	Construction	18.8%	$ 882.50	$ 84.50	$ 967.00
2026	Construction	16.9%	$ 794.20	$116.80	$ 911.00
2027	Construction	12.1%	$ 567.60	$144.80	$ 712.30
2028	Construction	6.2%	$ 291.00	$164.90	$ 455.90
2029	Construction	6.0%	$ 282.80	$180.70	$ 463.50
2030	Fully Operational	0.0%	$ -	$ -	$ -
	Total	100%	$ 4,697.2	$ 789.2	$ 5,486.4

Note: 50% IDC is attributed to spending in the year of construction based a mid-year average expenditure date.

5.13. Operation, Maintenance, Repair, and Replacement

AECOM developed estimates for the operation, maintenance, repair, and replacement (OMRR) costs for the Project. Annual costs developed included facility staffing, contract maintenance, tools and equipment, fixed and variable operation and maintenance costs (including expenses for power and water system operations), major repairs, periodic major equipment component refurbishment/replacement, power costs adjusted for power revenues, canal wheeling costs and the like. Costs for Costs for ongoing environmental mitigation and water quality monitoring were also considered. The annual costs for OMRR and mitigation and water quality monitoring were distributed over an assumed 93-year[1] period beginning in 2030 (start of operation). The NPV of the time series was then determined in October 2015 dollars using a discount rate of 3.5

[1] Based on a 100-year study period beginning at construction per WSIP guidance.

percent. The NPV costs for OMRR and mitigation and monitoring are included in the cost summary tables provided in Section 6.

5.14. Feasibility-Level Cost Estimate

The feasibility-level cost estimates are included in Appendix A.

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6. COST ESTIMATE SUMMARY

Table 6-1 summarizes the estimated feasibility-level capital cost summary for Alternative D in October 2015 dollars. Detailed cost estimate worksheets supporting the table are provided in Appendix A.

Table 6-1 Capital Cost Summary

Facility	Field Cost ($ Million)	Non-Contract Cost ($ Million)	Construction Cost ($ Million)
Develop Sites Reservoir	310	50	360
Main Dams	520	90	610
Saddle Dams	230	40	270
Holthouse Dam	160	30	190
Terminal Regulating Reservoir	33	6	39
Inlet/Outlet Structure and Tunnel	180	30	210
Sites Pumping/Generating Plant	680	120	800
Terminal Regulating Reservoir Pumping/Generating Plant	135	25	160
Sacramento River Pumping/Generating Plant	220	40	260
Sacramento River Fish Screen Structure	47	8	55
Red Bluff Addition	3	1	4
Sites Pumping/Generating Plant Conveyance Channel	42	7	49
Delevan Pipeline	560	100	660
Terminal Regulating Reservoir Pipeline	300	50	350
Utility Transmission Line Interconnections	160	30	190
General Property	26	4	30
Land Acquisition and Rights	100	10	110
Environmental Mitigation/Monitoring	340	10	350
Subtotals	4,046	651	4,697
Capital Cost	-	-	**4,697**

All costs are October 2015 costs

Table 6-2 summarizes the total project cost estimate for Alternative D in October 2015 dollars.

Table 6-2 Total Project Cost Summary

Item	Construction Cost[1] ($ Million)
Capital Cost	4,697
Interest During Construction	789
Operation, Maintenance, Repairs, Replacement (Note 2)	554
Ongoing Water Quality and Mitigation Monitoring Costs (Note 2)	175
Allowance for Utility Systems	50
Total Project Cost	6,265

Note: 1. All costs are October 2015 costs
2. Net present value of annual costs for assumed 93-year operating period beginning in 2030

The estimated annual operation and maintenance, repair and replacement costs, and the mitigation costs (totaling approximately $26.6 million annually) were applied over a 100-year operating period beginning in 2030. The net present value was then estimated in October 2015 dollars using the WSIP required discount rate (3.5 percent).

The estimates presented in Table 6-1 and Table 6-2 may not be a complete tabulation of all potential Authority costs to implement the project. An example of other costs might include electric utility owner costs for system improvements to provide power to the project or accept power from project generation. Further PG&E and WAPA system connection studies and discussions with these utilities would be part of future Project design activities that would identify if such costs would be incurred.

7. CONSTRUCTION SCHEDULE

AECOM has developed a preliminary project implementation schedule for Alternative D as part of developing the feasibility-level cost estimate. Figure 7-1 presents the roll-up schedule. Appendix B contains the full schedule that includes approximately 200 linked construction activities. The schedule presents a reasonable approach to construct the project that accounts for the logical sequencing of the work, procurement of equipment, and reasonable durations to complete construction activities. Durations reflect the estimated labor and equipment spreads needed to complete activities, including earthwork, balancing the movement of excavated soil and rock to placement sites, supplying and placing all materials, erecting structures, and installing major equipment. Labor and equipment costs are reflected in the cost estimate.

The schedule presents construction activities with an assumed construction start date in late March 2022. Predecessor activities like design, permitting, packaging the work, and bidding the construction packages are not included because of the uncertainty in scheduling these activities between now and 2022. With hydroelectric generation a part of the project, the FERC permitting process may also affect the actual start date.

As construction progresses, the critical path (or critical remaining work) moves between facilities. Completing the Sacramento River and Sites Pumping/Generating Plants in early 2030 are the final critical activities to achieve project construction completion and begin pumping operations.

Filling the reservoir is not reflected in the schedule due to the uncertainty in hydrological conditions at that time and the operating criteria that would be contained in the regulatory permits required for the project. It may be possible to begin filling the reservoir using natural runoff from Stone Corral and Funks Creek beginning with the 2028 and 2029 wet season. At this point the dams are completed. Adequate storage would be available to accommodate a major storm event (including the PMF) and release facilities would be available at Sites Dam if needed.

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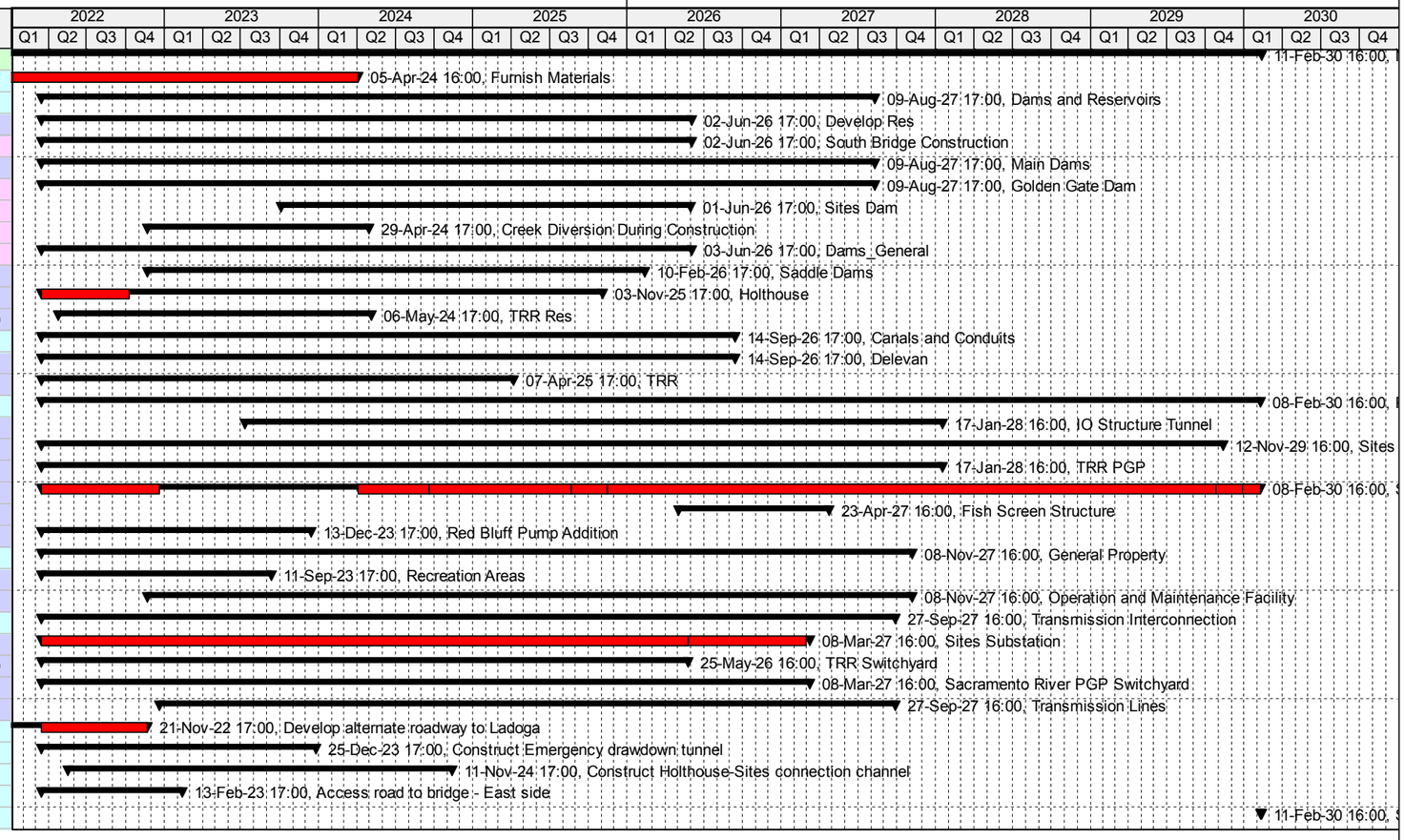
#	Activity ID	Activity Name	Original	Start	Finish
1		NODOS_Sites Reservoir_Ver2	3369	15-Mar-17 08:0	11-Feb-30 16:00
2		Furnish Materials	1095	27-Jan-20 08:0	05-Apr-24 16:00
3		Dams and Reservoirs	1410	15-Mar-22 08:0	09-Aug-27 17:00
4		Develop Res	1101	15-Mar-22 08:0	02-Jun-26 17:00
5		South Bridge Construction	1101	15-Mar-22 08:0	02-Jun-26 17:00
6		Main Dams	1410	15-Mar-22 08:0	09-Aug-27 17:00
7		Golden Gate Dam	1410	15-Mar-22 08:0	09-Aug-27 17:00
8		Sites Dam	695	03-Oct-23 08:00	01-Jun-26 17:00
9		Creek Diversion During Construction	375	22-Nov-22 08:0	29-Apr-24 17:00
10		Dams_General	1102	15-Mar-22 08:0	03-Jun-26 17:00
11		Saddle Dams	841	22-Nov-22 08:0	10-Feb-26 17:00
12		Holthouse	950	15-Mar-22 08:0	03-Nov-25 17:00
13		TRR Res	530	26-Apr-22 08:00	06-May-24 17:00
14		Canals and Conduits	1175	15-Mar-22 08:0	14-Sep-26 17:00
15		Delevan	1175	15-Mar-22 08:0	14-Sep-26 17:00
16		TRR	800	15-Mar-22 08:0	07-Apr-25 17:00
17		Pumping and Generating Plants	2064	15-Mar-22 08:0	08-Feb-30 16:00
18		IO Structure Tunnel	1180	11-Jul-23 08:00	17-Jan-28 16:00
19		Sites PGP	2000	15-Mar-22 08:0	12-Nov-29 16:00
20		TRR PGP	1525	15-Mar-22 08:0	17-Jan-28 16:00
21		Sac River PGP	2064	15-Mar-22 08:0	08-Feb-30 16:00
22		Fish Screen Structure	255	01-May-26 16:0	23-Apr-27 16:00
23		Red Bluff Pump Addition	457	15-Mar-22 08:0	13-Dec-23 17:00
24		General Property	1475	15-Mar-22 08:0	08-Nov-27 16:00
25		Recreation Areas	390	15-Mar-22 08:0	11-Sep-23 17:00
26		Operation and Maintenance Facility	1295	22-Nov-22 08:0	08-Nov-27 16:00
27		Transmission Interconnection	1445	15-Mar-22 08:0	27-Sep-27 16:00
28		Sites Substation	1300	15-Mar-22 08:0	08-Mar-27 16:00
29		TRR Switchyard	1095	15-Mar-22 08:0	25-May-26 16:00
30		Sacramento River PGP Switchyard	1300	15-Mar-22 08:0	08-Mar-27 16:00
31		Transmission Lines	1245	20-Dec-22 08:0	27-Sep-27 16:00
32		Develop alternate roadway to Ladoga	1484	15-Mar-17 08:0	21-Nov-22 17:00
33		Construct Emergency drawdown tunnel	465	15-Mar-22 08:0	25-Dec-23 17:00
34		Construct Holthouse-Sites connection channel	650	17-May-22 08:0	11-Nov-24 17:00
35		Access road to bridge - East side	240	15-Mar-22 08:0	13-Feb-23 17:00
36		Start Filling Sites Reservoir	1	08-Feb-30 16:0	11-Feb-30 16:00



Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

8. LIMITATIONS

The construction cost estimate presented in this BOE Report is a feasibility-level cost estimate that reflects a professional opinion of probable project construction costs, total project costs, and escalation to the assumed 2022 start of construction date based on conceptual-level design layouts developed using currently available information on the surface and subsurface site conditions.

Currently available subsurface information and topographic data relied upon by AECOM to prepare designs and cost estimates were developed by others. AECOM does no take responsibility for the accuracy or completeness of this information.

AECOM represents that its services were conducted in a manner consistent with the standard of care ordinarily applied as the state of practice in the profession, within the limits prescribed by our client. No other warranties, either expressed or implied, are included or intended in this technical memorandum.

AECOM assumes that the project will be implemented by the Authority. AECOM further assumes that the estimated cost for the project is based on a conventional design-bid-build approach to the work. Alternative bidding strategies, such as design build, can change the estimated cost.

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings. Unit rates have been obtained from historical records and/or discussion with contractors. Contractor costs include mark-ups covering the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work.

Cost estimates are an assessment of fair market value for the construction of this project. It is not a prediction of low bid. The construction cost estimate presumes that work packages are established for advertising and bidding such that a minimum of four qualified responsible general contractors bid on the work, and their bids include a minimum of four bidders for subcontracted work. Experience indicates that fewer bidders may result in higher bids. The estimated construction cost is based on industry practice, professional experience and qualifications and represents AECOM's best judgment as a professional construction consultancy familiar with the construction industry.

AECOM does not guarantee that the proposals, bids, or the construction cost will not vary from the estimate prepared. Since AECOM has no control over the cost of labor, material, equipment, the contractor's method of determining prices, the competitive bidding or market conditions at the time of bid, or escalation, the statement of feasibility-level cost is based on industry practice, professional experience and qualifications.

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9. REFERENCES

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APPENDIX A

FEASIBILITY-LEVEL COST ESTIMATES

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PROJECT COST ESTIMATE

PROJECT	North of the Delta Off Stream Storage Project (NODOS)				PREPARED BY	AECOM		
DIVISION					ESTIMATE DATE	30-Nov-2016		
UNIT					ESTIMATE TYPE	Feasibility		
FEATURE	Draft Cost Estimate for Project Alternative D				PRICE LEVEL	October 2015		
PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	DESCRIPTION	CURRENT FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST	TOTAL CONSTRUCTION COST
			NODOS PROJECT COST - PROJECT ALTERNATIVE D		4,046,300,000	650,549,000	4,696,849,000	4,696,849,000
1			RESERVOIRS AND DAMS		1,353,000,000	226,000,000	1,579,000,000	1,579,000,000
	01		Develop Sites Reservoir Area		410,000,000	60,000,000	470,000,000	
		100	Land and Rights	100,000,000				
		110	Public Road Relocations	67,000,000				
		110	South Bridge	175,000,000				
		120	Reservoir Clearing and Demolition	9,200,000				
		140	Project Roads	56,000,000				
			Rounding	2,800,000				
	02		Construct Main Dams		520,000,000	90,000,000	610,000,000	
		100	Land and Rights					
		150	Creek Diversion During Construction	15,000,000				
		151	Construct Sites Dam	135,000,000				
		151	Construct Golden Gate Dam	370,000,000				
		152	Rim Grouting	3,300,000				
			Rounding	(3,300,000)				
	03		Construct Saddle Dams		230,000,000	40,000,000	270,000,000	
		151	Land and Rights					
		151	Construct Saddle Dam 1	2,400,000				
		151	Construct Saddle Dam 2	3,000,000				
		151	Construct Saddle Dam 3	93,000,000				
		151	Construct Saddle Dam 4	520,000				
		151	Construct Saddle Dam 5	50,000,000				
		151	Construct Saddle Dam 6	9,900,000				
		151	Construct Saddle Dam 7	9,800,000				
		151	Construct Saddle Dam 8	56,000,000				
		151	Construct Saddle Dam 9	1,400,000				
			Rounding	3,980,000				

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	DESCRIPTION	CURRENT FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST	TOTAL CONSTRUCTION COST
	04		Construct Holthouse Reservoir and Appurtenances		160,000,000	30,000,000	190,000,000	
		100	Land and Rights					
		110	Relocations	38,000,000				
		151	Construct Holthouse Dam	105,000,000				
		152	TCCA Canal Bypass Pipeline	8,500,000				
		153	Waterway Structures	4,000,000				
		160	Pumps and Prime Movers					
		170	Accessory Electrical Equipment	4,500,000				
			Rounding					
	05		Construct TRR Reservoir		33,000,000	6,000,000	39,000,000	
		100	Land and Rights					
		151	Construct TRR Reservoir	25,000,000				
		153	Canal Control Structures	6,900,000				
		170	Accessory Electrical Equipment	1,050,000				
			Rounding	50,000				
3			PUMPING AND GENERATING PLANTS		1,265,300,000	223,549,000	1,488,849,000	1,488,849,000
	01		Construct I/O Structure and 30' Diameter Tunnel		180,000,000	30,000,000	210,000,000	
		152	30' Diameter Tunnel	120,000,000				
		152	Low level Intake Structure	25,000,000				
		152	Gated Intake/Outlet Tower (Including Mechanic	18,000,000				
		152	Construct Gated Intake Tower, Mechanical	14,000,000				
		152	Construct Gated Intake Tower, Electrical	1,600,000				
			Rounding	1,400,000				
	02		Sites Pumping-Generating Plant		680,000,000	120,000,000	800,000,000	
		100	Land and Rights					
		130	Structures and Improvements	210,000,000				
		140	Roads and Road Structures					
		152	Waterways	115,000,000				
		153	Waterway Structures	43,000,000				
		160	Pumps and Prime Movers	74,000,000				
		165	Turbines and Generators	145,000,000				
		170	Accessory Electrical Equipment	99,000,000				
			Rounding	(6,000,000)				

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	DESCRIPTION	CURRENT FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST	TOTAL CONSTRUCTION COST
	03		TRR Pumping-Generating Plant		135,000,000	25,000,000	160,000,000	
		100	Land and Rights					
		130	Structures and Improvements	64,000,000				
		140	Roads and Road Structures	1,150,000				
		152	Waterways	12,000,000				
		154	Waterway Protective Works	10,000,000				
		160	Pumps and Prime Movers	19,500,000				
		165	Turbines and Generators	7,600,000				
		170	Accessory Electrical Equipment	20,000,000				
			Rounding	750,000				
	04		Sacramento River Pumping-Generating Plant		220,000,000	40,000,000	260,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	100,000,000				
		140	Roads and Road Structures (Included with Res	740,000				
		152	Discharge Piping					
		154	Waterways - Buried Penstock Piping and Bifurc	3,000,000				
		160	Waterway Protective Structures	9,900,000				
		165	Pumps and Prime Movers	75,000,000				
		170	Turbines and Generators	10,500,000				
			Accessory Electrical Equipment	25,000,000				
			Rounding	(4,140,000)				
	05		Sacramento River Fish Screen Structure		47,000,000	8,000,000	55,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	47,000,000				
		140	Roads and Road Structures (Included with Res	165,000				
		170	Accessory Electrical Equipment	680,000				
			Rounding	(845,000)				
	06		Red Bluff Pump Addition		3,300,000	549,000	3,849,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	170,000				
		160	Pumps and Prime Movers	2,600,000				
		170	Accessory Electrical Equipment	500,000				
			Rounding	30,000				

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	DESCRIPTION	CURRENT FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST	TOTAL CONSTRUCTION COST
5			Canals and Conduits		902,000,000	157,000,000	1,059,000,000	1,059,000,000
	01		Construct Channel Sites to Holthouse		42,000,000	7,000,000	49,000,000	
		152	Conveyance Channel Sites to Holthouse	42,000,000				
			Rounding					
	02		Construct Delevan Pipeline		560,000,000	100,000,000	660,000,000	
		100	Land and Rights					
		120	Clearing and Demolition	390,000				
		152	Construct Delevan Pipeline	510,000,000				
		152	I-5 Crossing (Jacked)	39,000,000				
		152	Highway 45 Crossing (Jacked)	12,000,000				
			Rounding	(1,390,000)				
	03		Construct TRR Pipeline		300,000,000	50,000,000	350,000,000	
		100	Land and Rights					
		152	Construct TRR Pipeline	280,000,000				
		152	Holthouse Inlet Structure	8,200,000				
		152	Construct GCID Crossing	17,000,000				
			Rounding	(5,200,000)				
13			Transmission Lines, Switchyards and Substations		160,000,000	30,000,000	190,000,000	190,000,000
	01		Transmission and Interconnection		160,000,000	30,000,000	190,000,000	
		100	Land and Rights					
		175	Sites Substation	35,000,000				
		175	TRR Switchyard	10,000,000				
		175	Sacramento River PGP Switchyard	8,800,000				
		181	Transmission Lines	97,000,000				
		185	WAPA Substation	10,000,000				
			Rounding	(800,000)				
15			General Property		26,000,000	4,000,000	30,000,000	30,000,000
			General Property		26,000,000	4,000,000	30,000,000	
		195	Recreation Facilities	24,000,000				
		195	Operating and Maintenance Facility	2,500,000				
			Rounding	(500,000)				

PROPERTY CLASS	IDENTIFIED PROPERTY	PLANT ACCOUNT	DESCRIPTION	CURRENT FIELD COST	TOTAL FIELD COST	NONCONTRACT COST	CONSTRUCTION COST	TOTAL CONSTRUCTION COST
		Mitigation			340,000,000	10,000,000	350,000,000	350,000,000
		Mitigation			340,000,000	10,000,000	350,000,000	
			Surface Water Quality	1,800,000				
			Aquatic Resources	55,000,000				
			Botanical Resources	88,000,000				
			Wildlife Habitat	51,000,000				
			Wetlands Habitat	78,000,000				
			Cultural Resources	33,000,000				
			Land Use	30,000,000				
			Paleontology	1,400,000				
			Air Quality	175,000				
			Rounding	1,625,000				

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 1 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
(Includes land costs, clearing, demolition, public road relocations, and new project roads.)

Civil **Summary Sheet**

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Land & Rights

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					$90,700,000
		Subtotal					**$90,700,000**
		Mobilization	0%	+/-			$0
		Subtotal with Mobilization					**$90,700,000**
		Contract Cost Allowances (Sum of):	10%	+/-			$9,300,000
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$100,000,000**
		Construction Contingencies	0%	+/-			$0
		FIELD COST					**$100,000,000**
		Non-Contract Costs	10%	+/-			$10,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$110,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$125,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
		Mike Egge	42650
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
		December 2016	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
Land and Rights

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Land & Rights

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		Procure reservoir property and land					
		required for relocation of homes and					
		businesses outside reservoir					
	1	Sites Reservoir Project Lands		1	allow	$69,000,000.00	$69,000,000
	2	Easement Acquisition Costs		1	allow	$14,300,000.00	$14,300,000
	3	Parcel Acquisition & Admin Costs		1	allow	$6,900,000.00	$6,900,000
	4	Easement Acquisition & Admin Costs		1	allow	$1,100,000.00	$1,100,000
	5	Relocation Administrative Costs		1	allow	$2,120,000.00	$2,120,000
		Land costs extracted from the Real Estate					
		Plan included in Appendix D of the NODOS					
		Feasibility Study)					
		SUBTOTAL THIS SHEET					**$93,420,000**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
		Loren Murray	42662
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	10/07/16	October 2016	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 1 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
(Includes land costs, clearing, demolition, public road relocations, and new project roads.)

Civil **Summary Sheet**

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**

REGION: **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					
110		Public Road Relocation - Sheet 1					$28,077,255
		Public Road Relocation - Sheet 2					$4,427,467
		Public Road Relocation - Sheet 3					$17,581,830
		Public Road Relocation - Sheet 4					
110		South Bridge					$132,438,798
120		Reservoir Clearing/Demolition					$6,959,096
140		Project Roads - Sheet 1					$13,679,599
		Project Roads - Sheet 2					$10,562,115
		Project Roads - Sheet 3					$6,264,221
		Project Roads - Sheet 4					$4,163,903
		Project Roads - Sheet 5					$7,491,897
		Subtotal					**$231,646,183**
		Mobilization	5%	+/-			$11,500,000
		Subtotal with Mobilization					**$243,146,183**
		Contract Cost Allowances (Sum of):	10%	+/-			$26,853,817
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$270,000,000**
		Construction Contingencies	15%	+/-			$40,000,000
		FIELD COST					**$310,000,000**
		Non-Contract Costs	17%	+/-			$50,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$360,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$410,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Mike Egge	**CHECKED** 42650
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** December 2016	**PEER REVIEW / DATE**

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 2 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Land and Rights	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		Procure reservoir property and land					
		required for relocation of homes and					
		businesses outside reservoir					
		Land costs extracted from the Real Estate					
		Plan included in Appendix D of the NODOS					
		Feasibility Study)					
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
		Mike Egge	0
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	10/07/16	October 2016	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 3 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Public Road Relocation	**WOID:** / **ESTIMATE LEVEL:**
Sheet 1	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION				UNIT PRICE	AMOUNT
110		**Public Road Relocation**					
		Relocate in-reservoir public roads					
		around reservoir, construct road access to					
		new South Bridge.					
		PAVED -- S. Bridge Approaches - Including Stone Corral Rd. to E. Bridge Approach					
	1	Clearing and Grubbing		48	acre	$5,299.50	$254,376
	2	Earthwork - common cut		470,682	yd3	$9.01	$4,240,445
	3	Earthwork - rock cut		470,682	yd3	$22.26	$10,476,393
	4	Compacted embankment - fill		735,188	yd3	$10.60	$7,792,258
	5	Class 4 Aggregate subbase		15,920	ton	$12.72	$202,483
	6	Class 2 Aggregate base		34,500	ton	$21.20	$731,331
	7	Asphalt concrete (24' wide, 4" thick)		19,330	ton	$74.19	$1,434,151
	8	Culverts (6' dia. X 100' length)		1	Allow	$75,000.00	$75,000
	9	Guardrail		22,280	LF	$60.00	$1,336,800
	10	Striping, Signage, Misc.		1	Allow	$50,000.00	$50,000
		PAVED -- Eastside Road - Maxwell Sites Road to Stone Corral Rd.					
	1	Clearing and Grubbing		14	acre	$5,299.50	$74,193
	2	Earthwork - common cut		30,300	yd3	$9.01	$272,977
	3	Earthwork - rock cut		15,200	yd3	$22.26	$338,320
	4	Compacted embankment - fill		14,500	yd3	$10.60	$153,686
	5	Class 4 Aggregate subbase		7,400	ton	$12.72	$94,119
	6	Class 2 Aggregate base		7,400	ton	$21.20	$156,865
	7	Asphalt concrete (24' wide, 4" thick)		3,600	ton	$74.19	$267,095
	8	Fencing Right of Way		2	mi	$52,995.00	$116,589
	9	Striping, Signage, Misc.		8	acre	$1,271.88	$10,175
		SUBTOTAL THIS SHEET					**$28,077,255**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Dams	David Hughes	Mike Egge	0
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	10/07/16	October 2016	Joe Barnes

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 4 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
Public Road Relocation
Sheet 2
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**Public Road Relocation - Continued**					
		PAVED -- Eastside Road - Stone Corral Rd to and Including Access Roads					
	1	Clearing and Grubbing		36	acre	$5,299.50	$190,782
	2	Earthwork - common cut		75,300	yd3	$9.01	$678,389
	3	Earthwork - rock cut		37,600	yd3	$22.26	$836,897
	4	Compacted embankment - fill		87,400	yd3	$10.60	$926,353
	5	Class 4 Aggregate subbase		19,600	ton	$12.72	$249,288
	6	Class 2 Aggregate base		19,600	ton	$21.20	$415,481
	7	Asphalt concrete (24' wide, 4" thick)		9,500	Ton	$74.19	$704,834
	8	Culverts (6' dia. X 100' length)		2	ea.	$42,396.00	$84,792
	9	Fencing Right of Way		6	mi	$52,995.00	$312,671
	10	Striping, Signage, Misc.		22	acre	$1,271.88	$27,981
		PAVED -- Sulphur Gap Road - Maxwell Sites Road to Lurline Road					
	1	Clearing and Grubbing			acre	$5,299.50	$0
	2	Earthwork - common cut			yd3	$9.01	$0
	3	Earthwork - rock cut			yd3	$22.26	$0
	4	Compacted embankment - fill			yd3	$10.60	$0
	5	Class 4 Aggregate subbase			ton	$12.72	$0
	6	Class 2 Aggregate base			ton	$21.20	$0
	7	Asphalt concrete (24' wide, 4" thick)			ton	$74.19	$0
	8	Culverts (6' dia. X 100' length)			ea.	$42,396.00	$0
	9	Fencing Right of Way			mi	$52,995.00	$0
	10	Striping, Signage, Misc.			acre	$1,271.88	$0
		SUBTOTAL THIS SHEET					**$4,427,467**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 5 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Public Road Relocation	**WOID:** / **ESTIMATE LEVEL:**
Sheet 3	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**Public Road Relocation - continued**					
		PAVED -- Lurline Road - Sulphur Gap Road to Lurline Headwaters Rec Area					
	1	Clearing and Grubbing			acre	$5,299.50	$0
	2	Earthwork - common cut			yd3	$9.01	$0
	3	Earthwork - rock cut			yd3	$22.26	$0
	4	Compacted embankment - fill			yd3	$10.60	$0
	5	Class 4 Aggregate subbase			ton	$12.72	$0
	6	Class 2 Aggregate base			ton	$21.20	$0
	7	Asphalt concrete (24' wide, 4" thick)			ton	$74.19	$0
	8	Culverts (6' dia. X 100' length)			ea.	$42,396.00	$0
	9	Fencing Right of Way			mi	$52,995.00	$0
	10	Striping, Signage, Misc.			acre	$1,271.88	$0
		PAVED -- Temporary North Road					
	1	Clearing and Grubbing		75	acre	$5,299.50	$397,463
	2	Excavation		482,081	CY	$9.01	$4,343,550
	3	Fill		317,072	CY	$10.60	$3,360,963
	4	Class 4 Aggregate subbase		80,850	ton	$12.72	$1,028,412
	5	Class 2 Aggregate base		91,620	ton	$21.20	$1,942,344
	6	Asphalt concrete (24' wide, 4" thick)		64,200	ton	$74.19	$4,762,998
	7	Guardrail		27,435	LF	$60.00	$1,646,100
	8	Striping, Signage, Misc.		1	Allow	$100,000.00	$100,000
		SUBTOTAL THIS SHEET					**$17,581,830**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 6 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
Public Road Relocation
Sheet 4
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**Public Road Relocation - continued**					
		GRAVEL - Huffmaster Road South 5.5 Miles					
	1	Clearing and Grubbing			acre	$5,299.50	$0
	2	Earthwork - Grade 20' Wide			SF	$0.40	$0
	3	Earthwork - rock cut			yd3	$22.26	$0
	4	Compacted embankment - fill			yd3	$10.60	$0
	5	Class 4 Aggregate subbase			ton	$12.72	$0
	6	Class 2 Aggregate base - 6"			ton	$21.20	$0
	7	Asphalt concrete (24' wide, 4" thick)			ton	$74.19	$0
	8	Culverts (6' dia. X 100' length)			Allow	$100,000.00	$0
	9	Fencing Right of Way			mi	$52,995.00	$0
	10	Striping, Signage, Misc.			Allow	$25,000.00	$0
		GRAVEL -- Huffmaster to Leesville Rd. South End of Reservoir					
							$0
	1	Clearing and Grubbing			acre	$5,299.50	$0
	2	Earthwork - common cut			yd3	$9.01	$0
	3	Earthwork - rock cut			yd3	$22.26	$0
	4	Compacted embankment - fill			yd3	$10.60	$0
	5	Class 4 Aggregate subbase			ton	$12.72	$0
	6	Class 2 Aggregate base			ton	$21.20	$0
	7	Culverts (6' dia. X 100' length)			ea.	$42,396.00	$0
	8	Fencing Right of Way			mi	$52,995.00	$0
	9	Striping, Signage, Misc.			acre	$1,271.88	$0
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 7 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
South Bridge Construction

Structural

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**South Bridge Construction**					
	1	Grade temporary access pathway		150,000	ft2	$0.37	$55,645
	2	Layout		15	Days	$3,750.00	$56,250
	3	Caissons - Drill and Concrete & Rebar 48"		34,560	lft	$525.00	$18,144,000
	4	Add for rock sockets		8,640	lft	$250.00	$2,160,000
	5	Caissons - mobilization, Testing & moves		1	allow	$420,000.00	$420,000
	6	Caisson Observation tubes		864	Piles	$5,000.00	$4,320,000
	7	Excavate for Footings		81,835	yd3	$3.47	$283,629
	8	Footing Concrete		43,157	yd3	$234.27	$10,110,468
	9	Footing Formwork		65,280	SF	$14.02	$915,226
	10	Footing Rebar at 1.5% by Weight		8,631,467	lb.	$1.35	$11,652,480
	11	Backfill Footings		38,677	yd3	$32.52	$1,257,952
	12	Bridge Section 1					
	13	Structural excavation at abutments		1	LS	$154,300.00	$154,300
	14	Structural backfill		1	LS	$116,800.00	$116,800
	15	Structural Concrete for Bridge 1		16,920	CY	$705.88	$11,943,549
	16	Abutment Foundations		196	Cy	$436.27	$85,509
	17	Structural approach slab		78	CY	$800.00	$62,400
	18	Seal Joint Assembly		350	lft	$185.00	$64,750
	19	Reinforcing Steel		5,082,800	Lb	$1.35	$6,861,780
	20	Abutment caisson - 24"		2,240	lft	$130.00	$291,200
	21	Concrete barrier - Type 736		8,220	lft	$175.00	$1,438,500
	22	Precast box girder		141,750	SF	$150.00	$21,262,500
	23	Lighting		1	Allow	$140,000.00	$140,000
	24	Signage		1	allow	$15,000.00	$15,000
		SUBTOTAL THIS SHEET					**$91,811,937**

QUANTITIES

BY	CHECKED
Syed Kazmi	7-Oct
DATE PREPARED	**PEER REVIEW / DATE**
11/22/16	Joe Barnes

PRICES

BY	CHECKED
Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**
October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 7 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
South Bridge Construction	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Structural	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**South Bridge Construction**					
		Bridge Section 2					
	1	Structural excavation at abutments		1	LS	$154,300.00	$154,300
	2	Structural backfill		1	LS	$116,800.00	$116,800
	3	Structural Concrete for Bridge 1		15,495	CY	$705.88	$10,937,665
	4	Abutment Foundations		196	Cy	$436.27	$85,509
	5	Structural approach slab		78	CY	$800.00	$62,400
	6	Seal Joint Assembly		350	lft	$185.00	$64,750
	7	Reinforcing Steel		4,654,250	Lb	$1.35	$6,283,238
	8	Abutment caisson - 24"		2,240	lft	$130.00	$291,200
	9	Concrete barrier - Type 736		7,020	lft	$175.00	$1,228,500
	10	Precast box girder		141,750	SF	$150.00	$21,262,500
	11	Lighting		1	Allow	$125,000.00	$125,000
	12	Signage		1	allow	$15,000.00	$15,000
		SUBTOTAL THIS SHEET					**$40,626,861**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Syed Kazmi	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/22/16	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 8 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Reservoir Clearing/Demolition	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
120		**Reservoir Clearing/Demolition**					
		Reservoir clearing, including structure					
		demolition, fence removal, septic system					
		removal, water well plugging, gas well					
		plugging and the like.					
	1	Vegetation - Oak Woodland		700	acre	$5,300.00	$3,710,000
	2	Vegetation & Misc. - Occupied Areas		61	acre	$6,000.00	$366,000
	3	Demolish Houses		26	EA	$11,700.00	$304,200
	4	Remove Motor Homes		2	Ea.	$4,500.00	$9,000
	5	Demolish and clean Septic Systems		28	Ea.	$5,000.00	$140,000
	6	Plug Groundwater wells		38	EA	$12,500.00	$475,000
	7	Demolish Barns		31	EA	$13,500.00	$418,500
	8	Demolish Out-buildings - Sheds & Garages		37	EA	$2,700.00	$99,900
	9	Demolish silos & water towers		12	EA	$10,000.00	$120,000
	10	Gas Well Decommissioning		8,000	LB	$7.50	$60,000
	11	Underground Fuel Tanks		15	EA	$25,000.00	$375,000
	12	Remove Metal Fencing and Posts (No Salvage)		40	mile	$10,600.00	$424,000
	13	Remove Asphalt Paving (Two-Lane Roads)		57,547	yd2	$7.95	$457,496
		SUBTOTAL THIS SHEET					**$6,959,096**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 9 OF _ _

FEATURE: Reservoir and Dams
NODOS Project
Sites Reservoir - Develop Reservoir Area
Project Roads
Sheet 1
(Additional project roads other than public roads or or public road relocations)
Civil

PROJECT: NODOS Alternative D

WOID:
ESTIMATE LEVEL:
REGION:
UNIT PRICE LEVEL:
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Project Roads**					
		GRAVEL -- North Road - Road 69 @ TCC to Saddle Dam 9					
	1	**Clearing and Grubbing**		79	acre	$5,299.50	$418,661
	2	Earthwork - common cut		175,000	yd3	$9.01	$1,576,601
	3	Earthwork - rock cut		88,000	yd3	$22.26	$1,958,695
	4	Compacted embankment - fill		232,000	yd3	$10.60	$2,458,968
	5	Class 4 Aggregate subbase		43,000	ton	$12.72	$546,908
	6	Class 2 Aggregate base		43,000	ton	$21.20	$911,514
	7	Culverts (6' dia. X 100' length)		5	ea.	$42,396.00	$211,980
	8	Fencing Right of Way		13	mi	$52,995.00	$694,235
	9	Striping, Signage, Misc.		47	acre	$1,271.88	$59,778
		GRAVEL -- Peninsula Road - Sites Lodoga Road to Pen Hills Rec Area South Access					
	1	Clearing and Grubbing		18	acre	$5,299.50	$95,391
	2	Earthwork - common cut		160,000	yd3	$9.01	$1,441,464
	3	Earthwork - rock cut		80,000	yd3	$22.26	$1,780,632
	4	Compacted embankment - fill		97,000	yd3	$10.60	$1,028,103
	5	Class 4 Aggregate subbase		9,700	ton	$12.72	$123,372
	6	Class 2 Aggregate base		9,700	ton	$21.20	$205,621
	7	Fencing Right of Way		3	mi	$52,995.00	$153,686
	8	Striping, Signage, Misc.		11	acre	$1,271.88	$13,991
		SUBTOTAL THIS SHEET					**$13,679,599**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 10 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
Project Roads
Sheet 2
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Project Roads - Continued**					
140		**GRAVEL -- Eastside Road - Golden Gate Dam Access Roads to N. Property**					
	1	Clearing and Grubbing		18	acre	$5,299.50	$95,391
	2	Earthwork - common cut		26,000	yd3	$9.01	$234,238
	3	Earthwork - rock cut		13,000	yd3	$22.26	$289,353
	4	Compacted embankment - fill		68,400	yd3	$10.60	$724,972
	5	Class 4 Aggregate subbase		10,000	ton	$12.72	$127,188
	6	Class 2 Aggregate base		10,000	ton	$21.20	$211,980
	7	Culverts (6' dia. X 100' length)		2	ea.	$42,396.00	$84,792
	8	Fencing Right of Way		3	mi	$52,995.00	$158,985
	9	Striping, Signage, Misc.		11	acre	$1,271.88	$13,991
140		**GRAVEL -- Eastside Road - North Property to North Road**					
	1	Clearing and Grubbing		44	acre	$5,299.50	$233,178
	2	Earthwork - common cut		119,200	yd3	$9.01	$1,073,891
	3	Earthwork - rock cut		59,600	yd3	$22.26	$1,326,571
	4	Compacted embankment - fill		436,500	yd3	$10.60	$4,626,464
	5	Class 4 Aggregate subbase		24,000	ton	$12.72	$305,251
	6	Class 2 Aggregate base		24,000	ton	$21.20	$508,752
	7	Culverts (6' dia. X 100' length)		3	ea.	$42,396.00	$127,188
	8	Fencing Right of Way		7	mi	$52,995.00	$386,864
	9	Striping, Signage, Misc.		26	acre	$1,271.88	$33,069
		SUBTOTAL THIS SHEET					**$10,562,115**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 11 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Project Roads	**WOID:** / **ESTIMATE LEVEL:**
Sheet 3	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Project Roads - Continued**					
		GRAVEL -- Com Road - Lurline Rd. to Communication Tower					
	1	Clearing and Grubbing		36	acre	$5,299.50	$190,782
	2	Earthwork - common cut		73,000	yd3	$9.01	$657,668
	3	Earthwork - rock cut		36,500	yd3	$22.26	$812,413
	4	Compacted embankment - fill		335,900	yd3	$10.60	$3,560,204
	5	Class 4 Aggregate subbase		19,500	ton	$12.72	$248,017
	6	Class 2 Aggregate base		19,500	ton	$21.20	$413,361
	7	Culverts (6' dia. X 100' length)		1	ea.	$42,396.00	$42,396
	8	Fencing Right of Way		6	mi	$52,995.00	$312,671
	9	Striping, Signage, Misc.		21	acre	$1,271.88	$26,709
		SUBTOTAL THIS SHEET					**$6,264,221**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 12 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Develop Reservoir Area	
Project Roads	**WOID:** / **ESTIMATE LEVEL:**
Sheet 4	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Project Roads - Continued**					
		GRAVEL -- Saddle Dam Road - North Road to Saddle Dam 1 - DELETE					
	1	Clearing and Grubbing		38	acre	$5,159.00	$196,042
	2	Earthwork - common cut		72,300	yd3	$8.77	$634,071
	3	Earthwork - rock cut		36,200	yd3	$21.67	$784,454
	4	Compacted embankment - fill		35,700	yd3	$10.32	$368,424
	5	Class 4 Aggregate subbase		21,000	ton	$12.38	$259,980
	6	Class 2 Aggregate base		21,000	ton	$20.64	$433,440
	7	Fencing Right of Way		6	mi	$51,590.00	$325,017
	8	Striping, Signage, Misc.		23	acre	$1,238.16	$28,478
		GRAVEL -- Stone Corral Road - Stone Corral Rd. to Stone Corral Rec Area					
	1	Clearing and Grubbing		3	acre	$5,159.00	$15,477
	2	Earthwork - common cut		51,800	yd3	$8.77	$454,286
	3	Earthwork - rock cut		25,900	yd3	$21.67	$561,253
	4	Compacted embankment - fill		1,800	yd3	$10.32	$18,576
	5	Class 4 Aggregate subbase		1,700	ton	$12.38	$21,046
	6	Class 2 Aggregate base		1,700	ton	$20.64	$35,088
	7	Fencing Right of Way		1	mi	$51,590.00	$25,795
	8	Striping, Signage, Misc.		2	acre	$1,238.16	$2,476
		SUBTOTAL THIS SHEET					**$4,163,903**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 13 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Develop Reservoir Area
Project Roads
Sheet 5
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Project Roads - Continued**					
140		**PAVED -- GOLDEN GATE ACCESS ROADS (PRIVATE ACCESS)**					
	1	Clearing and Grubbing		18	acre	$5,159.00	$92,862
	2	Earthwork - common cut		139,000	yd3	$8.77	$1,219,030
	3	Earthwork - rock cut		69,500	yd3	$21.67	$1,506,065
	4	Compacted embankment - fill		114,000	yd3	$10.32	$1,176,480
	5	Class 4 Aggregate subbase		9,700	ton	$12.38	$120,086
	6	Class 2 Aggregate base		9,700	ton	$20.64	$200,208
	7	Asphalt concrete (24' wide, 4" thick)		4,700	ton	$72.23	$339,481
	8	Culverts (6' dia. X 100' length)		1	ea.	$41,272.00	$41,272
	9	Fencing Right of Way		3	mi	$51,590.00	$149,611
	10	Striping, Signage, Misc.		11	acre	$1,238.16	$13,620
		GRAVEL -- SADDLE DAM ACCESS ROADS (PRIVATE ACCESS)					
	1	Clearing and Grubbing		7	acre	$5,159.00	$36,113
	2	Earthwork - common cut		94,500	yd3	$8.77	$828,765
	3	Earthwork - rock cut		47,200	yd3	$21.67	$1,022,824
	4	Compacted embankment - fill		49,600	yd3	$10.32	$511,872
	5	Class 4 Aggregate subbase		3,800	ton	$12.38	$47,044
	6	Class 2 Aggregate base		3,800	ton	$20.64	$78,432
	7	Culverts (6' dia. X 100' length)		1	ea.	$41,272.00	$41,272
	8	Fencing Right of Way		1	mi	$51,590.00	$61,908
	9	Striping, Signage, Misc.		4	acre	$1,238.16	$4,953
		SUBTOTAL THIS SHEET					**$7,491,897**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 14 OF __

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Main Dam Construction	
(Includes diversion of Funks and Stone Corral Creeks, and construction of Sites and Golden gate dams.)	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
150		Creek Diversion During Construction					$11,167,433
151		Construct Sites Dam					$99,986,705
151		Construct Golden Gate Dam					$278,294,259
151		Rim Grouting					$2,465,134
		Subtotal					**$391,913,532**
		Mobilization	5%	+/-			$19,500,000
		Subtotal with Mobilization					**$411,413,532**
		Contract Cost Allowances (Sum of):	10%	+/-			$38,586,468
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$450,000,000**
		Construction Contingencies	15%	+/-			$70,000,000
		FIELD COST					**$520,000,000**
		Non-Contract Costs	17%	+/-			$90,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$610,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$700,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Sites Reservoir - Main Dam Construction
Creek Diversion During Construction
(In-reservoir channel cut connecting Sites and Stone Corral Creeks, tunnel through Sites Dam abutment.)
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
150		**Channel Excavation Joining Funks Creek and Stone Corral Creek**					
	1	Mass Excavation		650,000	yd3	$3.71	$2,411,273
	2	Containment embankment (cofferdams)		0	yd3	$5.30	$0
	3	Rip Rap Energy dissipation		3,000	yd3	$19.08	$57,235
		Creek Diversion Tunnel at Sites Dam					
	1	Tunnel Excavation		28,500	yd3	$23.48	$669,088
	2	Haul Excavated Material - 1 Mile		28,500	yd3	$26.53	$756,085
	3	Portal Slab		60	yd3	$390.73	$23,444
	4	Portal Walls & Ceiling		240	yd3	$577.25	$138,540
	5	Portal entrance walls		43	yd3	$577.25	$24,822
	6	Shotcrete		7,260	yd3	$567.05	$4,116,758
	7	Mesh		215,500	ft2	$1.17	$251,249
	8	Portal Entrance Wall Rebar 8%		13,760	lb	$1.35	$18,576
	9	Portal Wall & Ceiling Rebar 6%		57,600	lb	$1.35	$77,760
	10	Portal Slab Rebar 1 PSF		1,600	lb	$1.35	$2,160
	11	Steel stiffeners in shotcrete section		50,000	lb	$5.30	$264,975
	12	Steel Stiffeners as required in tunnel		120	ton	$7,419.30	$890,316
	13	Rock Bolts as required		800	ea	$418.66	$334,928
	14	Concrete Entrance Plug		25	yd3	$544.79	$13,620
	15	24" Low level release pipe		5,000	LF	$121.89	$609,443
	16	Ball Valve 24"		1	ea	$46,635.60	$46,636
	17	SCADA & Power		1	allow	$26,497.50	$26,498
	18	Rip Rap at Discharge End		600	yd3	$21.20	$12,719
	19	24" Pipe Dissipation structure		1	allow	$15,898.50	$15,899
	20	24" Pipe Saddle Supports at 10' Spacing		500	ea	$741.93	$370,965
	21	24"Energy Dissipating Valve		1	ea	$34,446.75	$34,447
		SUBTOTAL THIS SHEET					**$11,167,433**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Sites Reservoir - Main Dam Construction
Construct Sites Dam
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Sites Dam**					
		(Clearing included with Sites Reservoir)					
	1	Develop borrow area and temporary haul roads		1	ls	$1,168,159.25	$1,168,159
	2	Strip foundation areas		30	acre	$2,167.00	$65,010
	3	Foundation Excavation		793,500	cy	$13.63	$10,815,654
	4	Foundation Grouting					
	5	Furnish/handle cement material (Cement Type III)		63,604	bag	$17.70	$1,125,812
	6	Construct grout cap		4,955	cy	$234.27	$1,160,808
	7	Drill setup for all holes		843	ea.	$753.80	$635,454
	8	Drill curtain grout holes		84,805	LF	$27.06	$2,294,759
	9	Hookup to grout holes and grout nipples		843	ea.	$203.66	$171,685
	10	Inject Portland cement grout		1,800	hr	$498.26	$896,866
	11	Perform hydraulic conductivity tests		500	ea.	$323.68	$161,839
	12	Embankment Construction					
	13	Core zone (1 mile haul)		1,070,000	cy	$11.01	$11,783,226
	14	Filter drain and transition zones (35 mile haul)		852,400	ton	$31.74	$27,058,590
	15	Rock fill Zone 3 (1 mile haul)		1,180,500	cy	$22.90	$27,038,690
	16	Random fill Zone 4 (1 mile haul)		1,085,000	cy	$6.01	$6,520,452
	17	Unlisted Items		10%			$9,089,700
		SUBTOTAL THIS SHEET					**$99,986,705**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Sites Reservoir - Main Dam Construction
Construct Golden Gate Dam

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Golden Gate Dam**					
		(Clearing included with Sites Reservoir)					
	1	Develop borrow area and temporary haul roads		1	ls	$1,168,159.25	$1,168,159
	2	Clear and grub		50	acre	$2,167.00	$108,350
	3	Foundation Excavation		2,910,000	cy	$13.63	$39,664,214
	4	Foundation Grouting					
	5	Furnish/handle cement material (Cement Type III)		139,200	bag	$17.70	$2,463,886
	6	Construct grout cap		10,907	cy	$234.27	$2,555,183
	7	Drill setup for all holes		1,700	ea.	$753.80	$1,281,461
	8	Drill curtain grout holes		185,600	LF	$27.06	$5,022,196
	9	Hookup to grout holes and grout nipples		1,700	ea.	$203.66	$346,222
	10	Inject Portland cement grout		4,350	hr	$498.26	$2,167,427
	11	Perform hydraulic conductivity tests		1,160	ea.	$323.68	$375,466
	12	Embankment Construction					
	13	Core zone (1 mile haul)		3,460,000	cy	$11.01	$38,102,769
	14	Filter drain and transition zones (35 mile haul)		2,494,000	ton	$31.74	$79,169,548
	15	Rock fill Zone 3 (1 mile haul)		2,870,000	cy	$22.90	$65,735,740
	16	Random fill Zone 4 (1 mile haul)		1,470,000	cy	$6.01	$8,834,161
	17	Rim Grouting north of main dam		100,000	lft	$60.00	$6,000,000
	18	Unlisted Items		10%			$25,299,478
		SUBTOTAL THIS SHEET					**$278,294,259**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 17 OF _ _

FEATURE:
NODOS Project
Sites Reservoir - Main Dam Construction
Construct Golden Gate Dam

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Main Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Reservoir Rim Grouting**					
		(Clearing included with Sites Reservoir)					
	1						$0
	2	Clear and grub		2	acre	$2,167.00	$4,334
		Rim Grouting					
	3	Furnish/handle cement material (Cement Type III)		18,750	bag	$17.70	$331,881
	4	Construct grout cap		2,700	cy	$234.27	$632,529
	5	Drill setup for all holes		450	ea.	$753.80	$339,210
	6	Drill curtain grout holes		25,000	LF	$27.06	$676,481
	7	Hookup to grout holes and grout nipples		450	ea.	$203.66	$91,647
	8	Inject Portland cement grout		586	hr	$498.26	$291,949
	9	Perform hydraulic conductivity tests		300	ea.	$323.68	$97,103
		SUBTOTAL THIS SHEET					**$2,465,134**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 18 OF __

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Saddle Dam Construction	
Construct 9 Saddle Dams	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		Construct Saddle Dam 1 - Sheet 1					$1,825,854
		Construct Saddle Dam 2 - Sheet 1					$2,282,885
		Construct Saddle Dam 3 - Sheet 2					$69,759,369
		Construct Saddle Dam 4 - Sheet 2					$394,534
		Construct Saddle Dam 5 - Sheet 3					$37,420,287
		Construct Saddle Dam 6 - Sheet 4					$7,489,381
		Construct Saddle Dam 7 - Sheet 5					$7,342,052
		Construct Saddle Dam 8 - Sheet 6					$42,050,649
		Construct Saddle Dam 9 - Sheet 6					$1,050,946
		(Note that the signal spillway cost is					
		included on Sheet 4 with Saddle Dam No. 6.)					
		Subtotal					**$169,615,957**
		Mobilization	5%	+/-			$8,500,000
		Subtotal with Mobilization					**$178,115,957**
		Contract Cost Allowances (Sum of):	10%	+/-			$16,884,043
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$195,000,000**
		Construction Contingencies	15%	+/-			$35,000,000
		FIELD COST					**$230,000,000**
		Non-Contract Costs	17%	+/-			$40,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$270,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$310,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 19 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Saddle Dam Construction	
Construct Saddle Dams	**WOID:** / **ESTIMATE LEVEL:**
Sheet 1	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required)**					
		(All land acquisition included with					
		Sites Reservoir)					
		Saddle Dam No. 1					
	1	Clear and grub		2	acre	$2,167.00	$4,334.00
	2	Foundation excavation		27,600	cy	$13.63	$376,196.67
		Embankment construction					
	3	Core (zone 1) 1 mi haul		27,600	cy	$14.82	$408,960.30
	4	Random (Zone 2) 1 mi haul		44,300	cy	$9.81	$434,790.06
	5	Rock fill (Zone 3) 3 mi haul		7,000	cy	$22.90	$160,331.07
	6	Filter and drain (Zone 4) 30 mi haul processed		13,900	ton	$31.74	$441,241.67
		Saddle Dam No. 2					
	1	Clear and grub		2	acre	$2,167.00	$4,334.00
	2	Foundation excavation		26,300	cy	$13.63	$358,477.26
		Embankment construction					
	3	Core (zone 1) 1 mi haul		25,300	cy	$14.82	$374,880.27
	4	Random (Zone 2) 1 mi haul		39,200	cy	$9.81	$384,735.22
	5	Rock fill (Zone 3) 3 mi haul		10,000	cy	$22.90	$229,044.39
	6	Filter and drain (Zone 4) 30 mi haul processed		11,300	ton	$31.74	$358,707.26
	7	Construct Slurry Wall					
	8	Slurry wall		2,000	cy	$286.35	$572,706.37
		SUBTOTAL THIS SHEET					**$4,108,739**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
		October 2016	10/19/16

FEATURE:
NODOS Project
Sites Reservoir - Saddle Dam Construction
Construct Saddle Dams
Sheet 2
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required) - Continued**					
		Saddle Dam No. 3					
	1	Clear and grub		40	acre	$2,167.00	$86,680
	2	Foundation excavation		512,000	cy	$12.98	$6,647,693
		Embankment construction				$0.00	$0
	3	Core (zone 1) 1 mi haul		832,000	cy	$11.01	$9,162,284
	4	Random (Zone 2) 1 mi haul		1,532,000	cy	$6.01	$9,206,758
	5	Rock fill (Zone 3) 3 mi haul		1,014,000	cy	$22.90	$23,225,101
	6	Filter and drain (Zone 4) 30 mi haul processed		340,000	ton	$31.74	$10,792,962
	7	Foundation Grouting					
	8	Furnish/handle cement material (Cement Type III)		17,300	bag	$17.70	$306,216
	9	Construct grout cap		8,500	cy	$242.99	$2,065,438
	10	Drill setup for all holes		3,100	ea	$753.80	$2,336,783
	11	Drill curtain grout holes		86,500	LF	$27.06	$2,340,625
	12	Hookup to grout holes and grout nipples		3,100	ea	$203.66	$631,345
	13	Inject Portland cement grout		2,600	hr	$498.26	$1,295,473
	14	Perform hydraulic conductivity tests		3,100	ea	$323.68	$1,003,399
	15	Construct Slurry Wall		2,300	cy	$286.35	$658,612
		Saddle Dam No. 4					
	1	Clear and grub		1	acre	$2,060.54	$2,061
	2	Foundation excavation		7,100	cy	$13.63	$96,775
		Embankment construction					
	3	Core (zone 1) 1 mi haul		7,700	cy	$14.82	$114,094
	4	Random (Zone 2) 1 mi haul		6,700	cy	$9.81	$65,758
	5	Rock fill (Zone 3) 3 mi haul		900	cy	$22.90	$20,614
	6	Filter and drain (Zone 4) 30 mi haul processed		3,000	ton	$31.74	$95,232
		SUBTOTAL THIS SHEET					**$70,153,903**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 21 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Saddle Dam Construction	
Construct Saddle Dams	**WOID:** / **ESTIMATE LEVEL:**
Sheet 3	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required) - Continued**					
		Saddle Dam No. 5					
	1	Clear and grub		20	acre	$2,167.00	$43,340
	2	Foundation excavation		270,000	cy	$13.63	$3,680,185
		Embankment construction					
	3	Core (zone 1) 1 mi haul		378,000	cy	$14.82	$5,600,978
	4	Random (Zone 2) 1 mi haul		557,000	cy	$9.81	$5,466,773
	5	Rock fill (Zone 3) 3 mi haul		445,000	cy	$22.90	$10,192,475
	6	Filter and drain (Zone 4) 30 mi haul processed		214,200	ton	$31.74	$6,799,566
	7	Foundation Grouting					
	8	Furnish/handle cement material (Cement Type III)		8,500	bag	$17.70	$150,453
	9	Construct grout cap		5,100	cy	$242.99	$1,239,263
	10	Drill setup for all holes		1,400	ea	$753.80	$1,055,321
	11	Drill curtain grout holes		42,400	LF	$27.06	$1,147,312
	12	Hookup to grout holes and grout nipples		1,400	ea	$203.66	$285,124
	13	Inject Portland cement grout		1,300	hr	$498.26	$647,737
	14	Perform hydraulic conductivity tests		1,400	ea	$323.68	$453,148
	15	Slurry wall					
	16	Construct Slurry wall		2,300	cy	$286.35	$658,612
		SUBTOTAL THIS SHEET					**$37,420,287**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Saddle Dam Construction	
Construct Saddle Dams	**WOID:** / **ESTIMATE LEVEL:**
Sheet 4	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required) - Continued**					
		Saddle Dam No. 6					
		(Including signal spillway)					
	1	Clear and grub		3	acre	$2,167.00	$6,501
	2	Foundation excavation		36,000	cy	$13.63	$490,691
		Embankment construction					
	3	Core (zone 1) 1 mi haul		40,200	cy	$14.82	$595,660
	4	Random (Zone 2) 1 mi haul		39,000	cy	$9.81	$382,772
	5	Rock fill (Zone 3) 3 mi haul		50,000	cy	$22.90	$1,145,222
	6	Filter and drain (Zone 4) 30 mi haul processed		13,100	ton	$31.74	$415,846
	7	Foundation Grouting					
	8	Furnish/handle cement material (Cement Type III)		1,100	bag	$17.70	$19,470
	9	Construct grout cap		1,200	cy	$242.99	$291,591
	10	Drill setup for all holes		370	ea	$753.80	$278,906
	11	Drill curtain grout holes		5,500	LF	$27.06	$148,826
	12	Hookup to grout holes and grout nipples		370	ea	$203.66	$75,354
	13	Inject Portland cement grout		170	hr	$498.26	$84,704
	14	Perform hydraulic conductivity tests		370	ea	$323.68	$119,761
	15	Construct Signal Spillway					
	16	Signal Spillway		1	ls	$3,434,076.00	$3,434,076
		SUBTOTAL THIS SHEET					**$7,489,381**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 23 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Sites Reservoir - Saddle Dam Construction	
Construct Saddle Dams	**WOID:** / **ESTIMATE LEVEL:**
Sheet 5	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required) - Continued**					
		Saddle Dam No. 7					
	1	Clear and grub		5	acre	$2,167.00	$10,835
	2	Foundation excavation		67,000	cy	$13.63	$913,231
		Embankment construction					
	3	Core (zone 1) 1 mi haul		60,500	cy	$14.82	$896,453
	4	Random (Zone 2) 1 mi haul		41,000	cy	$9.81	$402,402
	5	Rock fill (Zone 3) 3 mi haul		61,000	cy	$22.90	$1,397,171
	6	Filter and drain (Zone 4) 30 mi haul processed		57,800	ton	$31.74	$1,834,803
	7	Foundation Grouting					
	8	Furnish/handle cement material (Cement Type III)		2,100	bag	$17.70	$37,171
	9	Construct grout cap		2,300	cy	$242.99	$558,883
	10	Drill setup for all holes		670	ea	$753.80	$505,047
	11	Drill curtain grout holes		10,100	LF	$27.06	$273,298
	12	Hookup to grout holes and grout nipples		670	ea	$203.66	$136,452
	13	Inject Portland cement grout		320	hr	$498.26	$159,443
	14	Perform hydraulic conductivity tests		670	ea	$323.68	$216,864
		SUBTOTAL THIS SHEET					**$7,342,052**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Sites Reservoir - Saddle Dam Construction
Construct Saddle Dams
Sheet 6
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Saddle Dams

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Saddle Dams (9 Required) - Continued**					
		Saddle Dam No. 8					
	1	Clear and grub		30	acre	$2,167.00	$65,010
	2	Foundation excavation		373,000	cy	$13.63	$5,084,107
		Embankment construction					
	3	Core (zone 1) 1 mi haul		542,000	cy	$11.01	$5,968,700
	4	Random (Zone 2) 1 mi haul		706,000	cy	$6.01	$4,242,801
	5	Rock fill (Zone 3) 3 mi haul		504,000	cy	$22.90	$11,543,837
	6	Filter and drain (Zone 4) 30 mi haul processed		282,200	ton	$31.74	$8,958,158
	7	Foundation Grouting					
	8	Furnish/handle cement material (Cement Type III)		9,900	bag	$17.70	$175,233
	9	Construct grout cap		6,700	cy	$242.99	$1,628,051
	10	Drill setup for all holes		1,800	ea	$753.80	$1,356,842
	11	Drill curtain grout holes		49,200	LF	$27.06	$1,331,315
	12	Hookup to grout holes and grout nipples		1,800	ea	$203.66	$366,588
	13	Inject Portland cement grout		1,500	hr	$498.26	$747,388
	14	Perform hydraulic conductivity tests		1,800	ea	$323.68	$582,619
		Saddle Dam No. 9					
	1	Clear and grub		2	acre	$2,167.00	$4,334
	2	Foundation excavation		19,000	cy	$13.63	$258,976
		Embankment construction					
	3	Core (zone 1) 1 mi haul		16,600	cy	$14.82	$245,969
	4	Random (Zone 2) 1 mi haul		20,500	cy	$9.81	$201,201
	5	Rock fill (Zone 3) 3 mi haul		3,500	cy	$22.90	$80,166
	6	Filter and drain (Zone 4) 30 mi haul processed		8,200	ton	$31.74	$260,301
		SUBTOTAL THIS SHEET					**$43,101,595**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 25 OF __

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Holthouse Reservoir	
Construct Holthouse Reservoir	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					$0
110		Relocations					$26,976,105
151		Construct Holthouse Dam					$77,628,972
152		Spillway Chute, Energy Dissipation Basin, I/O Structure					$6,149,727
153		T-C Canal Connections to Holthouse					$2,811,468
170		Accessory Electrical equipment					$3,024,818
		Subtotal					**$116,591,089**
		Mobilization	5%	+/-			$5,800,000
		Subtotal with Mobilization					**$122,391,089**
		Contract Cost Allowances (Sum of):	10%	+/-			$12,608,911
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$135,000,000**
		Construction Contingencies	15%	+/-			$25,000,000
		FIELD COST					**$160,000,000**
		Non-Contract Costs	17%	+/-			$30,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$190,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$220,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 26 OF _ _

FEATURE: **NODOS Project** **Holthouse Reservoir** **Land and Rights** **Civil**	**PROJECT:** **NODOS Alternative D** **WOID:** / **ESTIMATE LEVEL:** **REGION:** / **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		Included with Sites Reservoir					
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Holthouse Reservoir
Facility Relocations
(WAPPA Line and TCCA bypass pipeline through expanded Holthouse)
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
110		**Relocate WAPA Transmission Line**					
	1	Remove Transmission Line - West Run		8,748	LF	$85.50	$747,954
	2	Remove Transmission Line - East Run		7,778	LF	$85.50	$665,019
	3	Install New Overhead Lines over Holdhouse		16,900	LF	$910.19	$15,382,282
110		**Provide TCCA Bypass Pipe through Reservoir**					
	1	Clearing & Grubbing		55	acre	$2,167.00	$119,185
	2	Cut, Demo, & Remove Concrete Apron @ Intake		667	ft2	$18.44	$12,301
	3	Mass Excavation - Pipeline Installation		22,295	yd3	$3.47	$77,272
	4	144" Pipeline Installation		2,624	lft	$2,822.51	$7,406,276
	5	Concrete Pour Back @ Apron - Excl Reinforcing		17	yd3	$390.73	$6,447
	6	Concrete Pour Back @ Apron - Reinforcing (1 lb./sf by weight)		16	yd3	$54.68	$897
	7	Pipe Bedding Transit		2,938	yd3	$23.96	$70,407
	8	Pipe Bedding Placement		2,938	yd3	$147.45	$433,218
	9	Backfill Hauling		28,003	yd3	$1.47	$41,256
	10	Spreading of Backfill for Compaction		25,457	yd3	$0.87	$22,125
	11	Compacted Fill - Pipe Zone		25,457	yd3	$0.55	$14,031
	12	Water & Optimization Treatment for Trench Backfill Material		25,457	yd3	$1.60	$40,743
	13	Misc Metals - Exclusion Screen @ Bypass Intake		865	lb	$5.50	$4,758
	14	SCADA @ Gates		1	allow	$52,995.00	$52,995
	15	Gate Structure @ Bypass Intake - Slab & Ftgs		600	yd3	$312.50	$187,500
	16	Gate Structure @ Bypass Intake - Walls		500	yd3	$605.29	$302,645
	17	Gates		3	ea	$370,965.00	$1,112,895
	18	Gates Structure, Misc Metals		1	allow	$52,995.00	$52,995
	19	Electrical @ Gate Structure		1	allow	$52,995.00	$52,995
	20	Hazard Comm Signage		1	allow	$1,500.00	$1,500
	21	Levee Road Replacement - Gravel - Subbase - (400')		500	ton	$12.72	$6,359
	22	Levee Road Replacement - Gravel - Class II AB - (400')		500	ton	$21.20	$10,599
	23	Levee Road - Gravel - Spreading/Grading		588	yd3	$1.92	$1,128
	24	Levee Road Compaction		588	yd3	$0.55	$324
	25	Improve Existing Weir Infrastructure as req.		1	allow	$150,000.00	$150,000
		SUBTOTAL THIS SHEET					**$26,976,105**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Holthouse Reservoir
Construct Holthouse Dam
(Earth Dam and RCC Dam Sections)
(Includes Spillway Components within Gravity Dam Limits)
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
151		**Construct Holthouse Dam and Appurtenances**					
	1	Clear and grub		50	acre	$2,117.22	$105,861
	2	Remove Funk's Dam Gates		1	allow	$58,300.00	$58,300
	3	Pump Low Water From Funk's Reservoir		6	MO	$32,600.00	$195,600
	4	Remove Silt		300,000	yd3	$6.89	$2,066,805
	5	Foundation Excavation		463,550	yd3	$13.63	$6,318,332
	6	Furnish/handle cement material (Cement Type III)		20,400	bag	$17.70	$361,080
	7	Construct grout cap		11,160	cy	$234.27	$2,614,453
	8	Drill setup for all holes		1,860	ea.	$753.80	$1,402,068
	9	Drill curtain grout holes		96,600	LF	$27.06	$2,613,996
	10	Hookup to grout holes and grout nipples		1,860	ea.	$203.66	$378,808
	11	Inject Portland cement grout		638	hr	$498.26	$317,641
	12	Perform hydraulic conductivity tests		1,250	ea.	$323.68	$404,600
	13	Excavate Key Trench for soil/bentonite wall		20,833	CY	$8.00	$166,664
	14	Soil/Bentonite Wall		262,500	SF	$21.00	$5,512,500
	15	Backfill Key Trench		20,833	CY	$15.00	$312,495
	16	Core Zone preparation		83,300	SY	$3.60	$299,880
	17	Core zone (1 mile haul)		883,500	yd3	$11.01	$9,729,421
	18	Shell Zones		822,000	yd3	$7.76	$6,378,720
	19	Filter Zone		255,000	ton	$31.74	$8,094,721
	20	Rock fill Zone 3 (1 mile haul) Inc. Sand bedding		109,500	yd3	$22.90	$2,508,036
	21	Gravity Dam Concrete - Inc. Gate & Vent Shafts		31,400	yd3	$390.73	$12,268,922
	22	Reinforcing in Dam		31,400	yd3	$108.00	$3,391,200
	23	Spillway Top and Sides		6,900	yd3	$390.73	$2,696,037
	24	Spillway Base Slab		4,200	yd3	$390.73	$1,641,066
	25	Top and Side Rebar - 4%		1,104,000	lb	$1.35	$1,490,400
	26	Base Slab Rebar - 2%		336,000	lb	$1.35	$453,600
	27	Spillway Bridge		410	lft	$8,479.20	$3,476,472
	28	Dewatering Allowance		1	allow	$1,100,000.00	$1,100,000
	29	TC Canal Inlet Energy Dissipation Spillway		1,100	yd3	$516.44	$568,084
	30	Toe Drain 12" PVC		7,000	LF	$58.00	$406,000
	31	Crown Gravel		2,300	CY	$58.20	$133,860
	32	Hydroseed downstream slope		25	Acres	$6,534.00	$163,350
		SUBTOTAL THIS SHEET					**$77,628,972**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 29 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Holthouse Reservoir	
Spillway Chute, Energy Dissipation Basin	**WOID:** / **ESTIMATE LEVEL:**
Delevan/TRR Pipeline Inlet/Outlet Structure	**REGION:** / **UNIT PRICE LEVEL:**
Civil	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Spillway (Chute, Stilling Basin, and Walls)**					
	1	Excavation		37,000	CY	$13.63	$504,310
	2	Backfill		15,000	CY	$11.01	$165,150
	3	Haul & spread spoil		24,200	CY	$1.47	$35,574
	4	Concrete Slabs on Grade		1,100	CY	$390.73	$429,803
	5	Concrete Walls 18" thick		537	CY	$591.27	$317,512
	6	Concrete Walls - 24" Thick		415	CY	$577.25	$239,559
	7	Structural Slabs 12"		1,460	CY	$906.34	$1,323,256
	8	Spillway Bridge		1,800	SF	$500.00	$900,000
	9	Bride Guardrail		200	LF	$162.00	$32,400
	10	Chain Link Fencing		250	LF	$38.00	$9,500
	11	Channel cut to I/O Structure - Spread locally		81,000	CY	$5.24	$424,440
	12	Rebar for above 3% by Wt		421,440	LB	$1.35	$568,944
		I/O Structure for Delevan and TRR Pipelines					
	13	Slab on Grade		583	CY	$390.73	$227,796
	14	Formed and Shaped Walls		660	CY	$577.25	$380,985
	15	Fill Voids with soil		700	CY	$18.00	$12,600
	16	Roof Slab		320	CY	$487.15	$155,888
	17	Rebar for above 5% by Wt		312,600	LB	$1.35	$422,010
		SUBTOTAL THIS SHEET					**$6,149,727**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 30 OF _ _

FEATURE: **NODOS Project** **Holthouse Reservoir** **T-C Canal Connections to Holthouse** *(Inlet Spillway)* *(New Outlet Gate Structure)* **Civil**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
153		**Waterway Structures**					
		(At discharge to canal)					
	1	Energy dissipation structure at Canal		1	allow	$79,492.50	$79,493
	2	Gate structure at south canal - slab & ftgs		600	yd3	$312.50	$187,500
	3	Gate structure at south canal - Walls		500	yd3	$605.29	$302,645
	4	Gate Structure Bridge		800	ft2	$550.00	$440,000
	5	Gates		3	ea	$582,945.00	$1,748,835
	6	Gate Structure Misc. Metals		1	allow	$52,995.00	$52,995
		SUBTOTAL THIS SHEET					**$2,811,468**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 31 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Holthouse Reservoir	
T-C Canal Pump Station	**WOID:** / **ESTIMATE LEVEL:**
(Needed to supply water to T-C Canal	**REGION:** / **UNIT PRICE LEVEL:**
when level in Holthouse is too low for	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Holthouse Dam
Electrical *gravity flow to canal. Flow is 700 cfs.)*	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
170		**Accessory Electrical Equipment**					
	1	Overhead power line to Gravity Dam Gates		14,000	lft	$185.48	$2,596,755
	2	Data/communication feed to gates		14,000	lft	$12.72	$178,063
	3	Convenience power and lighting		1	Allow	$100,000.00	$100,000
	4	SCADA		1	allow	$50,000.00	$50,000
	5	Gate Structure Power/Data/SCADA - Bypass		1	allow	$100,000.00	$100,000
		SUBTOTAL THIS SHEET					**$3,024,818**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
I/O Structure and Tunnel	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		Construct I/O Tunnel. 30' Diam. Sheet 1 and 2					$87,700,354
152		Construct Low Level Intake Structure					$18,918,868
152		Construct Gated Intake Tower, Civil Sheet 1 and 2					$13,466,583
152		Construct Gated Intake Tower, Mechanical					$10,613,831
152		Construct Gated Intake Tower, Electrical					$1,211,684
		Subtotal					**$131,911,318**
		Mobilization	5%	+/-			$6,600,000
		Subtotal with Mobilization					**$138,511,318**
		Contract Cost Allowances (Sum of):	10%	+/-			$11,488,682
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$150,000,000**
		Construction Contingencies	15%	+/-			$30,000,000
		FIELD COST					**$180,000,000**
		Non-Contract Costs	17%	+/-			$30,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$210,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$240,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Pumping and Generating Plants
Inlet/Outlet Structure and Tunnel
Tunnel Construction
Sheet 1
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct I/O Tunnel. 30' Diam.**					
	1	Engineered Ventilation for Tunnel		1	allow	$2,000,000.00	$2,000,000
	2	Drill & Blast Rock for Tunnel (include 10% break back)		178,518	yd3	$22.60	$4,034,002
	3	Load & Haul Blasted Rock (25 cy off hwy		178,518	yd3	$34.94	$6,236,535
		dump, 4 mi round trip, 50% production					
		inefficiency due to congested work space)					
	4	1" Steel - Installation		1,730	ton	$7,140.00	$12,354,613
	5	Misc Metals - Welded Steel Liner Stiffeners		72	ton	$10,200.00	$729,514
	6	1' Steel Tie Rods		9	ton	$2,754.00	$23,547
	7	Steel Ribs (W12x79)		340	ton	$7,140.00	$2,424,744
	8	Misc Metals - Steel Foot Plate @ Rib		13	ton	$8,500.00	$106,250
	9	Grouting between Concrete Fill & Steel Liner		43,556	ft3	$7.75	$337,646
	10	Timber Lagging @ Shoring		21,362	ft2	$8.28	$176,963
	11	Timber Blocking @ Shoring		600	ea	$63.98	$38,391
	12	Rock Bolt Drilling - Tunnel		2,000	ea	$402.89	$805,778
	13	Rock Bolt - Install - Tunnel (1" bolt, 10' deep)		2,000	ea	$247.94	$495,874
	14	Gunnite Fill - Excl Reinforcing		61,554	yd3	$545.70	$33,590,018
	15	Rebar Reinforcing @ Gunnite (6% by weight)		61,554	yd3	$330.47	$20,341,772
	16	Drill & Blast Rock for Portal (include 10% break back)		1,925	yd3	$22.60	$43,501
	17	Load & Haul Blasted Rock (25 cy off hwy		1,925	yd3	$25.53	$49,138
		dump, 2 mi round trip)					
	18	Rock Bolt Drilling - Portal		24	ea	$402.89	$9,669
	19	Rock Bolt - Install - Portal (4 bolts @ 10' centers;		24	ea	$247.94	$5,950
		1" bolt, 10' deep)					
	20	Gunnite Fill - Excl Reinforcing - Portal		1,210	yd3	$545.70	$660,297
	21	Rebar Reinforcing @ Gunnite - Portal (6% by weight)		1,210	yd3	$330.47	$399,869
		SUBTOTAL THIS SHEET					**$84,864,072**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Inlet/Outlet Structure and Tunnel
Tunnel Construction
Sheet 2
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct I/O Tunnel. 30' Diam. - Continued**					
	22	Taper & Transition S.O.G.		1,020	yd3	$276.42	$281,948
	23	Taper & Transition Walls		1,370	yd3	$500.82	$686,123
	24	Taper & Transition Structural Slab		1,020	yd3	$316.20	$322,524
	25	Transition Slab Reinforcing (rebar 1% by wt.)		40,800	lb	$1.35	$55,080
	26	Transition Wall Reinforcing (3% by Weight)		164,400	lb	$1.35	$221,940
	27	Transition Structural Slab Reinforcing (Rebar 5%)		204,000	lb	$1.35	$275,400
	28	Onsite Welding, Mechanic, Misc		1,095	day	$775.72	$849,415
	29	Injection Grout		300	hole	$479.50	$143,851
		(Penstock piping downstream of tunnel					
		to the Sites PG Plant included with Sites PG					
		Plant.)					
							$0
							$0
		SUBTOTAL THIS SHEET					**$2,836,282**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
Inlet/Outlet Structure and Tunnel	**WOID:** / **ESTIMATE LEVEL:**
Low Level Intake Structure	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Low Level Intake Structure**					
	1	Initial portal and tower excavation		563,000	yd3	$4.59	$2,584,170
	2	Complete Intake Channel Excavation		840,000	yd3	$4.59	$3,855,600
	3	Backfill per IO-0502		14,800	yd3	$7.65	$113,220
	4	Rip Rap at Intake perimeter		650	yd3	$16.32	$10,608
	5	Pipe encasement tower concrete		25,500	yd3	$271.42	$6,921,210
	6	Pipe encasement Rebar 1% by wt.		1,020,000	lb	$1.35	$1,377,000
	7	Taper & transition Slab on Grade		1,020	yd3	$277.51	$283,060
	8	Taper & transition Walls		1,370	yd3	$340.81	$466,910
	9	Taper & transition Structural Slab		1,020	yd3	$424.29	$432,776
	10	Transition slab Rebar 1% by wt.		40,800	lb	$1.35	$55,080
	11	Transition Wall Rebar 3% by Weight		164,400	lb	$1.35	$221,940
	12	Transition Struct. Slab rebar 5%		204,000	lb	$1.35	$275,400
	13	Form Tower exterior		39,300	ft2	$14.02	$550,986
	14	Form interior radius section		30,400	ft2	$14.02	$426,208
	15	Trash screen support steel		210,800	lb	$2.75	$579,700
	16	Trash Screens@ 6 psf		34,000	ft2	$22.50	$765,000
		SUBTOTAL THIS SHEET					**$18,918,868**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Inlet/Outlet Structure and Tunnel
Gated Intake Tower
Sheet 1
Structural

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Gated Intake Tower**					
	1	General Slope excavation for Tower & Bridge		460,000	yd3	$4.59	$2,111,400
	2	Excavation to tunnel level for Tower		99,000	yd3	$5.10	$504,900
	3	Access Bridge footing excavation		3,000	yd3	$5.10	$15,300
	4	Backfill below el. 320		92,000	yd3	$6.63	$609,960
	5	Slab on grade - tunnel level		250	yd3	$271.09	$67,773
	6	Concrete walls - Tunnel Level 4' thick		400	yd3	$340.81	$136,324
	7	Wheel Gate Tracks - embeds		2,600	lft	$127.50	$331,500
	8	Square to Round vertical transition		510	yd3	$528.17	$269,367
	9	Tower Wall Concrete 3'-6" thick to level 540		4,100	yd3	$487.50	$1,998,750
	10	Tower Wall concrete 2'-0" level 540 to 575		300	yd3	$721.25	$216,375
	11	Tower Wall Forms (included with Concrete)		32,000	ft2		
	12	Level 320 concrete collar		260	yd3	$277.51	$72,153
	13	Interior deck slabs at 500 and 540'		110	yd3	$574.03	$63,143
	14	Top Deck Grating Support Steel 10PSF		8,000	ft2	$4.08	$32,640
	15	Top Deck Grating		800	ft2	$61.20	$48,960
	16	Trash Racks with fish screen		36	ea	$61,200.00	$2,203,200
	17	Stop Logs		82	ton	$4,400.00	$360,800
	18	Top Deck Railing		100	lft	$153.00	$15,300
	19	Ladders - Stainless Steel		150	lft	$734.40	$110,160
	20	Miscellaneous Metal & Steel Allowance		100	ton	$7,500.00	$750,000
	21	Allowance for support metal and embeds		1	allow	$50,000.00	$50,000
		SUBTOTAL THIS SHEET					**$9,968,004**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Inlet/Outlet Structure and Tunnel** **Gated Intake Tower** **Sheet 2** **Structural**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Gated Intake Tower (Continued)**					
	22	Caissons at Tower Bridge 36"		4,000	lft	$305.26	$1,221,040
	23	Footings at Tower Bridge		400	yd3	$234.27	$93,708
	24	Tower Bridge Piers		1,200	yd3	$785.81	$942,970
	25	Tower Access Bridge deck		600	yd3	$608.94	$365,363
	26	Tower Bridge Footing Rebar 1%		16,000	lb	$1.35	$21,600
	27	Tower Bridge Pier Rebar 6%		288,000	lb	$1.35	$388,800
	28	Tower Bridge Deck Rebar - 4% by weight		96,000	lb	$1.35	$129,600
	29	Tower Bridge PT 2 PSF		1,200	lb	$3.67	$4,406
	30	Rails for Tower access Bridge		1,100	lft	$153.00	$168,300
	31	Fencing at power enclosure		120	lft	$40.80	$4,896
	32	Access road to end of bridge		22,200	ft2	$6.63	$147,186
	33	Access road control gate		1	ea	$8,160.00	$8,160
	34	Signage		1	allow	$2,550.00	$2,550
		SUBTOTAL THIS SHEET					**$3,498,579**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Inlet/Outlet Structure and Tunnel** **Gated Intake Tower** **Sheet 3** **Mechanical**	**PROJECT:** **NODOS Alternative D**
	WOID: / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Gated Intake Tower**					
	1	Thimbles 6' ID		36	ea	$48,102.35	$1,731,685
	2	Thimble butterfly Valves - 72"		36	ea	$204,916.02	$7,376,977
	3	Wheel Gates 9'X 35' (40,000 lb ea)		80,000	lb	$8.67	$693,600
	4	Bridge Crane - 20 Tons		1	ea	$171,569.00	$171,569
	5	Jib Crane - 6 Tons		1	ea	$40,000.00	$40,000
	6	Fish Screen Hoist allowance		1	ea	$600,000.00	$600,000
		SUBTOTAL THIS SHEET					**$10,613,831**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Inlet/Outlet Structure and Tunnel** **Gated Intake Tower** **Sheet 4** **Electrical**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Gated Intake Tower**					
	1	SCADA provisions		1	allow	$102,000.00	$102,000
	2	Convenience power		1	allow	$10,200.00	$10,200
	3	Power for cranes		450	lft	$35.70	$16,065
	4	Power for butterfly valves		36	ea	$1,224.00	$44,064
	5	Lighting at tower access bridge		6	ea	$1,224.00	$7,344
	6	Overhead power transmission line		5,000	ft	$177.86	$889,313
	7	Transformer/switchgear enclosure		400	ft2	$102.00	$40,800
	8	Transformer and switchgear		1	allow	$91,800.00	$91,800
	9	Lighting at 500 and 540		12	ea	$459.00	$5,508
	10	Top Level lighting		6	ea	$765.00	$4,590
		SUBTOTAL THIS SHEET					**$1,211,684**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 33 OF __

FEATURE: NODOS Project TRR Reservoir Construct TRR Reservoir Civil Summary Sheet	**PROJECT:** NODOS Alternative D **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR Reservoir

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					$0
151		Construct TRR Reservoir					$18,590,872
153		Construct Canal Control Structures					$5,228,951
170		Accessory Electrical Equipment					$794,925
		Subtotal					**$24,614,748**
		Mobilization	5%	+/-			$1,250,000
		Subtotal with Mobilization					**$25,864,748**
		Contract Cost Allowances (Sum of):	10%	+/-			$2,135,252
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$28,000,000**
		Construction Contingencies	15%	+/-			$5,000,000
		FIELD COST					**$33,000,000**
		Non-Contract Costs	17%	+/-			$6,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$39,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$45,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 34 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
TRR Reservoir	
Construct TRR Reservoir	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR Reservoir

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		Included with Sites Reservoir					
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
TRR Reservoir
Construct TRR Reservoir
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR Reservoir

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Dams					
	1	Clear and grub		210	acre	$2,167.00	$455,070
	2	Mass excavation for Reservoir		930,000	yd3	$4.77	$4,435,682
	3	Demolish Canal for Dissipation bay		36,000	ft2	$1.85	$66,774
	4	Excavation for dissipation bay		16,700	yd3	$4.77	$79,651
	5	Dissipation bay embankment		2,040	yd3	$12.72	$25,946
	6	Concrete liner at dissipation bay		3,100	yd3	$516.44	$1,600,964
	7	Reinforcing Steel at liner 100 LB/CY		310,000	LB	$1.35	$418,500
	8	Excavation for inlet channel		10,500	yd3	$4.77	$50,080
	9	Embankment for inlet channel		5,330	yd3	$12.72	$67,791
	10	Reservoir perimeter embankment construction		166,000	yd3	$13.25	$2,199,293
	11	Dispose of excess excavation material - 5 mi.		981,000	CY	$4.73	$4,640,130
	12	Dissipation bay embankment		10,500	yd3	$4.77	$50,080
	13	Reinforcing Steel at liner 100 LB/CY		1,050,000	LB	$1.35	$1,417,500
	14	Inlet channel concrete liner		2,520	yd3	$516.44	$1,301,429
	15	Restore GCID Levee Road - Paved		4,800	ft2	$8.32	$39,937
	16	Levee bridge at TRR inlet		840	ft2	$550.00	$462,000
	17	TRR reservoir pond liner 60 mil		310,000	ft2	$1.43	$443,568
	18	Overflow structure		1	allow	$794,925.00	$794,925
	19	Embankment crown road - Class II on Class IV		31,500	SF	$1.32	$41,552
		SUBTOTAL THIS SHEET					**$18,590,872**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
TRR Reservoir
Construct Canal Control Structures
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR Reservoir

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
153		**Construct Canal Control Structures**					
	1	GCID Inlet					
	2	Inlet Structure at canal - slab 8"		1,417	yd3	$509.05	$721,324
	3	Inlet Structure at canal - slab 12"		335	yd3	$488.52	$163,654
	4	Energy dissipation Block area		200	yd3	$309.84	$61,968
	5	Gate Structure Bridge		1,272	ft2	$550.00	$699,600
	6	Radial Gates		6	ea	$94,800.00	$568,800
	7	Cross Canal Bridge Rails at check structure		212	lft	$150.00	$31,800
	8	Gate Structure Misc. Metals		1	allow	$55,000.00	$55,000
	9	Misc Concrete at inlet walls etc		1	Allow	$75,000.00	$75,000
	10	Base Rock under Slabs		2,500	T	$21.20	$53,000
	11	Rip Rap		450	CY	$48.00	$21,600
		TRR Spillway and Outfall					
	12	Sluice Gates 6'W X 5' H automated		4	EA	$80,000.00	$320,000
	13	Flatwork 8"		215	yd3	$509.05	$109,446
	14	Base Rock under Slabs		210	CY	$21.20	$4,452
	15	Misc Concrete at spillway - walls etc		1,000	CY	$605.29	$605,290
	16	Spillway Bridge		912	ea	$550.00	$501,600
	17	Bridge Rails		152	lft	$150.00	$22,800
	18	Spillway Misc. Metals		1	allow	$50,000.00	$50,000
	19	Outfall Channel Lining - gunite		275	CY	$1,050.00	$288,750
	20	Misc Concrete at Outfall		200	CY	$682.79	$136,558
	21	Rebar for above & 150 #cy		516,300	LB	$1.43	$738,309
		SUBTOTAL THIS SHEET					**$5,228,951**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 37 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
TRR Reservoir	
Provide Power and Control for Gate Structures	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR Reservoir
Electrical	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
170		**Accessory Electrical Equipment**					
	1	Gate Structure Power/Data/SCADA		1	allow	$264,975.00	$264,975
	2	Gate Structure Power/Data/SCADA		2	allow	$264,975.00	$529,950
		SUBTOTAL THIS SHEET					**$794,925**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
David Hughes	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
Sites Pumping Generating Plant	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights (Included with Reservoir)					$0
130		Structures and Improvements					$157,524,461
140		Roads and Road Structures (Included with Reservoir Project Roads)					
152		Waterways - Buried Penstock Piping and Bifurcations					$87,191,160
153		Waterway Structures					$32,183,901
160		Pumps and Prime Movers					$55,906,200
165		Turbines and Generators					$109,940,036
170		Accessory Electrical Equipment					$74,634,420
		Subtotal					**$517,380,178**
		Mobilization	5%	+/-			$26,000,000
		Subtotal with Mobilization					**$543,380,178**
		Contract Cost Allowances (Sum of):	10%	+/-			$56,619,822
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$600,000,000**
		Construction Contingencies	15%	+/-			$80,000,000
		FIELD COST					**$680,000,000**
		Non-Contract Costs	17%	+/-			$120,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$800,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$920,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
100 Land and Rights
130 Structures and Improvements
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		(Included with Sites Reservoir)					
130		**Structures and Improvements**					
		Sites Pumping-Generating Plant					
	1	Buried Penstocks and plant area excavation		2,995,000	yd3	$6.38	$19,093,125
	2	Water stop, Joint Material and Sealer		1	allow	$612,000.00	$612,000
	3	Temporary Concrete bulkheads		1	allow	$127,500.00	$127,500
	4	Concrete Hatch Covers		1	allow	$163,200.00	$163,200
	5	Structural Concrete		102,000	yd3	$449.23	$45,821,460
	6	Backfill Concrete		5,400	yd3	$234.27	$1,265,058
	7	Pneumatic Mortar 3" Thick		40,000	yd2	$850.00	$34,000,000
	8	Cement		544,000	cwt	n/a	$0
	9	Rebar		20,400,000	lb	$1.35	$27,540,000
	10	Welded wire Fabric		280,800	ft2	$1.12	$315,058
	11	Structural Steel Building @ 20psf		640	ton	$3,800.00	$2,432,000
		Structural Steel for Bridge Crane 600plf		507	ton	$3,800.00	$1,926,600
	12	Steel Roof Decking		64,000	ft2	$8.50	$544,000
	13	Miscellaneous Metal - Stop log		375,000	lb	$3.50	$1,312,500
		Miscellaneous Metal - Screens		150,000	lb	$3.50	$525,000
		Miscellaneous Metal - Other		100,000	lb	$3.50	$350,000
	14	Architectural Features - Skin - Uninsulated		138,000	SF	$29.00	$4,002,000
		Architectural Features - Interior		80,000	SF	$24.00	$1,920,000
	15	100 Ton Bridge Crane		1	ea	$357,000.00	$357,000
	16	50 Ton Gantry Crane		1	ea	$739,500.00	$739,500
=	17	10 Ton Gantry Crane		1	ea	$208,620.00	$208,620
	18	Other Hoisting Provisions		1	allow	$100,000.00	$100,000
	19	Miscellaneous mechanical and plant features		1	allow	$12,668,400.00	$12,668,400
	20	Structural Backfill		196,000	yd3	$7.14	$1,399,440
	21	Impervious backfill and drainage		1	allow	$102,000.00	$102,000
		SUBTOTAL THIS SHEET					**$157,524,461**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
		October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
140 Roads and Road Structures
152 Waterways - Buried Penstock Piping and Bifurcations
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
140		**Roads and Road Structures**					
		(Included with Sites Reservoir project Roads)					
152		**Waterways - Buried Penstock Piping and Bifurcations**					
		Buried penstock piping for Sites Pumping-					
		Generating Plant and Emergency Drawdown					
		Bypass Structure from I/O Tunnel					
		downstream portal to structures.					
	1	Earth Moving - Excavation for Piping -		1,581,463	yd3	$4.49	$7,094,541
		Manifold to Pump Station					
	2	Earth Moving - Excavation for Tunnel -		47,110	yd3	$4.49	$211,338
		Portal to First Manifold					
	3	Backfill Hauling - Portal to First Manifold		17,973	yd3	$1.46	$26,247
	4	Compacted Fill - Portal to First Manifold		16,339	yd3	$0.72	$11,844
	5	Spread Backfill for Compaction - Portal to Manifold		16,339	yd3	$1.90	$31,070
	6	Backfill Hauling - Manifold to Pump Station		909,455	yd3	$1.46	$1,328,108
	7	Compacted Fill - Manifold to Pump Station		826,777	yd3	$0.72	$599,342
	8	Spread Backfill for Compaction - Manifold to Station		826,777	yd3	$1.90	$1,572,188
	9	Water & Optimization Treatment for Backfill		559,748	yd3	$1.59	$887,988
	10	Loading & Hauling Leftover Excavated Material		754,686	yd3	$5.39	$4,067,439
		(15 c.y. Belly Dump, Ave Cycle 4 mi,					$0
		35 mph Ave, 15 min wait)					$0
	11	Spread Backfill for Compaction - Leftover Material		754,686	yd3	$1.90	$1,435,100
	12	Compaction - Leftover Material		754,686	yd3	$0.72	$547,082
	13	Surveying		30	day	$592.54	$17,776
							$0
							$0
		SUBTOTAL THIS SHEET					**$17,830,064**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
152 Waterways - Buried Penstock Piping and Bifurcations (Continued)
Civil

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Waterways - Buried Penstock Piping and Bifurcations - Continued**					
		Subtotal from Previous Sheet					$17,830,064.2
		Buried Penstock Piping and Bifurcations					
		(1) Sites Pumping-Generating Plant					
	1	Steel Penstock Piping, Welded - 30'		575	ton	$10,200.00	$5,865,395.6
	2	Steel Penstock Piping, Welded - 26		763	ton	$10,200.00	$7,781,939.3
	3	Steel Penstock Piping, Welded - 22		763	ton	$10,200.00	$7,781,939.3
	4	Steel Penstock Piping, Welded - 18'		370	ton	$10,200.00	$3,778,549.6
	5	Steel Penstock Piping, Welded - 13'		318	ton	$10,200.00	$3,246,204.9
	6	Steel Penstock Piping, Welded - 12.5'		58	ton	$10,200.00	$589,540.9
	7	Steel Penstock Piping, Welded - 11.5'		40	ton	$10,200.00	$408,262.4
	8	Steel Penstock Piping, Welded - 10.5'		167	ton	$10,200.00	$1,701,736.5
	9	Steel Penstock Piping, Welded - 9'		264	ton	$10,200.00	$2,694,994.9
	10	Steel Penstock Piping, Welded - 7.5'		64	ton	$10,200.00	$655,998.2
	11	Steel Penstock Piping, Welded - 6.5'		48	ton	$10,200.00	$492,727.5
	12	Concrete Encasements		16,000	cy	$487.15	$7,794,400.0
	13	Welding (24" weld per hr.)		772	day	$798.99	$616,823.0
		(2) Emergency Drawdown Bypass					
	1	Steel Penstock Piping, Welded - 26'		1,925	ton	$8,250.00	$15,881,250.0
	2	Steel Penstock Piping, Welded - 18'		210	ton	$8,250.00	$1,732,500.0
	3	Steel Penstock Piping, Welded - 13'		225	ton	$8,250.00	$1,856,250.0
	4	Steel Penstock Piping, Welded - 9'		35	ton	$8,250.00	$288,750.0
	5	Concrete Encasements		10,000	cy	$487.15	$4,871,500.0
	6	Welding (24" weld per hr.)- longitude		536	day	$798.99	$428,260.5
	7	Welding (24" weld per hr.) - Butts		1,119	day	$798.99	$894,073.8
		SUBTOTAL THIS SHEET					**$87,191,160.4**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
153 Waterway Structures
Emergency Drawdown Bypass Structure
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
153		**Waterway Structures**					
		Emergency Drawdown Bypass Structure					
	1	Structural concrete (including cement)		6,530	cy	$539.08	$3,520,166
	2	Steel Reinforcement		800,000	lb	$1.35	$1,080,000
	3	Embedded steel liner plates		273,000	lb	$4.80	$1,310,400
		Valves					
	4	8' 6" Howell-Bunger Valves		4	ea	$682,890.00	$2,731,560
	5	156" Fixed Cone Valves		4	ea	$3,385,443.60	$13,541,774
	6	156" Guard Valve - Butterfly		4	ea	$2,500,000.00	$10,000,000
		SUBTOTAL THIS SHEET					**$32,183,901**

QUANTITIES

BY	CHECKED
TL Peng	7-Oct
DATE PREPARED	**PEER REVIEW / DATE**
	Joe Barnes

PRICES

BY	CHECKED
Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**
October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
160 Pumps and Prime Movers
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
160		**Pumps and Prime Movers**					
	1	18,471 hp Francis Pump		2	ea.	$8,670,000.00	$17,340,000
	2	36,942 hp Francis Pump		2	ea.	$17,340,000.00	$34,680,000
	3	102" ANSI Butterfly Valves		2	ea.	$1,295,400.00	$2,590,800
	4	72" ANSI Butterfly Valves		2	ea.	$647,700.00	$1,295,400
		SUBTOTAL THIS SHEET					**$55,906,200**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
165 Turbines and Generators

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
165		**Turbines and Generators**					
	1	26,446 hp/24.6MW Francis Pump/Turbine		4	ea.	$20,817,000.00	$83,268,000
	2	13,243 hp/12.3MW Francis Pump/Turbine		2	ea.	$11,819,250.00	$23,638,500
	3	108" ANSI Butterfly Valves		4	ea.	$533,384.00	$2,133,536
	4	78" ANSI Butterfly Valves		2	ea.	$450,000.00	$900,000
		SUBTOTAL THIS SHEET					**$109,940,036**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sites Pumping Generating Plant
170 Accessory Electrical Equipment
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Sites PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
170		**Accessory Electrical Equipment**					
	1	Exposed and Embedded Conduit		1	lot	$5,202,000.00	$5,202,000
	2	Duct bank, MV Cable, & UG Vaults To Substation		1	lot	$18,360,000.00	$18,360,000
	3	Cable Trays		1	lot	$979,200.00	$979,200
	4	MV Circuits to Machines		1	lot	$1,785,000.00	$1,785,000
	5	LV, Inst, Comm, Control Cable		1	lot	$6,018,000.00	$6,018,000
	6	Station Service Unit Substations		2	ea	$714,000.00	$1,428,000
	7	Secondary Distribution Transformers		4	lot	$14,280.00	$57,120
	8	Panelboards		20	ea	$20,400.00	$408,000
	9	DC Power System		2	lot	$306,000.00	$612,000
	10	Standby Generator		1	lot	$255,000.00	$255,000
	11	Standby Switchgear		1	ea	$153,000.00	$153,000
	12	Automatic Transfer Switch		1	ea	$102,000.00	$102,000
	13	Motor Control Centers		30	ea	$81,600.00	$2,448,000
	14	UPS System		2	ea	$153,000.00	$306,000
	15	Lighting and Lighting Control		1	lot	$510,000.00	$510,000
	16	Convenience Power		1	lot	$81,600.00	$81,600
	17	Grounding		1	lot	$3,060,000.00	$3,060,000
	18	Lightning Protection		1	lot	$428,400.00	$428,400
	19	13.8kV switchgear		1	lot	$1,683,000.00	$1,683,000
	20	Protection and Control Panels		17	ea	$306,000.00	$5,202,000
	21	Plant Control System		1	lot	$4,080,000.00	$4,080,000
	22	Fire Detection System		1	lot	$1,428,000.00	$1,428,000
	23	Commissioning and Acceptance Testing		1	lot	$5,100,000.00	$5,100,000
	24	OH&P On Non-Unit Supply/Install		1	lot	$14,922,600.00	$14,922,600
	25	Electrical/SCADA @ Valves		1	allow	$25,500.00	$25,500
							$0
							$0
		SUBTOTAL THIS SHEET					**$74,634,420**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
TRR Pumping Generating Plant	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights (Included with Reservoir)					$0
130		Structures and Improvements					$48,536,262
140		Roads and Road Structures (Included with Reservoir Project Roads)					$851,112
152		Waterways - Buried Penstock Piping and Bifurcations					$8,880,079
154		Waterway Protective Structures					$7,546,980
160		Pumps and Prime Movers					$14,598,576
165		Turbines and Generators					$5,721,204
170		Accessory Electrical Equipment					$15,034,800
		Subtotal					**$101,169,014**
		Mobilization	5%	+/-			$5,100,000
		Subtotal with Mobilization					**$106,300,000**
		Contract Cost Allowances (Sum of):	10%	+/-			$8,700,000
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$115,000,000**
		Construction Contingencies	15%	+/-			$20,000,000
		FIELD COST					**$135,000,000**
		Non-Contract Costs	17%	+/-			$25,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$160,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$185,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 55 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
100 Land and Rights
130 Structures and Improvements
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
100		**Land and Rights**					
		(Included with Sites Reservoir)					$0
							$0
130		**Structures and Improvements**					$0
	1	Clear and Grub		25	acre	$4,202.40	$105,060
	2	Excavation (Stockpile-1/2 mi, Haul-17 Mi.)		400,000	yd3	$6.83	$2,731,560
	3	Backfill Pump Station (from Stockpile)		200,000	yd4	$7.35	$1,470,840
	4	Sheet Steel Piling at After bay		12,000	ft2	$35.00	$420,000
	5	Concrete		30,000	yd3	$449.23	$13,476,900
	6	Rebar at 4% by Weight		4,800,000	lb	$1.35	$6,480,000
	7	Structural Steel Framing		125	ton	$3,800.00	$475,000
	8	Fencing and Gates		1	allow	$75,000.00	$75,000
	9	Seeding		2	acre	$6,534.00	$13,068
	10	Dewatering		1	allow	$26,265.00	$26,265
	11	Superstructure - Building		1	allow	$2,652,765.00	$2,652,765
	12	Control Building 100' X 150'		15,000	ft2	$157.59	$2,363,850
	13	Building Site Utilities		1	allow	$89,301.00	$89,301
	14	150 Ton Crane		1	ea	$816,652.80	$816,653
	15	Mechanical Auxiliary System		1	allow	$12,240,000.00	$12,240,000
	16	Furnish & Install Special Equipment		1	allow	$5,100,000.00	$5,100,000
		SUBTOTAL THIS SHEET					**$48,536,262**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
TRR Pumping Generating Plant	**WOID:** / **ESTIMATE LEVEL:**
140 Roads and Road Structures	**REGION:** / **UNIT PRICE LEVEL:**
Civil	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
140		**Roads and Road Structures**					$0
	1	Road to plant 4000 LF, 24 feet wide		96,000	ft2	$8.25	$791,732
	2	Parking Area		7,200	ft2	$8.25	$59,380
							$0
							$0
		SUBTOTAL THIS SHEET					**$851,112**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
152 Waterways
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
152		**Waterways**					$0
	1	Steel Pipe and Manifolds		2,000,000	lb	$2.68	$5,358,060
	2	Mechanical Valve on Discharge Line		4	ea	$826,200.00	$3,304,800
	3	Sleeve Coupling		8	ea	$4,202.40	$33,619
	4	36" BFV for Refilling Pump		3	ea	$61,200.00	$183,600
							$0
							$0
		SUBTOTAL THIS SHEET					**$8,880,079**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
154 Waterway Protective Works
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
154		**Waterway Protective Works**					$0
	1	32" Diameter Air Chamber - Surge Control		2	ea	$1,733,490.00	$3,466,980
	2	Compressor		1	ea	$4,080,000.00	$4,080,000
							$0
							$0
		SUBTOTAL THIS SHEET					**$7,546,980**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
160 Pumps and Prime Movers

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
							$0
160		**Pumps and Prime Movers**					$0
	1	9,094hp Francis Pump		2	ea	$4,342,922.46	$8,685,845
	2	4,098hp Francis Pump		2	ea	$2,523,638.85	$5,047,278
	3	84" AWWA Butterfly Valves		2	ea	$259,420.82	$518,842
	4	60" AWWA Butterfly Valves		2	ea	$173,306.03	$346,612
							$0
							$0
		SUBTOTAL THIS SHEET					**$14,598,576**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 60 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
165 Turbines and Generators

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
							$0
165		**Turbines and Generators**					$0
	1	4.9MW KaplanTurbine		1	ea	$5,428,653.08	$5,428,653
	2	92" AWWA Butterfly Valves		1	ea	$292,551.10	$292,551
							$0
							$0
		SUBTOTAL THIS SHEET					**$5,721,204**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
TRR Pumping Generating Plant
170 Accessory Electrical Equipment

Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]TRR PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
170		**Accessory Electrical Equipment**					$0
	1	Exposed and Embedded Conduit		1	lot	$918,000.00	$918,000
	2	Duct bank, MV Cable, & UG Vaults To Substation		1	lot	$520,200.00	$520,200
	3	Cable Trays		1	lot	$173,400.00	$173,400
	4	MV Circuits to Machines		1	lot	$91,800.00	$91,800
	5	LV, Inst, Comm, Control Cable		1	lot	$1,020,000.00	$1,020,000
	6	Station Service Unit Substation		1	ea	$612,000.00	$612,000
	7	Secondary Distribution Transformers		2	lot	$14,280.00	$28,560
	8	Panelboards		6	ea	$20,400.00	$122,400
	9	DC Power System		2	lot	$122,400.00	$244,800
	10	Standby Generator		1	lot	$153,000.00	$153,000
	11	Standby Switchgear		1	ea	$81,600.00	$81,600
	12	Automatic Transfer Switch		1	ea	$81,600.00	$81,600
	13	Motor Control Centers		9	ea	$81,600.00	$734,400
	14	UPS System		2	ea	$61,200.00	$122,400
	15	Lighting and Lighting Control		1	lot	$122,400.00	$122,400
	16	Convenience Power		1	lot	$12,240.00	$12,240
	17	Grounding		1	lot	$510,000.00	$510,000
	18	Lightning Protection		1	lot	$102,000.00	$102,000
	19	13.8kV switchgear		1	lot	$714,000.00	$714,000
	20	Protection and Control Panels		10	ea	$306,000.00	$3,060,000
	21	Plant Control System		1	lot	$1,530,000.00	$1,530,000
	22	Fire Detection System		1	lot	$357,000.00	$357,000
	23	Commissioning and Acceptance Testing		1	lot	$714,000.00	$714,000
	24	Additional Equipment Supply/Install		1	lot	$3,009,000.00	$3,009,000
							$0
							$0
		SUBTOTAL THIS SHEET					**$15,034,800**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE: NODOS Project
Pumping and Generating Plants
Sacramento River Pumping Generating Plant

PROJECT: NODOS Alternative D

WOID:

ESTIMATE LEVEL:

REGION:

UNIT PRICE LEVEL:

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

Civil **Summary Sheet**

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights (Included with Reservoir)					$0
130		Structures and Improvements					$74,985,872
140		Roads and Road Structures (Included with Reservoir Project Roads)					$556,595
152		Discharge Piping					inc below
152		Waterways - Buried Penstock Piping and Bifurcations					$2,278,077
154		Waterway Protective Structures					$7,446,000
160		Pumps and Prime Movers					$56,538,591
165		Turbines and Generators					$7,725,102
170		Accessory Electrical Equipment					$18,664,860
		Subtotal					**$168,195,098**
		Mobilization	5%	+/-			$8,400,000
		Subtotal with Mobilization					**$176,595,098**
		Contract Cost Allowances (Sum of):	10%	+/-			$18,404,902
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$195,000,000**
		Construction Contingencies	15%	+/-			$25,000,000
		FIELD COST					**$220,000,000**
		Non-Contract Costs	17%	+/-			$40,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$260,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$300,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 63 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Pumping Generating Plant
100 Land and Rights
130 Structures and Improvements
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
100		**Land and Rights**					
		(Included with Sites Reservoir)					$0
							$0
130		**Structures and Improvements**					$0
	1	Clear and Grub Pump Plant		110	acre	$4,202.40	$462,264
	2	Excavation (Stockpile-1/2 mi, Haul-17 Mi.)		250,000	yd3	$3.74	$935,034
	3	Backfill Pump Station (from Stockpile)		250,000	yd3	$6.83	$1,707,225
	4	Sheet Steel Piling at After bay		79,800	ft2	$35.00	$2,793,000
	5	Sheet Steel Piling at Fore bay		72,600	ft2	$35.00	$2,541,000
	6	Sheet piling at Roads		90,288	ft2	$35.00	$3,160,080
	7	Permanent Sheet Pile at fish screen		76,976	ft2	$35.00	$2,694,160
	8	Concrete		30,000	yd3	$449.23	$13,476,900
	9	Rebar @5% by Weight		6,000,000	lb	$1.35	$8,100,000
	10	Structural Steel Framing		125	ton	$3,800.00	$475,000
	11	Fencing and Gates at Switchyard		400	lft	$36.00	$14,400
	12	Fencing and Gates at Perimeter		3,000	lft	$36.00	$108,000
	13	Seeding		2	acre	$6,534.00	$13,068
	14	Dewatering		1	allow	$300,000.00	$300,000
	15	Stone Slope Protection (10 mi haul)		7,500	ton	$44.13	$330,939
	16	Superstructure - Building		1	ls	$2,626,500.00	$2,626,500
	17	Control Building 100' X 150'		15,000	ft2	$157.59	$2,363,850
	18	Building Site Utilities		1	allow	$525,300.00	$525,300
	19	150 Ton Crane		1	ea	$841,152.38	$841,152
	20	Mechanical Auxiliary System		1	allow	$26,265,000.00	$26,265,000
	21	Furnish & Install Special Equipment		1	ea	$5,253,000.00	$5,253,000
		SUBTOTAL THIS SHEET					**$74,985,872**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 64 OF _ _

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Sacramento River Pumping Generating Plant** 140 Roads and Road Structures **Civil**	**PROJECT:** **NODOS Alternative D**
	WOID: / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
140		**Roads and Road Structures**					$0
	1	Approach and parking including grading		63,600	ft2	$8.75	$556,595
							$0
							$0
		SUBTOTAL THIS SHEET					**$556,595**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Pumping Generating Plant
152 Waterways
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
							$0
152		**Discharge Piping to Delevan**					$0
	1	Clearing & Grubbing - Extra Light, Selective		1	acre	$1,201.32	$1,201
	2	Install Dewatering Wells		4	ea	$26,265.00	$105,060
	3	Earthwork - Mass Excavation for Pipeline		9,105	yd3	$3.43	$31,235
	4	96" Pipeline Installation		400	LF	$2,057.43	$822,974
	5	Pipe Bedding Transit		204	yd3	$23.76	$4,846
	6	Pipe Bedding Placement		204	yd3	$146.16	$29,817
	7	Backfill Hauling		8,635	yd3	$1.46	$12,580
	8	Spreading of Backfill in Trench Zone for Compaction		8,635	yd3	$0.86	$7,436
	9	Compacted Fill- Pipe Zone, Bottom of Trench		4,032	yd3	$0.54	$2,185
		to 3' above T.O.P.					$0
	10	Compacted Fill - Random Fill above Pipe Zone		3,818	yd3	$0.72	$2,757
	11	Water and Optimization Treatment for Trench Backfill Materia		7,850	yd3	$1.58	$12,418
	12	Hauling of Leftover Excavation Material for Grade Raising		1,156	yd3	$1.46	$1,688
	13	Spreading of Leftover Excavation Materials for Grade Raising		1,156	yd3	$1.90	$2,200
	14	Compacted Fill - Leftover Excavation Materials for Grade Rai		1,051	yd3	$0.72	$762
	15	Water and Optimization Treatment for Leftover		1,051	yd3	$1.58	$1,663
		Excavation Materials for Grade Raising					$0
		SUBTOTAL THIS SHEET					**$1,038,822**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
Sacramento River Pumping Generating Plant	**WOID:** / **ESTIMATE LEVEL:**
152 Waterways (Continued)	**REGION:** / **UNIT PRICE LEVEL:**
Civil	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
		Subtotal from Previous Page					**$1,038,822**
							$0
152		**Discharge Piping to Delevan - Continued)**					$0
	16	Form & Concrete Placement - Deadman		148	yd3	$296.36	$43,861
		@ Butterfly Valves					$0
	17	Rebar Reinforcing - Deadman @ Butterfly		148	yd3	$343.20	$50,794
		Valves (6% by weight)					$0
	18	Concrete Transit Trucking @ Butterfly Valves		148	yd3	$23.76	$3,516
	19	Concrete Vault - Valve Box @ Butterfly Valves		4	ea	$8,175.77	$32,703
	20	30" Access Hole - Valve Vault @ Butterfly Valves		4	ea	$1,285.18	$5,141
	21	Misc Metals - Access Ladder @ Butterfly Valves		32	lft	$128.11	$4,099
	22	Misc Metals - Steel Vault Covers @ Butterfly Valves		8,000	lb	$5.45	$43,621
	23	Installation of Butterfly Valve Assemblies (x4)		4	ea	$210,120.00	$840,480
	24	Butterfly Valve Power/Data/SCADA		1	ls	$52,530.00	$52,530
	25	Onsite Welding, Mechanic, Misc		4	day	$798.99	$3,196
	26	Surveying		2	day	$592.54	$1,185
	27	Trucking - Access Road Gravel (20 mi cycle)		3,883	yd3	$9.70	$37,675
	28	Access Road- Gravel - Aggregate Subbase (0.5 mile)		3,300	ton	$12.61	$41,604
	29	Access Road - Gravel - Class II AB (0.5 mile)		3,300	ton	$21.01	$69,340
	30	Access Road, Spreading/Grading		3,883	yd3	$1.90	$7,389
	31	Compaction Access Road		3,883	yd3	$0.55	$2,121
							$0
							$0
		SUBTOTAL THIS SHEET					**$2,278,077**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 67 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Pumping Generating Plant
154 Waterway Protective Works
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
154		**Waterway Protective Works**					$0
	1	32' Diameter Air Chamber - Surge Control		2	ea	$1,683,000.00	$3,366,000
	2	Compressor including power and foundation		1	allow	$4,080,000.00	$4,080,000
							$0
							$0
		SUBTOTAL THIS SHEET					**$7,446,000**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Pumping and Generating Plants	
Sacramento River Pumping Generating Plant	**WOID:** / **ESTIMATE LEVEL:**
160 Pumps and Prime Movers	**REGION:** / **UNIT PRICE LEVEL:**
Civil	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
							$0
160		**Pumps and Prime Movers**					$0
	1	22,000hp Pump		4	ea	$13,875,227.02	$55,500,908
	2	84" AWWA Butterfly Valves		4	ea	$259,420.82	$1,037,683
							$0
							$0
		SUBTOTAL THIS SHEET					**$56,538,591**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 69 OF _ _

FEATURE:	PROJECT:	
NODOS Project Pumping and Generating Plants Sacramento River Pumping Generating Plant 165 Turbines and Generators Civil	NODOS Alternative D	
	WOID:	ESTIMATE LEVEL:
	REGION:	UNIT PRICE LEVEL:
	FILE:	G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
							$0
165		**Turbines and Generators**					$0
	1	5.4MW Generator		2	ea	$3,570,000.00	$7,140,000
	2	92" AWWA Butterfly Valves		2	ea	$292,551.10	$585,102
							$0
							$0
		SUBTOTAL THIS SHEET					**$7,725,102**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Pumping Generating Plant
170 Accessory Electrical Equipment

Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]SAC River PGP

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
170		**Accessory Electrical Equipment**		1	lot	$1,224,000.00	$1,224,000
	1	Exposed and Embedded Conduit		1	lot	$2,004,300.00	$2,004,300
	2	Duct bank, MV Cable, & UG Vaults To Substation		1	lot	$244,800.00	$244,800
	3	Cable Trays		1	lot	$280,500.00	$280,500
	4	MV Circuits to Machines		1	lot	$1,428,000.00	$1,428,000
	5	LV, Inst, Comm, Control Cable		1	ea	$714,000.00	$714,000
	6	Station Service Unit Substation		2	lot	$14,280.00	$28,560
	7	Secondary Distribution Transformers		8	ea	$20,400.00	$163,200
	8	Panelboards		2	lot	$122,400.00	$244,800
	9	DC Power System		1	lot	$153,000.00	$153,000
	10	Standby Generator		1	ea	$81,600.00	$81,600
	11	Standby Switchgear		1	ea	$81,600.00	$81,600
	12	Automatic Transfer Switch		10	ea	$81,600.00	$816,000
	13	Motor Control Centers		2	ea	$81,600.00	$163,200
	14	UPS System		1	lot	$178,500.00	$178,500
	15	Lighting and Lighting Control		1	lot	$20,400.00	$20,400
	16	Convenience Power		1	lot	$714,000.00	$714,000
	17	Grounding		1	lot	$153,000.00	$153,000
	18	Lightning Protection		1	lot	$714,000.00	$714,000
	19	13.8kV switchgear		10	ea	$306,000.00	$3,060,000
	20	Protection and Control Panels		1	lot	$1,530,000.00	$1,530,000
	21	Plant Control System		1	lot	$459,000.00	$459,000
	22	Fire Alarm and Sprinklers in Building		15,000	SF	$14.00	$210,000
	23	Commissioning and Acceptance Testing		1	lot	$3,998,400.00	$3,998,400
							$0
							$0
		SUBTOTAL THIS SHEET					**$18,664,860**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE: NODOS Project
Pumping and Generating Plants
Sacramento River Fish Screen Structure

PROJECT: NODOS Alternative D

WOID: **ESTIMATE LEVEL:**

REGION: **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Fish Screen Structure

Civil **Summary Sheet**

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights (Included with Reservoir)					$0
130		Structures and Improvements					$35,076,550
140		Roads and Road Structures (Included with Reservoir Project Roads)					$122,351
170		Accessory Electrical Equipment					$510,000
		Subtotal					**$35,708,901**
		Mobilization	5%	+/-			$1,800,000
		Subtotal with Mobilization					**$37,508,901**
		Contract Cost Allowances (Sum of):	10%	+/-			$3,491,099
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$41,000,000**
		Construction Contingencies	15%	+/-			$6,000,000
		FIELD COST					**$47,000,000**
		Non-Contract Costs	17%	+/-			$8,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$55,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$63,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 72 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Fish Screen Structure
100 Land and Rights
130 Structures and Improvements
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Fish Screen Structure

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		(Included with Sites Reservoir)					$0.00
							$0.00
130		**Structures and Improvements**					$0.00
		Clear and Grub Fish Screen		10	acre	$15,759.00	$157,590
		Site Surface Restoration		1	allow	$50,000.00	$50,000
							$0
		Site Preparation					$0
	1	Temporary Sheet Pile Cofferdam		108,000	ft2	$32.00	$3,456,000
	2	Fore bay Retaining Walls - Concrete footings		340	yd3	$271.42	$92,283
	3	Fore bay retaining walls - Walls		320	yd3	$779.35	$249,392
	4	Fore bay Retaining Wall Rebar at 5%		132,000	lb	$1.35	$178,200
	5	Fore bay Excavation		38,000	yd3	$4.73	$179,653
	6	Flood Gates at Fore bay		10	ea	$153,000.00	$1,530,000
							$0
		Fish Screen Structure					$0
	1	Fish Screen Piles		6,600	lft	$73.54	$485,377
	2	Fish Screen Tremie Slab		3,500	yd3	$430.42	$1,506,470
	3	Fish Screen Structural Slab		1,748	yd3	$584.58	$1,021,729
	4	Fish Screen Infill Slab		490	yd3	$457.62	$224,234
	5	Fish Screen Divider Walls		2,360	yd3	$692.70	$1,634,772
	6	Fish Screen Road Slab		5,090	yd3	$692.70	$3,525,843
	7	Fish Screen Road Rails - Concrete		140	yd3	$785.20	$109,928
	8	Fish Screen Rebar at 5% of total		2,700,000	lb	$1.35	$3,645,000
	9	Catwalk		2,860	ft2	$255.00	$729,300
	10	Bridge Railing - Metal Galvanized 36"		2,270	lft	$120.00	$272,400
	11	Miscellaneous Metal Allowance		100,000	lb	$4.75	$475,000
	12	Riprap and Placement		670	yd3	$54.63	$36,603
	13	Log Boom		592	lft	$374.54	$221,729
	14	Fore bay Access Bridge		1	allow	$160,000.00	$160,000
	15	Fish Screen		7,400	ft2	$55.00	$407,000
	16	Solid Panels		18,300	ft2	$175.00	$3,202,500
		SUBTOTAL THIS SHEET					**$23,551,002**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 73 OF _ _

FEATURE:
NODOS Project
Pumping and Generating Plants
Sacramento River Fish Screen Structure
130 Structures and Improvements (Continued)
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Fish Screen Structure

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
		Subtotal from Previous Sheet					**$23,551,002**
							$0
130		**Structures and Improvements (Continued)**					$0
	1	Trash Racks		8,800	ft2	$153.00	$1,346,400
	2	Tuning Baffles		34	ea	$45,900.00	$1,560,600
	3	Access doors		2	ea	$1,224.00	$2,448
	4	Sediment Removal Pumping & Platform		2	ea	$2,550,000.00	$5,100,000
	5	Fish Screen Cleaner & Platform		2	ea	$1,020,000.00	$2,040,000
		Maintenance Equipment					$0
	1	Hydraulic Beam Truck		1	allow	$400,000.00	$400,000
	2	Long Reach Excavator		1	allow	$459,000.00	$459,000
	3	Floating Work Platform		1	allow	$76,500.00	$76,500
	4	Floating Dredge		1	allow	$510,000.00	$510,000
	5	Portable High Pressure Washer		1	allow	$30,600.00	$30,600
		SUBTOTAL THIS SHEET					**$35,076,550**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 74 OF _ _

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Sacramento River Fish Screen Structure** 140 Roads and Road Structures **Civil**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Fish Screen Structure

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
140		**Roads and Road Structures**					$0
	1	Road to Fish Screen		14,400	ft2	$8.50	$122,351
							$0
							$0
		SUBTOTAL THIS SHEET					**$122,351**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 75 OF _ _

FEATURE: **NODOS Project** **Pumping and Generating Plants** **Sacramento River Fish Screen Structure** 170 Accessory Electrical Equipment **Electrical**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Fish Screen Structure

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
170		**Accessory Electrical Equipment**					$0
	1	Electrical For Fish Screen		1	allow	$510,000.00	$510,000
							$0
							$0
		SUBTOTAL THIS SHEET					**$510,000**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE: NODOS Project Pumping and Generating Plants Red Bluff Diversion Pump Addition	**PROJECT:** NODOS Alternative D
	WOID: / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Civil **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Red Bluff Pump Addition

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights (Included with Reservoir)					$0
130		Structures and Improvements					$127,530
160		Pumps and Prime Movers					$2,186,902
170		Accessory Electrical Equipment					$357,590
		Subtotal					**$2,672,022**
		Mobilization	5%	+/-			$135,000
		Subtotal with Mobilization					**$2,810,000**
		Contract Cost Allowances (Sum of):	10%	+/-			$281,000
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$3,000,000**
		Construction Contingencies	15%	+/-			$450,000
		FIELD COST					**$3,300,000**
		Non-Contract Costs	17%	+/-			$561,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$3,900,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$4,500,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Pumping and Generating Plants
Red Bluff Diversion Pump Addition

Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Red Bluff Pump Addition

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
							$0
100		**Land and Rights**					
		(No cost to NODOS, Pump Bay Exists)					$0
							$0
130		**Structures and Improvements**					$0
	1	Allowance for Minor Revisions & Repairs		1	allow	$52,530.00	$52,530
	2	Project General Requirements		1	allow	$75,000.00	$75,000
160		**Pumps and Prime Movers**					$0
	1	262.5 CFS Vertical Axis Flow Pump		2	ea	$645,631.00	$1,291,262
	2	Induction Motor		2	ea	$325,000.00	$650,000
	3	84" Dia Motor Operated Butterfly Valve		2	ea	$76,880.00	$153,760
	4	84" Dia Flap Gate		2	ea	$38,440.00	$76,880
	5	Vendor installation support		1	allow	$15,000.00	$15,000
170		**Accessory Electrical Equipment**					$0
		Control Systems					$0
	1	Pump Control System Connection		1	allow	$52,530.00	$52,530
	2	Commissioning and Acceptance Testing		1	lot	$50,000.00	$50,000
		Electrical Systems					$0
	1	Electrical conduit and connections		1	allow	$105,060.00	$105,060
	2	Other Equipment Supply/Install		1	lot	$150,000.00	$150,000
		SUBTOTAL THIS SHEET					**$2,672,022**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
TL Peng	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE: NODOS Project
Canals and Conduits
Conveyance Channel Sites to Holthouse
Civil **Summary Sheet**

PROJECT: NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		Conveyance Channel Sites to Holthouse					$31,932,366
		Subtotal					**$31,932,366**
		Mobilization	5%	+/-			$1,600,000
		Subtotal with Mobilization					**$33,532,366**
		Contract Cost Allowances (Sum of):	10%	+/-			$3,467,634
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$37,000,000**
		Construction Contingencies	15%	+/-			$5,000,000
		FIELD COST					**$42,000,000**
		Non-Contract Costs	17%	+/-			$7,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$49,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$56,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Canals and Conduits
Conveyance Channel Sites to Holthouse
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Conveyance Channel Sites to Holthouse**					
	1	Clear and grub		40	acre	$2,042.46	$81,698
	2	Excavation		3,600,000	yd3	$3.74	$13,464,490
	3	Haul material - 5 Mi. average round trip		3,600,000	yd3	$4.73	$17,019,720
	4	Spread Material		3,600,000	yd3	$0.38	$1,366,458
		SUBTOTAL THIS SHEET					**$31,932,366**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE: NODOS Project

Canals and Conduits

Delevan Pipeline

Two adjacent 12' pipelines from Sites PGP to TRR PGP vicinity.

Civil **Summary Sheet**

PROJECT: NODOS Alternative D

WOID: **ESTIMATE LEVEL:**

REGION: **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					$0
120		Clearing and Demolition					$293,999
152		Construct Delevan Pipeline					$385,864,419
152		I-5 Undercrossing (Jacked)					$29,186,893
152		Highway 45 Undercrossing (Jacked)					$8,892,705
		Subtotal					**$424,238,017**
		Mobilization	5%	+/-			$21,000,000
		Subtotal with Mobilization					**$445,238,017**
		Contract Cost Allowances (Sum of):	10%	+/-			$44,761,983
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$490,000,000**
		Construction Contingencies	15%	+/-			$70,000,000
		FIELD COST					**$560,000,000**
		Non-Contract Costs	17%	+/-			$100,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$660,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$760,000,000.00**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 81 OF _ _

FEATURE: **NODOS Project** **Canals and Conduits** **Delevan Pipeline** Land and Rights **Civil**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Delevan Pipeline Land and Rights**					
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 82 OF _ _

FEATURE: **NODOS Project** **Canals and Conduits** **Delevan Pipeline** Clearing and Demolition **Civil**	**PROJECT:** **NODOS Alternative D** **WOID:** **ESTIMATE LEVEL:** **REGION:** **UNIT PRICE LEVEL:** **FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
120		**Pipeline Clearing and Demolition**					
	1	Gas Well Decommissioning		6,000	lft	$7.35	$44,125
	2	Clearing & Grubbing		208	acre	$1,201.32	$249,874
		SUBTOTAL THIS SHEET					**$293,999**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 83 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Canals and Conduits	
Delevan Pipeline	**WOID:** / **ESTIMATE LEVEL:**
Construct Pipeline	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Construct Delevan Pipeline**					
	1	Install Dewatering Wells - Incl Temp Piping		100	ea	$26,265.00	$2,626,500
	2	Earthwork - Mass Excavation for Pipeline		2,953,117	yd3	$6.32	$18,663,699
	3	144" Pipeline Installation		112,460	lft	$2,828.00	$318,036,880
	4	Pipe Bedding Transit		125,956	yd3	$23.76	$2,992,110
	5	Pipe Bedding Placement		125,956	yd3	$146.16	$18,409,981
	6	Backfill Hauling		2,420,927	yd3	$1.46	$3,526,993
	7	Spreading Backfill in Trench Zone for Compaction		2,200,843	yd3	$0.86	$1,895,238
	8	Compacted Fill - Pipe Zone		1,049,252	yd3	$0.54	$568,712
	9	Compacted Fill - Random Fill above Pipe Zone		1,151,591	yd3	$0.72	$831,465
	10	Water & Optimization Treatment for Trench Backfill Material		2,200,843	yd3	$1.58	$3,481,661
	11	Segregate & Spread Topsoil in Agricultural Areas (Top 1.5' of		295,520	yd3	$1.90	$562,359
	12	Compaction of Topsoil in Agricultural Areas		268,655	yd3	$0.72	$193,973
	13	Loading & Trucking of Leftover Excavation Materials		843,830	yd3	$9.70	$8,187,377
	14	Spreading of Leftover Excavation Materials		843,830	yd3	$1.90	$1,605,765
	15	Compacted Fill - Leftover Excavation Materials		767,118	yd3	$0.72	$553,870
	16	Form & Place Concrete @ MH-ARV & Blow off		1,452	yd3	$611.81	$888,343
	17	Rebar Reinforcing @ MH-ARV & Blow off (6% by weight)		1,452	yd3	$324.00	$470,448
	18	Concrete Transit Trucking @ MH-ARV & Blow off		1,452	yd3	$23.76	$34,493
	19	108" RCP Vault Riser at MH-ARV & Blow off		24	ea	$8,175.77	$196,218
	20	30" Access Hole @ MH-ARV & Blow off		24	ea	$1,285.18	$30,844
	21	Misc Metals - Access Ladder @ MH-ARV & Blow off		192	lft	$128.11	$24,596
	22	Misc Metals - Steel Vault Covers @ MH-ARV & Blow off		48,000	lb	$5.45	$261,773
	23	Installation of MH-ARV & Blow off Assemblies		24	ea	$35,720.40	$857,290
	24	Onsite Welding, Mechanic, Misc		880	day	$798.99	$703,114
	25	Surveying		440	day	$592.54	$260,717
	26	Dewatering contingency					
		SUBTOTAL THIS SHEET					**$385,864,419**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 84 OF _ _

FEATURE:
NODOS Project
Canals and Conduits
Delevan Pipeline
I-5 Undercrossing (Jacked)
Civil

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**I-5 Undercrossing (Jacked)**					
	1	Earthwork - Mass Ex for Jacking & Receiving Pits		22,288	yd3	$6.32	$140,860
	2	Form & Place Concrete, Jacking Pit S.O.G (Excl Reinforcing)		46	yd3	$526.32	$24,369
	3	Reinforcing for Jacking Pit S.O.G.		46	yd3	$294.00	$13,612
	4	Concrete Transit Trucking		46	yd3	$23.06	$1,068
	5	Installation of TBM/Jacking Assembly		1	ls	$16,130.21	$16,130
	6	144" Pipe Installation w/ 192" ID Casing (incl mucking)		2,400	lft	$11,000.00	$26,400,000
	7	Liner Grouting, Exterior Annular Space, Casing		142,572	CF	$6.63	$945,252
	8	Liner Grouting, Annular Space, Pipe & Casing		112,683	CF	$6.63	$747,088
	9	Demolition/Disposal, Jacking Pit		25,000	SF	$17.75	$443,693
	10	Backfill Hauling, Jacking & Receiving Pits		24,515	yd3	$1.41	$34,675
	11	Spreading of Backfill Material		24,515	yd3	$0.84	$20,496
	12	Compacted Embankment - Fill		22,288	yd3	$0.70	$15,686
	13	Water & Optimization Treatment for Backfill		22,288	yd3	$1.54	$34,232
	14	Loading & Trucking of Leftover Excavation Material		24,881	yd3	$9.42	$234,498
	15	Spreading of Leftover Excavation Materials		24,881	yd3	$1.85	$45,968
	16	Compacted Fill - Leftover Excavation Materials		22,619	yd3	$0.70	$15,919
	17	Optimization Moisture for Leftover Excavation Materials		22,619	yd3	$1.54	$34,740
	18	Onsite Welding, Mechanic, Misc		24	day	$775.20	$18,605
		SUBTOTAL THIS SHEET					**$29,186,893**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 85 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Canals and Conduits	
Delevan Pipeline	**WOID:** / **ESTIMATE LEVEL:**
Highway 45 Undercrossing (Jacked)	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property
Civil	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
152		**Highway 45 And Basin Undercrossing (Jacked)**					
	1	Earthwork - Mass Ex for Jacking & Receiving Pits		17,580	yd3	$6.32	$111,106
	2	Form & Place Concrete, Jacking Pit S.O.G (Excl Reinforcing)		92	yd3	$526.32	$48,421
	3	Reinforcing for Jacking Pit S.O.G. (1lb/sf)		92	yd3	$294.00	$27,048
	4	Concrete Transit Trucking		92	yd3	$23.06	$2,122
	5	Installation of TBM/Jacking Assembly		1	ls	$16,130.21	$16,130
	6	144" Pipe Jacking Installation		757	lft	$11,000.00	$8,327,000
	7	Liner Grouting, Exterior Annular Space, Pipeline		28,274	ft3	$6.63	$187,457
	8	Demolition/Disposal, Jacking Pit		5,000	ft2	$17.75	$88,739
	9	Backfill Hauling, Jacking & Receiving Pits		19,336	yd3	$1.41	$27,350
	10	Spreading of Backfill Material		19,336	yd3	$0.84	$16,166
	11	Compacted Embankment - Fill, Jacking & Receiving Pits		17,580	yd3	$0.70	$12,373
	12	Loading & Trucking of Leftover Excavation Material		4,914	yd3	$3.37	$16,571
	13	Spreading of Leftover Excavation Materials		4,914	yd3	$1.85	$9,079
	14	Compacted Fill - Leftover Excavation Materials		4,468	yd3	$0.70	$3,145
		SUBTOTAL THIS SHEET					**$8,892,705**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Melissa Wong	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
General Property	
General Property	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Electrical NODOS F **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		Recreation Areas - Sheet 1					$9,043,990
195		Recreation Areas - Sheet 2					$0
195		Recreation Areas - Sheet 3					$8,934,669
195		Operating and Maintenance Facility					$1,879,991
		Subtotal					**$19,858,649**
		Mobilization	5%	+/-			$990,000
		Subtotal with Mobilization					**$20,848,649**
		Contract Cost Allowances (Sum of):	10%	+/-			$2,151,351
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$23,000,000**
		Construction Contingencies	15%	+/-			$3,000,000
		FIELD COST					**$26,000,000**
		Non-Contract Costs	17%	+/-			$4,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$30,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$34,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
General Property
Recreation Areas
Sheet 1
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Stone Corral**					
	1	Clear and grub Stone Corral 10% of total		24	acre	$2,042.46	$47,998
	2	AC Paved Roads		310,000	ft2	$8.25	$2,556,635
	3	Gravel Roads		50,000	ft2	$6.99	$349,325
	4	Walking Trails		26,400	ft2	$2.63	$69,340
	5	Parking Lots		168,000	ft2	$7.46	$1,253,156
	6	Boat Ramp - Concrete Slab 6"		50,000	ft2	$10.04	$502,187
	7	Camp Sites with parking		100	ea	$19,646.22	$1,964,622
	8	**Picnic Sites with parking**		3	ea	$9,770.58	$29,312
	9	Electrical power to site - Overhead		10,000	ft2	$183.86	$1,838,550
	10	Light Fixtures at Parking areas		20	ea	$4,727.70	$94,554
	11	Emergency Phone		1	allow	$10,506.00	$10,506
	12	Transformer and fenced enclosure		1	allow	$26,265.00	$26,265
	13	Water well, Pump house and distribution		1	allow	$157,590.00	$157,590
	14	Kiosk		1	ea	$15,759.00	$15,759
	15	Entry gate with Structure		1	ea	$60,409.50	$60,410
	16	Vault Toilets		10	ea	$5,253.00	$52,530
	17	Signage		1	allow	$5,253.00	$5,253
	18	Interpretive elements		1	allow	$10,000.00	$10,000
		SUBTOTAL THIS SHEET					**$9,043,990**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 99 OF _ _

FEATURE:
NODOS Project
General Property
Recreation Areas
Sheet 2
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Modified Lurline**					
	1	Clear and grub Lurline 10%			acre	$2,042.46	$0
	2	AC Paved Roads			ft2	$8.25	$0
	3	Gravel Roads			ft2	$6.99	$0
	4	Walking Trails			ft2	$2.63	$0
	5	Parking Lots			ft2	$7.46	$0
	7	Camp Sites with parking			ea	$19,646.22	$0
	8	Picnic Sites with parking			ea	$9,770.58	$0
	9	Electrical power to site - Overhead			lft	$183.86	$0
	10	Light Fixtures at Parking areas			ea	$4,727.70	$0
	11	Transformer and fenced enclosure			allow	$26,265.00	$0
	12	Water well, Pump house and distribution			allow	$157,590.00	$0
	13	Entry gate with Structure			ea	$60,409.50	$0
	14	Vault Toilets			ea	$5,253.00	$0
	15	Signage			allow	$5,253.00	$0
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
General Property
Recreation Areas
Sheet 2
Electrical

PROJECT:
NODOS Alternative D

WOID:
ESTIMATE LEVEL:
REGION:
UNIT PRICE LEVEL:
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Peninsula Hills**					
	1	Clear and grub Lurline 10%		51	acre	$2,042.46	$104,166
	2	AC Paved Roads		280,000	ft2	$8.25	$2,309,219
	3	Gravel Roads		32,000	ft2	$6.99	$223,568
	4	Walking Trails		17,000	ft2	$2.63	$44,651
	5	Parking Lots		144,000	ft2	$7.46	$1,074,133
	7	Camp Sites with parking		100	ea	$19,646.22	$1,964,622
	8	Picnic Sites with parking		10	ea	$9,770.58	$97,706
	9	Electrical power to site - Overhead		15,000	lft	$183.86	$2,757,825
	10	Light Fixtures at Parking areas		12	ea	$4,727.70	$56,732
	11	Transformer and fenced enclosure		1	allow	$26,265.00	$26,265
	12	Water well, Pump house and distribution		1	allow	$157,590.00	$157,590
	13	Entry gate with Structure		1	ea	$60,409.50	$60,410
	14	Vault Toilets		10	ea	$5,253.00	$52,530
	15	Signage		1	allow	$5,253.00	$5,253
		SUBTOTAL THIS SHEET					**$8,934,669**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 100 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
General Property	
Operating Facility	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Electrical	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Operating and Maintenance Facility**					
	1	Grade Site		100,000	ft2	$3.15	$315,180
	2	Drainage		1	allow	$30,000.00	$30,000
	3	Septic structure		1	ea	$21,000.00	$21,000
	4	Well		1	ea	$31,518.00	$31,518
	5	OH Power & Data from PGP to Field Office		3,000	lft	$84.05	$252,144
	6	Site Lighting - Poles - LED		10	ea	$4,500.00	$45,000
	7	Vehicle Wash Area		1,000	ft2	$12.01	$12,010
	8	Fuel Storage & dispensing		1	allow	$50,000.00	$50,000
	9	Transformer & switchgear		1	allow	$75,000.00	$75,000
	10	Paving		80,000	ft2	$3.68	$294,168
	11	Fencing		1,300	lft	$36.00	$46,800
	12	Site signage		1	allow	$5,500.00	$5,500
	13	Metal Building		10,000	ft2	$24.00	$240,000
	14	Foundations		50	yd3	$271.42	$13,571
	15	SOG including grading, rock Vapor barrier rebar		10,000	ft2	$12.01	$120,100
	16	Office Area TI work		2,000	ft2	$45.00	$90,000
	17	Warehouse Area TI work		8,000	ft2	$16.00	$128,000
	18	Tools and Equipment (Lifts, Trolley Cranes,		1	allow	$110,000.00	$110,000
	19	Air Compressors, Etc.)					
		SUBTOTAL THIS SHEET					**$1,879,991**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 91 OF __

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Transmission and Interconnections	
Transmission and Interconnections	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Electrical **Summary Sheet**	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		Land and Rights					
175		Sites Substation					$26,245,000
175		TRR Switchyard					$7,662,113
175		Sacramento River PGP Switchyard					$6,607,900
181/183		Transmission Lines					$73,016,329
185		WAPA Substation					$7,597,119
		Estimate includes no costs associated with outside utility fees related to facility upgrades or power charges.					
		Subtotal					**$121,128,461**
		Mobilization	5%	+/-			$6,100,000
		Subtotal with Mobilization					**$127,228,461**
		Contract Cost Allowances (Sum of):	10%	+/-			$12,771,539
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$140,000,000**
		Construction Contingencies	15%	+/-			$20,000,000
		FIELD COST					**$160,000,000**
		Non-Contract Costs	17%	+/-			$30,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$190,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to December 2015)					**$220,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
Transmission and Interconnections	
Transmission Line	**WOID:** / **ESTIMATE LEVEL:**
Land and Rights	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property
Electrical	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100		**Land and Rights**					
		(Included with Delevan Pipeline)					
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

FEATURE:
NODOS Project
Transmission and Interconnections
Sites Substation
Electrical

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
175		**Sites Substation**					
	1	Clear and grub		5.0	acre	$2,042.46	$10,212
	2	Power Transformer		2.0	ea	$1,920,380.00	$3,840,760
		75 MVA, 230-13.2 KV, 3 phase					
	3	Power Transformer		1.0	ea	$1,862,768.00	$1,862,768
		60 MVA, 230-13.2 KV, 3 phase					
	4	Power Transformer		1.0	ea	$1,838,764.00	$1,838,764
		55 MVA, 230-13.2 KV, 3 phase					
	5	230kV Circuit Breakers, 1200A		12.0	ea	$631,400.00	$7,576,800
		40kA, 3 phase, SF6					
	6	230kV Disconnect Switch, 1200A		24.0	ea	$38,955.00	$934,920
		3 phase					
	7	230kV Oil filled Potential Transformer		12.0	ea	$51,870.00	$622,440
		Meter accuracy					
	8	Substation Steel		1.0	lot	$687,766.00	$687,766
	9	Surface and Below Grade Package		1.0	lot	$115,500.00	$115,500
		Fence, Rock surfacing, Conduit, Grounding, etc.					
	10	Above Grade Package		1.0	lot	$141,680.00	$141,680
		Bus, Jumpers, Fittings, etc.					
	11	Control Building w/ ancillary equipment		1.0	ea	$907,290.00	$907,290
		Control panels, HVAC, AC/DC system, etc.					
	12	Engineering / Management		1.0	lot	$1,535,100.00	$1,535,100
		Construction					
	13	Below Grade		1.0	lot	$2,397,000.00	$2,397,000
	14	Above Grade		1.0	lot	$3,315,000.00	$3,315,000
	15	VAR Support		1.0	allow	$459,000.00	$459,000
		SUBTOTAL THIS SHEET					**$26,245,000**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Transmission and Interconnections
TRR Switchyard
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
175		**TRR Switchyard**					
	1	Clear and grub		5.0	acre	$2,042.46	$10,212
	2	Power Transformer		1.0	ea	$1,837,804.00	$1,837,804
		20 MVA, 230-13.2 KV, 3 phase					
	3	Power Transformer		1.0	ea	$1,837,804.00	$1,837,804
		10 MVA, 230-13.2 KV, 3 phase					
	4	230kV Circuit Breakers, 1200A		2.0	ea	$631,400.00	$1,262,800
		40kA, 3 phase, SF6					
	5	230kV Disconnect Switch, 1200A		4.0	ea	$28,567.00	$114,268
		3 phase					
	6	230kV Disconnect Switch, 1200A		1.0	ea	$76,755.00	$76,755
		Motor operated, 3 phase					
	7	230kV Oil filled Potential Transformer		3.0	ea	$51,870.00	$155,610
		Meter accuracy					
	8	Substation Steel		1.0	lot	$159,366.00	$159,366
	9	Surface and Below Grade Package		1.0	lot	$84,700.00	$84,700
		Fence, Rock surfacing, Conduit, Grounding, etc.					
	10	Above Grade Package		1.0	lot	$36,128.40	$36,128
		Bus, Jumpers, Fittings, etc.					
	11	Control Building w/ ancillary equipment		1.0	ea	$332,265.00	$332,265
		Control panels, HVAC, AC/DC system, etc.					
	12	Engineering / Management		1.0	lot	$402,900.00	$402,900
		Construction					
	13	Below Grade		1.0	lot	$561,000.00	$561,000
	14	Above Grade		1.0	lot	$790,500.00	$790,500
		SUBTOTAL THIS SHEET					**$7,662,113**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 95 OF _ _

FEATURE:
NODOS Project
Transmission and Interconnections
Sacramento River Switchyard
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
175		**Sacramento River PGP Switchyard**					
	1	Clear and grub		5.0	acre	$2,042.46	$10,212
	2	Power Transformer		1.0	ea	$1,544,561.00	$1,544,561
		50 MVA, 230-13.2 KV, 3 phase					
	3	Power Transformer		1.0	ea	$1,543,755.00	$1,543,755
		30 MVA, 230-13.2 KV, 3 phase					
	4	230kV Circuit Breakers, 1200A		2.0	ea	$423,038.00	$846,076
		40kA, 3 phase, SF6					
	5	230kV Disconnect Switch, 1200A		3.0	ea	$17,140.00	$51,420
		3 phase					
	6	230kV Disconnect Switch, 1200A		1.0	ea	$58,023.00	$58,023
		Motor operated, 3 phase					
	7	230kV Oil filled Potential Transformer		3.0	ea	$37,865.00	$113,595
		Meter accuracy					
	8	Substation Steel		1.0	lot	$142,835.00	$142,835
	9	Surface and Below Grade Package		1.0	lot	$84,700.00	$84,700
		Fence, Rock surfacing, Conduit, Grounding, etc.					
	10	Above Grade Package		1.0	lot	$40,378.00	$40,378
		Bus, Jumpers, Fittings, etc.					
	11	Control Building w/ ancillary equipment		1.0	ea	$332,265.00	$332,265
		Control panels, HVAC, AC/DC system, etc.					
	12	Engineering / Management		1.0	lot	$488,580.00	$488,580
		Construction					
	13	Below Grade		1.0	lot	$561,000.00	$561,000
	14	Above Grade		1.0	lot	$790,500.00	$790,500
		SUBTOTAL THIS SHEET					**$6,607,900**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
Transmission and Interconnections
Transmission Lines
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
181/183		**Transmission Lines**					
	1	Clear and grub		20.0	acre	$2,042.46	$40,849
		PG&E Tap to Sites Substation					
	2	230kV, Double Circuit, Lattice Towers		2.3	mi	$5,293,500.00	$12,175,050
		Single 2156 ACSR "Bluebird" per Circuit					
	3	230kV, Single Circuit, Lattice Towers		2.3	mi	$4,345,500.00	$9,994,650
		Single 2156 ACSR "Bluebird" per Circuit					
	4	PG&E Tap 230kV, Single Circuit, Steel Dead end Structure		1.0	ea	$476,865.00	$476,865
	5	PG&E Tap230kV, Double Circuit, Steel Dead end Structure		1.0	ea	$476,865.00	$476,865
	6	Sites Switchyard to TRR Switchyard		3.5	mi	$7,477,500.00	$26,171,250
		230kV, Single Circuit, Mono-Pole					
		Single 2156 ACSR "Bluebird" per Circuit					
	7	New WAPA Substation to Delevan Switchyard		11.0	mi	$2,152,800.00	$23,680,800
		SUBTOTAL THIS SHEET					**$73,016,329**

QUANTITIES

BY	CHECKED
Anthony Quantrell	7-Oct
DATE PREPARED	**PEER REVIEW / DATE**
	Joe Barnes

PRICES

BY	CHECKED
Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**
October 2016	10/19/16

FEATURE:
NODOS Project
Transmission and Interconnections
WAPA Substation

Electrical

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**

REGION: **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]General Property

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
175		**WAPA Substation**					
	1	Clear and grub		5.0	acre	$2,042.46	$10,212
	2	Power Transformer		1.0	ea	$1,837,804.00	$1,837,804
		20 MVA, 230-115kV KV, 3 phase					
	3	230kV Circuit Breakers, 1200A		4.0	ea	$631,400.00	$2,525,600
		40kA, 3 phase, SF6					
	4	230kV Disconnect Switch, 1200A		4.0	ea	$28,567.00	$114,268
		3 phase					
	5	230kV Disconnect Switch, 1200A		2.0	ea	$76,755.00	$153,510
		Motor operated, 3 phase					
	6	230kV Oil filled Potential Transformer		3.0	ea	$51,870.00	$155,610
		Meter accuracy					
	7	115kV Circuit Breakers, 1200A		1.0	ea	$423,038.00	$423,038
		40kA, 3 phase, SF6					
	8	115kV Disconnect Switch, 1200A		1.0	ea	$17,140.00	$17,140
		3 phase					
	9	Substation Steel		1.0	lot	$145,691.70	$145,692
	10	Surface and Below Grade Package		1.0	lot	$86,394.00	$86,394
		Fence, Rock surfacing, Conduit, Grounding, etc.					
	11	Above Grade Package		1.0	lot	$41,185.56	$41,186
		Bus, Jumpers, Fittings, etc.					
	12	Control Building w/ ancillary equipment		1.0	ea	$332,265.00	$332,265
		Control panels, HVAC, AC/DC system, etc.					
	13	Engineering / Management		1.0	lot	$402,900.00	$402,900
		Construction					
	14	Below Grade		1.0	lot	$561,000.00	$561,000
	15	Above Grade		1.0	lot	$790,500.00	$790,500
		SUBTOTAL THIS SHEET					**$7,597,119**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Lou George		Lou George	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/21/16		11/22/16	

BUREAU OF RECLAMATION **ESTIMATE WORKSHEET** SHEET 97 OF __

FEATURE: NODOS Project General Property General Property	**PROJECT:** NODOS Alternative D
	WOID: / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Electrical NODOS F Summary Sheet	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		Recreation Areas - Sheet 1					$9,043,990
195		Recreation Areas - Sheet 2					$0
195		Recreation Areas - Sheet 3					$8,934,669
195		Operating and Maintenance Facility					$1,879,991
		Subtotal					**$19,858,649**
		Mobilization	5%	+/-			$990,000
		Subtotal with Mobilization					**$20,848,649**
		Contract Cost Allowances (Sum of):	10%	+/-			$2,151,351
		Design Contingencies, 10 % (+/-)					
		APS, 0 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$23,000,000**
		Construction Contingencies	15%	+/-			$3,000,000
		FIELD COST					**$26,000,000**
		Non-Contract Costs	17%	+/-			$4,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$30,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year for	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$34,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
NODOS Project
General Property
Recreation Areas
Sheet 1
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Stone Corral**					
	1	Clear and grub Stone Corral 10% of total		24	acre	$2,042.46	$47,998
	2	AC Paved Roads		310,000	ft2	$8.25	$2,556,635
	3	Gravel Roads		50,000	ft2	$6.99	$349,325
	4	Walking Trails		26,400	ft2	$2.63	$69,340
	5	Parking Lots		168,000	ft2	$7.46	$1,253,156
	6	Boat Ramp - Concrete Slab 6"		50,000	ft2	$10.04	$502,187
	7	Camp Sites with parking		100	ea	$19,646.22	$1,964,622
	8	**Picnic Sites with parking**		3	ea	$9,770.58	$29,312
	9	Electrical power to site - Overhead		10,000	ft2	$183.86	$1,838,550
	10	Light Fixtures at Parking areas		20	ea	$4,727.70	$94,554
	11	Emergency Phone		1	allow	$10,506.00	$10,506
	12	Transformer and fenced enclosure		1	allow	$26,265.00	$26,265
	13	Water well, Pump house and distribution		1	allow	$157,590.00	$157,590
	14	Kiosk		1	ea	$15,759.00	$15,759
	15	Entry gate with Structure		1	ea	$60,409.50	$60,410
	16	Vault Toilets		10	ea	$5,253.00	$52,530
	17	Signage		1	allow	$5,253.00	$5,253
	18	Interpretive elements		1	allow	$10,000.00	$10,000
		SUBTOTAL THIS SHEET					**$9,043,990**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 99 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
General Property	
Recreation Areas	**WOID:** / **ESTIMATE LEVEL:**
Sheet 2	**REGION:** / **UNIT PRICE LEVEL:**
	FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation
Electrical	

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Modified Lurline**					
	1	Clear and grub Lurline 10%			acre	$2,042.46	$0
	2	AC Paved Roads			ft2	$8.25	$0
	3	Gravel Roads			ft2	$6.99	$0
	4	Walking Trails			ft2	$2.63	$0
	5	Parking Lots			ft2	$7.46	$0
	7	Camp Sites with parking			ea	$19,646.22	$0
	8	Picnic Sites with parking			ea	$9,770.58	$0
	9	Electrical power to site - Overhead			lft	$183.86	$0
	10	Light Fixtures at Parking areas			ea	$4,727.70	$0
	11	Transformer and fenced enclosure			allow	$26,265.00	$0
	12	Water well, Pump house and distribution			allow	$157,590.00	$0
	13	Entry gate with Structure			ea	$60,409.50	$0
	14	Vault Toilets			ea	$5,253.00	$0
	15	Signage			allow	$5,253.00	$0
		SUBTOTAL THIS SHEET					**$0**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 99 OF _ _

FEATURE:
NODOS Project
General Property
Recreation Areas
Sheet 2
Electrical

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Peninsula Hills**					
	1	Clear and grub Lurline 10%		51	acre	$2,042.46	$104,166
	2	AC Paved Roads		280,000	ft2	$8.25	$2,309,219
	3	Gravel Roads		32,000	ft2	$6.99	$223,568
	4	Walking Trails		17,000	ft2	$2.63	$44,651
	5	Parking Lots		144,000	ft2	$7.46	$1,074,133
	7	Camp Sites with parking		100	ea	$19,646.22	$1,964,622
	8	Picnic Sites with parking		10	ea	$9,770.58	$97,706
	9	Electrical power to site - Overhead		15,000	lft	$183.86	$2,757,825
	10	Light Fixtures at Parking areas		12	ea	$4,727.70	$56,732
	11	Transformer and fenced enclosure		1	allow	$26,265.00	$26,265
	12	Water well, Pump house and distribution		1	allow	$157,590.00	$157,590
	13	Entry gate with Structure		1	ea	$60,409.50	$60,410
	14	Vault Toilets		10	ea	$5,253.00	$52,530
	15	Signage		1	allow	$5,253.00	$5,253
		SUBTOTAL THIS SHEET					**$8,934,669**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

SHEET 100 OF _ _

FEATURE:	**PROJECT:**
NODOS Project	**NODOS Alternative D**
General Property	
Operating Facility	**WOID:** / **ESTIMATE LEVEL:**
	REGION: / **UNIT PRICE LEVEL:**
Electrical	**FILE:** G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
195		**Operating and Maintenance Facility**					
	1	Grade Site		100,000	ft2	$3.15	$315,180
	2	Drainage		1	allow	$30,000.00	$30,000
	3	Septic structure		1	ea	$21,000.00	$21,000
	4	Well		1	ea	$31,518.00	$31,518
	5	OH Power & Data from PGP to Field Office		3,000	lft	$84.05	$252,144
	6	Site Lighting - Poles - LED		10	ea	$4,500.00	$45,000
	7	Vehicle Wash Area		1,000	ft2	$12.01	$12,010
	8	Fuel Storage & dispensing		1	allow	$50,000.00	$50,000
	9	Transformer & switchgear		1	allow	$75,000.00	$75,000
	10	Paving		80,000	ft2	$3.68	$294,168
	11	Fencing		1,300	lft	$36.00	$46,800
	12	Site signage		1	allow	$5,500.00	$5,500
	13	Metal Building		10,000	ft2	$24.00	$240,000
	14	Foundations		50	yd3	$271.42	$13,571
	15	SOG including grading, rock Vapor barrier rebar		10,000	ft2	$12.01	$120,100
	16	Office Area TI work		2,000	ft2	$45.00	$90,000
	17	Warehouse Area TI work		8,000	ft2	$16.00	$128,000
	18	Tools and Equipment (Lifts, Trolley Cranes,		1	allow	$110,000.00	$110,000
	19	Air Compressors, Etc.)					
		SUBTOTAL THIS SHEET					**$1,879,991**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Anthony Quantrell	7-Oct	Mike Egge	Joe Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
	Joe Barnes	October 2016	10/19/16

SITES RESERVOIR JOINT POWERS AUTHORITY

ESTIMATE WORKSHEET

101

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

Summary Sheet

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Surface Water Quality					$1,510,108
		Aquatic Resources					$46,487,500
		Botanical Resources					$75,033,200
		Wildlife Habitat					$43,753,900
		Wetlands Habitat					$66,540,000
		Cultural Resources					$27,690,000
		Land Use					$25,789,375
		Paleontology					$1,210,000
		Air Quality					$150,000
		Subtotal					**$288,164,083**
		Mobilization	2%	+/-			$5,800,000
		Subtotal with Mobilization					**$293,964,083**
		Contract Cost Allowances (Sum of):	13%	+/-			$36,035,917
		Design Contingencies, 12 % (+/-)					
		APS, 1 % (+/-). Type of procurement: Full and open sealed bid competition					
		CONTRACT COST					**$330,000,000**
		Construction Contingencies	2%	+/-			$10,000,000
		FIELD COST					**$340,000,000**
		Non-Contract Costs	4%	+/-			$10,000,000
		CONSTRUCTION COST (Unit Price Level December 2015)					**$350,000,000**
		Escalation to Notice to Proceed (NTP) *(separate calculation not included here)*					
		at	2.0%	per year fo	7.00	years	
		CONSTRUCTION COST (with Escalation to NTP)					**$400,000,000**
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Loren Murray	Anthony Quintrall	Loren Murray	Joseph Barnes
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
5/26/2016		December-16	01/00/00

SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET**

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Surface Water Quality

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Surface Water Quality					
	1	*SWQual-1a*	SWQ	1.0	ea	$1,500,000.00	$1,500,000
		SWQual-1b	SWQ				
	2	Clear & Grub		1.0	ea	$5,000.00	$5,000
	3	Earthwork - excavate around springs (est. 3 springs)		50.0	yd3	$3.27	$164
	4	Grout Injection (est. 3.33 yd3 per spring)		10.0	yd3	$100.00	$1,000
	5	Concrete Transit Trucking		60.0	yd3	$22.71	$1,363
	6	Backfill, Concrete site capping		50.0	yd3	$50.00	$2,500
	7	Spreading/compaction - excavated materials		100.0	yd3	$0.82	$82
		SUBTOTAL THIS SHEET					**$1,510,108**

QUANTITIES		**PRICES**	
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SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET** 0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Aquatic Resources

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
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FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Aquatic Resources					
		Fish-1e	AR				
	1	Land Acquisition - Fee Title	AR	681.0	acre	$2,500.00	$1,702,500
	2	Riparian Restoration	AR	681.0	acre	$65,000.00	$44,265,000
		Fish-1h					
	3	Fish salvage and rescue plan	AR	1.0	ea	$20,000.00	$20,000
	4	Fish salvage and rescue implementation	AR	1.0	ea.	$500,000.00	$500,000
		SUBTOTAL THIS SHEET					**$46,487,500**

QUANTITIES		**PRICES**	
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SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET** 0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Botanical Resources

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Vegetation Communities					
		Bot-1[x]; Bot-2[x]; Bot-3[x]					
	1	Annual grasslands, permanent (2:1)		27,391.4	acre	$2,500.00	$68,478,500
	2	Blue oak woodlands, permanent (1:1)		478.6	acre	$3,000.00	$1,435,800
	3	Blue oak mixed chaparral, perm. (1:1)		33.40	acre	$3,000.00	$100,200
	4	Canal, permanent (1:1)		1.0	acre	$20,000.00	$20,000
	5	Valley oak woodland, permanent (3:1)		10.5	acre	$3,000.00	$31,500
	6	*Bot-1b*					
		Watershed Hydrological Studies (alkaline wetlands)		1.0	LS	$300,000.00	$300,000
		Bot-1d					
		Watershed Hydrological Studies (groundwater pressure)		1.0	LS	$300,000.00	$300,000
		Bot-2a					
		Sidalcea keckii and Amsinckia lunaris Surveys		2250.0	days	$1,600.00	$3,600,000
		Bot-2c					
		Rare Alkaline Wetland Species Surveys		7.0	days	$1,600.00	$11,200
		Bot-2d					
		Special-Status Plant Species Surveys		472.5	days	$1,600.00	$756,000
		SUBTOTAL THIS SHEET					**$75,033,200**

QUANTITIES		PRICES	
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SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET** **0**

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Wildlife Habitat

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Wild-1[x]; Wild-2[x]					
	1	Blue oak woodland (GE; SH; WSF)(4:1)	Wild-2	3550.0	acre	$3,000.00	$10,650,000
	2	Deciduous orchard (GGS)	Wild-2c	46.2	acre	$4,500.00	$207,900
	3	Dryland grain and seed crops (SH)(0.5:1)	Wild-1a	166.6	acre	$2,000.00	$333,200
	4	Irrigated row and field crops (SH)(0.5:1)	Wild-1a	77.8	acre	$2,500.00	$194,500
	5	Pasture (GSC; FH; BO; WTK)(1:1)		72.7	acre	$4,500.00	$327,150
	6	Rice (GGS)(3:1 perm ac./ 1:1 temp ac.)	Wild-2c	1752.7	acre	$4,500.00	$7,887,150
	7	Valley foothill riparian (3:1) (GGS; VELB		334.6	acre	$3,000.00	$1,003,800
		CTS; BE; SH; WYBC; VRI; WPT; RT)					
	8	Blue Oak woodland/mixed (*Bot-[x]*)	Bot-2a	52.0	acre	$3,000.00	$156,000
	9	*Wild-1b* Implement bat exclusion measures	Wild-1b	18.0	days	$1,600.00	$28,800
	9	*Wild-2b* Bald eagle nest removal	Wild-2b	3.0	Nest	$11,960.00	$35,880
		Wild-2d					
	10	Golden eagle pre-/post-construction	Wild-2d	7.0	Years	$290,000.00	$2,030,000
		satellite telemetry studies					
	11	Golden Eagle Monitoring Plan	Wild-2d	1.0	LS	$150,000.00	$150,000
	12	Golden eagle Protection Plan	Wild-2d	1.0	LS	$150,000.00	$150,000
	13	Independent Expert (Pete Bloom)	Wild-2d	1.0	LS	$120,000.00	$120,000
	14	Helicopter survey - nesting population	Wild-2d	4.0	Survey	$10,800.00	$43,200
	15	Helicopter detraction actions	Wild-2d	3.0	Nest	$17,940.00	$53,820
		Wild-2g					
	16	Pre-constr survey western burrowing owls	Wild-2g	16500.0	acre	$200.00	$3,300,000
		Wild-2h					
	17	Pre-constr survey western pond turtle	Wild-2h	1712.5	acre	$200.00	$342,500
		Wild-4					
	18	Awareness training (human disturbance)	Wild-4	1.0	LS	$100,000.00	$100,000
	19	Pre-constr surveys /monitoring during	Wild-4	10.0	Year	$1,664,000.00	$16,640,000
		construction					
		SUBTOTAL THIS SHEET					**$43,753,900**

QUANTITIES		**PRICES**	
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SITES RESERVOIR JOINT POWERS AUTHORITY

ESTIMATE WORKSHEET

0

FEATURE:

NODOS Project

Project Mitigation and Monitoring Plan

Resource Category Cost Estimates

Wetlands Habitat

PROJECT:

NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**

REGION: | **UNIT PRICE LEVEL:**

FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Wet-1[x]					
	1	Alkaline wetlands (2:1; onsite)		74.0	acre	$150,000.00	$11,100,000
	2	Emergent wetlands (3:1; offsite)		7.2	acre	$100,000.00	$720,000
	3	Seasonal wetlands (3:1)		547.2	acre	$100,000.00	$54,720,000
		SUBTOTAL THIS SHEET					**$66,540,000**

QUANTITIES

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05/26/16	01/00/00

PRICES

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SITES RESERVOIR JOINT POWERS AUTHORITY

ESTIMATE WORKSHEET

0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Cultural Resources

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Cultural Resources					
		Cul-1a					
	1	Remaining surveys for avoidance	Cul-1a	1000.0	acre	$40.00	$40,000
		Complete desktop evaluations	Cul-1a	1.0	LS	$100,000.00	$100,000
		Cul-1b					
		Conduct Archeological Recovery	Cul-1b				
	2	Ethnographic Studies/Inventory	Cul-1b	1.0	LS	$250,000.00	$250,000
	3	Evaluation of NRHP/CRHR eligib	Cul-1b	10.0	sites	$250,000.00	$2,500,000
	4	Test Pitting, excavation and exam.	Cul-1b	1.0	LS	$100,000.00	$100,000
	5	Preparation and Curation	Cul-1b	1000.0	boxes	$5,000.00	$5,000,000
		Cul-1c					
	6	Resources discovery during Construction	Cul-1c	10.0	ea.	$400,000.00	$4,000,000
		Cul-1e					
	7	Future Operational Impacts Agreements	Cul-1e	1.0	LS	$200,000.00	$200,000
		Cul-2a					
	8	Properties/Resources Treatment	Cul-2a	1.0	LS	$1,000,000.00	$1,000,000
		Cul-2b					
	9	HABS/HAER Documentation	Cul-2b	1.0	LS	$1,000,000.00	$1,000,000
		Cul-3					
	10	Tribal Consultation for impacts to TCPs	Cul-3	4.0	Tribes	$500,000.00	$2,000,000
		Cul-4a					
	11	Relocations of known cemeteries	Cul-4a	250.0	Persons	$4,000.00	$1,000,000
	12	Midden grave site (unofficial cemetery)	Cul-4a	1.0	LS	$10,000,000.00	$10,000,000
		Cul-4b					
	13	Human remains discovery/treatment	Cul-4b	100.0	Persons	$5,000.00	$500,000
		SUBTOTAL THIS SHEET					**$27,690,000**

QUANTITIES		PRICES	
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SITES RESERVOIR JOINT POWERS AUTHORITY

ESTIMATE WORKSHEET

0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Land and Agriculture

PROJECT:
NODOS Alternative D

WOID: | **ESTIMATE LEVEL:**
REGION: | **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Land and Agriculture					
		Land-2a					
	1	Glenn County Coordination		1.0	LS	$50,000.00	$50,000
		Land-2b					
	2	Wetlands easement cancellation and		21.0	acre	$150,000.00	$3,150,000
		compensatory mitigation (3:1)					
		Land-3b					
	3	Maxwell Irrigation District Agreements		1.0	LS	$50,000.00	$50,000
		Land-4a					
	4	Agricultural conservations easements		1.0	LS	$5,000,000.00	$5,000,000
		FMMP Mitigation (1:1)		2,500.0	acre	$5,000.00	$12,500,000
		(in Glenn and Colusa County)					
		Land-5c					
	5	Williamson Act contracts rescinded		16,126.0	acre	$312.50	$5,039,375
		(12.5% of value; value avg. at $2500/ac.)					$0
		SUBTOTAL THIS SHEET					**$25,789,375**

QUANTITIES		PRICES	
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SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET** 0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Resource Category Cost Estimates
Paleontology

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Paleontology					
		Paleo-1b					
	1	Paleontological Resource Specialist		1.0	LS	$350,000.00	$350,000
		pre-construction consultation					
		Paleo-1c					
	2	Implement Paleontological Resources		1.0	LS	$200,000.00	$200,000
		Monitoring/Mitigation Plan					
		Paleo-1d					
	3	Paleontological Resources Awareness		1.0	LS	$100,000.00	$100,000
		Training					
		Paleo-1e					
	4	Monitoring during Construction and		8.0	Year	$50,000.00	$400,000
		monthly reporting					
		Paleo-1f					
	5	Ensure Monitoring & Mitigation		8.0	Year	$20,000.00	$160,000
		implementation plan					
		SUBTOTAL THIS SHEET					**$1,210,000**

QUANTITIES		**PRICES**	
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SITES RESERVOIR JOINT POWERS AUTHORITY **ESTIMATE WORKSHEET** 0

FEATURE:
NODOS Project
Project Mitigation and Monitoring Plan
Air Quality

PROJECT:
NODOS Alternative D

WOID: **ESTIMATE LEVEL:**
REGION: **UNIT PRICE LEVEL:**
FILE: G:\US Bureau of Rec\GSA NODOS\Project Files\WORKING\Cost Estimating 2016\20170216 BOE Final\Estimates\[Red Bluff Alt D Sites Reservoir 05052017.xlsx]Mitigation

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Air Quality Impacts					
		Air Qual - 1a					
	1	Fugitive Dust Control Plan		1.0	LS	$100,000.00	$100,000
		Air Qual - 1b					
	2	Equipment/Vehicle Emissions Reduction		10.0	year	$5,000.00	$50,000
		SUBTOTAL THIS SHEET					**$150,000**

QUANTITIES

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05/26/16	01/00/00

PRICES

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Loren Murray	Joseph Barnes
DATE PREPARED	**PEER REVIEW / DATE**
Dec-16	01/00/00

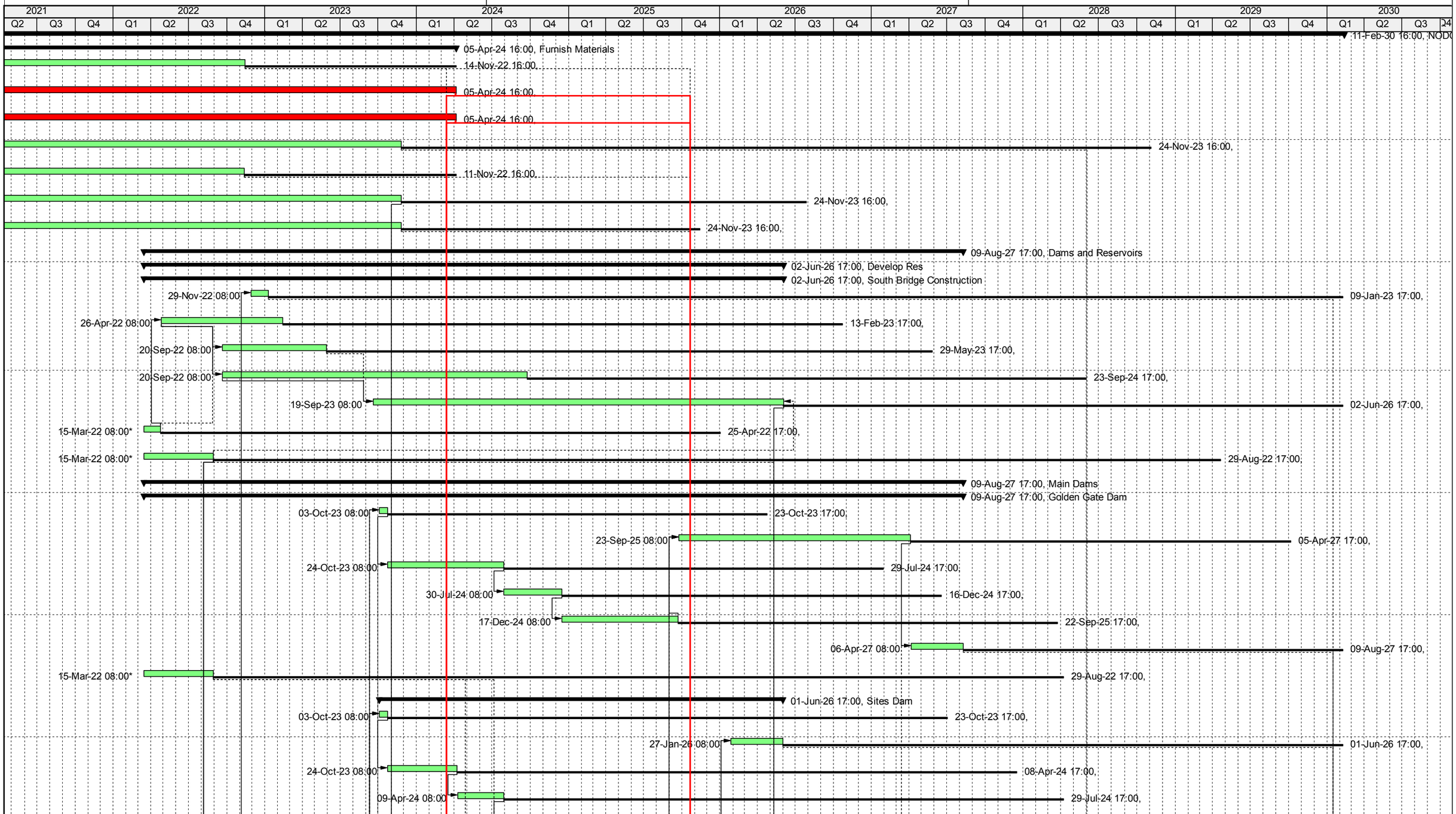
APPENDIX B

PRELIMINARY CONSTRUCTION SCHEDULE

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
1	NODOS_Sites Reservoir_Ver2				3369	15-Mar-17 08:0	11-Feb-30 16:00	0	0
2	Furnish Materials				1095	27-Jan-20 08:0	05-Apr-24 16:00	1195	0
3	A390	Furnish Air Chambers		A1720, A1790	731	27-Jan-20 08:00*	14-Nov-22 16:00	364	364
4	A370	Furnish Ball Valves		A1720, A1790	1095	27-Jan-20 08:00*	05-Apr-24 16:00	0	0
5	A380	Furnish Butterfly Valves		A1720, A1790	1095	27-Jan-20 08:00*	05-Apr-24 16:00	0	0
6	A420	Furnish Kaplan Turbine/Generators		A1420	1000	27-Jan-20 08:00*	24-Nov-23 16:00	1290	1196
7	A360	Furnish Bridge Cranes		A1720, A1790	730	27-Jan-20 08:00*	11-Nov-22 16:00	365	365
8	A440	Furnish TRR Pumps & Motors		A1611	1000	27-Jan-20 08:00*	24-Nov-23 16:00	696	0
9	A430	Furnish Sac. River Pumps & Motors		A1790	1000	27-Jan-20 08:00*	24-Nov-23 16:00	515	515
10	Dams and Reservoirs				1410	15-Mar-22 08:0	09-Aug-27 17:00	655	0
11	Develop Res				1101	15-Mar-22 08:0	02-Jun-26 17:00	963	0
12	South Bridge Construction				1101	15-Mar-22 08:0	02-Jun-26 17:00	963	0
13	A1980	Demolition & clear & grub within reservoir	A1230	A2240	30	29-Nov-22 08:00	09-Jan-23 17:00	1849	1849
14	A1370	Construct Bridge Foundations	A1360	A1380, A2260	210	26-Apr-22 08:00	13-Feb-23 17:00	963	0
15	A2260	Construct Bridge Abutments	A1360, A1370	A1390	180	20-Sep-22 08:00	29-May-23 17:00	1043	80
16	A1380	Construct Bridge Piers	A1370	A1390	525	20-Sep-22 08:00	23-Sep-24 17:00	963	0
17	A1390	Construct Bridge Deck	A1380, A2260,	A2220	706	19-Sep-23 08:00	02-Jun-26 17:00	963	0
18	A1360	Construct access road to bridge piers & abutments		A2260, A1370	30	15-Mar-22 08:00*	25-Apr-22 17:00	963	0
19	A1820	Access road to bridge - West side		A2220, A1390,	120	15-Mar-22 08:00*	29-Aug-22 17:00	1734	0
20	Main Dams				1410	15-Mar-22 08:0	09-Aug-27 17:00	655	0
21	Golden Gate Dam				1410	15-Mar-22 08:0	09-Aug-27 17:00	654	0
22	A1880	Clear/Grub/remove overburden	A1250, A1330	A1890	15	03-Oct-23 08:00	23-Oct-23 17:00	654	0
23	A1910B	Golden Gate Dam Fill - Core and Shell above grade	A1560A, A1560D,	A1920	400	23-Sep-25 08:00	05-Apr-27 17:00	654	0
24	A1890	Excavate Golden Gate Key	A1880, A1560A	A1900	200	24-Oct-23 08:00	29-Jul-24 17:00	654	0
25	A1900	Grout Foundation at Golden Gate Dam	A1890	A1910A	100	30-Jul-24 08:00	16-Dec-24 17:00	654	0
26	A1910A	Golden Gate Dam Fill - Fill to grade	A1900	A1910B	200	17-Dec-24 08:00	22-Sep-25 17:00	654	0
27	A1920	Spillway at Golden Gate Dam	A1910B, A1840	A2240	90	06-Apr-27 08:00	09-Aug-27 17:00	654	654
28	A1990	Activate Stoney Creek quarry		A1870, A1960A	120	15-Mar-22 08:00*	29-Aug-22 17:00	1464	451
29	Sites Dam				695	03-Oct-23 08:00	01-Jun-26 17:00	964	0
30	A1930	Clear/Grub/remove overburden	A1050, A1240,	A1940	15	03-Oct-23 08:00	23-Oct-23 17:00	964	0
31	A1970	Spillway at Sites Dam	A1850, A1960B	A2240	90	27-Jan-26 08:00	01-Jun-26 17:00	964	964
32	A1940	Excavate Sites Dam key	A1930	A1950	120	24-Oct-23 08:00	08-Apr-24 17:00	964	0
33	A1950	Grout Foundation at Sites Dam	A1940	A1960A	80	09-Apr-24 08:00	29-Jul-24 17:00	964	0

Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

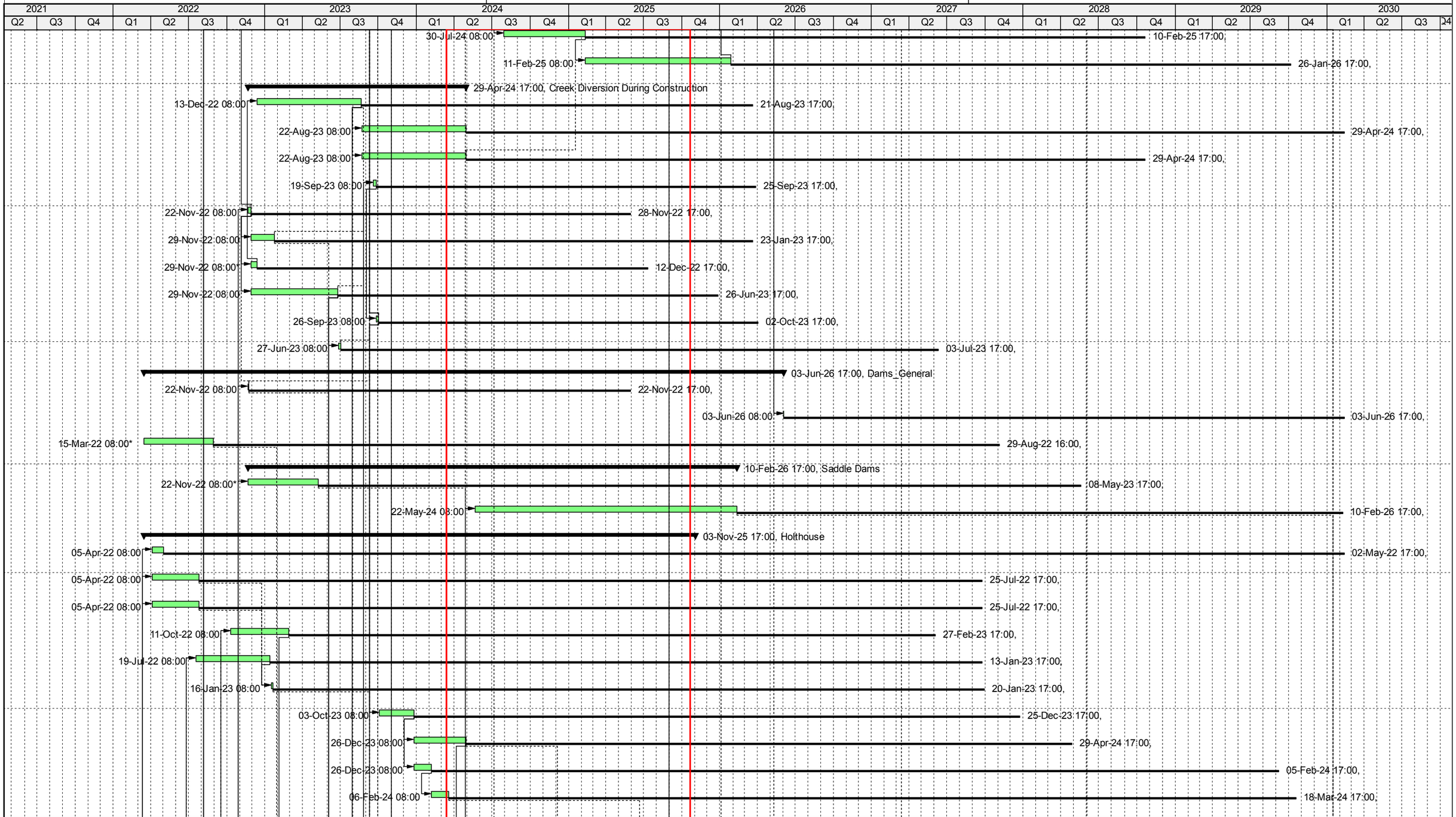
TASK filter: All Activities



Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
34	A1960A	Sites Dam Fill - Fill to grade	A1950, A1990,	A1960B	140	30-Jul-24 08:00	10-Feb-25 17:00	964	0
35	A1960B	Sites Dam Fill - Core and Shell above grade	A1960A, A1030	A1970	250	11-Feb-25 08:00	26-Jan-26 17:00	964	0
36	Creek Diversion During Construction				375	22-Nov-22 08:(	29-Apr-24 17:00	1510	0
37	A1010	Excavate Channel	A1000	A1020, A1030,	180	13-Dec-22 08:00	21-Aug-23 17:00	674	0
38	A1020	Move topsoil to designated location	A1010		180	22-Aug-23 08:00	29-Apr-24 17:00	1510	1510
39	A1030	Move material to Sites Dam as stockpile	A1010	A1960B	180	22-Aug-23 08:00	29-Apr-24 17:00	1169	205
40	A1320	Block downstream flow of Funk's Creek	A1010, A2250,	A1330	5	19-Sep-23 08:00	25-Sep-23 17:00	654	0
41	A1230	Residents move from Valley	A1210	A2250, A1980,	5	22-Nov-22 08:00	28-Nov-22 17:00	654	0
42	A1060	Prepare two creek diversion intercept at tunnel top	A1230	A1320, A1350	40	29-Nov-22 08:00	23-Jan-23 17:00	824	110
43	A1000	Clear & Grub as required for Diversion	A1230	A1010	10	29-Nov-22 08:00*	12-Dec-22 17:00	674	0
44	A2250	Dig diversion tunnel at Sites	A1230, A1240	A1040, A1050,	150	29-Nov-22 08:00	26-Jun-23 17:00	654	0
45	A1330	Divert Funk's Creek flow into diversion channel	A1320	A1130, A1880,	5	26-Sep-23 08:00	02-Oct-23 17:00	654	0
46	A1350	Divert Antelope Creek flow to short channel & tunnel	A2250, A1060	A1930	5	27-Jun-23 08:00	03-Jul-23 17:00	1029	65
47	Dams_General				1102	15-Mar-22 08:(	03-Jun-26 17:00	963	0
48	A1240	Close Sites Road, All traffic diverted	A1220	A2250, A1050,	1	22-Nov-22 08:00	22-Nov-22 17:00	658	4
49	A2220	Route traffic to new bridge	A1390, A1820,		1	03-Jun-26 08:00	03-Jun-26 17:00	963	963
50	A540	Develop Quarry Sites		A1459	120	15-Mar-22 08:00*	29-Aug-22 16:00	1354	126
51	Saddle Dams				841	22-Nov-22 08:(	10-Feb-26 17:00	1043	0
52	A1855	New Saddle Dam Road off North Road	A1210	A1870	120	22-Nov-22 08:00*	08-May-23 17:00	1314	271
53	A1870	Construct Saddle Dams 1 - 9	A1990, A1560C,	A2240	450	22-May-24 08:00	10-Feb-26 17:00	1043	1043
54	Holthouse				950	15-Mar-22 08:(	03-Nov-25 17:00	1115	0
55	A1080	Move topsoil to designated location	A1070		20	05-Apr-22 08:00	02-May-22 17:00	2030	2030
56	A1090	Construct upper intercept for bypass	A1070	A1120	80	05-Apr-22 08:00	25-Jul-22 17:00	1348	124
57	A1100	Construct lower Canal dissipation & inflow structure	A1070	A1120	80	05-Apr-22 08:00	25-Jul-22 17:00	1348	124
58	A1460	Excavate Trench for Holthouse foundation	A1070, A1450	A1470	100	11-Oct-22 08:00	27-Feb-23 17:00	1114	0
59	A1110	Install bypass pipeline	A1070, A1458	A1120	129	19-Jul-22 08:00	13-Jan-23 17:00	1224	0
60	A1120	Divert TCC flow to bypass	A1090, A1100,	A1130	5	16-Jan-23 08:00	20-Jan-23 17:00	1224	181
61	A1130	Drain Funks Reservoir	A1120, A1330	A1140, A1170	60	03-Oct-23 08:00	25-Dec-23 17:00	1043	0
62	A1170	Allow drying and move sediment	A1130	A1180, A1550	90	26-Dec-23 08:00	29-Apr-24 17:00	1043	0
63	A1140	Remove Gates at Funk's Spillway	A1130	A1141	30	26-Dec-23 08:00	05-Feb-24 17:00	1459	0
64	A1141	Demolish Existing Funks Dam and move material to Holdhouse - as REQ	A1140	A1580	30	06-Feb-24 08:00	18-Mar-24 17:00	1459	345



TASK filter: All Activities

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
65	A1180	Compact sediment in new location (to West)	A1160, A1170		40	30-Apr-24 08:00	24-Jun-24 17:00	1470	1470
66	A1470	Grout Rock at Holthouse foundation	A1460	A1480, A1490	80	28-Feb-23 08:00	19-Jun-23 17:00	1114	0
67	A1480	Build Houlthouse foundation to grade	A1470	A1530	80	20-Jun-23 08:00	09-Oct-23 17:00	1184	70
68	A1490	Lay pipelines under Holthouse dam shoulder	A1470	A1500, A1510,	30	20-Jun-23 08:00	31-Jul-23 17:00	1114	0
69	A1530	Earth fill above grade for Holthouse	A1480, A1500,	A1540	200	16-Jan-24 08:00	21-Oct-24 17:00	1114	0
70	A1500	Construct concrete I/O inside Holthouse	A1490	A1530	50	01-Aug-23 08:00	09-Oct-23 17:00	1184	70
71	A1510	Construct Gate base at Holthouse abutment	A1490	A1520, A1530	50	01-Aug-23 08:00	09-Oct-23 17:00	1114	0
72	A1520	Construct vertical gate control structure	A1510	A1530	70	10-Oct-23 08:00	15-Jan-24 17:00	1114	0
73	A1540	Construct Holthouse Spillway	A1530	A1541	120	22-Oct-24 08:00	07-Apr-25 17:00	1114	0
74	A1541	Install Holthouse Gates	A1540	A2280, A1121	65	08-Apr-25 08:00	07-Jul-25 17:00	1114	0
75	A1121	Restore TC Canal flow	A1541	A1580	2	08-Jul-25 08:00	09-Jul-25 17:00	1117	3
76	A2280	Open TC Canal Gates & close TC Canal bypass	A1541	A1580	5	08-Jul-25 08:00	14-Jul-25 17:00	1114	0
77	A1580	Fill Holdhouse Reservoir	A2280, A1141,	A2240	80	15-Jul-25 08:00	03-Nov-25 17:00	1114	1114
78	A1459	Stockpile Holthouse Dam Material	A540, A1458,	A1530	120	22-Feb-23 08:00	08-Aug-23 17:00	1228	114
79	A1160	Clear/Grade/Bench sediment disposal site		A1180	15	15-Mar-22 08:00*	04-Apr-22 17:00	2010	540
80	A1070	Clear & Grub for Bypass AND Holthouse footprint		A1080, A1090,	15	15-Mar-22 08:00*	04-Apr-22 17:00	1249	0
81	A1458	Develop/Improve road to Holthouse		A1459, A1110	90	15-Mar-22 08:00*	18-Jul-22 17:00	1224	0
82	Relocate WAPA Transmission Line				150	15-Mar-22 08:(	10-Oct-22 17:00	0	0
83	A1450	Relocate WAPA Lines at Holthouse Dam		A1460	150	15-Mar-22 08:00*	10-Oct-22 17:00	0	0
84	TRR Res				530	26-Apr-22 08:00	06-May-24 17:00	1474	0
85	A1600	Construct TRR Reservoir pond & embankment	A1590	A1620, A1630	365	26-Apr-22 08:00	18-Sep-23 17:00	1474	0
86	A1630	Break into GCC & Fill TRR	A1620, A1600	A2130	15	16-Apr-24 08:00	06-May-24 17:00	1474	935
87	A1620	Connection structure - TRR to GCC canal	A1680, A1600	A1630	150	19-Sep-23 08:00	15-Apr-24 17:00	1474	0
88	Canals and Conduits				1175	15-Mar-22 08:(	14-Sep-26 17:00	859	0
89	Delevan				1175	15-Mar-22 08:(	14-Sep-26 17:00	859	0
90	A1690	Pipeline Sacramento River to I-5	A1650, A1660,	A2140	875	09-May-23 08:00	14-Sep-26 17:00	859	859
91	A1700	Pipeline I-5 to TRR	A1650, A1670	A2140	240	09-May-23 08:00	08-Apr-24 17:00	1494	1494
92	A1640	Colusa Basin Drain Jack & Bore		A1690	130	15-Mar-22 08:00*	12-Sep-22 17:00	1029	170
93	A1650	Pipeline Jack & Bore at I-5 & 99		A1690, A1700	300	15-Mar-22 08:00*	08-May-23 17:00	859	0
94	A1660	Pipeline Jack & Bore at Hwy 45		A1690, A1720	130	15-Mar-22 08:00*	12-Sep-22 17:00	409	170
95	A1670	Pipeline Jack & Bore at PG&E gas line		A1700	130	15-Mar-22 08:00*	12-Sep-22 17:00	1664	170

Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030

Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4

30-Apr-24 08:00 — 24-Jun-24 17:00,
28-Feb-23 08:00 — 19-Jun-23 17:00,
20-Jun-23 08:00 — 09-Oct-23 17:00,
20-Jun-23 08:00 — 31-Jul-23 17:00,
16-Jan-24 08:00 — 21-Oct-24 17:00,
01-Aug-23 08:00 — 09-Oct-23 17:00,
01-Aug-23 08:00 — 09-Oct-23 17:00,
10-Oct-23 08:00 — 15-Jan-24 17:00,
22-Oct-24 08:00 — 07-Apr-25 17:00,
08-Apr-25 08:00 — 07-Jul-25 17:00,
08-Jul-25 08:00 — 09-Jul-25 17:00,
08-Jul-25 08:00 — 14-Jul-25 17:00,
15-Jul-25 08:00 — 03-Nov-25 17:00,
22-Feb-23 08:00 — 08-Aug-23 17:00,
15-Mar-22 08:00* — 04-Apr-22 17:00,
15-Mar-22 08:00* — 04-Apr-22 17:00,
15-Mar-22 08:00* — 18-Jul-22 17:00,
10-Oct-22 17:00, Relocate WAPA Transmission Line
15-Mar-22 08:00* — 10-Oct-22 17:00,
06-May-24 17:00, TRR Res
26-Apr-22 08:00 — 18-Sep-23 17:00,
16-Apr-24 08:00 — 06-May-24 17:00,
19-Sep-23 08:00 — 15-Apr-24 17:00,
14-Sep-26 17:00, Canals and Conduits
14-Sep-26 17:00, Delevan
09-May-23 08:00 — 14-Sep-26 17:00,
09-May-23 08:00 — 08-Apr-24 17:00,
15-Mar-22 08:00* — 12-Sep-22 17:00,
15-Mar-22 08:00* — 08-May-23 17:00,
15-Mar-22 08:00* — 12-Sep-22 17:00,
15-Mar-22 08:00* — 12-Sep-22 17:00,

Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
96	TRR				800	15-Mar-22 08:0	07-Apr-25 17:00	1234	0
97	A1710	Pipeline GCC to Holthouse	A1680, A1490	A2130, A2140	600	20-Dec-22 08:00	07-Apr-25 17:00	1234	695
98	A1680	Pipeline Jack & Bore at GCC		A1710, A1620	200	15-Mar-22 08:00*	19-Dec-22 17:00	1234	0
99	Pumping and Generating Plants				2064	15-Mar-22 08:0	08-Feb-30 16:00	1	0
100	IO Structure Tunnel				1180	11-Jul-23 08:00	17-Jan-28 16:00	539	0
101	A1290	Excavate/construct horizontal tunnel	A1260, A1280	A1300	400	11-Jul-23 08:00	20-Jan-25 17:00	830	0
102	A1280	Excavate in reservoir basin for Inlet/Outlet structure and emergency drain structure	A1270	A1290, A1280A,	240	03-Oct-23 08:00	02-Sep-24 17:00	764	0
103	A1310	Build inlet-outlet tower base connect to tunnel	A1280	A1400A	75	03-Sep-24 08:00	16-Dec-24 17:00	764	0
104	A1280A	Move excess material to Sites Dam site	A1280	A1910B	240	04-Oct-23 08:00	03-Sep-24 17:00	928	274
105	A1300	Construct Vertical Gate shaft for tunnel	A1290	A1430	90	21-Jan-25 08:00	26-May-25 17:00	830	765
106	A1400A	Construct Sites inlet/outlet tower	A1310	A2150, A2160,	300	17-Dec-24 08:00	09-Feb-26 17:00	764	0
107	A2150	Construct Bridge to Inlet/Outlet tower	A1400A	A2160	200	10-Feb-26 08:00	16-Nov-26 17:00	764	225
108	A1400C	Tie Tower to Emergency Drain	A1400A, A1400B	A2240	40	10-Feb-26 08:00	06-Apr-26 17:00	1004	1004
109	A2160	Power connections for Inlet/Outlet structure	A1400A, A2070,	A2170	60	27-Sep-27 16:00	20-Dec-27 16:00	539	0
110	A2170	Functional Testing of Inlet/Outlet structure	A2160	A2240	20	20-Dec-27 16:00	17-Jan-28 16:00	539	539
111	Sites PGP				2000	15-Mar-22 08:0	12-Nov-29 16:00	65	0
112	A1410	Concrete work at West portal	A1260, A400,	A1420, A1430,	540	12-Jan-26 16:00	07-Feb-28 16:00	65	0
113	A1400B	Construct Emergency Drain Structure	A1280	A1400C	180	03-Sep-24 08:00	12-May-25 17:00	1199	195
114	A1430	Pipe manifold Tunnel to Sites PGP	A1300, A1410	A1435	500	08-Mar-27 16:00	05-Feb-29 16:00	65	0
115	A1411	Install Bridge Crane at Sites PGP	A1410	A1420, A1412	100	07-Feb-28 16:00	26-Jun-28 16:00	94	0
116	A1420	Pump turbine installation	A1410, A1411,	A1440	240	26-Jun-28 16:00	28-May-29 16:00	94	0
117	A1412	Sites PGP enclosure building	A1411	A1440	180	26-Jun-28 16:00	05-Mar-29 16:00	154	60
118	A1435	Fill at Pipe Manifold	A1430		200	05-Feb-29 16:00	12-Nov-29 16:00	65	65
119	A2120	Functional Testing - Sites Pump/Gen	A1440, A1860,	A2240	45	30-Jul-29 16:00	01-Oct-29 16:00	94	94
120	A2080	Power Lines to bridge & Inlet/Outlet Structure	A2050	A2160	120	01-Mar-27 16:00	16-Aug-27 16:00	569	30
121	A1440	Test & commission Sites Pump Station	A2100, A1412,	A2120	45	28-May-29 16:00	30-Jul-29 16:00	94	0
122	A1040	Move material to Sites Dam as stockpile	A2250	A1960A	5	27-Jun-23 08:00	03-Jul-23 17:00	1244	280
123	A1050	Construct Sites tunnel energy dissipation structure	A2250, A1240	A1320, A1930	60	27-Jun-23 08:00	18-Sep-23 17:00	654	0
124	A410	Furnish Sites PGP Pumps & Motors		A1410	1000	15-Mar-22 08:00*	12-Jan-26 16:00	65	0
125	A400	Furnish Sites PGP Pumps/Turbines		A1410	1000	15-Mar-22 08:00*	12-Jan-26 16:00	65	0
126	TRR PGP				1525	15-Mar-22 08:0	17-Jan-28 16:00	539	0

Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

2021 Q2 Q3 Q4 | 2022 Q1 Q2 Q3 Q4 | 2023 Q1 Q2 Q3 Q4 | 2024 Q1 Q2 Q3 Q4 | 2025 Q1 Q2 Q3 Q4 | 2026 Q1 Q2 Q3 Q4 | 2027 Q1 Q2 Q3 Q4 | 2028 Q1 Q2 Q3 Q4 | 2029 Q1 Q2 Q3 Q4 | 2030 Q1 Q2 Q3 Q4

07-Apr-25 17:00, TRR
20-Dec-22 08:00
07-Apr-25 17:00,
15-Mar-22 08:00*
19-Dec-22 17:00,
08-Feb-30 16:00, Pump
17-Jan-28 16:00, IO Structure Tunnel
11-Jul-23 08:00
20-Jan-25 17:00,
03-Oct-23 08:00
02-Sep-24 17:00,
03-Sep-24 08:00
16-Dec-24 17:00,
04-Oct-23 08:00
03-Sep-24 17:00,
21-Jan-25 08:00
26-May-25 17:00,
17-Dec-24 08:00
09-Feb-26 17:00,
10-Feb-26 08:00
16-Nov-26 17:00,
10-Feb-26 08:00
06-Apr-26 17:00,
27-Sep-27 16:00
20-Dec-27 16:00,
20-Dec-27 16:00
17-Jan-28 16:00,
12-Nov-29 16:00, Sites PGP
12-Jan-26 16:00
07-Feb-28 16:00,
03-Sep-24 08:00
12-May-25 17:00,
08-Mar-27 16:00
05-Feb-29 16:00,
07-Feb-28 16:00
26-Jun-28 16:00,
26-Jun-28 16:00
28-May-29 16:00,
26-Jun-28 16:00
05-Mar-29 16:00,
05-Feb-29 16:00
12-Nov-29 16:00,
30-Jul-29 16:00
01-Oct-29 16:00,
01-Mar-27 16:00
16-Aug-27 16:00,
28-May-29 16:00
30-Jul-29 16:00,
27-Jun-23 08:00
03-Jul-23 17:00,
27-Jun-23 08:00
18-Sep-23 17:00,
15-Mar-22 08:00*
12-Jan-26 16:00,
15-Mar-22 08:00*
12-Jan-26 16:00,
17-Jan-28 16:00, TRR PGP

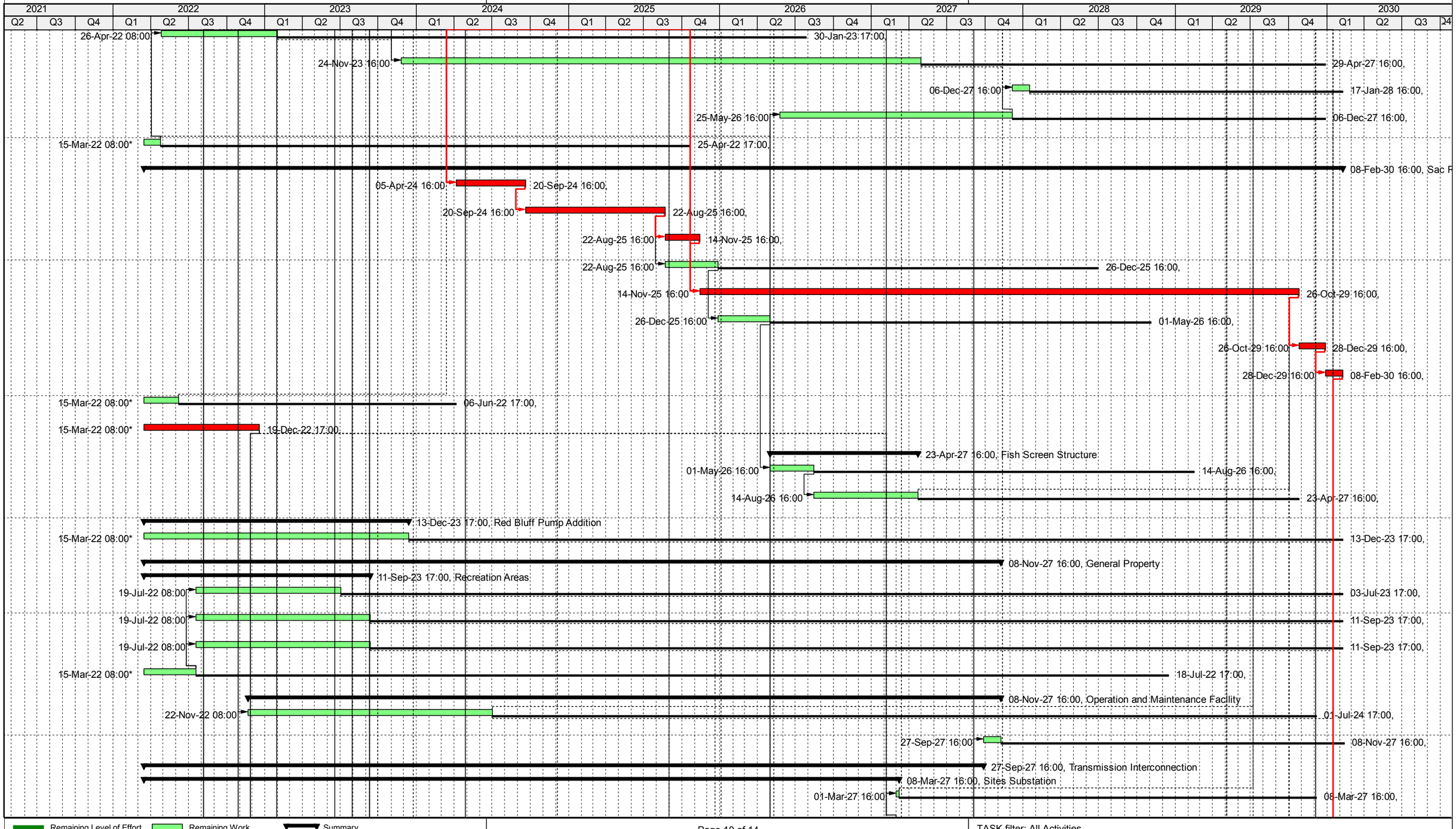
Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
127	A1610	Build TRR Pump Station to Equipment Need	A1590	A1611	200	26-Apr-22 08:00	30-Jan-23 17:00	910	214
128	A1611	Complete TRR Pump Station with Equipment	A1610, A440	A2130	894	24-Nov-23 16:00	29-Apr-27 16:00	696	157
129	A2130	Functional Testing - TRR Pump Plant	A1630, A2060,	A2240	30	06-Dec-27 16:00	17-Jan-28 16:00	539	539
130	A1612	Construct TRR Substation	A480, A500,	A2130	400	25-May-26 16:00	06-Dec-27 16:00	539	0
131	A1590	Develop access to TRR		A1600, A1610,	30	15-Mar-22 08:00*	25-Apr-22 17:00	910	0
132	Sac River PGP				2064	15-Mar-22 08:(	08-Feb-30 16:00	0	0
133	A1720	Construct Sacramento River Pump Station temp levee	A1660, A360,	A1730	120	05-Apr-24 16:00	20-Sep-24 16:00	0	0
134	A1730	Concrete Structure for Sacramento River Pump Station	A1720	A1740, A1760	240	20-Sep-24 16:00	22-Aug-25 16:00	0	0
135	A1740	Fill to elevation 90 West of Sac River pump station	A1730	A1790	60	22-Aug-25 16:00	14-Nov-25 16:00	0	0
136	A1760	Excavate bay to -35	A1730	A1770	90	22-Aug-25 16:00	26-Dec-25 16:00	655	0
137	A1790	Install all Sacramento River Pump Station equipment	A1740, A360,	A1800	1030	14-Nov-25 16:00	26-Oct-29 16:00	0	0
138	A1770	Remove existing levee at bay	A1760	A1810	90	26-Dec-25 16:00	01-May-26 16:00	655	0
139	A1800	Test & Commission Sac River Pump Station	A1790, A1811,	A2140	45	26-Oct-29 16:00	28-Dec-29 16:00	0	0
140	A2140	Functional Testing - Sacramento River Pump Plant	A1800, A2020,	A2240	30	28-Dec-29 16:00	08-Feb-30 16:00	0	0
141	A1719	Highway 45 access to Sac. River Pump Plant		A1720	60	15-Mar-22 08:00*	06-Jun-22 17:00	479	479
142	A2040	Primary WAPA Substation		A2020, A2030,	200	15-Mar-22 08:00*	19-Dec-22 17:00	0	0
143	Fish Screen Structure				255	01-May-26 16:(	23-Apr-27 16:00	655	0
144	A1810	Sacramento River & Fish Screen excavation	A1770	A1811	75	01-May-26 16:00	14-Aug-26 16:00	655	0
145	A1811	Sheet Pile and Fish screen structure Sac River Pump Station	A1810	A1800	180	14-Aug-26 16:00	23-Apr-27 16:00	655	655
146	Red Bluff Pump Addition				457	15-Mar-22 08:(	13-Dec-23 17:00	1607	0
147	A2000	Pump work Red Bluff		A2240	457	15-Mar-22 08:00*	13-Dec-23 17:00	1607	1607
148	General Property				1475	15-Mar-22 08:(	08-Nov-27 16:00	590	0
149	Recreation Areas				390	15-Mar-22 08:(	11-Sep-23 17:00	1674	0
150	A2191	Construct Lurline Recreation Area	A2180	A2240	250	19-Jul-22 08:00	03-Jul-23 17:00	1724	1724
151	A2192	Construct East Recreation Areas	A2180	A2240	300	19-Jul-22 08:00	11-Sep-23 17:00	1674	1674
152	A2194	Construct Stone Corral Recreation Area	A2180	A2240	300	19-Jul-22 08:00	11-Sep-23 17:00	1674	1674
153	A2180	Roadwork for recreation areas		A2191, A2192,	90	15-Mar-22 08:00*	18-Jul-22 17:00	1674	0
154	Operation and Maintenance Facility				1295	22-Nov-22 08:(	08-Nov-27 16:00	590	0
155	A1860	Maintenance building, yard and field office	A1830	A2120, A2240	420	22-Nov-22 08:00	01-Jul-24 17:00	1419	1325
156	A2210	Powerline to Maintenance Facility	A2070		30	27-Sep-27 16:00	08-Nov-27 16:00	590	590
157	Transmission Interconnection				1445	15-Mar-22 08:(	27-Sep-27 16:00	589	0
158	Sites Substation				1300	15-Mar-22 08:(	08-Mar-27 16:00	719	0
159	A2060	Energize Sites Switchyard	A2040, A2050,	A2120, A2130	5	01-Mar-27 16:00	08-Mar-27 16:00	719	195

Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities



Remaining Level of Effort | Remaining Work | Summary
Actual Level of Effort | Critical Remaining Work | Float Bar
Actual Work | Milestone | Neg Float Bar

TASK filter: All Activities

#	Activity ID	Activity Name	Predeces	Successo	Original	Start	Finish	Total Float	Free Float
160	A2050	Build fenced Sites Switchyard	A530, A510	A2060, A2070,	200	25-May-26 16:00*	01-Mar-27 16:00	-1095	0
161	A510	Furnish Switchyard Equipment - Sites		A2050	1095	15-Mar-22 08:00*	25-May-26 16:00	-1095	0
162	A530	Furnish Transformer Equipment - Sites		A2050	1095	15-Mar-22 08:00*	25-May-26 16:00	-1095	0
163	TRR Switchyard				1095	15-Mar-22 08:(	25-May-26 16:00	539	0
164	A480	Furnish Switchyard Equipment - TRR		A1612	1095	15-Mar-22 08:00*	25-May-26 16:00	539	0
165	A500	Furnish Transformer Equipment - TRR		A1612	1095	15-Mar-22 08:00*	25-May-26 16:00	539	0
166	Sacramento River PGP Switchyard				1300	15-Mar-22 08:(	08-Mar-27 16:00	689	0
167	A2020	Energize Sacramento River Switchyard	A2010, A2040,	A2140, A1800	5	01-Mar-27 16:00	08-Mar-27 16:00	689	689
168	A2010	Build fenced Sacramento River Switchyard	A450, A470	A2020, A2030	200	25-May-26 16:00*	01-Mar-27 16:00	589	0
169	A450	Furnish Switchyard Equipment - Sac. River		A2010	1095	15-Mar-22 08:00*	25-May-26 16:00	589	0
170	A470	Furnish Transformer Equipment - Sac River		A2010	1095	15-Mar-22 08:00*	25-May-26 16:00	589	0
171	Transmission Lines				1245	20-Dec-22 08:(	27-Sep-27 16:00	589	0
172	A2030	Power lines to Sacramento River Pump Station	A2010, A2040,	A2140	150	01-Mar-27 16:00	27-Sep-27 16:00	589	589
173	A2090	Overhead lines from WAPA substation to Sacramento River Switchyard	A2040	A2020, A2030,	365	20-Dec-22 08:00	13-May-24 17:00	949	0
174	A2100	Overhead Power WAPA Substation to Site Switchyard	A2040	A1440, A2060	150	20-Dec-22 08:00	17-Jul-23 17:00	1624	945
175	A2070	Power lines to Sites Pump Station	A2050	A2120, A2160,	150	01-Mar-27 16:00	27-Sep-27 16:00	529	0
176	A2110	Overhead Power Sites switchyard to TRR Pump Station	A2090	A1612	120	14-May-24 08:00	28-Oct-24 17:00	949	410
177	Develop alternate roadway to Ladoga				1484	15-Mar-17 08:(	21-Nov-22 17:00	658	0
178	A1200	Complete design for temporary road - contract	A1190	A1210	200	05-Apr-17 08:00	09-Jan-18 17:00	1089	1089
179	A1210	Construct Temporary Road	A1200	A1220, A1230,	180	15-Mar-22 08:00*	21-Nov-22 17:00	0	0
180	A1220	Erect appropriate new road signage	A1210	A1240	20	25-Oct-22 08:00	21-Nov-22 17:00	658	0
181	A1190	Survey & develop temporary road alignment		A1200	15	15-Mar-17 08:00*	04-Apr-17 17:00	0	0
182	Construct Emergency drawdown tunnel				465	15-Mar-22 08:(	25-Dec-23 17:00	1600	0
183	A1270	Develop Access Road to inlet/outlet	A1010	A1280	30	22-Aug-23 08:00	02-Oct-23 17:00	764	0
184	A1260	Excavate West portal of emergency tunnel	A1250	A1290, A1410,	300	17-May-22 08:00	10-Jul-23 17:00	720	0
185	A1265	Move excess spoil to Golden Gate Dam material storage area	A1260, A1330		60	03-Oct-23 08:00	25-Dec-23 17:00	1600	1600
186	A1250	Develop access road to Tunnel site & Golden Gate Dam		A1260, A1880,	45	15-Mar-22 08:00*	16-May-22 17:00	720	0
187	Construct Holthouse-Sites connection channel				650	17-May-22 08:(	11-Nov-24 17:00	903	0
188	A1550	Excavate Channel	A1170, A1250	A1560A, A1440	650	17-May-22 08:00	11-Nov-24 17:00	903	0
189	A1560A	Haul to Golden Gate Dam	A1550	A1560B, A1890,	100	18-May-22 08:00	04-Oct-22 17:00	903	0
190	A1560B	Haul to Holdhouse stockpile	A1560A	A1560C, A1530,	100	05-Oct-22 08:00	21-Feb-23 17:00	903	0
191	A1560C	Haul to Saddle Dams	A1560B	A1560D, A1870	325	22-Feb-23 08:00	21-May-24 17:00	903	0

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2021 Q2 Q3 Q4 | 2022 Q1 Q2 Q3 Q4 | 2023 Q1 Q2 Q3 Q4 | 2024 Q1 Q2 Q3 Q4 | 2025 Q1 Q2 Q3 Q4 | 2026 Q1 Q2 Q3 Q4 | 2027 Q1 Q2 Q3 Q4 | 2028 Q1 Q2 Q3 Q4 | 2029 Q1 Q2 Q3 Q4 | 2030 Q1 Q2 Q3 Q4

25-May-26 16:00* 01-Mar-27 16:00,
15-Mar-22 08:00* 25-May-26 16:00,
15-Mar-22 08:00* 25-May-26 16:00,
25-May-26 16:00, TRR Switchyard
15-Mar-22 08:00* 25-May-26 16:00,
15-Mar-22 08:00* 25-May-26 16:00,
08-Mar-27 16:00, Sacramento River PGP Switchyard
01-Mar-27 16:00 08-Mar-27 16:00,
25-May-26 16:00* 01-Mar-27 16:00,
15-Mar-22 08:00* 25-May-26 16:00,
15-Mar-22 08:00* 25-May-26 16:00,
27-Sep-27 16:00, Transmission Lines
01-Mar-27 16:00 27-Sep-27 16:00,
20-Dec-22 08:00 13-May-24 17:00,
20-Dec-22 08:00 17-Jul-23 17:00,
01-Mar-27 16:00 27-Sep-27 16:00,
14-May-24 08:00 28-Oct-24 17:00,
21-Nov-22 17:00, Develop alternate roadway to Ladoga
09-Jan-18 17:00,
15-Mar-22 08:00* 21-Nov-22 17:00,
25-Oct-22 08:00 21-Nov-22 17:00,
25-Dec-23 17:00, Construct Emergency drawdown tunnel
22-Aug-23 08:00 02-Oct-23 17:00
17-May-22 08:00 10-Jul-23 17:00,
03-Oct-23 08:00 25-Dec-23 17:00,
15-Mar-22 08:00* 16-May-22 17:00,
11-Nov-24 17:00, Construct Holthouse-Sites connection channel
17-May-22 08:00 11-Nov-24 17:00,
18-May-22 08:00 04-Oct-22 17:00,
05-Oct-22 08:00 21-Feb-23 17:00,
22-Feb-23 08:00 21-May-24 17:00,

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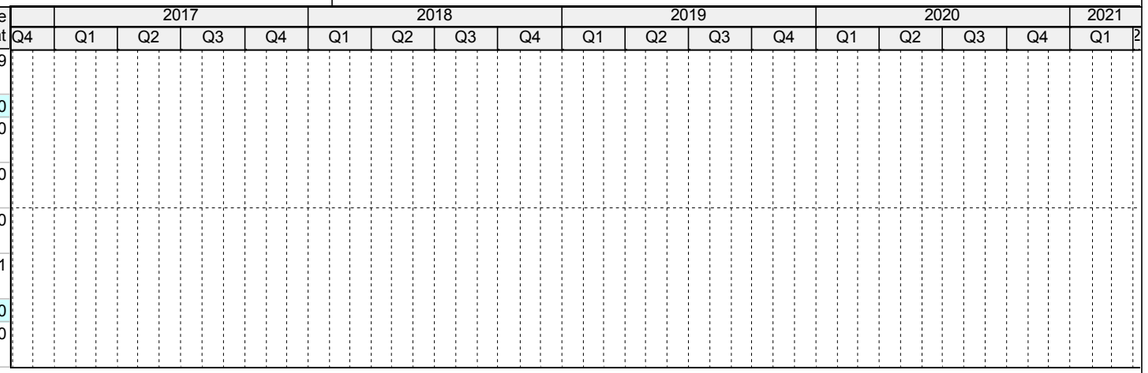
192	A1560D	Haul to Golden Gate Dam East side	A1560C	A1910B	100	22-May-24 08:00	08-Oct-24 17:00	903	249
193	Access road to bridge - East side				240	15-Mar-22 08:0	13-Feb-23 17:00	1824	0
194	A1840	Construct Road to Golden Gate Dam top	A1820	A1920	120	30-Aug-22 08:00*	13-Feb-23 17:00	1734	1080
195	A1850	Construct Access Rd to Sites Crown	A1820	A1970	120	30-Aug-22 08:00*	13-Feb-23 17:00	1734	770
196	A1830	Construct Road to maintenance & Site Pump plant		A1860	180	15-Mar-22 08:00*	21-Nov-22 17:00	1419	0
197	A2270	Access road to bridge - East Side		A2220	120	15-Mar-22 08:00*	29-Aug-22 17:00	1944	981
198	Start Filling Sites Reservoir				1	08-Feb-30 16:0	11-Feb-30 16:00	0	0
199	A2240	Start Filling Sites Reservoir	A1870, A1920,		1	08-Feb-30 16:00	11-Feb-30 16:00	0	0



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