

## **TABLE OF CONTENTS**

1. INTRODUCTION	1-1
Study Authority	1-1
Study Purpose	1-1
Study Scope	1-1
Study and Report Process	1-2
Study Participants and Coordination	1-2
Prior Studies and Reports	1-5
2. WITHOUT-PROJECT CONDITIONS	2-1
General	2-1
Study Area Description	2-1
Ventura River Watershed	2-1
Matilija Creek	2-4
Lower North Fork of Matilija Creek	2-5
Ventura River	2-6
Population and Land Use Characteristics	2-6
Recreation	2-8
Study Reaches	2-9
Historic Watershed Use	2-12
Cultural Resources	2-14
Groundwater Supply and Use	2-16
Water Quality	2-16
Environmental Studies	2-17
Biological Resources	2-18
Matilija Watershed	2-18
Ventura River Watershed	2-20
Ventura River Estuary	2-21
Steelhead Habitat Needs	2-22
River Flow and Water Diversions	2-23
Matilija Dam	2-24
Structural Dam Safety Evaluation	2-26
Monitoring and Management of Matilija Dam	2-27
Robles Diversion Dam	2-28
Robles Fishway	2-30
Casitas Dam	2-31
Foster Park Diversion	2-32
Water Rights	2-33
Wastewater Treatment	2-33
Hydrologic, Hydraulic and Sediment Transport Studies	2-33
Hydrologic Studies	2-34
Hydraulic Studies	2-35
Sediment Transport Studies	2-36
Sediment Deposition at Matilija Dam	2-36
Geotechnical Investigations of Deposited Sediments	2-39

Hazardous and Toxic Waste Sediment Assessment	2-41
Ventura River Morphology (Deposition and Erosion Patterns)	2-42
Habitat Evaluation Procedure	2-45
Riparian Habitat Component	2-46
Steelhead Habitat Component	2-47
Natural Processes Component	2-47
Existing Floodplain Features and Issues	2-48
3. PLAN FORMULATION	3-1
Problems and Opportunities	3-1
Objectives and Constraints	3-5
National Objectives	3-6
Formulation of Measures and Alternative Plans	3-7
Measures Addressing Fate of Matilija Dam	3-8
No Dam Deconstruction	3-8
Dam Deconstruction	3-9
Measures to Address Trapped Sediment Behind Matilija Dam	3-11
Mechanical Transport of Sediment	3-11
Natural Sediment Transport	3-16
On-Site Sediment Stabilization	3-16
Additional Measures	3-18
Basis for General Characteristics of Alternative Plans	3-19
Alternative Plans	3-20
No Action Alternative	3-21
Alternative 1: Full Dam Removal/Mechanical Sediment Transport: Slurry ‘Reservoir Area’ Sediment to Disposal Site/Sell Coarse from Dam	3-21
Alternative 2a: Full Dam Removal/Natural Sediment Transport: Slurry ‘Reservoir Area’ Sediment Offsite	3-24
Alternative 2b: Full Dam Removal/Natural Sediment Transport: Natural Transport of ‘Reservoir Area’ Sediment	3-25
Alternative 3a: Incremental Dam Removal/Natural Sediment Transport: Slurry ‘Reservoir Area’ Sediment Offsite	3-28
Alternative 3b: Incremental Dam Removal/Natural Sediment Transport: Natural Transport of ‘Reservoir Area’ Sediment	3-29
Alternative 4a Full Dam Removal/On-Site Sediment Stabilization: Long-Term Transport Period	3-32
Alternative 4b Full Dam Removal/On-Site Sediment Stabilization: Short-Term Transport Period	3-33
Evaluation of Alternative Plans	3-38
Sediment Transport	3-38
Downstream Deposition and Turbidity	3-39
Flooding	3-46
Flood Protection Improvements	3-47
Beach Nourishment and Sediment Yield to the Ocean	3-50
Environmental Resources	3-51
Dam Site Topography	3-51
Biological Resources	3-54

Restoration Measures For Biological Resources	3-61
Giant Reed Management	3-61
Cultural Resources Impacts	3-62
Air Quality, Noise, and Traffic	3-63
Water Supply	3-65
Water Source for Slurry Operation	3-65
Robles Diversion Dam and Lake Casitas	3-66
Mitigation Measures For Diversion Operation Impacts to Robles Diversion Dam and Lake Casitas	3-72
Diversion Operation Impacts to Foster Park	3-74
Mitigation Measures For Diversion Operation Impacts at Foster Park	3-76
Groundwater Impacts	3-76
Comparison of the Alternative Plans	3-77
Completeness	3-80
Effectiveness	3-80
Efficiency	3-80
Acceptability	3-80
Alternative Benefits	3-84
Alternative Costs	3-84
National Ecosystem Restoration Plan	3-87
Locally Preferred Plan	3-87
4. THE RECOMMENDED PLAN	4-1
General	4-1
Plan Description	4-1
Site Preparation	4-1
Removal of ‘Reservoir Area’ Sediments	4-1
Management of ‘Delta’ and ‘Upstream Channel’ Area Sediments	4-5
Dam Demolition	4-7
Final Clean-up	4-7
Mitigation for Flooding Impacts	4-7
Summary of Mitigation Features	4-17
Mitigation for Water Supply Impacts	4-17
Robles Diversion Dam	4-18
Foster Park Water Supply Facilities	4-19
Water Supply Mitigation Measures	4-19
Other Environmental Features	4-22
Other Environmental Mitigation Measures	4-22
Real Estate Requirements	4-23
Dam and Sediment Removal	4-23
Mitigation for induced Flooding	4-23
Mitigation for Water Supply Impacts	4-24
Monitoring and Adaptive Management	4-27
Recreation Plan	4-29
Recreation Trails and Associated Features	4-30
Design and Construction Considerations	4-35
Operations, Maintenance, Repair, Rehabilitation & Replacement Considerations (OMRRR)	4-35

Ecosystem Restoration Features	4-35
Mitigation for Induced Flooding	4-35
Mitigation for Water Supply Impacts	4-35
Other Environmental Features	4-36
Recreation Plan	4-36
Desilting Basin	4-36
Project Costs	4-36
First Costs	4-36
Real Estate Costs	4-37
Monitoring and Adaptive Management Costs	4-37
Associated Feature Costs	4-37
OMRRR Costs	4-41
Project Benefits	4-41
Ecosystem Restoration Benefits	4-41
Flood Protection Benefits	4-43
Water Supply Benefits	4-43
Economic Summary	4-43
Project Justification	4-45
Environmental Commitments	4-45
Relationship to Environmental Requirements	4-49
5. PLAN IMPLEMENTATION	5-1
General	5-1
Federal and Non-Federal Costs	5-1
Ecosystem Restoration	5-1
Recreation	5-1
Other Purposes or Associated Features	5-2
Cost Apportionment	5-2
Operation, Maintenance, Repair, Rehabilitation, & Replacement (OMRRR) Costs	5-3
Other Non-Federal Requirements	5-4
Schedule	5-6
Cost Estimates	5-7
Non –Federal	5-8
Sponsor Support	5-8
Financial Analysis	5-8
6. SUMMARY OF COORDINATION, PUBLIC VIEWS & COMMENTS	6-1
Public Involvement Program	6-1
Public Workshop	6-1
Public Concerns	6-1
Public Review of Draft Report	6-4
Institutional Involvement	6-5
Additional Coordination	6-6
Report Recipients	6-7
7. CONCLUSIONS	7-1
General	7-1
8. RECOMMENDATIONS	8-1
9. REFERENCES	9-1

**LIST OF FIGURES/PHOTOS**

Figure #:	Description	Page #:
1-1	Organizational Chart	1-4
2-1	Study Area	2-2
2-2	Land Use	2-7
2-3	Study Reaches	2-10
2-4	Fishermen with Steelhead: Upper Ventura River, circa 1920	2-13
2-5	Matilija Creek (pre-dam construction)	2-19
2-6	Pre-Dam Photo of Matilija Creek	2-19
2-7	Ventura River Estuary	2-22
2-8	Matilija Dam in 1948	2-25
2-9	Matilija Dam in 2001	2-25
2-10	Historic Notching of Dam	2-27
2-11	Robles Diversion Dam Sediment Basin	2-29
2-12	Robles Diversion Dam Sluice Gates	2-30
2-13	Foster Park Diversion Structure	2-32
2-14	Peak Discharge History in the Ventura River	2-35
2-15	Aerial View of Matilija Dam and Reservoir, 1960	2-37
2-16	Aerial View of Matilija Dam and Reservoir, 1978	2-37
2-17	Sediment Deposition Areas	2-39
2-18	Matilija Reservoir Area (Partially Drained)	2-40
2-19	Typical Surface Bed Material	2-42
2-20	Erosion at Surfer's Point Near Mouth of the Ventura River	2-36
2-21	50-yr Floodplain	2-49
2-22	100-yr Floodplain	2-50
2-23	Matilija Dam During Recent Storm	2-51
2-24	Casitas Springs Levee in Feb 1998 Storm Event	2-52
3-1	Alternative 1	3-23
3-2	Alternative 2a	3-26
3-3	Alternative 2b	3-27
3-4	Alternative 3a	3-30
3-5	Alternative 3b	3-31
3-6	Alternative 4a	3-34
3-7	Alternative 4b	3-37
3-8	Haul Routes	3-78
4-1	Recommended Plan	4-2
4-2	Slurry Disposal Site	4-4
4-3	Sediment Storage Sites	4-6
4-4	100-yr Floodplain Without Project Conditions	4-9
4-5	100-yr Floodplain with Bridge Modifications Only	4-10
4-6	100-yr Floodplain with Levees and Bridge Modifications	4-11
4-7	100-yr Floodplain Meiners Oaks	4-12
4-8	100-yr Floodplain Live Oak	4-13

4-9	100-yr Floodplain Casitas Springs	4-14
4-10	Robles Sediment Bypass Structure	4-21
4-11	Desilting Basin - Conceptual Design	4-26
4-12	Potential Desilting Basin Sites	4-27
4-13	Recreation Features	4-33
4-14	Lower Portion of Recreation Trail	4-34

### LIST OF TABLES

Table #:	Description	Page #:
S-1	Economic Outputs	xi
2-1	Major Subwatersheds	2-3
2-2	Upper Matilija Creek Basin	2-5
2-3	Major Reaches of Matilija Creek and the Ventura River	2-11
2-4	Peak Flows at Selected Locations	2-34
2-5	Projected Deposition with Dam in Place	2-38
2-6	Approximate Quantity of Materials behind Matilija Dam	2-40
2-7	Avg Sediment Deposition by Reach for Without Project Conditions	2-44
2-8	Current & Equilibrium Sediment Delivery	2-45
2-9	Summary Baseline Conditions HEP Outputs	2-48
2-10	Potential Crop Damages	2-51
3-1	Required Downstream Flood Mitigation Measures	3-49
3-2	Summary of Sediment Delivery to the Ocean	3-50
3-3	Annual Water Volume Not Diverted at Foster Park	3-75
3-4	Summary of NED/NER Outputs	3-81
3-5	Summary of Environmental Quality Outputs	3-82
3-6	Summary of RED & OSE Outputs	3-83
3-7	Comparison of Environmental HEP Outputs	3-84
3-8	Economic Outputs	3-86
3-9	Cost Effectiveness Analysis	3-87
4-1	Downstream Flood Mitigation Measures	4-8
4-2	Summary of Risk and Uncertainty Measures for Alternative 4b	4-16
4-3	Summary of Measures Included to Mitigate Induced Flooding	4-17
4-4	First Cost to Implement the Recommended Plan	4-38
4-5	OMRRR Costs	4-41
4-6	HEP Comparison of Baseline Conditions to Recommended Plan	4-42
4-7	Economic Analysis of Recommended Plan	4-44
4-8	Environmental Impacts & Mitigation Measures for Recommend Plan	4-46
4-9	Degree of Compliance with Environmental Requirements	4-50
5-1	Recommended Plan Cost Apportionment	5-3
5-2	OMRRR Costs	5-4
5-3	Milestone Schedule	5-7
5-4	Funding by Federal Fiscal Year	5-8

**APPENDICES (Under Three Separate Covers)**

- 1). Environmental Impact Statement/Environmental Impact Report
- 2). Technical Appendices:
  - Appendix A: Civil Design
  - Appendix B: Structural Evaluation
  - Appendix C: Geotechnical Report
  - Appendix E: Economics
  - Appendix F: Cost Estimates
  - Appendix G: Real Estate
- 3). Technical Appendix D: Hydrologic, Hydraulic and Sediment Transport Studies