COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Appendix C
Capital and Annual Costs of Measures for the UARP and Chili Bar Project

FEIS

APPENDIX C

CAPITAL AND ANNUAL COSTS OF MEASURES FOR THE UARP AND CHILI BAR PROJECT

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C.1 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE UARP ALTERNATIVES

In this section, we present the costs of environmental measures associated with the UARP alternatives. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted, in this case, to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-1. No reduction in dependable capacity was identified by SMUD for any environmental measures. Because table 1 of SMUD's April 11, 2007, submittal shows the total generation benefits drop by $8,848,800 and table 4 shows the total generation benefit drops by $8,914,400, we used the slightly lower value in our analysis to be consistent with SMUD's projected effect on energy generation. We also note that in some cases the footnotes, resulting costs, and Settlement Agreement did not always agree. In those instances, we made an appropriate entry in the column labeled comments. We show corrections to footnotes in italics. We also note when staff does not endorse a particular measure. Please note that minor round off errors of $100 may occur because all values are rounded to the nearest $100.

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Table C-1. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications. (Source: SMUD, 2007; Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
1	**Article 1-1. Minimum streamflows.**							
2	Implement daily minimum reservoir release schedule, and provide compliance documentation to FERC annually.	$0	$5,500	$5,500	$0	Water quantity	Yes	
3	Periodic manual adjustments to minimum release valves at all 10 Project dams.[c]	$0	$23,600	$23,600	$0	Water quantity	Yes	
4	Minimum release at Rubicon dam; installation of larger valve required.	$273,300	$0	$18,100	$710,000	Water quantity	Yes	
5	Minimum release at Buck Island.	$0	$0	$0	$134,000	Water quantity	Yes	
6	Minimum release at Loon Lake.	$0	$0	$0	$964,000	Water quantity	Yes	
7	Combined minimum release at Gerle Creek dam and Robbs Peak dam.	$0	$0	$0	$1,265,000	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
8	Minimum release at Ice House dam.		$0		$617,000	Water quantity	Yes	
9	Installation of larger valve at Ice House.	$273,300	$0	$18,100	$0	Water quantity	No	
10	Minimum release at Junction dam.	$0	$0	$0	$457,000	Water quantity	Yes	
11	Minimum release at Camino dam.	$0	$0	$0	$484,000	Water quantity	Yes	
12	Minimum release at Brush Creek dam.	$0	$0	$0	$2,000	Water quantity	Yes	
13	Minimum release at Slab Creek dam; installation of larger valve required.	$2,076,700	$0	$137,900	$2,648,000	Water quantity	Yes	
14	**Articles 1-2 and 1-3. Pulse flows**							
15	Implement pulse flows below Rubicon dam, with ramping; capital costs are for physical modifications at tunnel gate to facilitate pulse flows.[d]	$82,000	$1,500	$6,900	$152,000	Soils and geology	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
16	Implement geomorphic pulse flows below Loon Lake dam, with ramping; capital costs are for site sensitivity investigation and test releases prior to implementation.	$273,300	$500	$18,600	$126,000	Soils and geology	Yes	
17	Implement geomorphic pulse flows below Ice House dam, with ramping.	$0	$500	$500	$200,000	Soils and geology	Yes	
18	**Article 1-4. Develop and file a plan to coordinate with Chili Bar Licensee on operations and in implementing certain license conditions.**	$32,800	$10,900	$13,100	$0	Water quantity	Yes	
19	**Article 1-5. Monitoring program.**							
20	Prepare and implement long-term monitoring plan for trout populations.[e]	$10,900	$39,300	$40,000	$0	Aquatic	Yes	
21	Prepare and implement long-term monitoring plan for hardhead populations.[f]	$10,900	$6,600	$7,300	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
22	Prepare and implement long-term monitoring plan for aquatic macroinvertebrates.[g]	$10,900	$13,100	$13,800	$0	Aquatic	Yes	
23	Prepare and implement long-term monitoring plan for foothill yellow-legged frogs.[h]	$10,900	$37,700	$38,400	$0	Terrestrial	Yes	
24	Prepare and implement long-term monitoring plan for mountain yellow-legged frogs.[i]	$10,900	$6,600	$7,300	$0	Terrestrial	Yes	
25	Prepare and implement long-term monitoring plan for riparian vegetation.[j]	$10,900	$19,700	$20,400	$0	Terrestrial	Yes	Staff corrected footnote—every 10 years after year 15.
26	Investigate fluvial geomorphic properties at two sites in Loon Lake dam reach.	$273,300	$0	$18,100	$0	Soils and geology	Yes	
27	Prepare and implement long-term monitoring plan for geomorphology.[k]	$10,900	$10,500	$11,200	$0	Soils and geology	Yes	Staff corrected footnote—every 10 years after year 15.
28	Prepare and implement long-term monitoring plan for water temperature.[l]	$131,200	$27,300	$36,000	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
29	Prepare and implement long-term monitoring plan for physical water quality.[m]	$10,900	$109,300	$110,000	$0	Water quality	Yes	
30	Prepare and implement long-term monitoring plan chemistry water quality.[n]	$10,900	$54,700	$55,400	$0	Water quality	Yes	
31	Prepare and implement long-term monitoring plan for bacterial water quality.[o]	$10,900	$16,400	$17,100	$0	Water quality	Yes	Staff revision based on applicant's information on monitoring frequency in Settlement Agreement.
32	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish.[p]	$10,900	$5,500	$6,200	$0	Water quality	Yes	
33	Prepare and implement 2-year monitoring plan for fish entrainment at Robbs Peak powerhouse.	$327,900	$0	$21,800	$0	Aquatic	Yes	
34	Prepare and implement long-term monitoring plan for bears.[q]	$10,900	$10,900	$11,600	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
35	Prepare and implement long-term monitoring plan for bald eagles.	$10,900	$32,800	$33,500	$0	Terrestrial	Yes	
36	**Article 1-6. Adaptive Management Program.[r]**	$0	$0	$0	$0	Multidisciplinary	Yes	
37	**Article 1-7. Develop and implement Stream Channel Stabilization Plan in Loon Lake dam reach.[s]**	$109,300	$0	$7,300	$0	Soils and geology	Yes	
38	**Article 1-8. Maintain elevation of Gerle Creek reservoir to ensure fish passage into Gerle Creek.[t]**	$27,000	$5,000	$6,800	$0	Aquatic	Yes	
39	**Article 1-9. Implement plan to pass large woody debris downstream at Robbs Peak, Junction, Camino and Slab Creek dams.**	$21,900	$12,500	$14,000	$0	Aquatic	Yes	
40	**Article 1-10. Develop and implement a Streamflow and Reservoir Elevation Gaging Plan.[u]**	$655,800	$54,700	$98,200	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
41	**Article 1-11. Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points.**	$32,800	$0	$2,200	$0	Water quality	Yes	
42	**Article 1-12. Wildlife and plant protection measures.**							
43	Annually monitor for deer or wildlife in Gerle Canal.	$0	$1,100	$1,100	$0	Terrestrial	Yes	
44	If any new construction or maintenance may affect Forest Service sensitive plants or wildlife, or ESA species, conduct a biological evaluation; the Forest Service may require measures to protect sensitive species, and a biological assessment and consultations with FWS may be required per the ESA.	$0	$16,400	$16,400	$0	Terrestrial	Yes	
45	Conduct annual review of special-status species lists and prepare study plan and perform study, if necessary.[v]	$0	$11,400	$11,400	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
46	Consult with agencies before conducting any O&M under transmission lines within the Pine Hill Pare Plant Preserve.	$0	$1,000	$1,000	$0	Terrestrial	Yes	
47	Develop Avian Protection Plan that addresses retrofitting transmission lines to meet design and sighting standards to minimize bird electrocutions and collisions.[w]	$306,000	$0	$20,300	$0	Terrestrial	Yes	
48	**Article 1-13. Develop and implement a Vegetation and Invasive Weed Management Plan for ENF lands, and monitor annually.**	$43,700	$54,700	$57,600	$0	Terrestrial	Yes	Staff revision of proposed measure to include all Project lands and employee awareness training.
49	**Expand Vegetation and Invasive Weed Management Plan to include all Project lands and monitor annually**	$0	$30,300	$30,300	$0	Terrestrial	Yes	Not an applicant measure.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
50	**Article 1-14. Meet annually with resource agencies to review results of implementing all ecological measures, and prepare and share a Project O&M plan for that year.**	$0	$32,800	$32,800	$0	Terrestrial	Yes	
51	**Article 1-15. Develop Recreation Implementation Plan, and update every 6 years (cost of updates incorporated into facility review measure).**	$16,400	$0	$1,100	$0	Recreation	Yes	
52	**Article 1-16. Conduct recreation survey and prepare Recreation Report every 6 years.[x]**	$0	$55,100	$55,100	$0	Recreation	Yes	
53	**Article 1-17. Designate a Forest Service liaison.**	$0	$32,800	$32,800	$0	Recreation	Yes	
54	**Article 1-18. Review recreation facilities every 6 years.**	$0	$21,900	$21,900	$0	Recreation	Yes	
55	**Article 1-19. Specific recreation measures.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
56	Prepare and implement a plan to install bear-proof food storage and trash receptacle facilities.[y]	$568,400	$0	$37,700	$0	Recreation	Yes	
57	Construct vault toilet at Buck Island reservoir.	$54,700	$0	$3,600	$0	Recreation	Yes	
58	Improve hiking trails at Buck Island reservoir.	$10,900	$0	$700	$0	Recreation	Yes	
59	Reconstruct or relocate portions of Rubicon Hiking Trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
60	Reconstruct hiking trail at Pleasant Campground.	$10,900	$0	$700	$0	Recreation	Yes	
61	Construct vault toilet at Ellis Creek staging area.	$32,800	$0	$2,200	$0	Recreation	Yes	
62	Prepare and implement a Development Plan for Loon Lake.	$371,600	$0	$24,700	$0	Recreation	Yes	
63	Reconstruct Pleasant Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
64	Expand and upgrade Northshore RV Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	
65	Reconstruct Loon Lake Campground (including Equestrian Loop).	$1,038,400	$0	$68,900	$0	Recreation	Yes	
66	Upgrade Loon Lake Group Campgrounds.	$98,400	$0	$6,500	$0	Recreation	Yes	
67	Reconstruct Loon Lake Group Equestrian Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
68	Upgrade Loon Lake Boat Launch and Day Use Area.	$21,900	$0	$1,500	$0	Recreation	Yes	
69	Upgrade Red Fir Group Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
70	Upgrade Loon Lake Chalet.	$437,200	$0	$29,000	$0	Recreation	Yes	
71	Upgrade Loon Lake Sanitation Station.	$16,400	$0	$1,100	$0	Recreation	Yes	
72	Upgrade Loon Lake Trailhead facility.	$16,400	$0	$1,100	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
73	Construct a new campground on the south shore of Loon Lake reservoir.	$2,951,100	$0	$195,900	$0	Recreation	Yes	
74	Prepare and implement a Development Plan for the Gerle Creek and Airport Flat areas.	$98,400	$0	$6,500	$0	Recreation	Yes	
75	Reconstruct Gerle Creek Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
76	Upgrade Gerle Creek Day Use Area.	$27,300	$0	$1,800	$0	Recreation	Yes	
77	Upgrade Angel Creek Day Use Area.	$306,000	$0	$20,300	$0	Recreation	Yes	
78	Upgrade Airport Flat Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
79	Extend Angel Creek Trail (to tie into Summer Harvest Trail).	$273,300	$0	$18,100	$0	Recreation	Yes	
80	Upgrade Summer Harvest Trail.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
81	Prepare and implement a Development Plan for the Union Valley area.	$131,200	$0	$8,700	$0	Recreation	Yes	
82	Prepare and implement a Union Valley Reservoir Boating Management Plan.	$76,500	$0	$5,100	$0	Recreation	Yes	
83	Upgrade Azalea Cove Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
84	Upgrade Big Silver Group Campground.	$109,300	$0	$7,300	$0	Recreation	Yes	
85	Upgrade Camino Cove Campground.	$437,200	$0	$29,000	$0	Recreation	Yes	
86	Upgrade Fashoda Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
87	Upgrade Fashoda Day Use Area.	$16,400	$0	$1,100	$0	Recreation	Yes	
88	Upgrade Jones Fork Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
89	Upgrade Lone Rock Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
90	Reconstruct Sunset Campground.	$983,700	$0	$65,300	$0	Recreation	Yes	
91	Upgrade Sunset Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
92	Reconstruct Wench Creek Campground.	$874,400	$0	$58,000	$0	Recreation	Yes	
93	Reconstruct Wench Creek Group Campground.	$218,600	$0	$14,500	$0	Recreation	Yes	
94	Upgrade West Point Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
95	Upgrade West Point Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
96	Upgrade Wolf Creek Campground.	$382,600	$0	$25,400	$0	Recreation	Yes	
97	Upgrade Wolf Creek Group Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
98	Reconstruct Yellowjacket Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
99	Upgrade Yellowjacket Boat Launch and extend boat ramp.	$109,300	$0	$7,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
100	Extend the Union Valley Reservoir bike trail (to loop the reservoir).	$3,289,900	$0	$218,400	$0	Recreation	Yes	
101	Construct access trails and restore areas on north side of Union Valley reservoir.	$453,600	$0	$30,100	$0	Recreation	Yes	
102	Prepare and implement a Development Plan for the Ice House area.	$371,600	$0	$24,700	$0	Recreation	Yes	
103	Site and construct a new small boat-in camping area.	$98,400	$0	$6,500	$0	Recreation	Yes	
104	Reconstruct Ice House Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
105	Reconstruct Ice House Day Use Area.	$191,300	$0	$12,700	$0	Recreation	Yes	
106	Upgrade Northwind Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
107	Upgrade Strawberry Point Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
108	Upgrade Ice House Boat Launch.	$21,900	$0	$1,500	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
109	Reconstruct Ice House Sanitation Station.	$54,700	$0	$3,600	$0	Recreation	Yes	
110	Construct access trails and restoration along Lakeshore Road.	$191,300	$0	$12,700	$0	Recreation	Yes	
111	Construct a new day use facility (Highland Point).	$453,600	$0	$30,100	$0	Recreation	Yes	
112	Construct a new day use facility (Upper Silver Creek/Ice reservoir).	$453,600	$0	$30,100	$0	Recreation	Yes	
113	Extend the Ice House Mountain Bike Trail (to loop the connector trail to Union Valley reservoir bike trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
114	Upgrade Big Hill Overlook facility.	$10,900	$0	$700	$0	Recreation	Yes	
115	Improve the informal boat launch at Junction reservoir.	$109,300	$0	$7,300	$0	Recreation	Yes	
116	Improve the access area at Bryant Springs Road and SF Silver Creek.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
117	Develop and implement plan to improve access at Brush Creek reservoir.	$131,200	$0	$8,700	$0	Recreation	Yes	
118	Develop and implement plan for boating access at Slab (upstream end).[z]	$2,448,300	$0	$162,500	$0	Recreation	Yes	
119	Develop and implement plan to improve boating access at Slab Creek reservoir (near dam).[aa]	$338,800	$0	$22,500	$0	Recreation	Yes	
120	**Article 1-20. Complete necessary heavy maintenance as determined via 6-year recreation facility review.[bb]**	$0	$109,300	$109,300	$0	Recreation	Yes	
121	**Article 1-21. Annually pay the Forest Service $1,000,000 for O&M and administration of recreation facilities and to manage use.**	$0	$1,000,000	$1,000,000	$0	Recreation	Yes	Staff recommends that SMUD provide for operations and maintain and does not endorse cost cap.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
122	**Article 1-22. Provide data to the Forest Service for carrying capacity.**	$71,000	$0	$4,700	$0	Recreation	Yes	
123	**Article 1-23. Reservoir levels.**							
124	Meet specific, summer monthly reservoir levels at Loon Lake, Union Valley, and Ice House reservoirs.[cc]	$0	$0	$0	$725,400	Recreation	Yes	
125	Maintain Gerle Creek reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 through September 10.[dd]	$0	$0	$0	$0	Recreation	Yes	
126	Maintain Slab Creek reservoir elevation above 1,830 feet during daylight hours, and restrict daily fluctuations to less than seven feet during daylight hours between July 1 and September 30.[dd]	$0	$0	$0	$0	Recreation	Yes	
127	Maintain the seasonal reservoir levels at Junction and Brush Creek reservoirs within historical levels.	$0	$0	$0	$0	Recreation	No	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
128	Maintain Rubicon and Buck Island reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 to September 10.[dd]	$0	$0	$0	$0	Recreation	No	
129	Monitor reservoir levels and prepare report every 5 years.	$0	$10,900	$10,900	$0	Recreation	Yes	
130	**Article 1-24. Recreation streamflows.**							
131	Provide up to 19 days annually during March 1 through May 31 and in October of various flows from Slab Creek dam for whitewater boating, with ramping, and use monitoring.	$0	$35,200	$35,200	$322,000	Recreation	Yes	Cost associated with physical modifications and reduced energy benefits associated with October flow releases in year 15 are contingent on studies in year 10.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
132	Slab Creek whitwater boating capital costs for physical modifications to facilitate long-term boating flows.[ee]	$10,930,000	$0	$725,500	$0	Recreation	No	Staff has not included this cost for either the Proposed Action or Proposed Action with Staff Modifications because SMUD now indicates the cost could be considerably less than $10.9 million if the Iowa Hill development is constructed.
133	Develop and implement a whitewater boating management plan for Slab Creek dam reach, including access facilities and a plan for easement for access and parking.[ff]	$732,300	$0	$48,600	$0	Recreation	Yes	
134	Provide up to 16 days annually of various flows from Ice House dam for whitewater boating, with ramping, and use monitoring.	$0	$19,000	$19,000	$108,000	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
135	**Article 1-25. Public information services.**							
136	Develop and implement plan to make Project information (streamflow and reservoir levels) available to the public.	$32,800	$10,900	$13,100	$0	Recreation	Yes	
137	Develop and implement an interpretive, education and public information plan, and provide a Project recreation brochure.	$109,300	$27,300	$34,600	$0	Recreation	Yes	
138	**Article 1-26. Annually match fish stocking by CDFG, up to 50,000 pounds of fish each year.**	$0	$106,100	$106,100	$0	Recreation	Yes	
139	**Article 1-27. Visual resource protection.**						Yes	
140	Meet with the Forest Service every 5 years and review opportunities to better blend Project features with landscape.[gg]	$0	$3,300	$3,300	$0	Land use and aesthetics	Yes	
141	Prior to any new construction or maintenance, prepare plan to protect visual resources.	$0	$5,500	$5,500	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
142	Improve visual quality of Robbs powerhouse and Jones Fork penstock.[hh]	$0	$0	$0	$0	Land use and aesthetics	Yes	
143	Improve visual quality of fencing at Union Valley dam switchyard.	$360,700	$0	$23,900	$0	Land use and aesthetics	Yes	
144	Improve visual quality of weather stations.	$480,900	$0	$31,900	$0	Land use and aesthetics	Yes	
145	Improve visual quality of several other Project features.	$273,300	$0	$18,100	$0	Land use and aesthetics	Yes	
146	**Articles 1-28 and 1-29. Develop and implement the Heritage Properties Management Plan, and suspend work or operations in the event heritage resources are discovered.**	$16,400	$5,500	$6,600	$0	Cultural resources	Yes	
147	**Article 1-30. Transportation system management.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
148	Develop and implement Transportation System Management Plan, including a Snow Plowing Plan; update every 5 years.[ii]	$98,400	$273,300	$279,800	$0	Land use and aesthetics	Yes	Staff restricts this measure to only Project-related roads primarily used for Project purposes
149	Improve three Forest Service roads (5.3 miles of north shore road at Union Valley Reservoir, 1.3 miles of lake shore road at Ice House reservoir, and Wright's Lake tie-in intersection) and add gate at Junction dam road.[jj]	$4,382,900	$0	$290,900	$0	Land use and aesthetics	Yes	
150	**Article 1-31. Develop and implement a Trails System Management Plan; update every 5 years.[kk]**	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
151	**Article 1-32. Develop and implement a Facility Management Plan; update every 5 years.**	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
152	**Article 1-33. Develop and implement a Vegetation Management Plan to rehabilitate inadequately vegetated areas.[ll]**	$32,800	$21,900	$24,100	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
153	**Article 1-34. Develop and implement a Fire Prevention and Response Plan.[ll]**	$82,000	$21,900	$27,300	$0	Land use and aesthetics	Yes	
154	**Article 1-37. Develop a Project Implementation Plan that sets forth a schedule for implementing all articles in the license.**	$16,400	$0	$1,100	$0	Multidisciplinary	Yes	
155	**Article 1-40. Aquatic resources–Iowa Hill development.**							
156	Monitor hardhead populations in Slab Creek reservoir 2 years before and 2 years after construction of Iowa Hill development.	$382,600	$0	$25,400	$0	Aquatic	Yes	
157	Monitor temperatures in shallow water areas of Slab Creek reservoir to determine if Iowa Hill development is affecting hardhead distribution.[mm]	$0	$2,600	$2,600	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
158	Maintain 12°C or higher temperatures during June, July, and August in SFAR reach below Mosquito Bridge (Iowa Hill development measure).[nn]	$0	$16,400	$16,400	$0	Aquatic	Yes	
159	**Article 1-41. Purchase equivalent land or conservation easement for inkind replacement of wildlife habitat due to Iowa Hill development.[oo]**	$546,500	$0	$36,300	$0	Terrestrial	Yes	
160	Develop a wildlife lands mitigation plan for Iowa Hill construction.	$20,000		$1,300	$0	Terrestrial	Yes	Not an applicant measure.
161	**Article 1-42. Develop and implement a Storm Water Pollution Prevention Plan for construction of Iowa Hill development.[pp]**	$54,700	$0	$3,600	$0	Water quality	Yes	
162	**Article 1-43. Prepare and implement a Groundwater Management Plan for managing groundwater inflows during construction of the Iowa Hill development and post construction monitoring.[pp]**	$54,700	$0	$3,600	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
163	**Article 1-44. Develop a design for the Iowa Hill development that meets the visual quality standards of the ENF Management Plan.[pp]**	$27,300	$0	$1,800	$0	Land use and aesthetics	Yes	
164	**Article 1-45. Heritage resources protection.[qq]**	$0	$0	$0	$0	cultural resources	Yes	
165	**Article 1-48. Develop and implement a noise attenuation plan for construction of the Iowa Hill development.**	$54,700	$0	$3,600	$0	Land use and aesthetics	Yes	
166	**Article 1-49. Develop a Recreation Access Plan for Slab Creek reservoir to address access during Iowa Hill development construction and post construction.[rr]**	$27,300	$0	$1,800	$0	Recreation	Yes	
167	File and implement a transporation plan for Iowa Hill	$30,000	$3,900	$5,900	$0	Land Use and Aesthetics	Yes	Included in license application, but not in Settlement Agreement

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
168	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[ss]	$0	$461,800	$461,800	$0	Multidisciplinary	Yes	
169	**Total of all Article 1 measures under the UARP-only Alternative.**	$48,753,100	$2,850,800	$6,086,300	$8,914,400			
170	**Total of all Article 1 measures under the Proposed Action.**	$39,000,900	$2,873,700	$5,461,800	$8,914,400			
171	**Total of all Article 1 measures under the Proposed Action with Staff Modifications.**	$38,747,600	$2,904,000	$5,475,300	$8,914,400			

[a] Annualized costs for one-time and capital costs determined as actual costs over a 50-year license term with 6.25 percent SMUD discount rate.

[b] Flow-related costs were derived from output of the CHEOPS water balance model, and represent incremental generation value costs from the model Base Case due to modifications to system operations at individual facilities.

[c] Annual cost based on substantial increase in frequency of dam visits to adjust valves to implement monthly release schedule.

[d] Estimated capital cost assumes minor modifications to Rockbound tunnel intake gate at Rubicon reservoir.

[e] Annual cost based on $163,950 per year of trout sampling at 13 sites, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly trout sampling cost based on relicensing study costs 2002-2004. Four of the sites will require helicopter transport.

[f] Annual cost based on $27,325 per year of hardhead sampling, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term.

[g] Annual cost based on $54,650 per year of benthic macroinvertebrates at 10 sites, performed every 2 of 5 years during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly BMI sampling based on relicensing study costs 2002–2004. One of the sites will require helicopter transport.

[h] Annual cost based on $81,975 per year of foothill yellow-legged frog sampling at 6 sites in three Project reaches, performed at variable frequencies depending on Project reach. Yearly sampling based on relicensing studies and PG&E survey protocols, which call for repeat visits to sampling sites. Monitoring results may lead to expansion of monitoring program and higher costs.

[i] Annual cost based on $54,650 per year of mountain yellow-legged frog sampling at Rubicon Reservoir, Rockbound Lake, and Buck Island reservoir (spring/summer surveys). Yearly sampling based on relicensing studies and PG&E survey protocols, which call for periodic visits to sampling sites. Studies performed by CDFG may result in reduced monitoring costs.

[j] Annual cost based on $163,950 per year for aerial photograph mapping and intensive greenline sampling at 15 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly riparian sampling cost based on relicensing study costs of 2003. Three of the sites will require helicopter transport.

[k] Annual cost based on $87,440 per year of sampling at 8 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly geomorphology sampling cost determined from relicensing studies.

[l] One time cost associated with installing permanent temperature monitoring instruments at 12 Project facilities with linkage to SMUD data management systems. Annual costs associated with yearly installation of 5 non-permanent instruments.

[m] Annual cost based on $109,300 per year of sampling, performed every year of license term. Yearly physical monitoring at 7 Project reservoirs (two seasons/year) and multiple stream sites (four seasons/year) above and below Project reservoirs based on costs to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[n] Annual cost based on $273,250 per year of sampling, performed every 5 years of license term. Yearly water chemistry monitoring at all Project reservoirs (four seasons/year) and multiple stream sites above and below Project reservoirs based on costs (e.g., laboratory costs for total and dissolved metals at very low detection levels) to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[o] Annual cost based on $32,790 per year of sampling at 15 sites, performed every year the first 5 years then every other year through the term of the license. Yearly sampling based on relicensing study costs. Monitoring results may lead to sampling every year, which will increase annual costs.

[p] Annual cost based on $27,325 per year of sampling at 6 reservoirs, performed every 5 years throughout the license term. Yearly sampling based on relicensing study costs. Additional studies may be required based on results of sampling.

[q] One time and/or annual costs could increase under the adaptive management plan depending on results of monitoring plan.

[r] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[s] Includes one-time cost of developing study plan to investigate stream stabilization throughout 8.5-mile Loon Lake dam reach and performing the field investigation (stream stability was not studied throughout Loon Lake dam reach during relicensing). Implementing any remedial actions is an unknown future cost and not included in the table.

[t] One-time cost associated with study of current passage conditions. Annual cost associated with regular re-evaluations of passage conditions through license term. This measure is estimated to result in no reduction in annual energy benefits.

[u] One-time and capital cost is for adding new gaging sites below Gerle Creek dam and Robbs forebay dam ($546,500), and staff gages for the two boating reaches and possible telemetry equipment installation below Rubicon and Buck Island dams ($109,300); annual cost is for two streamflow monitoring sites and nine reservoir monitoring sites to be added to compliance program, and maintenance of new gages and telemetry equipment in remote sites.

[v] Annual costs associated with performing periodic reviews of new species added to special-status species lists ($5,000). A total cost of $320,000 (8 surveys at $40,000 per survey) is assumed for special-status species field surveys, distributed equally over the 50-year license term.

[w] One time cost estimate includes Avian Protection Plan development and $54,650 per year for 5 years of study. Results of study may require retrofitting.

[x] Annual cost based on $234,995 for recreation survey and $109,300 for recreation report, performed every 6 years through license term.

[y] Capital cost of $21,860 for plan development and $546,500 for implementation.

[z] Capital and one-time costs are for plan development and a new access route from the south side of the reservoir.

[aa] Actual costs may be significantly greater due to steep topography.

[bb] Actual costs may vary significantly from year to year.

[cc] Power generation losses associated with this measure reflect CHEOPS model simulated spill at UARP storage reservoirs. See section 2.0 for a discussion of the likelihood of spill occurring at the storage reservoirs under real time operation.

[dd] This reservoir level restriction measure is estimated to result in no reduction in annual energy benefits.

[ee] Capital cost is based on reconfiguring White Rock tunnel adit to serve as release point for boating flows; this reconfiguration work would be done in year 15 and only if the Iowa Hill development is not built and use triggers have been met.

[ff] Actual costs may vary.

[gg] Annual costs are for meetings with the Forest Service only. As a result of the meetings, additional annual costs are likely for measures to blend Project facilities into surrounding landscape.

[hh] The cost to paint the powerhouse and penstock are not included because SMUD will incur these costs as part of regular maintenance activities during the license term.

[ii] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan. Annual costs include road maintenance and snow plowing.

[jj] Breakdown of one-time costs: (1) North Union Valley Road cost share portion: $3,278,000, (2) Lakeshore Road: $821,500, (3) Wright's Lake tie-in cost share portion: $272,500, and (4) Junction Dam Road: $10,930.

[kk] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ll] Actual costs may vary significantly from year to year.

[mm] Annual costs based on assumption of need to place 6 to 8 temperature sensors throughout Slab Creek Reservoir annually for period of 10 years to demonstrate that temperatures in shallow water areas of Slab Creek Reservoir are not affecting hardhead distribution by pump discharge.

[nn] Annual costs associated with placing temporary temperature probe in SFAR at Mosquito Road Bridge each year from June through August.

[oo] Actual cost may vary significantly depending on future land prices in rural Sierra Nevada foothill area.

[pp] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[qq] Estimated costs for this measure are incorporated into the cost estimates for Articles 1-28 and 1-29.

[rr] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ss] Annual cost is based on 2,730 hours of Project Management (2,730 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 887 hours of General Administration (887 hours x $60.43 direct rate + 64 percent surcharge for overhead).

C.2 CAPITAL COST AND ANNUALIZED COSTS FOR SHARED MEASURES FOR THE UARP AND CHILI BAR PROJECTS

Costs identified in this section will result from SMUD's 90 percent contribution to the implementation of overlapping-issue measures contained in the Chili Bar Project, as described in appendix 2 of the Settlement Agreement. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted in this case to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-2.

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Table C-2. Summary of SMUD's capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for shared measures included in the Proposed Action and Proposed Action with Staff Modifications. (Source: SMUD, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$0	Water quantity	Yes	
2	**Article 2-2. Ramping rates.**	$0	$0	$0	$0	Water quantity	Yes	
3	**Article 2-3. Develop a plan to coordination with UARP Licensee.**	--	--	--	--	Water quantity	Yes	
4	**Article 2-4. Monitoring Program to prepare and implement long-term monitoring plan for fish at two sites downstream of Chili Bar dam.**	$9,800	$7,000	$7,700	$0	Aquatic	Yes	
5	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites downstream of Chili Bar dam.	$9,800	$5,900	$6,600	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
6	Prepare and implement long-term monitoring plan for amphibians and reptiles (FYLF, CRLF, and western pond turtle) in one reach downstream of Chili Bar dam.	$9,800	$15,100	$15,800	$0	Terrestrial	Yes	
7	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam	$9,800	$9,500	$10,200	$0	Terrestrial	Yes	
8	Prepare and implement long-term monitoring plan for water temperature at four stations downstream of Chili Bar dam.	$9,800	$13,500	$14,200	$0	Water quality	Yes	
9	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and downstream of the Chili Bar dam.	$9,800	$22,500	$23,200	$0	Water quality	Yes	
10	Prepare and implement long-term monitoring plan chemistry water quality in Chili Bar reservoir and downstream of Chili Bar dam.	$9,800	$9,000	$9,700	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
11	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$9,800	$12,200	$12,900	$0	Water quality	Yes	
12	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$9,800	$1,800	$2,500	$0	Water quality	Yes	
13	**Article 2-5. Adaptive Management Program.**[a]	$0	$0	$0	$0	Multidisciplinary	Yes	
14	**Article 2-6. Sediment Management Program.**	$9,800	$5,800	$6,500	$0	Soils and geology	Yes	
15	**Article 2-7. Large woody debris.**	--	--	--	--	Aquatic	Yes	
16	**Article 2-8. Streamflow and reservoir elevation gaging.**	--	--	--	--	water quantity	Yes	
17	**Article 2-9. Wildlife and plant protection measures.**	--	--	--	--	Terrestrial		
18	**Article 2-10. Invasive Weed and Vegetation Management plans**	--	--	--	--	Terrestrial	Yes	Staff revision to include all Project lands.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
19	**Article 2-11. Annual review of ecological conditions.**	--	--	--	--	Terrestrial	Yes	
20	**Article 2-12. BLM liaison.**	--	--	--	--	Recreation	Yes	
21	**Article 2-13. BLM recreation improvements.**	--	--	--	--	Recreation	Yes	
22	**Article 2-14. Public information services. Plan for providing streamflow and reservoir level information.**	$9,800	$13,500	$14,200	$0	Recreation	Yes	
23	Pay BLM $15,000 annually to provide Project related brochure and public education plan.		$15,000	$15,000			Yes	Staff would recommend that PG&E prepare a brochure and education plan and does not endorse cost cap.
24	**Article 2-15. Recreational streamflows.**	$0	$0	$0	$0	Recreation	Yes	
25	**Article 2-16. Visual resource protection.**	--	--	--	--	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
26	**Article 2-17. Heritage resources.**	--	--	--	--	Cultural resources	Yes	
27	**Article 2-18. Heritage resource discovery.**	--	--	--	--	Cultural resources	No	This measure is part of the PA that is implemented before the new license.
28	**Article 2-21. Implementation schedule.**	--	--	--	--	Multidisciplinary	Yes	
29	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[b]	$0	$24,400	$24,400	$0	Multidisciplinary	Yes	
30	**Proposed Action**	$107,800	$155,200	$162,900	$0			

Notes: Measures with a dash in the cost columns are not overlapping measures.

[a] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[b] Annual cost is based on 144 hours of Project Management (144 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 47 hours of General Administration (47 hours x $60.43 direct rate + 64 percent surcharge for overhead).

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C.3 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE CHILI BAR PROJECT

In this section, we present the costs of environmental measures associated with the Chili Bar Project. The latest cost information for the Chili Bar Project was submitted on May 16, 2007, by PG&E. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-3. No reduction in dependable capacity was identified by PG&E for any environmental measures. We note that PG&E made an estimate of the reduction of energy benefits in its May 16, 2007, submittal and estimated the total benefit reduction as approximately 1,000 MWh.

To enable staff to make a preliminary estimate in the final EIS, we assumed that the combined effect of minimum instream flow, ramping and recreational streamflow is a loss of 1,000 MWh as per the May 16, 2007, PG&E submittal. We applied the same ratio of peak to off-peak generation loss as PG&E previously estimated for its proposal in its additional information response dated May 18, 2006. This would result in a loss of 27.8 MWh of on peak energy and 972.2 MWh of off-peak energy.

Additionally, the effect of the Iowa Hill development on annual energy change, including both on-peak and off-peak energy, should be provided if new modeling shows a different result than the 2006 modeling. PG&E made an earlier estimate of this effect in its additional information response dated May 18, 2006, and we used this estimate in our analysis of the effect of the Iowa Hill development on energy generation and the resulting change in benefit. We applied the SMUD peak and off-peak energy rates to PG&E's 709-MWh loss due to environmental measures and the additional 291-MWh energy decrease due to the Iowa Hill development. That estimate showed that on-peak generation would increase by 638 MWh if the Iowa Hill development were to be built, and off-peak generation would decrease by 929 MWh, resulting in a decrease of 291 MWh. Therefore, if the Iowa Hill development were to be constructed, there would be an overall energy decrease of 1,000 MWh. If PG&E chooses to use peak, partial peak, off-peak, and super off-peak energy values on a monthly basis, it would need to provide complete backup information so that the Commission staff can independently check the computations.

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Table C-3. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: PG&E, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$56,300	Water quantity	Computed as 27.8 MWh times $73.89/MWh plus 972.2 MWh times $55.80/MWh
2	**Article 2-2. Ramping rates.**	$30,000	$15,000	$19,400		Water quantity	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
3	**Article 2-3. Coordination with UARP Licensee.**	$0	$10,000	$10,000	$0	Water quantity	
4	**Article 2-4. Monitoring Program.[b]**						
5	Prepare and implement long-term monitoring plan for fish at two sites in the reach downstream of Chili Bar dam.	$1,100	$800	$1,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
6	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites in the reach downstream of Chili Bar dam.	$1,100	$700	$900	$0	Aquatic	
7	Prepare and implement long-term monitoring plan for amphibians and reptiles in the reach downstream of Chili Bar dam.	$1,100	$1,700	$1,900	$0	Terrestrial	
8	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam.	$1,100	$1,100	$1,300	$0	Terrestrial	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
9	Prepare and implement long-term monitoring plan for water temperature at four stations in the reach downstream of Chili Bar dam.	$1,100	$1,500	$1,700	$0	Water quality	
10	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and in the reach downstream of the Chili Bar dam.	$1,100	$2,500	$2,700	$0	Water quality	
11	Prepare and implement long-term monitoring plan for water chemistry in Chili Bar reservoir and in the reach downstream of Chili Bar dam.	$1,100	$1,000	$1,200	$0	Water quality	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
12	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$1,100	$1,400	$1,600	$0	Water quality	
13	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$1,100	$200	$400	$0	Water quality	
14	**Article 2-5. Adaptive Management Program.[c]**	$0	$0	$0	$0	Multidisciplinary	
15	**Article 2-6. Sediment Management Program.[b]**	$1,100	$600	$800	$0	Soils and geology	
16	**Article 2-7. Large woody debris.**	$0	$10,000	$10,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
17	**Article 2-8. Streamflow and reservoir elevation gaging.**	$10,000	$5,000	$6,500	$0	Water quantity	
18	**Article 2-9. Wildlife and plant protection measures.**	$0	$5,000	$5,000	$0	Terrestrial	
19	**Article 2-10. Invasive Weed and Vegetation Management Plans.**	$10,000	$5,000	$6,500	$0	Terrestrial	
20	**Article 2-11. Annual review of ecological conditions.**	$0	$10,000	$10,000	$0	Terrestrial	
21	**Article 2-12. BLM liaison.**	$0	$2,000	$2,000	$0	Recreation	
22	**Article 2-13. BLM recreation improvements.**	$70,000	$5,000	$15,200	$0	Recreation	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
23	**Article 2-14. Public information services.**	$1,100	$1,500	$1,700	$0	Recreation	
24	**Article 2-15. Recreational stream flows.**	$0	$0	$0	$0	Recreation	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
25	**Article 2-16. Visual resource protection.**	$0	$0	$0	$0	Land use and aesthetics	
26	**Article 2-17. Heritage resources.**	$10,000	$2,000	$3,500	$0	Cultural resources	
27	**Article 2-18. Heritage resource discovery.**	$0	$0	$0	$0	Cultural resources	
28	**Article 2-21. Implementation schedule.**	$25,000	$5,000	$8,600	$0	Multidisciplinary	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
29	PG&E labor to manage development and implementation of plans, monitoring programs, data management, etc.	$0	$25,000	$25,000	$0	Multidisciplinary	
30	**Proposed Action**	$167,100	$112,000	$136,900			
31	Additional staff measure(s)						
32	Prepare a recreation plan for Chili Bar Project every 6 years.		$2,700	$2,700		Recreation	PG7E estimates that additional costs could result as the plan evolves.
33	**Proposed Action with Staff Modifications**	$167,100	$114,700	$139,300			
34	**Iowa Hill development effect on Chili Bar generation**				–$4,800		Computed as –638 MWh times $73.89/MWh plus 929 MWh times $55.80/Mwh

[a] As per PG&E, costs are current estimates based on initial analysis of the Settlement Agreement and are subject to revision.

[b] Overlapping measure with UARP.

[c] Adaptive management measure costs are not included due to the uncertainty associated with the nature, extent and implementation.

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