CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

ALTERNATIVE DEVELOPMENT

Reclamation considered a broad range of alternatives that could be implemented to satisfy the purpose and need for reducing the risks posed by Clear Lake Dam. These alternatives included both structural and non-structural means to correct the safety deficiencies and reduce the risk of failure of the dam. The various alternatives were evaluated for their technical, economic and environmental viability.

ALTERNATIVES CONSIDERED IN DETAIL

Proposed Action Alternative (the preferred alternative). Reclamation would modify the dam site by constructing a roller-compacted concrete (RCC) structure immediately downstream of the existing embankment. The following elements were common to all RCC options considered:

- The modified structure would have a 15 to 20 foot wide crest.
- The modified structure would have a crest elevation of 4547 feet.
- The existing embankment would be partially removed.
- The existing dam outlet works and spillway would be used.
- The existing access road to the dam would be maintained (graded, filled, turnouts).
- The modified structure would be located immediately downstream of the existing embankment.

Reclamation believes that a RCC embankment structure would be the most practicable and feasible option given the site-specific conditions and criteria at Clear Lake. The RCC structure would have the following elements:

Structural Features - The dam site would be modified by constructing a RCC embankment structure immediately downstream of the existing embankment (Figure 3). The RCC structure would have a crest elevation of 4543.0 feet, with a 4-foot parapet wall at final elevation of 4547 feet. It would consist of bonded horizontal lifts of RCC, a minimum 15-foot crest width, a vertical upstream face, and a sloping downstream face. The upstream face would consist of precast concrete panels. Vertical contraction joints would be provided on approximately 50-foot centers for crack control, and angled drain holes would be provided on 10-foot centers beneath the dam for uplift pressure relief. Portions of the existing embankment crest would be excavated in advance of the RCC structure foundation excavation to provide sufficient construction phase slope stability.

The existing outlet works would be extended. The extended outlet works would be located on the left abutment within the existing outlet works channel. It would consist of a single 6-by 6-foot gated outlet conduit (with guard and regulating gates) having an invert elevation of 4510 feet, matching the existing outlet works. The conduit would be incorporated into a concrete section in the existing outlet channel and overlaid with RCC lifts. A gate structure with guard and regulating slide gates

operated in a wet well would be provided on the upstream side of the RCC structure. The modified outlet works would have approximately the same capacity as the existing outlet works and would be used for daily operations. A low-flow bypass pipe would be designed and installed as part of the modified outlet works. The pipe would be 12-inch minimum diameter and regulated with a control valve to allow low flows when required. The gates in the existing outlet works would be removed or fixed permanently open. The existing concrete spillway would be retained. The RCC structure would provide flood protection similar to the existing structure. A fish screen would be incorporated into the design of the RCC structure, or the mesh barrier net would be re-installed around the dam outlet works, to prevent entrainment of endangered suckers from Clear Lake into the Lost River.

Draw down and/or Releases During Construction - No draw down of Clear Lake would be needed to complete construction of the RCC structure. Normal water deliveries/releases to the Lost River would not be interrupted during construction. After completion of construction and appropriate monitoring of dam filling, the modified structure would be operated in accordance with the Standard Operating Criteria for Clear Lake Dam and the applicable biological opinion from the U.S. Fish and Wildlife Service (Reclamation 1994). Reclamation is reinitiating consultation with the U.S. Fish and Wildlife Service on operation of the Klamath Project and expects a new biological opinion in early 2000. Lake elevation restrictions and monitoring requirements presently in place may be removed.

Construction-Related Activities - The construction activities for the RCC structure would require approximately nine months to complete (proposed construction start would be April 2000). Approximately 20,000 cubic yards (cyd) to 34,000 cyd of borrow and/or aggregate material would be needed to construct the RCC structure. The source of the borrow and aggregate material would be either a portion of Contractor Use Area No. 3 or No. 4 or commercial off-site locations (Figure 4). A spoil disposal site would be needed for material removed to partially remove the existing embankment. Approximately 30,000 cyd of spoil material from the removal would be disposed of in Contractor Use Area No. 4. The contractor use areas would be located on an upland site near the right and left abutments of the dam site and on existing disturbed areas or clearings (such as road right-of ways, parking areas or areas that would be cleared for the SOD modification). Such work areas would occupy about 28 acres. They would be used for work yards, storage areas, equipment parking, offices and other temporary construction facilities. No new areas would be cleared solely for use as a contractor work area.

Access to the construction site at the dam would be over an existing gravel/dirt-surfaced road. Approximately 16 miles of the road would be maintained by Reclamation to support SOD-related traffic. Maintenance of the road would include surface grading, clearing of brush and debris within the existing road prism and filling/placement of gravel on the existing roadway. All maintenance activities would occur within the existing road prism and would be coordinated with Modoc County and the U.S. Forest Service. No new areas would be disturbed outside the existing road prism. Water would be applied to the road surface when needed for dust abatement, public safety and maintenance of the existing road. A road would be constructed from Contractor Use Areas No. 3 and/or 4 to allow access for construction. This road(s) would be part of the area directly disturbed for construction of the RCC structure. No utilities (such as power lines) or facilities (such as roads) would be relocated to accommodate construction. There would be a public closure of the construction area. Signs would be placed on the existing road to advise/warn the public of the construction traffic and the project at the dam.

Cofferdams/Diversions - The existing embankment would serve as an upstream cofferdam during construction of the RCC structure. A temporary diversion pipeline would be constructed for downstream water delivery if construction of the modified outlet works rendered the existing outlet

works unusable for such deliveries during irrigation season. Completion of the modified outlet works is planned to be completed after irrigation releases have been made.

Mitigation Commitments Part of the Proposed Action Alternative. The following commitments would be implemented as an integral part of the Proposed Action Alternative:

1. Management practices will be employed during construction activities to minimize environmental effects and will be implemented by Reclamation construction forces or included in construction specifications. Those practices or specifications include sections on public safety, dust abatement, air pollution, noise abatement, water pollution abatement, waste material disposal, erosion control, archaeological and historical resources, vegetation and wildlife.

2. If the proposed action changes significantly from that described in the EA because of additional or new information, additional environmental analyses and compliance may be necessary. For example, if the estimate of spoil material increases or if different spoil, borrow or work areas are required, environmental as well as cost considerations will be included in determining the final location of these areas.

3. Construction of a RCC structure would require a Corps of Engineers Clean Water Act-Section 404 Permit/State Stream Alteration Permit for discharges of dredged or fill material into the waters of the United States. Such activities associated with this project could include cofferdams, disposal sites for excavated material or construction material sources. The necessary permits and authorizations would be acquired by Reclamation prior to initiation of construction activities. The conditions and requirements of the 404 Permit will be strictly adhered to by Reclamation. Reclamation would fully mitigate any loss of jurisdictional wetland with appropriate in-basin, in-kind mitigation as determined in consultation with the U.S. Army Corps of Engineers, the State of California and required as a condition of a 404/stream alteration permit. Reclamation will implement adequate wetland mitigation to fully compensate for any impacts to the waters of the United States.

4. A Clean Water Act-Section 402 National Pollutant Discharge Elimination System (NPDES) permit would be required and obtained from the State of California prior to any discharges of water resulting from activities associated with construction of the RCC structure and appurtenant facilities, if such water is to be discharged as a point source into the Lost River immediately downstream from the dam.

5. In the event that any cultural and/or paleontological site (historic or prehistoric) is discovered, it shall be immediately reported to the Area Manager of the Klamath Basin Area Office. An evaluation of the significance of the discovery will be made by the archaeologist to determine appropriate actions to be taken to prevent loss of significant cultural or scientific value and; (2) Any person who knows, or has reason to know, that they have inadvertently discovered human remains on Federal or Tribal lands must provide immediate telephone notification of the inadvertent discovery to the Area Manager at (541)883-6935. Work will stop until Bureau of Reclamation archaeologists are able to assess the situation onsite. Follow-up actions will comply with the Native American Graves Protection and Repatriation Act (P.L.101-60) of November 1990.

6. All construction activities and appurtenant work (such as borrow sources, waste areas, work, staging and storage areas, and vehicle and equipment parking areas) will be on previously-disturbed areas, to the extent practicable.

7. Existing roads will be used for project activities.

8. There will be no change in the operation of Clear Lake Dam or irrigation water deliveries to accomplish the project.

9. A fish screen will be incorporated into design of the RCC structure, or the mesh barrier net would be re-installed around the dam outlet works, to prevent entrainment of endangered suckers from Clear Lake into the Lost River.

10. Construction sites will be closed to public access -- signs or temporary fencing may be installed to prevent public access. Reclamation will coordinate with landowners/permittees and other authorized parties regarding access to or through the project area.

11. All disturbed areas resulting from the project shall be smoothed, shaped, recontoured and rehabilitated to as near their pre-project construction condition, as practicable. Disturbed areas shall be reseeded with appropriate native seed mixes and at times suitable for successful revegetation after completion of construction and restoration activities. The composition of seed mixes shall be coordinated with management agencies.

12. An Environmental Commitment Plan (ECP) and Checklist (ECC) will be prepared and used by the Klamath Basin Area Office to ensure compliance with the environmental commitments and the environmental quality protection requirements. A post-construction environmental summary (PCES) shall be prepared within one year after completion of the project to assess the effectiveness of the mitigation measures.

13. Permits required pursuant to compliance with federal, state, local and tribal environmental protection laws and regulation shall be acquired prior to initiation of ground-disturbing activities. Conditions of such permits shall be fully complied with by Reclamation and/or its designated representative.

No Action Alternative. Under this alternative, Reclamation would not structurally modify Clear Lake Dam to reduce the risks created by the seepage and piping potential. The existing dam would remain in place. In compliance with necessary dam safety requirements, Reclamation would implement a permanent reservoir elevation restriction for Clear Lake. The lake elevation would be restricted to no higher than 4525.0. The Standing Operating Procedures would be revised to incorporate this elevation for operation of the dam. Normal and flood operation of the dam would be in accordance with this restriction. Reclamation would reinitiate consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act because the elevation restriction would constitute new information and would likely result in a significant departure from the operational guidance in the July 1994 Biological Opinion. Project water storage in Clear Lake from October 1 through March 1 would be limited to 45,280 acre-feet at elevation 4525.0. Monitoring of the dam, lake levels and Lost River flows downstream of the dam would continue. Surveillance of the dam would be continued. The Emergency Action Plan would be reviewed annually to ensure adequate downstream response in the event of an emergency at the dam.

Table 2.1 - Comparison of Alternatives
Clear Lake Dam Safety of Dams EA

Construction Feature	Alternatives Considered in Detail	
	Proposed Action	**No Action**
Lake draw down, lake elevation restriction and downstream releases	No draw down, lake elevation restrictions or change in downstream releases would be necessary for the SOD project. Dam operation would be the same after completion of the RCC structure.	Permanent reservoir elevation restriction of 4525.0 for Clear Lake would be implemented. Standing Operating Procedures and 1994 Biological Opinion would be revised to incorporate the restriction into dam operation.
Volume, source and size of borrow area(s)	20,000 to 34,000 cyd of fill needed; Areas No.3 and 4 and/or off-site commercial borrow source(s) would be used.	Not applicable.
Location and size of contractor use areas	Contractor work areas would be located on Areas No.3 (6.3 acres) and 4 (22.1 acres), existing disturbed areas or clearings, or areas used/cleared for the SOD modification.	Not applicable.
Volume of waste material and location of disposal sites	About 30,000 cyd within Area No. 3 and/or 4.	Not applicable.
Duration of construction activity	Nine months; construction proposed to start in April 2000.	Not applicable.
Permanent and temporary construction access roads	16 miles of existing access road to dam would maintained (road surface graded, filled and turnouts cleared).	Not applicable.
Utility/facility relocations	No utility and/or facility relocations would be needed to perform the SOD project.	No utilities or facilities would be relocated.
Cofferdam	Existing embankment structure would serve as upstream cofferdam during construction.	Not applicable.
Diversions during construction	A temporary 300 cfs diversion pipeline would be constructed for downstream water delivery if construction of the modified outlet works interfered with deliveries during irrigation season	Not applicable.
Cost (estimate)	$10,000,000	Undetermined annual cost to provide replacement water for reduction in project water supply resulting from reduced storage capacity of Clear Lake plus $25,000 per year additional O&M cost to monitor safety of existing dam.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

The following alternatives were considered but eliminated from further study because of the reason(s) stated in the following summary descriptions:

Permanent Clear Lake operating restriction - Under this alternative, Clear Lake Dam would be operated to maintain the elevation of Clear Lake below certain elevation(s) to reduce the risk of piping and internal erosion of the upstream embankment to an acceptable level of risk. Based upon the July 1999 risk analysis, Clear Lake would have to be restricted to no more than 4525. This elevation, or lower, would achieve an acceptable level of risk. Elevation 4536.4 - 4537.4 is the normal maximum water surface. Several other restricted elevations were briefly considered such as 4530 and 4532. These elevations were eliminated from further consideration because of potentially significant adverse impacts such as: (1) the operational flexibility of Clear Lake would be severely limited; (2) water storage availability for project purposes would be severely curtailed or eliminated; and (3) flood control operations would be severely compromised. The U.S. Fish and Wildlife Service determined that this action would not be in compliance with the 1994 Biological Opinion (Fish and Wildlife Service 1999). The carrying capacity of Clear Lake for fish would be severely reduced because of the reduced reservoir size. With less lake habitat available, endangered Lost River and shortnose sucker populations would likely be smaller than under historic operations. During drought times, there would be more chance of severely reduced lake size because there would be no opportunity to store water as a buffer against drought. Sensitive and significant cultural resource sites may be exposed more frequently, as the lake is lowered, and subject to vandalism.

Breach Clear Lake Dam and drain the lake to its pre-dam elevation - Under this alternative, the lake would be drained through the outlet works. When the lake was drained to its original pre-dam elevation, the dam would be breached by excavating a notch in the dam embankment. The intent of this alternative is to prevent potential dam failure by functionally removing the dam. This alternative was eliminated from further analysis because it would eliminate the irrigation and flood control project benefits of the dam. It would also have significant adverse impacts on Clear Lake National Wildlife Refuge and populations and habitat of endangered fishes in Clear Lake and Lost River, migratory bird habitat and nesting areas of the California white pelican.

Other structural alternatives - Several other structural alternatives were considered, such as: a zoned earth fill structure; a concrete face rock fill structure or; installing a cutoff wall though the existing embankment. These alternatives were eliminated from further consideration for one or more of the following reasons: (1) they would require draw down of Clear Lake and potential interruption of irrigation water deliveries; (2) they would not be technically feasible and would not fix the underlying problems of the dam; (3) they would impact a larger area of wetlands downstream from the dam and result in greater short-term and long-term environmental impacts and/or; (4) cost.