# San Antonio Dam Multi-Year Maintenance Plan

## **SUBJECT TO REVISION**

Reservoir Operations Committee May 5, 2016

> Chris Moss, P.E. Sr. Water Resources Engineer

#### Monterey County Water Resources Agency

#### San Antonio Dam Multi-Year Maintenance Plan as of May 5, 2016

- Costs escalated at 2-percent per year (per U.S. Army Corps of Engineers Civil Works Construction Cost Index System, Amendment 7, 30 Sep 2015)
- Revenue escalated at 2-percent per year
- Six work items may need to be addressed as part of the Interlake Tunnel / Spillway Modification Project

## San Antonio Dam - Large Upcoming Maintenance Projects

Work Item	Project	Projected Fiscal Year	stimated Cost L6 Dollars
17	Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (1 of 9)	16-17	\$ 105,000
10	Install New 8" ARV (near BFV) - 1 of 7	16-17	\$ 19,799
16	Fabricate new intake structure bulkhead gate	16-17	\$ 55,520
48	Install inlet structure bulkhead gate	18-19	\$ 35,598
52	Purchase and Install New 8" ARV (near BFV) - 2 of 7	18-19	\$ 18,652
54	Fabricate new inlet trash racks	18-19	\$ 91,623
	underwater		 
69	Install new inlet trash racks by Dec 31, 2020 (per DSOD) wild wers	19-20	\$ 161,530
67	Purchase and Install New 8" ARV (near BFV) - 3 of 7	19-20	\$ 18,652
84	Road Maint - Patch/Repair AREA 1 - Main Gate to Control House	20-21	\$ 60,804
87	Purchase and Install New 8" ARV (near BFV) - 4 of 7	20-21	\$ 20,295
	Road Maint - Patch/Repair AREA 2 - Up to and across dam crest,		 
102	including around south knob	21-22	\$ 60,804
106	Purchase and Install New 8" ARV (near BFV) - 5 of 7	21-22	\$ 18,652
119	Purchase and Install New 8" ARV (near BFV) - 6 of 7	22-23	\$ 18,652
135	Purchase and Install New 8" ARV (near BFV) - 7 of 7	23-24	\$ 18,652
136	Repalce 10" ARV (D/S of BFV) - 1 of 7	23-24	\$ 20,952
137	Repalce 10" ARV (D/S of BFV) - 2 of 7	23-24	\$ 20,952
138	Repalce 10" ARV (D/S of BFV) - 3 of 7	22-23	\$ 20,952
139	Repalce 10" ARV (D/S of BFV) - 4 of 7	23-24	\$ 20,952
140	Repalce 10" ARV (D/S of BFV) - 5 of 7	23-24	\$ 20,952
141	Repalce 10" ARV (D/S of BFV) - 6 of 7	23-24	\$ 20,952
142	Repalce 10" ARV (D/S of BFV) - 7 of 7	23-24	\$ 20,952

#### **SUBJECT TO REVISION**

BUTTERFLY VALVE ARV AIR REIRASE VALVE

# Items that may be addressed during Tunnel / Spillway Modification Project

Description  1 Repair spillway concrete floor	Fiscal Year	Regulatory Reference	Esti		Allocation for Future Repair (Sinking Fund)	C	stimated onsultant tractor Cost	Estimated Service & Supply Cost	Cor	stimated Outside Insultant & Intractor & I	Estir	.6 DOLLARS mated Total oject Cost
Replace logboom at spillway inlet channel with Tuff-Boom type			\$	42,892		\$	450,000	×,000	\$	450,000	\$	492,892
2 debris boom			\$	9,221				\$ 100,000	ċ	100,000	<u>I</u>	
3 Road Maint - Patch/Repair AREA 4 - Spillway Access Roads			\$	20,804		Ś	30,000		<del>-</del>	30,000		109,221
Investigate spillway concrete deterioration and prepare 4 maintenance / repair plan		OSOD 5-5- 2015 Insp. Report	¢	12,225					¥	30,000	3	50,804
Install new piezometers in dam - abandon existing casagrande 5 piezometers			· <u>۲</u>						\$		\$	12,225
6 Update dam stability analysis - last done: Bechtel, 1970						\$	230,000		\$	230,000	\$	276,436
			\$	26,454		\$	50,000		\$	50,000	\$	76,454
FOR FURTHER CONSIDERATION		i i										
Road Maint - Patch/Repair AREA 3 - Vista Rd and Parking Lot			\$	20,804		Ś	40.000		ς	40.000		60.904

<sup>=</sup> dam safety program compliance item

<sup>= &</sup>quot;project" meaning work item projected to accomplish during a particular fiscal year

Multi-Year Plan YEAR: 1

Years' Cost Escalated from 2016 D

Description  1 Vegetation Control, Rodent Control	Fiscal Year	Regulatory Reference		mated Staff Cost	Allocation for Future Repair (Sinking Fund)		Estimated Consultant ontractor Cost	Se	timated rvice &	1	Estimated Outside Consultant & Contractor & Supply Cost	Esti	6 DOLLARS mated Total oject Cost	Esti	SCALATION ROM 16-17 mated Tota
	16-17		\$	18,683				\$	3,300	_	3,300		21,983	_	-
2 100% Cycle Butterfly Valve & Howell-Bunger Valve	15.17	DSOD 5-5-	20			0000					3,500		21,363	3	21,983
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.	10-17	2015 Insp Rpt	\$	2,774		~====				\$	٠.	\$	2,774	5	2,774
monitor compromised spillway floor concrete & inspect spillway  3 bridge)	16-17	DSOD, MCWRA		42.000					************					Ť	2,772
Piezomter / Drain monitor, data process, consultant management,	1017	IVICVVIA	\$	13,068						\$		\$	13,068	\$	13,068
4 annual survelliance report review	16-17	DSOD	\$	20 200		20								1	
5 Settlement & Shift Survey	16-17		- <del>\$</del>	30,399		\$	41,891			\$	41,891	\$	72,290	\$	72,290
6 Flush Piezometers (suspended until reservoir reaches min-pool)	16-17	0300		5,948		\$	15,000			\$	15,000	\$	20,948	\$	20,948
General Maintenance of Lights, Roadways, Signs, Guardrails	10-17		\$	20,624						\$	-	\$	20,624	\$	20,624
7 Fences, Gutters, Roads, Access, etc.	16-17														
Asst. Maint. Supt Supervision of Maintenance - Coordination.	10-17		\$	36,307						\$	-	\$	36,307	\$	36,307
8 Timekeeping, Reporting	16-17		\$	17.000											
Inspect, clean, re-coat Howell-Bunger valve & sleeve, and replace			à.	17,096		_				\$	-	\$	17,096	\$	17,096
9 brass bushing	16-17		é	12 101										1	
10 Install New 8" ARV (near BFV) - 1 of 7	16-17		\$	13,181		\$	5,000	\$	1,440		6,440	\$	19,621	\$	19,621
Purchase & Install Closed Circuit TV & Communications in BFV			2	17,799				\$	2,000	\$	2,000	\$	19,799	\$	19,799
11 Chamber	16-17														
12 Inspect 96" BFV trunion packing/parts & service as-needed	16-17		\$	15,154				\$	5,000	\$	5,000	\$	20,154	\$	20,154
Inspect spillway bridge - develop maintenance/repair plan & cost	10-17		>	10,551				\$	3,000	\$	3,000	\$		\$	13,551
13 estimate as-needed	16-17														
14 Repair spillway 10" clay pipe subsurface drain (right side)	16-17		\$	3,832						\$		\$	3,832	\$	3,832
		DSOD 7-29-	\$	17,799				\$	1,500	\$	1,500	\$	19,299		19,299
15 Prepare Emergency Action Plan for SA Dam		2015 Ltr	\$	7.026						Una					
16 Fabricate intake structure bulkhead gate	16-17		\$	7,936 19,160						\$	-		7,936	\$	7,936
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (1			<u> </u>	19,100		\$	36,360			\$	36,360	\$	55,520	\$	55,520
17 of 9)	16-17		Ś		★ ************************************										
Touch-up paint outer 84" steel penstock in tunnel - PARTIAL (YEAR	10-17		3		105,000					\$		\$	105,000	\$	105,000
18 1 of 2 - FILL-IN WORK AS-NEEDED)	16 17									XX-0-000					
19 Contingency	16-17 16-17		\$	6,226				\$	1,000	\$	1,000	\$	7,226	\$	7,226
	10-17		_		The second secon								,,220	Ś	7,220
			\$	100,029								\$	100,029	\$	100,029

Target Budget for Items Shown: \$ 577,057

Budget - Estimated Total Cost: \$ 388

Multi-Year Plan YEAR: 2

Years' Cost Escalated from 2016 Do

Target Budget for Items Shown: \$

Budget - Estimated Total Cost: \$

588,994

E Description	Fiscal Year	Regulatory Reference	Esti	mated Staff Cost	Allocation Future F	Repair	Ci	Estimated Consultant ontractor Cost	Se	timated ervice & oply Cost	1	Estimated Outside Consultant & Contractor & Supply Cost	Es	016 DOLLARS timated Total Project Cost	Esti	SCALATION ROM 16-17 imated Total roject Cost
20 Vegetation Control, Rodent Control	17-18		\$	18,683			uno		\$	3,300	\$	3,300	\$	21,983	_	22,422
21 100% Cycle Butterfly Valve & Howell-Bunger Valve	17-18	DSOD 5-5- 2015 Insp Rpt	\$	2,774			243000				\$		\$	2,774		2,829
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl. monitor compromised spillway floor concrete & inspect spillway		DSOD,												***************************************		
22 bridge) Piezomter / Drain monitor, data process, consultant management,	17-18	MCWRA	\$	13,068							\$		\$	13,068	\$	13,329
23 annual survelliance report review	17-19	DSOD	ė	20.200								VOSTERS				
24 Settlement & Shift Survey		DSOD	5	30,399 5,948			\$	41,891			\$	41,891		72,290		73,736
25 Flush Piezometers (suspended until reservoir reaches min-pool)	17-18		\$	20,624			\$	15,000			\$	15,000		20,948		21,367
General Maintenance of Lights, Roadways, Signs, Guardrails,				20,624							\$		\$	20,624	\$	21,037
26 Fences, Gutters, Roads, Access, etc.	17-18		\$	36,307							\$		\$	36,307	\$	37,034
Asst. Maint. Supt Supervision of Maintenance - Coordination,	WHE		2										e dinero			
27 Timekeeping, Reporting 28 Update SA Dam Emergecny Action Plan (EAP)	17-18 17-18		\$	17,096							\$	-	\$	17,096	\$	17,437
	2000		\$	2,116					-		\$		\$	2,116	\$	2,159
29 96" BFV hydraulic operation system repair & upgrade Repair spalled concrete at spillway left approach wall and at left	17-18		\$	10,808					\$	12,000	\$	12,000	\$	22,808	\$	23,264
30 wall near bridge	17-18	DSOD 5-5- 2015 Insp Rpt	\$	6,462					\$	1,000	\$	1,000	\$	7,462	\$	7,611
31 Video spillway 10" dia subsurface drains	17-18		\$	5,548					\$	2,500	\$	2,500	Ś	8,048	\$	8,209
32 Replace left abutment surface drain piping (side hill drains)	17-18		\$	27,662					Ś	4,000		4,000		31,662		32,295
Install new access hatch in 84" penstock near BFV for downstream													·			32,233
33 penstock internal re-coating work	17-18		\$	19,160			\$	20,000			\$	20,000	\$	39,160	4	39,943
Repair Howell-Bunger valve Discharge Cone (Sandblast,								*****************					·	33,100	<del></del>	33,343
34 Patch/Repair, Resurface) DWGs 3440-6-008, 017	17-18		\$	23,449			\$	35,000			\$	35,000	\$	58,449	4	59,618
Determine need/benefits of replacing 96" BFV weight/lever with	DI-VERTERANDEN								*****						-X	33,010
gear operator; develop preliminary specs and cost estimate as																
35 needed	17-18		\$	5,948							\$		\$	5,948	Ś	6,067
Reline 84" Penstock downstream of BFV (±600 LF) SINKING FUND (2			0000000												<u> </u>	0,007
36 of 9)	17-18		\$	-	\$ 105	5,000		MARANAS EN PATRICONA	00000-1100		\$	-	\$	105,000	\$	105,000
Touch-up paint outer 84" steel penstock in tunnel - PARTIAL (YEAR		soc surdiosina accomitate d	economic and													
37 2 of 2 - FILL-IN WORK AS-NEEDED)	17-18		\$	6,226					\$	1,000	\$	1,000	\$	7,226	\$	7,370
38 Contingency	17-18		20000000											-,-20	\$	
	11-11		\$	86,078				The little					\$	86,078	\$	87,799
			\$	338,356	\$ 105	,000	\$	111,891	\$	23,800	4	135,691	4	579,047	\$	588,528

Multi-Year Plan YEAR: 3

Years' Cost Escalated from 2016 Do

Description  39 Vegetation Control, Rodent Control		Regulatory Reference	Esti	mated Staff Cost	Allocation fo Future Repai (Sinking Fund	r	Estimated Consultant ontractor Cost	Estimated Service & Supply Cost		Estimated Outside Consultant & Contractor & Supply Cost	Estim	5 DOLLARS nated Total nject Cost	FR: Estin	CALATION OM 16-17 nated Tota oject Cost
	18-19	DSOD 5-5-	<u>\$</u>	18,683				\$ 3,300	\$	3,300	\$	21,983	\$	22,873
40 100% Cycle Butterfly Valve & Howell-Bunger Valve	18-19	2015 Insp Rpt	ć	2 774									1	
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.		LOID HISP KPC		2,774					\$		\$	2,774	\$	2,886
monitor compromised spillway floor concrete & inspect spillway  41 bridge)	18-19	DSOD, MCWRA	\$	13,068							242	1706450042		
Piezomter / Drain monitor, data process, consultant management,			<u></u>	13,000					\$		\$	13,068	\$	13,596
42 annual survelliance report review	18-19	DSOD	\$	30,399		Ś	41 001			2002	1727		-	
43 Settlement & Shift Survey	18-19	DSOD	\$	5,948		<del></del> \$	41,891 15,000		\$	41,891		72,290	\$	75,211
44 Flush Piezometers (suspended until reservoir reaches min-pool)	18-19		\$	20,624			15,000		\$			20,948	\$	21,795
General Maintenance of Lights, Roadways, Signs, Guardrails,			<u></u>	20,024					\$		\$	20,624	\$	21,457
45 Fences, Gutters, Roads, Access, etc.	18-19		\$	36,307					-		ov:			
Asst. Maint. Supt Supervision of Maintenance - Coordination, 46 Timekeeping, Reporting	18-19	****************	\$						\$		\$	36,307	\$	37,774
47 Update SA Dam Emergecny Action Plan (EAP)	18-19		\$	17,096					\$	-	\$	17,096	\$	17,786
48 Install inlet structure bulkhead gate	18-19		\$	2,116					\$	-	\$	2,116	\$	2,202
Internal Inspection of 84" Penstock & Touch-Up Coat Internal	10-13		3	35,598					\$	-	\$	35,598	\$	37,036
49 Penstock D/S of BFV	18-19	DSOD	\$	20.00=										
50 Flush left abut drains & spillway drains (last flushed 2015)	18-19	0300	\$	30,307		\$	16,800	\$ 3,000		19,800		50,107	\$	52,132
Investigate condition of electrical wiring in tunnel; develop plan	10 13			8,435		\$	10,274		\$	10,274	\$	18,709	\$	19,464
51 and cost estimate(s) as needed	18-19		Ś	2 774										
52 Purchase and Install New 8" ARV (near BFV) - 2 of 7	18-19		\$	2,774 12,452		\$	1,400		\$	1,400		4,174	\$	4,342
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (3				12,452				\$ 6,200	\$	6,200	\$	18,652	\$	19,405
53 of 9)	18-19		4											
***************************************		DSOD 5-5-	\$		\$ 105,000				\$	-	\$	105,000	\$	105,000
54 Fabricate new inlet trash racks		2015 Insp Rpt	ė	12.000			72127556					PATE STREET STREET		A THE SAME SHEET OF THE SAME SAME
55 Contingency	18-19	2010 map rept	3	13,869		\$	77,754		\$	77,754	\$	91,623	\$	95,325
Part Control III.	2.700		\$	50,213									\$	-
			-	30,213		-					\$	50,213	\$	52,241
			\$	300,662	\$ 105,000	\$	163,119	\$ 12,500		175,619 Target Budget fo	\$ or Item	581,281 ns Shown:	\$	600,523 600,774

Target Budget for Items Shown: \$ 600,774
Budget - Estimated Total Cost: \$ 251

Multi-Year Plan YEAR: 4

Years' Cost Escalated from 2016 Do

			_						_		_					3
Description		Regulatory Reference	Estin	mated Staff Cost	Allocation for Future Repa (Sinking Fun	ir	Cor	timated nsultant ractor Cost	S	stimated ervice & pply Cost	0	Estimated Outside Consultant & Contractor & Supply Cost	Est	016 DOLLARS timated Total Project Cost	Esti	CALATION ROM 16-17 mated Tot roject Cost
56 Vegetation Control, Rodent Control	19-20		\$	18,683					\$	3,300	\$	3,300	\$	21,983	\$	23,32
57 100% Cycle Butterfly Valve & Howell-Bunger Valve	19-20	DSOD 5-5- 2015 Insp Rpt	\$	2,774							\$	_	\$	2,774	\$	2,94
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl. monitor compromised spillway floor concrete & inspect spillway 58 bridge)	19-20	DSOD, MCWRA	\$	13,068							\$	2	\$	13,068	Ś	13,86
Piezomter / Drain monitor, data process, consultant management, 59 annual survelliance report review	19-20	DSOD	\$	30,399			\$	41,891			Ś	41,891		72,290		76,71
60 Settlement & Shift Survey	19-20	DSOD	\$	5,948			\$	15,000			Ś	15,000		20,948		22,23
61 Flush Piezometers (suspended until reservoir reaches min-pool)	19-20	***************	\$	20,624							\$		\$	20,624		21,88
General Maintenance of Lights, Roadways, Signs, Guardrails,														20,021		22,00
62 Fences, Gutters, Roads, Access, etc.	19-20		\$	36,307							\$		\$	36,307	Ś	38,53
Asst. Maint. Supt Supervision of Maintenance - Coordination,										*************						
63 Timekeeping, Reporting	19-20		\$	17,096							\$		\$	17,096	Ś	18,14
64 Update SA Dam Emergecny Action Plan (EAP)	19-20		\$	2,116				***************************************			\$	-	\$	2,116		2,24
65 Install new survey monuments	19-20		\$	3,688					\$	750	\$	750	\$	4,438	\$	4,71
66 RFP, hire dam survelliance consultant for 5-yr term	19-20	DSOD	\$	7,936							\$	-	\$	7,936	\$	8,42
67 Purchase and Install New 8" ARV (near BFV) - 3 of 7	19-20		\$	12,452					\$	6,200	\$	6,200	\$	18,652	\$	19,79
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (4																
68 of 9)	19-20		\$		\$ 105,00	0					\$		\$	105,000	\$	105,00
		DSOD 5-5-														
69 Install new inlet trash racks by Dec 31, 2020 (per DSOD)		2015 Insp Rpt	\$	41,608			\$	100,000	\$	19,922	\$	119,922	\$	161,530	\$	171,41
70 Contingency	19-20														\$	-
			\$	78,548									\$	78,548	\$	83,35
			\$	291,247	\$ 105,00	0 5	\$	156,891	\$	30,172		187,063		583,310	\$	612,586

Target Budget for Items Shown: \$ 612,789
Budget - Estimated Total Cost: \$ 203

Multi-Year Plan YEAR: 5 Years' Cost Escalated from 2016 Do 4 Estimated Outside **ESCALATION** Allocation for **Estimated Estimated** Consultant & 2016 DOLLARS FROM 16-17 Fiscal **Estimated Staff** Regulatory **Future Repair** Consultant Service & Contractor & **Estimated Total Estimated Total** Description Year Reference Cost (Sinking Fund) Contractor Cost **Supply Cost Supply Cost Project Cost Project Cost** 71 Vegetation Control, Rodent Control 20-21 18,683 3,300 3,300 \$ 21,983 \$ 23,795 DSOD 5-5-72 100% Cycle Butterfly Valve & Howell-Bunger Valve 20-21 2015 Insp Rpt \$ 2,774 Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl. - \$ 2,774 | \$ 3,002 monitor compromised spillway floor concrete & inspect spillway DSOD. 73 bridge) 20-21 MCWRA \$ 13,068 Piezomter / Drain monitor, data process, consultant management, - \$ 13,068 \$ 14,145 74 annual survelliance report review 20-21 DSOD 30,399 41,891 \$ 41,891 \$ 72,290 78.249 75 Settlement & Shift Survey 20-21 DSOD \$ 5.948 15.000 \$ 76 Flush Piezometers (suspended until reservoir reaches min-pool) 15,000 \$ 20,948 22,675 20-21 20,624 \$ - \$ 20,624 \$ General Maintenance of Lights, Roadways, Signs, Guardrails, 22,324 77 Fences, Gutters, Roads, Access, etc. 20-21 \$ 36,307 \$ - \$ Asst. Maint. Supt. - Supervision of Maintenance - Coordination, 36,307 \$ 39,300 78 Timekeeping, Reporting 20-21 17,096 79 Update SA Dam Emergecny Action Plan (EAP) 17,096 18,505 20-21 2.116 2,116 \$ 2,291 Inspect Howell-Bunger valve & sleeve, and clean/recoat sleeve, 80 replace brass bushing - as needed 20-21 8,578 3,000 \$ 1,440 \$ 81 Video spillway 10" dia subsurface drains 4,440 \$ 13,018 14,092 20-21 5,548 2,500 2,500 \$ 8,048 \$ Purchase Dam Barrier Buoy Line (alternative to New Debris Boom) 8,711 82 SINKING FUND (1 of 3) 20-21 \$ 35,185 83 Dam Failure Inundation Mapping for SA Dam (for EAP) 35,185 38,085 20-21 DSOD 7-29-\$ 10,582 \$ 20,000 \$ 20,000 \$ 30,582 33,103 84 Road Maint - Patch/Repair AREA 1 - Main Gate to Control House 20-21 20,804 40,000 40,000 \$ 60,804 85 Install guard rails on spillway walls adjacent access manholes 65,816 20-21 \$ 9,750 4,000 \$ 4,000 \$ 13,750 86 Repair toe relief well concrete bases 14,883 20-21 31,592 1,500 \$ 1,500 33,092 35,819 87 Replace 8" ARV (near BFV) - 4 of 7 20-21 14,095 6,200 \$ 6,200 \$ 20,295 21,968 Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (5 88 of 9) 20-21 - \$ 105,000 89 Contingency 105,000 105,000 20-21 Ś 58,223 \$ 58,223 | \$ 63,023 \$ 306,187 \$ 140,185 \$ 119,891 \$ 18,940 \$ 138,831 \$ 585,203 \$ 624,787 Target Budget for Items Shown: \$ 625,045

#### SUBJECT TO REVISION

Budget - Estimated Total Cost: \$

258

Multi-Year Plan YEAR: 6

Years' Cost Escalated from 2016 Do

			-			-									5
<b>5</b>	Fiscal	Regulatory	Esti	mated Staff	Allocation for Future Repair	4	Estimated Consultant		stimated ervice &		Estimated Outside Consultant & Contractor &		016 DOLLARS	F	SCALATION ROM 16-17
Description Description	Year	Reference		Cost	(Sinking Fund	) (	Contractor Cost	Su	pply Cost		Supply Cost		Project Cost	P	roject Cost
90 Vegetation Control, Rodent Control	21-22		\$	18,683				\$	3,300	\$	3,300	\$	21,983	\$	24,271
		DSOD 5-5-													
91 100% Cycle Butterfly Valve & Howell-Bunger Valve	21-22	2015 Insp Rpt	\$	2,774						\$		\$	2,774	S	3,063
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.									***********			-			
monitor compromised spillway floor concrete & inspect spillway		DSOD,													
92 bridge)	21-22	MCWRA	\$	13,068						\$	-	\$	13,068	S	14,428
Piezomter / Drain monitor, data process, consultant management,															
93 annual survelliance report review	21-22	DSOD	\$	30,399		\$	41,891			\$	41,891	\$	72,290	Ś	79,814
94 Settlement & Shift Survey	21-22	DSOD	\$	5,948		\$	15,000			\$					23,129
95 Flush Piezometers (suspended until reservoir reaches min-pool)	21-22		\$	20,624			**************			\$		\$			22,771
General Maintenance of Lights, Roadways, Signs, Guardrails,											***********				
96 Fences, Gutters, Roads, Access, etc.	21-22		\$	36,307						\$		\$	36,307	\$	40,086
Asst. Maint. Supt Supervision of Maintenance - Coordination,					**************		***************								
97 Timekeeping, Reporting	21-22		\$	17,096						\$		\$	17,096	Ś	18,875
98 Update SA Dam Emergecny Action Plan (EAP)	21-22		\$	2,116						\$		\$	2,116		2,337
Inspect Howell-Bunger valve Discharge Cone (Repair/Recoat as-															
99 needed) DWGs 3440-6-008, 017	21-22		\$	8,578		\$	2,000			\$	2,000	Ś	10,578	Ś	11,679
100 96" BFV hydraulic operation system service & repair - as needed	21-22		\$	7,520				\$	3,500	\$	3,500	\$	11,020	Ś	12,167
Purchase Dam Barrier Buoy Line (alternative to New Debris Boom)														-	
101 SINKING FUND (2 of 3)	21-22		\$		\$ 35,185	ě				\$		\$	35,185	Ś	38,847
Road Maint - Patch/Repair AREA 2 - Up to and across dam crest,															
102 including around south knob	21-22		\$	20,804		\$	40,000			\$	40,000	\$	60,804	\$	67,132
103 Flush left abut drains & spillway drains (last flushed 2015)	21-22		\$	8,435		\$	10,274			\$			18,709		20,656
Internal Inspection of 84" Penstock & Touch-Up Coat Internal															
104 Penstock D/S of BFV	21-22	DSOD	\$	30,307		\$	16,800	\$	3,000	\$	19,800	\$	50,107	5	55,322
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (6															
105 of 9)	21-22		\$		\$ 105,000	)				\$	*	\$	105,000	\$	105,000
106 Purchase and Install New 8" ARV (near BFV) - 5 of 7	21-22		\$	12,452				\$	6,200	\$	6,200		18,652	\$	20,593
107 Contingency	21-22													\$	
	15.5	The state of	\$	69,835	19-10-10-10-1		A STATE OF THE STA		WALL THE			\$	69,835	\$	77,103
			_	201.0	A		****	_			****	-		_	
			5	304,946	\$ 140,185	\$	125,965	\$	16,000	5	141,965	\$	587,096	\$	637,273

Target Budget for Items Shown: \$ 637,546
Budget - Estimated Total Cost: \$ 273

Multi-Year Plan YEAR: 7

Years' Cost Escalated from 2016 Do

Budget - Estimated Total Cost: \$

35,190

Description  108 Vegetation Control, Rodent Control	Fiscal Year	Regulatory Reference	Esti	mated Staff Cost	Allocation Future Rep (Sinking Fu	oair	C	stimated onsultant tractor Cost	S	stimated ervice & pply Cost	Co	Estimated Outside onsultant & ontractor & supply Cost	Est	016 DOLLARS cimated Total Project Cost	Esti	6 SCALATION ROM 16-17 imated Total roject Cost
100 vegetation control, Rodent Control	22-23	DSOD 5-5-	\$	18,683					\$	3,300	\$	3,300	\$	21,983	\$	24,756
109 100% Cycle Butterfly Valve & Howell-Bunger Valve Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.	22-23	2015 Insp Rpt	\$	2,774							\$		\$	2,774	\$	3,124
monitor compromised spillway floor concrete & inspect spillway  110 bridge)	22-23	DSOD, MCWRA	\$	13,068							\$		\$	13,068	\$	14,717
Piezomter / Drain monitor, data process, consultant management, annual survelliance report review	22-23	DSOD	\$	30,399	***************************************		<u> </u>	41,891			\$	41,891				
112 Settlement & Shift Survey	22-23	DSOD	\$	5,948			\$	15,000			\$			72,290		81,410
113 Flush Piezometers (suspended until reservoir reaches min-pool)	22-23		Ś	20,624			<u></u>	13,000			\$	15,000		20,948		23,591
General Maintenance of Lights, Roadways, Signs, Guardrails, 114 Fences, Gutters, Roads, Access, etc. Asst. Maint. Supt Supervision of Maintenance - Coordination,	22-23		\$	36,307							\$	-	\$	20,624 36,307		23,226
115 Timekeeping, Reporting	22.22		020	02/42/07												
116 Update SA Dam Emergecny Action Plan (EAP)	22-23		<u> </u>	17,096						************	\$	-	\$	17,096	\$	19,252
117 Replace left abutment surface drain piping (side hill drains)			\$	2,116							\$	-	\$	2,116	\$	2,383
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (7	22-23		\$	27,662					\$	4,000	\$	4,000	\$	31,662	\$	35,656
118 of 9)	22-23		\$		\$ 105.0	000					4		\$	105,000	\$	105 000
119 Purchase and Install New 8" ARV (near BFV) - 6 of 7	22-23		\$	12,452					Ś	6,200	Ś	6,200		18,652		105,000 21,005
Purchase Dam Barrier Buoy Line (alternative to New Debris Boom) 120 SINKING FUND (3 of 3)	22-23		\$		\$ 35,1	85										
121 Install Dam Barrier Buoy Line (alternative to New Debris Boom)	22-23		\$	40,812	7 33,1						\$		\$	35,185		39,624
122 Paint external conduit & bypass piping in BFV room	22-23		\$	11,224			ζ	26,262			\$		\$	40,812		45,961
123 Contingency	22-23			11,227			·	20,202			>	26,262	\$	37,486	\$	42,215
			\$	81,957									\$	81,957	\$	92,297
			\$	321,122	\$ 140,1	85	\$	83,153	\$	13,500	(E)	96,653		557,960 ems Shown:	1.00	615,107 650,297

Multi-Year Plan YEAR: 8

Years' Cost Escalated from 2016 Do

Budget - Estimated Total Cost: \$

13,708

Description		Regulatory Reference	Esti	mated Staff Cost	Allocation for Future Repair (Sinking Fund)	c	Estimated Consultant Contractor Cost		Estimated Service & upply Cost	0	Estimated Outside onsultant & ontractor & supply Cost	Est	016 DOLLARS timated Total Project Cost	FR Estin	CALATION ROM 16-17 mated Total roject Cost
124 Vegetation Control, Rodent Control	23-24		\$	18,683				\$	3,300	\$	3,300	\$	21,983	\$	25,251
		DSOD 5-5-													
125 100% Cycle Butterfly Valve & Howell-Bunger Valve	23-24	2015 Insp Rpt	\$	2,774		0000				\$		\$	2,774	\$	3,186
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.															
monitor compromised spillway floor concrete & inspect spillway		DSOD,													
126 bridge)	23-24	MCWRA	\$	13,068						\$		\$	13,068	\$	15,011
Piezomter / Drain monitor, data process, consultant management,															
127 annual survelliance report review	23-24	DSOD	\$	30,399		\$	41,891			\$	41,891	\$	72,290	\$	83,039
128 Settlement & Shift Survey	23-24	DSOD	\$	5,948		\$	15,000			\$	15,000	\$	20,948	\$	24,063
129 Flush Piezometers (suspended until reservoir reaches min-pool)	23-24		\$	20,624						\$	-		20,624		23,691
General Maintenance of Lights, Roadways, Signs, Guardrails,		****************													
130 Fences, Gutters, Roads, Access, etc.	23-24		\$	36,307						\$	14	\$	36,307	\$	41,706
Asst. Maint. Supt Supervision of Maintenance - Coordination,															
131 Timekeeping, Reporting	23-24		\$	17,096						\$		\$	17,096	Ś	19,637
132 Update SA Dam Emergecny Action Plan (EAP)	23-24	***************************************	\$	2,116						\$	-	\$	2,116		2,431
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (8															
133 of 9)	23-24		\$	-	\$ 105,000					\$		\$	105,000	¢	105,000
134 Video spillway 10" dia subsurface drains	23-24		\$	5,548				Ś	2,500	Ś	2,500		8,048	Ś	9,244
135 Purchase and Install New 8" ARV (near BFV) - 7 of 7	23-24		\$	12,452				Ś		\$			18,652		21,425
136 Repaice 10" ARV (D/S of BFV) - 1 of 7	23-24		\$	12,452	**************			\$		\$	8,500		20,952		24,067
137 Repaice 10" ARV (D/S of BFV) - 2 of 7	23-24		\$	12,452				\$		\$	8,500		20,952		24,067
138 Repaice 10" ARV (D/S of BFV) - 3 of 7	22-23		\$	12,452				\$	8,500		8,500		20,952		24,067
139 Repaice 10" ARV (D/S of BFV) - 4 of 7	23-24		\$	12,452				\$	8,500	*****	8,500		20,952		24,067
140 Repaice 10" ARV (D/S of BFV) - 5 of 7	23-24		\$	12,452				Ś	8,500		8,500		20,952		24,067
141 Repaice 10" ARV (D/S of BFV) - 6 of 7	23-24		\$	12,452				Ś	8,500	-	8,500		20,952	è	24,067
142 Repaice 10" ARV (D/S of BFV) - 7 of 7	23-24		\$	12,452		****		Ś	8,500		8,500		20,952	5	24,067
Grout reservoir water level tube from control building to inlet			<u>Y</u>					<u>-</u>	0,000				20,332	-	24,007
143 structure	23-24		Ś	8.578				\$	3,000	\$	3,000	¢	11,578	4	13,300
144 Contingency	23-24		<u>Y</u>	0,570					3,000	·	3,000		11,376	\$	13,300
		Marin Open	\$	81,957		136				100		Ś	81,957	\$	94,143
	_		_	02,007	THE STATE OF THE S	-						*	01,537	7	54,143
			\$	342,712	\$ 105,000	\$	56,891	\$	74,500	850.	131,391 arget Budget	- 177	579,103 tems Shown:	\$	649,595 663,303

Multi-Year Plan YEAR: 9

Years' Cost Escalated from 2016 Do

	T	1	Т							Т	Estimated	_		_	8
E Description		Regulatory	Est	imated Staff	Allocation for Future Repair		Estimated Consultant	2 2000	mated vice &	1	Outside onsultant & ontractor &		16 DOLLARS	FR	CALATION ROM 16-17 mated Total
145 Vegetation Control, Rodent Control	Year	Reference		Cost	(Sinking Fund)	Co	ntractor Cost	Supp	oly Cost	S	upply Cost	Pr	oject Cost	Pr	oject Cost
143 vegetation control, Rodent Control	24-25		\$	18,683				\$	3,300	\$	3,300	\$	21,983	\$	25,756
146 100% Ovelo Buttonfly Volvo B Hamall B	727577213	DSOD 5-5-												†~~~	
146 100% Cycle Butterfly Valve & Howell-Bunger Valve	24-25	2015 Insp Rpt	\$	2,774						\$	-	\$	2,774	\$	3,250
Dam Inspections: DSOD, MCWRA, Consultant, earthquakes (incl.														†	
monitor compromised spillway floor concrete & inspect spillway		DSOD,												1	
147 bridge)	24-25	MCWRA	\$	13,068						\$	-	\$	13,068	Ś	15,311
Piezomter / Drain monitor, data process, consultant managemer														† <u>*</u>	
148 annual survelliance report review		DSOD	\$	30,399		\$	41,891			\$	41,891	\$	72,290	s	84,699
149 Settlement & Shift Survey		DSOD	\$	5,948		\$	15,000			\$	15,000		20,948		24,544
150 Flush Piezometers (suspended until reservoir reaches min-pool)	24-25		\$	20,624						\$	-		20,624		24,164
General Maintenance of Lights, Roadways, Signs, Guardrails,													20,021	<u> </u>	24,104
151 Fences, Gutters, Roads, Access, etc.	24-25		\$	36,307						\$	(C=	\$	36,307	\$	42,540
Asst. Maint. Supt Supervision of Maintenance - Coordination,													50,507	<u> </u>	42,540
152 Timekeeping, Reporting	24-25		\$	17,096						\$		\$	17,096	\$	20,030
153 Update SA Dam Emergecny Action Plan (EAP)	24-25		\$	2,116						Ś		\$	2,116		2,480
154 RFP, hire dam survelliance consultant for 5-yr term	24-25	DSOD	\$	7,936		\$	49,450			\$	49,450		57,386	_	
155 Replace left abutment surface drain piping (side hill drains)	24-25		\$	27,662				Ś	4,000		4,000		31,662		67,237
Reline 84" Penstock dwnstream of BFV (±600 LF) SINKING FUND (	9							<u> </u>	4,000		4,000		31,002	3	37,097
156 of 9)	24-25		\$	_	\$ 105,000					\$		\$	105,000	s	405 000
Reline 84" Internal Penstock downstream of BFV (±600 LF) &					200,000								105,000	>	105,000
Internal Inspection of Entire Penstock (Expend \$945,000 allocated	1														
over prior nine years for contractor costs. Estimated staff costs															
157 included here.)	24-25		\$	42,265										١.	
158 Flush left abut drains & spillway drains (last flushed 2015)	24-25		\$	8,435	***************************************	Ś	10,274			\$			42,265		49,520
Inspect Howell-Bunger valve & sleeve, and clean/recoat sleeve,						3	10,274			\$	10,274	\$	18,709	\$	21,920
159 replace brass bushing - as needed	24-25		\$	8,578			2 000								
160 Contingency	24-25			0,3/8		\$	3,000	>	1,440	\$	4,440	\$	13,018	\$	15,253
		77	3	83,846		_						_	20.0:-	\$	-
			<u> </u>	03,040		_				_		\$	83,846	\$	98,238
			\$	325,737	\$ 105,000	\$	119,615	\$	8,740	\$	128,355	\$	559,092	\$	637,041
									-		arget Budget		1000	9.0	676,569
											Budget - Estin				
											oudget - Estin	iateo	Total Cost:	5	39,528