B.4 Preliminary Feasibility Cost Estimate

Introduction

This section presents preliminary feasibility-level cost estimates for NODOS/Sites Reservoir Project Alternatives A, B, C, and D, described in Section B.3, Design Considerations. Table B.4-1 provides a list of the major project components for each alternative that are included in the cost estimates.

The construction cost estimates presented in this section reflect the current conceptual level of project design, with appropriate allowances for contingencies, non-contracts costs, and forward escalation. Other project-related costs are also provided, including environmental mitigation, and temporary and permanent easement acquisition. Key estimating assumptions are documented.

The costs provided for Alternatives A, B, and C build on previous estimates prepared by DWR or its consultants, and reflect the current conceptual designs. The cost for Alternative D reflects the Authority's concept for the project. Where applicable, the cost estimates for Alternatives A, B, and C also reflect updated and refined pricing that was developed for the estimate for Alternative D. Estimated price levels are in October 2015 dollars.

Complete cost estimates are provided for the project alternatives. It is assumed that this cost information would be combined with other analyses and evaluations to identify a preferred project, and that additional design and cost estimating would be performed to confirm project feasibility. To support that work, additional field investigations and construction material evaluations should be performed. The actual project construction cost ultimately would depend on the final design details of the preferred project alternative and the labor and material costs, market conditions, and other variable factors existing at the time of bid. Accordingly, the final project cost would vary from the preliminary estimates presented in this section.

Level and Classification of Cost Estimates

The availability of site data and design information to support preparing cost estimates varies between the facilities that constitute the NODOS project. Some facilities (like the main dams) are advanced enough to support a lower-bound Class 3 estimate as defined by the Association for Advancement of Cost Engineering, International. Other facilities, like the pumping/generating plants or Holthouse Dam, only support a Class 4 estimate. Overall, the estimates presented in this appendix are Class 4 estimates.

The estimates are suitable to apply for California Water Storage Investment Program funding, but are not currently at the Class 3 level needed for a feasibility determination. To complete the feasibility study, additional site investigation and engineering are being planned for the project. Additional evaluations of cost-estimating allowances and contingencies are planned. Design, Estimating, and Constructability (DEC) comments are also being further reviewed. When completed, these evaluations will provide sufficient design data and supporting documentation to support Class 3 cost estimates for all facilities, and for the project as a whole.

Table B.4-1. Alternative Project Components

Facility	Alternative A (1.3 MAF)	Alternative B (1.8 MAF)	Alternative C (1.8 MAF)	Alternative D (1.8 MAF)
Sites Reservoir Clearing and Demolition	Yes	Yes	Yes	Yes
Sites Dam	Yes	Yes	Yes	Yes
Golden Gate Dam	Yes	Yes	Yes	Yes
Saddle Dams				
Saddle Dam 1	Yes	Yes	Yes	Yes
Saddle Dam 2	Yes	Yes	Yes	Yes
Saddle Dam 3	Yes	Yes	Yes	Yes
Saddle Dam 4	No	Yes	Yes	Yes
Saddle Dam 5	Yes	Yes	Yes	Yes
Saddle Dam 6	Yes	Yes	Yes	Yes
Saddle Dam 7	No	Yes	Yes	Yes
Saddle Dam 8	No	Yes	Yes	Yes
Saddle Dam 8A and 8B	Yes	No	No	No
Golden Gate Saddle Dam	Yes	No	No	No
Saddle Dam 9	No	Yes	Yes	Yes
Signal Spillway at Saddle Dam 6	Yes	Yes	Yes	Yes
Sites Reservoir Inlet/Outlet				
Tunnel	Yes	Yes	Yes	Yes
Inlet/Outlet Structure	Yes	Yes	Yes	Yes
Access Road	Yes	Yes	Yes	Yes
Sites Pumping/Generating Plant				
Pumping/Generating Plant	Yes	Yes	Yes	Yes
Emergency Drawdown Bypass	Yes	Yes	Yes	Yes
Plant Access Road	Yes	Yes	Yes	Yes
T-C Canal Bypass Pipeline	Yes	Yes	Yes	Yes
Holthouse Reservoir	Yes	Yes	Yes	Yes
TRR Reservoir	Yes	Yes	Yes	Yes
TRR Pumping/Generating Plant	Yes	Yes	Yes	Yes
TRR Pipeline	Yes	Yes	Yes	Yes
Delevan Pipeline	Yes	Yes	Yes	Yes
Sacramento River Release-Only Structure	No	Yes	No	No
Delevan Intake Pumping/Generating Plant				
Pumping/Generating Plant	Yes	No	Yes	Yes
Fish Screen Facility	Yes	No	Yes	Yes
Project Access Roads and Bridges				
Access Roads (Public and Private)	Yes	Yes	Yes	Yes
South Bridge	Yes	Yes	Yes	Yes
Electrical Transmission (230 kV Option)				
E-W Line to Delevan Intake	Yes	Yes	Yes	No
N-S Line to Delevan Intake	No	No	No	Yes
Recreation				
Three Recreation Areas	Yes	Yes	Yes	No
Two Recreation Areas	No	No	No	Yes

Key:
GCID = Glenn-Colusa Irrigation District
kV = kilovolts
T-C = Tehama-Colusa
TRR = Terminal Regulating Reservoir

Cost Estimate Considerations

Estimating Terminology

Contract Costs: Contract costs include detailed quantity and unit price estimates, plus allowances for mobilization/demobilization, design contingency, and unlisted items.

Field Cost: The field cost is the sum of the contract cost and construction contingency.

Non-Contract Costs: Non-contract costs include engineering, administration, legal services, and permitting costs.

Construction Cost: The construction cost is the sum of the field cost and non-contract costs. The construction cost can be escalated to the notice to proceed date for the project, and for each project component.

Construction Cost Components

Estimate Base and Escalation

The contract, field, and construction cost estimates presented in this section were compiled using individual-estimate worksheets for each NODOS/Sites Reservoir Project feature. All costs are provided at October 2015 prices. Escalation of construction costs to a notice to proceed date in mid-2022 has been included. Escalation was evaluated using various sources, including the USACE Civil Works Construction Cost Index and the Consumer Price Index. Results varied from 15.3 percent to 15.8 percent over the escalation period. For the project alternatives, 15 percent over 7 years has been applied for each alternative.

Construction Contingency

Construction contingency is a percentage allowance added to develop the field cost. Contingencies are funds for use after construction starts to compensate the contractor for such issues as unforeseen or changed site conditions, owner-directed orders for change, and quantity overruns. Contingency allowances are generally higher for appraisal-level estimates than for feasibility-level estimates.

Table B.4-2 presents the allowances and contingency percentages adopted and applied to the feasibility-level cost estimate for the alternative projects.

Table B.4-2. Allowances and Contingencies for Estimating

Allowances and Contingencies	Percentages
Mobilization/Demobilization	5 percent
Design Contingency and Procurement Strategy	10 percent
Construction Contingency	15 percent
Non-Contract Costs	17 percent

Mobilization/Demobilization at 5 percent and Design Contingency and allowance for procurement strategy at 10 percent combined are reasonable allowances for feasibility-level estimating on large projects.

The mobilization/demobilization allowance and design and construction contingencies were applied to the contractor costs to develop the contract cost. The construction contingency was applied to the contract cost to arrive at the field cost. Non-contract costs were applied to the field cost to arrive at the construction cost.

Non-Contract Costs

Non-contract costs include engineering and design, construction management, project close-out, administration, legal services, permitting, etc. For the estimates presented in this section, the non-contract costs were estimated to be 17 percent of the total field costs (contract cost plus contingency). Actual non-contract costs would vary from facility to facility; however, 17 percent is assumed to represent the average value. This allowance was used for all four alternatives; however, further evaluation of this allowance should be performed in future phases of the NODOS/Sites Reservoir Project to determine if adjustments are warranted, based on financing and levels of Federal, State, and local participation. It is recognized that there would be some participation in the project by Reclamation, because Reclamation owns the existing Funks Reservoir and the T-C Canal.

Other Cost Allowances

Environmental Mitigation

Many environmental laws affect the State's major water supply programs, and environmental concerns play a major role in water policy and planning. Mitigation costs for Alternative C are based on the environmental impact analysis, and implementing the mitigation measures from the *NODOS Preliminary Administrative Draft Environmental Impact Report* (DWR 2013). Additional details are available in *Sites Reservoir Feasibility Study Technical Memorandum: Mitigation Measure Evaluation and Cost Estimate* (AECOM 2016a).

The allowances and contingencies by component applied to mitigation cost estimates are presented in Table B.4-3. The mobilization/demobilization allowance and design and construction contingencies were applied to develop the field cost. The non-contract cost allowance was then applied to the field cost to arrive at the construction cost.

Table B.4-3. Cost Estimate Allowances and Contingencies for Mitigation Costs

Component	Value	Basis for Assigned Allowance or Contingency
Mobilization/ Demobilization	2%	Approximately 65% of the mitigation costs are associated with real estate actions, 19% of the costs with environmental and cultural resources monitoring, and the remaining 16% for restoration. Mobilization/demobilization for monitoring largely consists of the mobilization and demobilization of environmental monitoring staff with pickup trucks, and infrequent short-term monitoring by watercraft. In this case, mobilization/demobilization costs are likely to be in the range of 1% to 2%.
Design Contingency	12%	Covers minor unlisted items, minor design and scope changes, and cost estimating refinements. This is the area of greatest uncertainty prior to the negotiation of permits. We recommend increasing the design contingency from 10% to 12%.
Procurement Strategy	1%	The most notable effort would be associated with procuring mitigation credits. The construction contractors selected for facility construction would perform the bulk of the restoration- and construction-related tasks. There would be a real estate contractor and one or two environmental monitoring contracts. There may be some small landscaping contracts. Most of the oversight throughout would likely be performed by the environmental contractor, who would work for the Authority.
Escalation to Notice to Proceed	—	This would be consistent with the overall project construction cost estimate.
Construction Contingency	2%	Only 16% of the total mitigation is anticipated to include construction costs related to restoration. The construction contingency for real estate and monitoring should be very low.
Non-Contract Costs	4%	Approximately $52 million in monitoring costs is already included in the mitigation estimates. We do not anticipate another layer of construction management. There would be some design, but the design would be highly constrained by the permits.

Source: Data compiled by AECOM in 2016.

Table B.4-4 presents a summary of estimated construction-phase mitigation costs by category.

Table B.4-4. Construction Phase Mitigation Costs

Mitigation Category	Estimated Cost
Vegetation Communities/Botanical Resources	$91,800,000
Wetlands/Surface Waters	$83,000,000
Aquatic Resources	$56,000,000
Wildlife Habitat	$53,000,000
Cultural/Historic/Paleontological Resources	$35,000,000
Land and Agriculture	$31,000,000
Air Quality	$200,000
Total	$350,000,000

Source: Data compiled by AECOM in 2016.

Right-of-Way

ROW costs represent the estimated fair market value of the real estate required for the NODOS/Sites Reservoir Project; they do not include staff costs for appraisals or acquisition, damages to the remaining land caused by the acquisition or construction of the project, or utility relocations that may be necessary. Additional information regarding the estimated costs for real estate is provided in Appendix D.

Assumptions

Major assumptions made to prepare the preliminary feasibility cost estimates include:

- Competitive market conditions would prevail at the time of bid tender.
- Work would be packaged for bidding so that the magnitude of the contract would not unduly restrict competition.
- The construction schedule assumes a start of field construction activities in the second quarter of 2022 for all alternatives.
- Environmental mitigation and ecosystem enhancement measures would be consistent with those currently used in practice, and would be the same for each alternative.
- Builder's Risk Insurance would be available to the contractor.
- Materials such as sand, gravel, and cement would remain available within the haul distances used to prepare the estimates.

Exclusions

Major exclusions from the cost estimates include:

- Utility costs for system upgrades to provide pumping power or receive generation power are not defied at this time, and no costs are included.
- There would be no new overpasses, interchanges, or sidings required for existing highways, roads, and rail lines associated with constructing the NODOS/Sites Reservoir Project.
- Non-contract cost allowance does not provide for permitting or water rights costs.

Cost Estimate Summaries

Table B.4-5 presents the estimated cost for each of the four NODOS/Sites Reservoir Project alternatives. Project Cost Estimate summary sheets for each alternative are provided at the end of this appendix.

Table B.4-5. Estimate Summary

Facility	Alternative A ($)	Alternative B ($)	Alternative C ($)	Alternative D ($)
Develop Sites Reservoir, including Land, Roads, South Bridge, Clearing and Demolition	447,000,000	447,000,000	447,000,000	410,000,000
Construct Main Dams, including Sites Dam and Golden Gate Dam	340,000,000	520,000,000	520,000,000	520,000,000
Construct Saddle Dams	80,000,000	230,000,000	230,000,000	230,000,000
Construct Holthouse Reservoir	160,000,000	160,000,000	160,000,000	160,000,000
Construct TRR	36,000,000	36,000,000	36,000,000	33,000,000
Construct I/O Structure and Tunnel for Reservoir	175,000,000	180,000,000	180,000,000	180,000,000
Construct Sites Pumping/Generating Plant	680,000,000	630,000,000	680,000,000	680,000,000
Construct TRR Pumping/Generating Plant	145,000,000	145,000,000	145,000,000	135,000,000
Construct Sacramento River Pumping/Generating Plant	210,000,000	—	215,000,000	220,000,000
Construct Sacramento River Release-Only Facility	—	9,000,000	—	—
Construct Sacramento River Fish Screening Plant	50,000,000	—	50,000,000	47,000,000
Red Bluff Pump Addition	3,300,000	3,300,000	3,300,000	3,300,000
Construct Holthouse Channel	42,000,000	42,000,000	42,000,000	42,000,000
Construct Delevan Pipeline	560,000,000	560,000,000	560,000,000	560,000,000
Construct TRR Pipeline	300,000,000	300,000,000	300,000,000	300,000,000
Transmission Lines, Substations, Switchyards	98,000,000	98,000,000	97,000,000	160,000,000
General Property, including Recreation Areas and OM&R Facilities	23,000,000	23,000,000	23,000,000	26,000,000
Mitigation	340,000,000	340,000,000	340,000,000	340,000,000
Field Cost	3,689,300,000	3,723,300,000	4,028,300,000	4,046,300,000
Non-Contract Cost	580,500,000	589,300,000	642,500,000	650,500,000
Construction Cost (October 2015)	4,269,800,000	4,312,600,000	4,670,800,000	4,696,800,000
Escalation to 2022	641,000,000	648,200,000	700,600,000	705,000,000
Escalated Construction Cost	4,909,300,000	4,960,800,000	5,371,400,000	5,401,800,000

Notes:
Estimate Summary – October 2016
Key:
I/O = inlet/outlet
OM&R = operation, maintenance, and replacement
TRR = Terminal Regulating Reservoir

Cost Estimate for Alternative A

Project Cost Estimate

PROJECT	PREPARED BY
North of the Delta Offstream Storage Project (NODOS)	**AECOM**
DIVISION	ESTIMATE DATE **October 14, 2016**
UNIT	ESTIMATE TYPE **Feasibility**
FEATURE **Draft Cost Estimate for Project Alternative A**	PRICE LEVELS **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 A		3,689,300,300	580,549,000	4,269,849,000	4,269,849,000
01			**RESERVOIRS AND DAMS**		1,063,000,000	173,000,000	1,236,000,000	1,236,000,000
	01		**Develop Sites Reservoir Area**		447,000,000	68,000,000	515,000,000	
		100	Land and Rights	97,000,000				
		110	Public Road Relocations	79,000,000				
		110	South Bridge	185,000,000				
		120	Reservoir Clearing and Demolition	7,000,000				
		140	Project Roads	79,000,000				
	02		**Construct Main Dams**		340,000,000	60,000,000	400,000,000	
		100	Land and Rights					
		150	Creek Diversion During Construction	14,500,000				
		151	Construct Sites Dam	99,000,000				
		151	Construction Golden Gate Dam	225,000,000				
		151	Rim Grouting	1,500,000				
	03		**Construct Saddle Dams**		80,000,000	14,000,000	94,000,000	
		151	Land and Rights					
		151	Construct Saddle Dam 1	500,000				
		151	Construct Saddle Dam 2					
		151	Construct Saddle Dam 3	47,000,000				
		151	Construct Saddle Dam 4					
		151	Construct Saddle Dam 5	17,000,000				
		151	Construct Saddle Dam 6	2,500,000				
		151	Construct Saddle Dam 7					
		151	Construct Saddle Dam 8	13,000,000				
		151	Construct Saddle Dam 9					

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	25,000,000	1825,000,000	
		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				
	05		**Construct TRR Reservoir**		36,000,000	6,000,000	42,000,000	
		100	Land and Rights					
		151	Construct TRR Reservoir	27,000,000				
		153	Canal Control Structures	7,500,000				
		170	Accessory Electrical Equipment	1,500,000				
03			**PUMPING AND GENERATING PLANTS**		1,263,300,000	219,549,000	1,482,849,000	1,482,849,000
	01		**Construct I/O Structure and 30' Diameter Tunnel**		175,000,000	25,000,000	200,000,000	
		152	30' Diameter Tunnel	120,000,000				
		152	Low Level Intake Structure	25,000,000				
		152	Gated Intake/Outlet Tower (Including Mechanical)	16,000,000				
		152	Construct Gate Intake Tower, Mechanical	12,000,000				
		152	Construct Gate Intake Tower, Electrical	2,000,000				
	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	99,000,000				
		153	Waterway Structures	25,000,000				
		160	Pumps and Prime Movers	76,000,000				
		165	Turbines and Generators	165,000,000				
		170	Accessory Electrical Equipment	105,000,000				
	03		**TRR Pumping-Generating Plant**		145,000,000	25,000,000	170,000,000	
		100	Land and Rights					
		130	Structures and Improvements	72,000,000				
		140	Roads and Road Structures	1,100,000				
		152	Waterways	12,000,000				
		154	Waterways Protective Works	10,500,000				
		160	Pumps and Prime Movers	20,000,000				
		165	Turbines and Generators	8,400,000				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		170	Accessory Electrical Equipment	21,000,000				
	04		**Sacramento River Pumping-Generating Plant**		210,000,000	40,000,000	250,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	85,000,000				
		140	Roads and Road Structures (Including with Reservoir)	1,000,000				
		152	Discharge Piping					
		152	Waterways-Buried Penstock Piping and Bifu	3,000,000				
		154	Waterways Protective Structures	10,000,000				
		160	Pumps and Prime Movers	76,000,000				
		165	Turbines and Generators	10,000,000				
		170	Accessory Electrical Equipment	25,000,000				
	05		**Sacramento River Fish Screen Structure**		50,000,000	9,000,000	59,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	49,016,734				
		140	Roads and Road Structures (Included with Reservoir)	167,388				
		170	Accessory Electrical Equipment	697,730				
	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				
05			**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				
	02		**Construct Develan Pipeline**		560,000,000	100,000,000	660,000,000	
		100	Land and Rights					
		120	Clearing and Demolition	500,000				
		152	Construct Develan Pipeline	510,000,000				
		152	I-5 Crossing (Jacked)	38,000,000				
		152	Highway 45 Crossing (Jacked)	11,500,000				
	03		**Construct TRR Pipeline**		300,000,000	50,000,000	350,000,000	
		100	Land and Rigths					
		152	Construct TRR Pipeline	275,000,000				
		152	Holthouse Inlet Structure	8,000,000				
		152	Construct GCID Crossing	17,000,000				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
13			**TRANSMISSION LINES, SWITCHYARDS AND SUBSTATIONS**		98,000,000	17,000,000	115,000,000	115,000,000
	01		**Transmission and Interconnection**		98,000,000	17,000,000	115,000,000	
		100	Land and Rights					
		175	Sites Substation	29,000,000				
		175	TRR Switchyard	7,000,000				
		175	Sacramento River PGP Switchyard	8,000,000				
		181	Transmission Lines	54,000,000				
15			**GENERAL PROPERTY**		23,000,000	4,000,000	27,000,000	27,000,000
			General Property		23,000,000	4,000,000	27,000,000	
		195	**Recreation Facilities**	21,000,000				
		195	**Operating and Maintenance Facility**	2,000,000				
			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	79,000,000				
			Cultural Resources	33,000,000				
			Land Use	30,000,000				
			Paleontology	2,000,000				
			Air Quality	200,000				

Cost Estimate for Alternative B

Project Cost Estimate

PROJECT **North of the Delta Offstream Storage Project (NODOS)**	PREPARED BY **AECOM**
DIVISION	ESTIMATE DATE **October 14, 2016**
UNIT	ESTIMATE TYPE **Feasibility**
FEATURE **Draft Cost Estimate for Project Alternative B**	PRICE LEVELS **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 B		3,723,300,000	589,300,000	4,312,600,000	4,312,600,000
01			**RESERVOIRS AND DAMS**		1,393,000,000	234,000,000	1,627,000,000	1,627,000,000
	01		**Develop Sites Reservoir Area**		447,000,000	68,000,000	515,000,000	
		100	Land and Rights	97,000,000				
		110	Public Road Relocations	79,000,000				
		110	South Bridge	185,000,000				
		120	Reservoir Clearing and Demolition	7,000,000				
		140	Project Roads	79,000,000				
	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	130,000,000				
		151	Construction Golden Gate Dam	370,000,000				
		151	Rim Grouting	5,000,000				
	03		**Construct Saddle Dams**		230,000,000	40,000,000	270,000,000	
		151	Land and Rights					
		151	Construct Saddle Dam 1	2,500,000				
		151	Construct Saddle Dam 2	3,000,000				
		151	Construct Saddle Dam 3	95,000,000				
		151	Construct Saddle Dam 4	1,000,000				
		151	Construct Saddle Dam 5	51,000,000				
		151	Construct Saddle Dam 6	10,000,000				
		151	Construct Saddle Dam 7	10,000,000				
		151	Construct Saddle Dam 8	56,000,000				
		151	Construct Saddle Dam 9	1,500,000				

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				
	05		**Construct TRR Reservoir**		36,000,000	6,000,000	42,000,000	
		100	Land and Rights					
		151	Construct TRR Reservoir	27,000,000				
		153	Canal Control Structures	7,500,000				
		170	Accessory Electrical Equipment	1,500,000				
03			**PUMPING AND GENERATING PLANTS**		967,300,000	167,300,000	1,134,600,000	1,134,600,000
	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	24,000,000				
		152	Gated Intake/Outlet Tower (Including Mechanical)	19,000,000				
		152	Construct Gate Intake Tower, Mechanical	15,000,000				
		152	Construct Gate Intake Tower, Electrical	2,000,000				
	02		**Sites Pumping-Generating Plant**		630,000,000	110,000,000	740,000,000	
		100	Land and Rights					
		130	Structures and Improvements	210,000,000				
		140	Roads and Road Structures					
		152	Waterways	99,000,000				
		153	Waterway Structures	26,000,000				
		160	Pumps and Prime Movers	25,000,000				
		165	Turbines and Generators	170,000,000				
		170	Accessory Electrical Equipment	100,000,000				
	03		**TRR Pumping-Generating Plant**		145,000,000	25,000,000	170,000,000	
		100	Land and Rights					
		130	Structures and Improvements	72,000,000				
		140	Roads and Road Structures	1,100,000				
		152	Waterways	12,000,000				
		154	Waterways Protective Works	10,500,000				
		160	Pumps and Prime Movers	20,000,000				
		165	Turbines and Generators	8,400,000				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		170	Accessory Electrical Equipment	21,000,000				
	04		**Sacramento River Pumping-Generating Plant**		9,000,000	1,700,000	10,700,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	7,200,000				
		140	Roads and Road Structures (Including with Reservoir)	200,000				
		152	Discharge Piping	1,400,000				
		152	Waterways-Buried Penstock Piping and Bifu					
		154	Waterways Protective Structures					
		160	Pumps and Prime Movers					
		165	Turbines and Generators					
		170	Accessory Electrical Equipment					
	05		**Sacramento River Fish Screen Structure**					
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements					
		140	Roads and Road Structures (Included with Reservoir)					
		170	Accessory Electrical Equipment					
	06		**Red Bluff Pump Addition**		3,300,000	600,000	3,900,000	
		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				
05			**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				
	02		**Construct Develan Pipeline**		560,000,000	100,000,000	660,000,000	
		100	Land and Rights					
		120	Clearing and Demolition	500,000				
		152	Construct Develan Pipeline	510,000,000				
		152	I-5 Crossing (Jacked)	38,000,000				
		152	Highway 45 Crossing (Jacked)	11,500,000				
	03		**Construct TRR Pipeline**		300,000,000	50,000,000	350,000,000	
		100	Land and Rigths	375,000,000				
		152	Construct TRR Pipeline	8,000,000				
		152	Holthouse Inlet Structure	17,000,000				
		152	Construct GCID Crossing					

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
13			**TRANSMISSION LINES, SWITCHYARDS AND SUBSTATIONS**		98,000,000	17,000,000	115,000,000	115,000,000
	01		**Transmission and Interconnection**		98,000,000	17,000,000	115,000,000	
		100	Land and Rights					
		175	Sites Substation	29,000,000				
		175	TRR Switchyard	7,000,000				
		175	Sacramento River PGP Switchyard	8,000,000				
		181	Transmission Lines	54,000,000				
15			**GENERAL PROPERTY**		23,000,000	4,000,000	27,000,000	27,000,000
			General Property		23,000,000	4,000,000	27,000,000	
		195	**Recreation Facilities**	21,000,000				
		195	**Operating and Maintenance Facility**	2,000,000				
			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	85,000,000				
			Wildlife Habitat	51,000,000				
			Wetlands Habitat	79,000,000				
			Cultural Resources	33,000,000				
			Land Use	30,000,000				
			Paleontology	2,000,000				
			Air Quality	200,000				

Cost Estimate for Alternative C

Project Cost Estimate

PROJECT	PREPARED BY
North of the Delta Offstream Storage Project (NODOS)	**AECOM**
DIVISION	ESTIMATE DATE **October 14, 2016**
UNIT	ESTIMATE TYPE **Feasibility**
FEATURE **Draft Cost Estimate for Project Alternative C**	PRICE LEVELS **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 C		4,028,300,000	642,544,000	4,670,844,000	4,670,844,000
01			**RESERVOIRS AND DAMS**		1,393,000,000	234,000,000	1,627,000,000	1,627,000,000
	01		**Develop Sites Reservoir Area**		447,000,000	68,000,000	515,000,000	
		100	Land and Rights	97,000,000				
		110	Public Road Relocations	79,000,000				
		110	South Bridge	185,000,000				
		120	Reservoir Clearing and Demolition	7,000,000				
		140	Project Roads	79,000,000				
	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	130,000,000				
		151	Construction Golden Gate Dam	370,000,000				
		151	Rim Grouting	5,000,000				
	03		**Construct Saddle Dams**		230,000,000	40,000,000	270,000,000	
		151	Land and Rights					
		151	Construct Saddle Dam 1	2,500,000				
		151	Construct Saddle Dam 2	3,000,000				
		151	Construct Saddle Dam 3	95,000,000				
		151	Construct Saddle Dam 4	1,000,000				
		151	Construct Saddle Dam 5	51,000,000				
		151	Construct Saddle Dam 6	10,000,000				
		151	Construct Saddle Dam 7	10,000,000				
		151	Construct Saddle Dam 8	56,000,000				
		151	Construct Saddle Dam 9	1,500,000				

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				
	05		**Construct TRR Reservoir**		36,000,000	6,000,000	42,000,000	
		100	Land and Rights					
		151	Construct TRR Reservoir	27,000,000				
		153	Canal Control Structures	7,500,000				
		170	Accessory Electrical Equipment	1,500,000				
03			**PUMPING AND GENERATING PLANTS**		1,273,300,000	219,544,000	1,492,844,000	1,492,844,000
	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	24,000,000				
		152	Gated Intake/Outlet Tower (Including Mechanical)	19,000,000				
		152	Construct Gate Intake Tower, Mechanical	15,000,000				
		152	Construct Gate Intake Tower, Electrical	2,000,000				
	02		**Sites Pumping-Generating Plant**		680,000,000	12,000,000	800,000,000	
		100	Land and Rights					
		130	Structures and Improvements	210,000,000				
		140	Roads and Road Structures					
		152	Waterways	99,000,000				
		153	Waterway Structures	25,000,000				
		160	Pumps and Prime Movers	76,000,000				
		165	Turbines and Generators	165,000,000				
		170	Accessory Electrical Equipment	105,000,000				
	03		**TRR Pumping-Generating Plant**		145,000,000	25,000,000	170,000,000	
		100	Land and Rights					
		130	Structures and Improvements	72,000,000				
		140	Roads and Road Structures	1,100,000				
		152	Waterways	12,000,000				
		154	Waterways Protective Works	10,500,000				
		160	Pumps and Prime Movers	20,000,000				
		165	Turbines and Generators	8,400,000				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		170	Accessory Electrical Equipment	21,000,000				
	04		**Sacramento River Pumping-Generating Plant**		215,000,000	35,000,000	250,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	86,000,000				
		140	Roads and Road Structures (Including with Reservoir)	1,000,000				
		152	Discharge Piping					
		152	Waterways-Buried Penstock Piping and Bifu	3,000,000				
		154	Waterways Protective Structures	11,000,000				
		160	Pumps and Prime Movers	78,000,000				
		165	Turbines and Generators	11,000,000				
		170	Accessory Electrical Equipment	25,000,000				
	05		**Sacramento River Fish Screen Structure**		50,000,000	9,000,000	59,000,000	
		100	Land and Rights (Included with Reservoir)					
		130	Structures and Improvements	49,000,000				
		140	Roads and Road Structures (Included with Reservoir)	200,000				
		170	Accessory Electrical Equipment	800,000				
	06		**Red Bluff Pump Addition**		3,300,000	544,000	3,844,000	
		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				
05			**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				
	02		**Construct Develan Pipeline**		560,000,000	100,000,000	660,000,000	
		100	Land and Rights					
		120	Clearing and Demolition	500,000				
		152	Construct Develan Pipeline	510,000,000				
		152	I-5 Crossing (Jacked)	38,000,000				
		152	Highway 45 Crossing (Jacked)	11,500,000				
	03		**Construct TRR Pipeline**		300,000,000	50,000,000	350,000,000	
		100	Land and Rigths					
		152	Construct TRR Pipeline	275,000,000				
		152	Holthouse Inlet Structure	8,000,000				
		152	Construct GCID Crossing	17,000,000				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
13			**TRANSMISSION LINES, SWITCHYARDS AND SUBSTATIONS**		97,000,000	18,000,000	115,000,000	115,000,000
	01		**Transmission and Interconnection**		97,000,000	18,000,000	115,000,000	
		100	Land and Rights					
		175	Sites Substation	28,000,000				
		175	TRR Switchyard	7,000,000				
		175	Sacramento River PGP Switchyard	8,000,000				
		181	Transmission Lines	54,000,000				
15			**GENERAL PROPERTY**		23,000,000	4,000,000	27,000,000	27,000,000
			General Property		23,000,000	4,000,000	27,000,000	
		195	**Recreation Facilities**	21,000,000				
		195	**Operating and Maintenance Facility**	2,000,000				
			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	79,000,000				
			Cultural Resources	33,000,000				
			Land Use	30,000,000				
			Paleontology	2,000,000				
			Air Quality	200,000				

Cost Estimate for Alternative D

Project Cost Estimate

PROJECT	PREPARED BY
North of the Delta Offstream Storage Project (NODOS)	**AECOM**
DIVISION	ESTIMATE DATE **November 30, 2016**
UNIT	ESTIMATE TYPE **Feasibility**
FEATURE **Draft Cost Estimate for Project Alternative D**	PRICE LEVELS **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
01			**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	Construction Golden Gate Dam	370,000,000				
		151	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				

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		151	Construct Saddle Dam 8	56,000,000				
		151	Construct Saddle Dam 9	1,400,000				
			Rounding	3,980,000				
	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				
	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				
03			**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 Mechanical)	18,000,000				
		152	Construct Gate Intake Tower, Mechanical	14,000,000				
		152	Construct Gate 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)				
	03		**TRR Pumping-Generating Plant**		135,000,000	25,000,000	160,000,000	
		100	Land and Rights					

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		130	Structures and Improvements	64,000,000				
		140	Roads and Road Structures	1,150,000				
		152	Waterways	12,000,000				
		154	Waterways 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 (Including with Reservoir)	740,000				
		152	Discharge Piping					
		152	Waterways-Buried Penstock Piping and Bifu	3,000,000				
		154	Waterways Protective Structures	9,900,000				
		160	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 Reservoir)	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				
05			**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 Develan Pipeline**		560,000,000	100,000,000	660,000,000	

Property Class	Identified Property	Plant Account	Description	Current Field Cost	Total Field Cost	Noncontract Cost	Construction Cost	Total Construction Cost
		100	Land and Rights					
		120	Clearing and Demolition	390,000				
		152	Construct Develan 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				
15			**GENERAL PROPERTY**	10,000,000				
			Rounding	(800,000)				
			General Property		26,000,000	4,000,000	30,000,000	30,000,000
		195	**Recreation Facilities**		26,000,000	4,000,000	30,000,000	
		195	**Operating and Maintenance Facility**	24,000,000				
			Rounding	(500,000)				
			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				

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